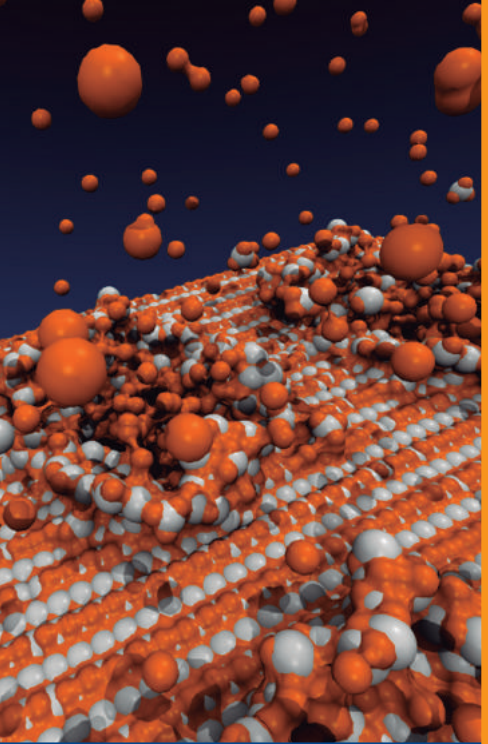
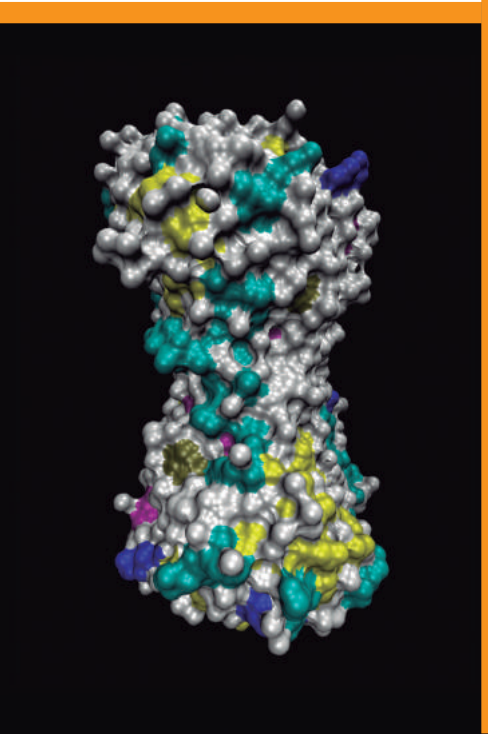
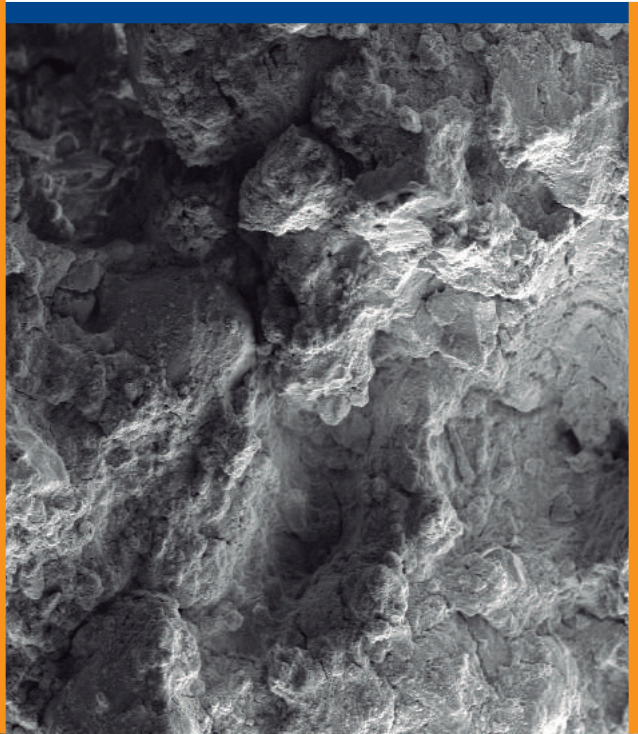


Engineering and Applied Sciences Doctorate





Pontificia Universidad
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Cali, Colombia

Engineering and Applied Sciences Doctorate

Program Description, Faculty and Research

Doctorado en Ingeniería y Ciencias Aplicadas

Descripción del Programa, Facultad e Investigación

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TOPICS

EN

The Engineering and Applied Sciences Doctorate program offered by the Javeriana University demonstrates the result of 45 years of systematic and rigorous work, during which, it has consolidated a robust academic community that is committed with the advance of the engineering field for the benefit of mankind.

The doctorate program has three significant virtues that give it a very special character: it promotes interdisciplinary work, implicitly and explicitly; it demonstrates in-depth knowledge of the problems facing society today, and our team's close ties other agents of change; and it is supported by an intellectually productive academic community that generates knowledge that is internationally referenced.

We expect our doctorate program to become a source for generating innovative solutions that will creatively and positively impact our country and region. It has been conceived as a node, immersed in a network of academic collaborators and peers around the world.

The Javeriana University in Cali has placed all of its human and infrastructural resources and experience nucleating and starting this doctoral program. It validates our continued commitment to excellence as a high-quality accredited educational institution and it represents a concrete act of social responsibility. We consider this program as a fundamental strategy to generate knowledge, a substantive function that every university has to fulfill in the procurement and betterment of life.

ES

El Doctorado en Ingeniería y Ciencias Aplicadas que la Universidad Javeriana Cali ofrece, es el producto de 45 años de trabajo sistemático y riguroso, durante los cuales ha consolidado una comunidad académica robusta y comprometida con el avance de la ingeniería para el beneficio de la humanidad, tal como se demuestra en el presente documento.

El doctorado que brindamos tiene tres virtudes muy significativas que le imprimen un carácter especial: promueve de manera implícita y explícita el trabajo interdisciplinar; demuestra una comprensión en profundidad de las problemáticas que aquejan a nuestra sociedad y genera un vínculo estrecho con los demás agentes que la influencian; y lo atiende una comunidad académica intelectualmente productiva en la generación de conocimiento referenciado internacionalmente.

Ofrecemos un doctorado que esperamos se convierta en una fuente de generación de soluciones innovadoras que impacten de manera creativa y positiva al país y la región. Ha sido concebido como un nodo inmerso en una red mundial de pares y colaboradores académicos.

La Pontificia Universidad Javeriana Cali ha puesto todos sus recursos humanos y de infraestructura y su experiencia, para la gestación y puesta en marcha de este doctorado. Es una apuesta como institución educativa acreditada de alta calidad y una acción concreta de responsabilidad social universitaria, pues consideramos como función sustantiva de toda universidad, el generar conocimiento en procura de una vida abundante y cada vez mejor.

Luis Felipe
Gómez-Restrepo, S.J.

Rector

Introduction to the Engineering and Applied Sciences Doctorate

TOPICS

EN

Denomination: Engineering and Applied Sciences Doctorate
Degree: Doctor in Engineering and Applied Sciences
Education level: graduate, doctorate level
Modality: full time
Qualified Registration (MEN): No. 17767 October 22nd, 2014
URL: http://www.doctoradoingenieria.javerianacali.edu.co
Cost: https://www.javerianacali.edu.co/programas/doctorado-en-ingenieria/costo-y-financiacion
Applications: all year round
Admissions: twice a year: January and June according to the availability of quotas.

ES

Denominación: Doctorado en Ingeniería y Ciencias Aplicadas
Grado: Doctor en Ingeniería y Ciencias Aplicadas
Nivel educativo: posgrado, nivel doctoral
Modalidad: tiempo completo
Registro calificado ante el Ministerio de Educación Nacional (MEN): No. 17767 Octubre 22, 2014
URL: http://www.doctoradoingenieria.javerianacali.edu.co
Costo: https://www.javerianacali.edu.co/programas/doctorado-en-ingenieria/costo-y-financiacion
Recepción de aplicaciones: durante todo el año
Admisiones: dos veces al año: enero y junio de acuerdo con la disponibilidad de cupos.

The Doctor of Engineering and Applied Sciences is the highest degree awarded in the engineering field. The mission of our Doctoral program is to create a culture of scholarship and high impact research that produces articulate professionals that are called upon to hold the highest leadership positions in society and academia.

Why does Colombia need Doctorates in Engineering and Applied Sciences?

World progress demonstrates that development and productivity have a direct relation with investment in intangible assets, also known as knowledge-based capital.

Economical growth studies for the European Union, developed Asian countries and the USA confirm that investment in knowledge-based capital is the mayor source of impact (between 20% and 27%) on the average growth of labor productivity.

The role of doctoral level education in sustaining any knowledge-based economy is critical and foundational. According to a 2013 report on Science, Technology and Industry from the Organization for Economic Cooperation and Development (OECD)[1] the graduation rate from doctoral programs increased for all but one of the member countries (33 in total), with the highest percent distribution in favor of engineering and science

El grado de Doctor en Ingeniería y Ciencias Aplicadas es el más alto grado otorgado en esta disciplina. La misión de nuestro programa de Doctorado en Ingeniería y Ciencias Aplicadas es crear una cultura de escolaridad e investigación de alto impacto para producir profesionales articulados que ocupen las posiciones de mayor liderazgo en Academia, industria, o Gobierno.

¿Por qué Colombia necesita Doctores en Ingeniería y Ciencias Aplicadas?

El progreso mundial demuestra que el desarrollo y la productividad tienen una relación directa con la inversión en activos intangibles, también conocidos como capital basado en conocimiento. Estudios de crecimiento para los países de la Unión Europea, los países desarrollados del Asia, y los Estados Unidos de América confirman que la inversión en capital basado en conocimiento es la mayor fuente de impacto (entre el 20%-27%) sobre el promedio de crecimiento de la labor productiva.

El rol de la educación a nivel doctoral en la sostenibilidad de una economía basada en el conocimiento es crítico y fundamental, ya que de acuerdo con el reporte para el año 2013 sobre Ciencia, Tecnología e Industria de la Organización para la Cooperación y el Desarrollo Económico (OECD por sus siglas en Inglés) la tasa de graduación de programas doctorales incremen-

degrees (40%). OECD opened accession discussions with Colombia in 2013, and a preliminary assessment indicates that to ensure sustainable and inclusive growth over the medium-term, Colombia must address three key challenges: adjusting to the commodity boom, boosting productivity growth and reducing income inequality. All of these challenges involve and target an increase in the knowledge-based assets, through higher-level education.

Colombia formed 16 doctors in engineering in 2013 (equivalent to 0.35 doctors per year, per million inhabitants), which in spite of the notable increase in support for students enrolled in foreign and national doctoral programs in the last decade, remains insufficient to attend to the national and regional needs. Our economy is still primarily based on commerce and exploitation of natural resources, and we are in dire need to shift it towards a value added economy. This constitutes a change of paradigm, a change that involves you.

tó para todos (menos uno) de sus países miembros (33 en total), con el mayor porcentaje de distribución a favor de los programas en Ingeniería y Ciencias naturales (40%). La OECD abrió discusiones de acceso con Colombia en el año 2013, y la valoración preliminar indica que, para asegurar sostenibilidad e incluso crecimiento en el mediano plazo, Colombia debe solucionar tres retos claves: ajustarse al BOOM de las mercancías, aumentar el crecimiento productivo y reducir la inequidad en ingresos; ya que todos estos retos involucrar un incremento en la base de activos basados en conocimiento, mediante la educación de alto nivel.

Colombia formó 16 doctores en ingeniería en el año 2013 (equivalente a 0.35 doctores por año, por millón de habitantes), cifra que aún considerando el notable incremento de apoyo financiero para estudiantes enrolados en programas doctorales extranjeros, es insuficiente para atender las necesidades regionales y nacionales; ya que nuestra economía aún se nutre principalmente del comercio y la explotación de recursos naturales, y se necesita de manera urgente convertirla en una economía de valor agregado, pues esto constituye un cambio de paradigma, un cambio que nos involucra a todos, incluyéndolo a usted.

Why should you choose our Engineering and Applied Sciences Doctoral program?

The Engineering and Applied Sciences program at the Pontificia Universidad Javeriana in Cali provides a unique and high-quality academic setting designed to stimulate this shift, because our program:

▪ Offers an academic and interdisciplinary research program that promotes knowledge discovery at the intersection between the traditional fields of engineering, natural sciences, and mathematics; all students prepare in at least two complementary fields, and they are mentored to solve open (currently impossible) problems using an interdisciplinary approach that incorporates theory and methods from both fields.

Harbors a group of close to 40 internationally recognized doctoral Faculty members in engineering, computer science, natural sciences, and mathematics, who contribute diversity, experience, competence and unique scientific research results. A Faculty team with highly visible intellectual production, as evidenced from an average of 50 yearly international citations (over the period between 2000-2013 in ISI Web of Knowledge) to their peer-reviewed scientific publications.

▪ Offers students the possibility of participating in groundbreaking research and contributing new fundamental or applied knowledge that is expected to significantly shape the future of engineering and technology, our nation's future, and our future as a race.

¿Por qué optar por nuestro programa de Doctorado en Ingeniería y Ciencias Aplicadas?

|El programa de Doctorado en Ingeniería y Ciencias Aplicadas de la Pontificia Universidad Javeriana Cali, proporciona un contexto único y de alta calidad académica diseñado para estimular el cambio paradigmático referido, porque:

▪ Ofrece un programa de estudio e investigación interdisciplinar que promueve el descubrimiento de conocimiento en la intersección de los campos tradicionales de la ingeniería, las ciencias naturales y las matemáticas. Sus estudiantes se preparan en al menos dos campos complementarios, y son orientados a resolver problemas abiertos considerados hoy como imposibles usando un enfoque que incorpora teoría, métodos y técnicas de dichos campos.

Alberga un grupo cercano a los 40 profesores con doctorado en Ingeniería, Ciencias de la Computación, Ciencias Naturales y Matemáticas, quienes contribuyen a la diversidad, experiencia, competencia y originalidad científica. Un equipo de Facultad con producción intelectual científica altamente visible y reconocida, nacional e internacionalmente, como se evidencia del promedio aproximado de 50 citaciones de nivel ISI (Web of Knowledge) por año (calculado para el periodo comprendido entre los años 2000-2013).

▪ Ofrece múltiples oportunidades y modalidades para la participación directa de estudiantes en proyectos financiados, a nivel nacional o internacional, habilitando soluciones a problemas del mundo real en ambientes co-

▪ This includes involvement in nationally and internationally funded research projects, directly in nationally and internationally funded research projects, enabling solutions to real-world problems within collaborative environments that involve Colombian and foreign investigators at top research centers around the world.

▪ The highly specialized peer networks established by our Faculty members provide essential pathways for our doctoral students to comply with the international research internship requirement (6 to 12 months) in a leading research center or academic institution abroad.

▪ Has more that 14 specialized laboratories with onsite technical support and the latest technological resources to attend coursework and research needs; a distributed library system with more than 14,000 titles in natural and applied sciences, and technology, and online access to 79 electronic databases (including full text ones); computer systems interconnected by a 1Gb/s Intranet, with access to Internet via a dedicated 160Mb/s channel, 95% Wi-Fi coverage, and an automatic connection to advanced networks (Internet2 and Geant2) through the **Red Nacional Académica de Tecnología Avanzada – RENATA.**

laborativos que involucran investigadores colombianos y extranjeros, quienes participan dentro y fuera del país. Las redes de pares especializados conformadas por los miembros de la Facultad, proporcionan espacios y caminos esenciales para el crecimiento de las capacidades investigativas y personales de nuestros estudiantes doctorales, y una ruta clara para cumplir con el requisito de su pasantía de investigación internacional en un centro científico de excelencia, reconocido internacionalmente (de 6 a 12 meses).

▪ Ofrece múltiples oportunidades y modalidades para la participación directa de estudiantes en proyectos financiados, a nivel nacional o internacional, habilitando soluciones a problemas del mundo real en ambientes colaborativos que involucran investigadores colombianos y extranjeros, participando dentro y fuera del país. Las redes de pares especializados conformadas por los miembros de la Facultad, proporcionan espacios y caminos esenciales para el crecimiento de las capacidades investigativas y personales de nuestros estudiantes doctorales, y una ruta clara para cumplir con el requisito de su pasantía de investigación internacional en un centro científico de excelencia, reconocido internacionalmente (de 6 a 12 meses).

▪ Alberga mas de 20 laboratorios especializados, equipados con recursos de última generación y con soporte técnico in-situ, para atender las necesidades permanentes de estudio e investigación; una biblioteca con más de 14.000 títulos en ciencias naturales y aplicadas, y tecnología, con

▪ It provides the necessary conditions and resources to stimulate intellectual growth within a healthy environment that includes a Student Welfare Center, the Loyola Sports Center, the Center for Cultural Expression, the San Francisco Javier Spiritual Guidance Center, a central cafeteria and satellite restaurants distributed around the grounds.

▪ Grants doctoral students with priority access to local supercomputer clusters, individual workstations, TIC platforms for online learning support, and other specialized resources, in addition to all the shared computational resources available on campus (including 1,009 computers, 65 iPads 2 and 30 Ultrabooks for mobile classes), among others.

The Engineering and Applied Sciences Doctorate program from the Pontificia Universidad Javeriana at Cali is meant for exceptional candidates that have an undergraduate or master's level degree in Engineering (or related field, including natural sciences, computer and computational sciences, and mathematics), who demonstrate outstanding academic (and professional) achievements in their corresponding fields, and verifiable interest and abilities for directed and independent scientific research.

The Pontificia Universidad Javeriana at Cali was granted High-Quality Institutional Accreditation for 8 years by the National Ministry of Education (Resolution No.2333 from March 6th, 2012); it is a University that provides 13 scholarship programs and financial aid to students that require it; a University with an Engineering Faculty and Sciences and Sciences and Sciences and Scien-

acceso en línea a 79 bases de datos de publicaciones científicas electrónicas (incluyendo de texto completo); sistemas de cómputo interconectados por una intranet de 1Gb/s, acceso a Internet vía canal dedicado de 160Mb/s, cubrimiento Wi-Fi del 95% del área del campus, y una conexión automática a redes de datos avanzadas (Internet2 y Geant2) a través de la **Red Nacional Académica de Tecnología Avanzada – RENATA.**

▪ Se encuentra en un campus universitario que ofrece las condiciones y recursos ideales para estimular el crecimiento intelectual, en un ambiente saludable y sostenible. Entre los recursos de bienestar, se encuentran el Centro de Bienestar Estudiantil, el Centro Deportivo Loyola, el Centro de Expresión Cultural, el Centro de Guía Espiritual San Francisco Javier, una cafetería central y restaurantes satélites distribuidos en el campus.

▪ Otorga a sus estudiantes acceso prioritario a los supercomputadores, proporciona estaciones de trabajo y de cómputo individuales, plataformas TIC de apoyo al proceso de aprendizaje, y otros recursos especializados, así como acceso a todos los recursos computacionales disponibles en el campus (incluyendo 1.009 computadores, 65 iPads 2 y 30 Ultrabooks para clases móviles), entre otros.

El programa de Doctorado en Ingeniería y Ciencias Aplicadas de la Pontificia Universidad Javeriana de Cali es para candidatos excepcionales con preparación de pregrado o maestría en Ingeniería (o campos afines, incluyendo

ces committed to excellence, permanent and critical self-evaluation and accreditation of its programs. Our Engineering Faculty and Sciences was the 1st ever to attain high-quality accreditation for one of its programs by the National Accreditation Council - CNA and is currently pursuing international accreditation by The United States Accreditation Board for Engineering and Technology (ABET). It comes as no surprise that our Doctoral program in Engineering and Applied Sciences was the first program approved by the National Ministry of Education to be

Ciencias Naturales, Ciencias de la Computación, y Matemáticas), quienes demuestren logros académicos (y profesionales) sobresalientes en sus campos correspondientes de actuación, así como habilidades específicas y un interés verificable hacia la investigación científica dirigida o autónoma.

La Pontificia Universidad Javeriana en Cali está acreditada institucionalmente por el Ministerio de Educación Nacional de Colombia (actualmente por 8 años, bajo la Resolución No. 2333 de marzo 6 de 2012); maneja 14 programas de becas y de ayuda financiera para sus estudiantes; es una institución comprometida con los procesos de autoevaluación y acreditación de alta calidad. En septiembre de 2016, los 4 programas de pregrado (Ingeniería Industrial, Civil, Electrónica y Ciencias de la Computación) obtuvieron acreditación internacional por parte de la ABET (Accreditation Board for Engineering and Technology) de los Estados Unidos lo que confirma que sus programas son suficientemente equivalentes a los programas acreditados en ese país. En consecuencia, este programa de Doctorado en Ingeniería y Ciencias Aplicadas se presenta como la primera alternativa privada en la región del suroccidente colombiano.

ABET | Engineering Technology Accreditation Commission

offered by any private university in the South West Colombian region.

How does our Research benefit you, as a student of the program or as a member of the industrial or commercial sectors?

An essential characteristic of any leading doctoral program is its ability to address solutions to open and critical problems through scientific research and development, and knowledge transfer to society.

Research and development is therefore the driving force in this program, and how we do it is what makes it so uniquely suited to drive positive and transformative change.
Top-caliber engineers and scientists in our doctoral program team lead breakthrough research that shifts paradigms, launches new fields, creates technologies, and benefits our society as a whole.

To maximize the benefit to our society, scientific and technical discoveries and inventions are transferred to the outside world, in the form of publications, patents, technology consulting, technological products and services, or start-up and spin-off companies (alone or in joint ventures). Our Faculty has demonstrated experience in all forms of knowledge transfer.

We want to invite the industrial and commercial sectors to join in the benefits of co-sponsoring our research programs or participating in active collaborations with our team of experts. We assure you that in the medium to long terms, this will make or save your company money or improve your productivity.

¿Cómo lo beneficia a usted nuestra investigación, como estudiante del programa o como miembro del sector industrial/empresarial?

Una característica esencial en cualquier programa líder de doctorado es su habilidad para identificar y proponer soluciones a problemas abiertos y críticos mediante la investigación y el desarrollo científico, y su consecuente transferencia de conocimiento a la sociedad. La investigación y el desarrollo tecnológico son la esencia de nuestro programa de Doctorado en Ingeniería y Ciencias Aplicadas, y la manera como las ejecutamos es lo que permitirá el cambio positivo y transformativo de nuestra sociedad.

Los ingenieros y científicos de nuestro programa doctoral lideran investigaciones que cambiarán paradigmas, lanzan nuevos campos de trabajo y crean tecnologías que benefician y continuarán beneficiando a nuestra sociedad. Para maximizar este beneficio, los descubrimientos científicos y tecnológicos se transfieren al mundo externo desde la Universidad, en la forma de publicaciones, patentes, consultoría técnica, productos y servicios tecnológicos, o mediante la creación de empresas escindidas o iniciadas de la actividad académica investigativa. Los profesores de nuestro programa doctoral, a quienes conocerá con mejor detalle en estas páginas, tienen experiencia demostrada en todas las formas de transferencia de conocimiento descritas.

Queremos invitar a los sectores de la industria y el comercio a vincularse a nuestro programa, mediante la cofinanciación de proyectos de investigación o desarrollo tecnológico, o la parti-

This catalog is meant to present a summary of what we do research on, why it is important, and how our results contribute to the different fields we engage on.

Figure 1 depicts the general research topics that are currently active within the Engineering and Applied Sciences Faculty members. You will find more details as you read the research profiles from our team of scientists herein, and we expect you will be able to identify topics that are aligned with your own interests.

Current projects by our Faculty members involve work on: renewable and clean energy generation and storage systems; nanoscale science and engineering; porous materials for sensing and sequestration of gas- and liquid-phase particles and molecules; equations of state for chemical and industrial thermodynamic processes; process characterization, optimization and control; growth and characterization of coatings and thin films; computer graphics in didactic and training environments; transportation logistics and route optimization; data mining using dynamic systems theory; infrared thermography for medical diagnosis and non-destructive industrial testing; characterization of earthquake resistant civil structures using frequency response functions; characterization and optimization of cementitiuous materials; first-principles based multiscale modeling and simulation for in-silico design of nano-devices, sensors and systems; cellular cycle control biology and its relation with the carcinogenic process; chemistry-free DNA sequencing systems; In-silico screening of protein-ligand complexes for drug development and treatment of congenital illnesses; high-performance manipulator and autonomous vehicle robotics; technology for the handicapped; celestial dynamics and quantum physics; among others. These projects have financial support from local, national, or in some cases international sources.

This document is not only meant to inform you, but to bring you closer to the possible solution of some of the critical engineering or technological problems you or your company may be facing. It does so, by providing you with the relevant topical points of contact and enabling an agile engagement environment within sponsored research collaborations between you and our program members. Typical collaborations range between 1-3 years, and must be driven by results. Sponsoring our research will not only benefit you and your company, but it will directly

Aquí se presenta de manera resumida y en un lenguaje común las áreas de investigación, el por qué son importantes, y cómo nuestro equipo de profesores ha contribuido a las mismas.

La Figura 1 muestra las líneas de investigación y desarrollo a cargo de nuestro cuerpo de profesores en la Facultad de Ingeniería y Ciencias. Podrá encontrar más detalles e identificar afinidades temáticas en los perfiles de investigación más adelante.

El registro actual de proyectos de investigación, a cargo de los profesores del programa, incluye trabajos en una variedad de áreas, entre otras: sistemas para la generación y almacenamiento de energía renovable y limpia; ciencia e ingeniería de nanoescala; materiales porosos para sensado y secuestrado de partículas y moléculas en diferentes fases; desarrollo de ecuaciones de estado para procesos termodinámicos químicos e industriales; caracterización, optimización y control de procesos; crecimiento y caracterización de películas delgadas (e.g. recubrimientos duros); computación gráfica en entornos didácticos y de entrenamiento; logística de transporte y optimización de rutas; minería de datos empleando teoría de sistemas dinámicos; termografía infrarroja digital para aplicaciones de diagnóstico médico y pruebas industriales no destructivas; caracterización de estructuras civiles sismorresistentes empleando funciones de respuesta en frecuencia; caracterización y optimización de materiales cementosos; modelado y simulación de primeros principios para el diseño “in silico” de nanodispositivos, sensores y sistemas; biología de sistemas de control del ciclo celular y su relación con el proceso carcinogénico; sistemas de secuenciación de ADN rápido y libre de química; prototipado y selección rápida de complejos proteína-ligando para el desarrollo de drogas para el tratamiento de enfermedades congénitas; vehículos autónomos y manipuladores robóticos de alto rendimiento; tecnologías de ayuda a los discapacitados; dinámica celeste; información y computación cuántica; los cuales tienen patrocinio financiero de fuentes locales, nacionales e internacionales.

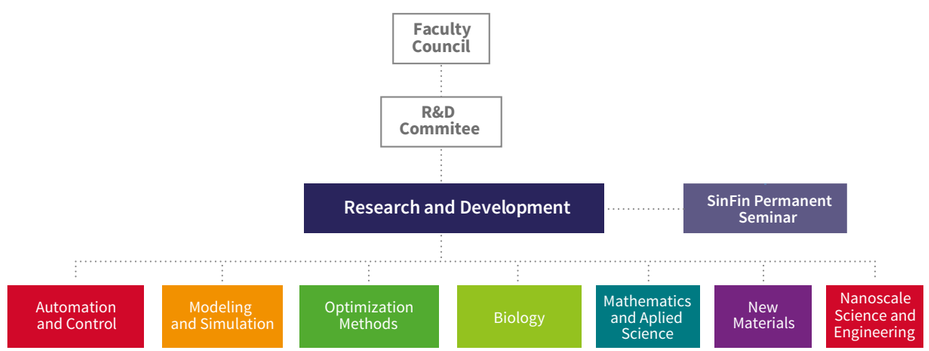

Figure. 1. Research areas associated to the Engineering and Applied Sciences Faculty members

support the pertinent activities associated and allocated to your project, leading to mutually beneficial results. This includes preparing the highly skilled labor that will become essential to you and your company's success in the near future. *For more information on how to engage in such projects and collaborations, please contact the appropriate Faculty member that pertains to your problem or the Doctoral Program Director.*

Este documento tiene la intención no solo de informarle, sino de acercarlo a la solución de sus problemas (o los de su empresa) en ingeniería o tecnología. Para ello le brinda los puntos de contacto relevantes y habilita un entorno de compromiso mutuo y ágil en colaboraciones co-patrocinadas, entre usted y miembros de nuestro programa. La duración típica de proyectos de esta naturaleza está entre 1 y 3 años, y debe ser orientada por los resultados. De tal manera, que su participación lo beneficie a usted y a su empresa, y lo lleve al desarrollo de beneficios compartidos que trascienden a nuestra sociedad. Se resalta el proceso de preparación del recurso humano altamente calificado que será fundamental para usted y para el éxito de su empresa en un futuro cercano.
Para más información sobre cómo patrocinar un proyecto de interés específico o una colaboración con nuestros profesores, por favor, contáctenos.

Doctoral program curriculum and requirements:

The Engineering and Applied Sciences Doctorate curriculum at the Pontificia Universidad Javeriana in Cali is designed to fit the individual background and research potential of each and every student admitted into the program. It offers a flexible, yet rigorous study plan that is custom designed to enable each student to attain the state of the art in two complementary fields of study, and to effectively contribute with new knowledge by combining theory, viewpoints and methods from both fields. Students are therefore required to think within their primary field of study and outside of it (i.e. through a complementary field of choice).

The cardinal directions in **Figure 2**, i.e. physical sciences, life sciences, earth sciences and mathematics or computer science (CS), depict the 4 choices for primary and complementary fields of study. Scientific computing (not to be confused with Computer Science, CS) will be a threading requirement for all students.

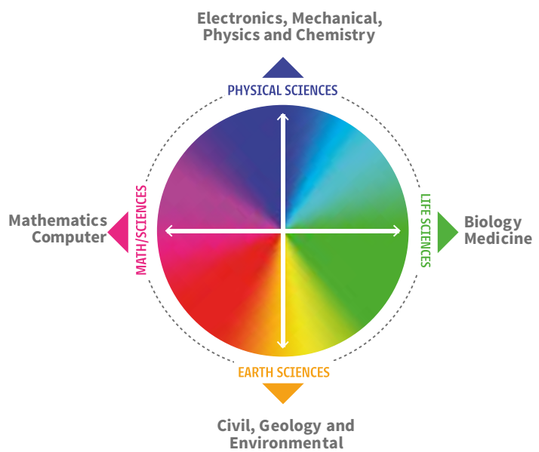

Figure. 2. Engineering and Applied Sciences Doctorate areas of study

Currículo y requisitos del programa:

El currículo del Doctorado en Ingeniería y Ciencias Aplicadas de la Pontificia Universidad Javeriana Cali está diseñado para encajar con el perfil individual y el potencial para la investigación científica de cada estudiante admitido.

El plan de estudios es riguroso pero flexible, diseñado a la medida de cada estudiante. Sin embargo, en lugar de buscar la profundización en el conocimiento de la disciplina tradicional, se promueve explícitamente que la exploración dinámica se dé entre las fronteras de las disciplinas tradicionales que conforman el grueso de la ingeniería. Para ello, en el transcurso de los primeros 44 créditos, todo estudiante debe declarar un eje de estudio primario y uno complementario, para alcanzar un conocimiento profundo en el estado del arte de ambas áreas de profundización.

La Figura 2 muestra los cuatros ejes e ilustra la combinación temática posible entre ellos (ciencias físicas, ciencias de la vida, ciencias de la tierra o matemáticas y ciencias de la computación). La computación científica (que no debe confundirse con ciencias de la computación) es un eje hilador requerido para todos los estudiantes. Esto permite que cada doctor formado contribuya, a través de su disertación doctoral, con nuevo conocimiento mediante la combinación de teoría, métodos y puntos de vista que complementan su disciplina tradicional.

Los estudiantes admitidos y registrados en el programa deben completar un plan de estudios de al menos 112 créditos, que debe ser consistente con su formación de base y con los ejes primario y secundario declarados en su aplicación para admisión. El plan de estudios tiene la

Registered students must complete a study plan of at least 112 academic credits that is consistent with their formal training background and with the primary and complementary fields of study declared in their application form. The plan has the following credit structure, distributed in fundamental and advanced coursework (40 credits), and scientific research activities (72 credits)[3] :

Initial credits include 44 credit:

- 12 credits in fundamental courses (4 in a MAT[3] level course, 4 in primary field of study, and 4 in a COM level course),
- 16 credits in disciplinary courses (8 in the primary and 8 in the complementary fields of study),
- 12 credits in directed projects within at least two[4] research rotations within the local research groups, at the end of which the student must have a thesis advisor.
- 4 credits in an elective course outside of the primary or complementary disciplines.

An academic Tutor will be assigned to every student upon admission and registration to the program. The Tutor will establish the coursework required for his/her pupil/s, until a Thesis advisor is named. Once a student has completed these 44 credits, he/she must pass an oral Competences Examination (CoE) to demonstrate his/her problem-solving skills within the primary and complementary fields of study. Having passed the CoE the student may opt to obtain a Master's degree in Engineering, if he/she does not wish to pursue the doctoral degree. Students that have successfully completed a Master's program from an accredited institu-tion, in Colombia or abroad, may apply and homologate up to 44 credits towards the doctoral degree in Engineering and Applied Sciences.

A Thesis advisor, named during or immediately after a student has completed the 12 credit research rotations, must then approve an additional 8 credits in advanced coursework for his/her advisee (known as the Advanced Study Plan - ASP), after which the oral Candidacy Exam (CaE) to evaluate the student's Thesis research plan must be passed. Students that successfully complete the CaE become Doctoral Candidates and must work towards completing an additional 60 credits of scientific research that will be known as the student's doctoral dissertation. The doctoral dissertation must be defended orally and evaluated by the student's doctoral committee in order to fulfill the program requirements, and subsequently obtain the title of Doctor in Engineering and Applied Sciences.

What should you expect as a student and graduate of this program?

The educational goals of this program must guarantee that its graduates: recognize the state of the art in their corresponding fields of study; plan, set forth and defend an original

siguiente estructura de créditos, distribuidos entre cursos fundamentales y avanzados (40 créditos) y las actividades de investigación científica (72 créditos).

Créditos Iniciales:

- 12 créditos en cursos fundamentales (4 en cursos MAT[3], 4 en eje de estudios primario y 4 en un curso COMP),
- 16 créditos en cursos disciplinares (8 en el eje de estudios primario y 8 en el secundario).
- 12 créditos en proyectos dirigidos dentro de al menos dos[4] rotaciones de investigación al interior de los grupos asociados con los profesores de planta del programa),
- 4 créditos en curso electivo, fuera de los ejes de estudio primario y secundario.

Un tutor académico será asignado para cada estudiante en el momento de su admisión y su consecuente registro. El tutor definirá el programa de estudios requerido para su pupilo hasta que se defina su director de tesis. Una vez el estudiante apruebe estos 44 créditos, debe presentar y pasar un examen oral, denominado examen de competencias (ECo), para demostrar sus habilidades en la solución de problemas dentro de los ejes de estudio primario y secundario. El ECo deberá ser definido por el Comité de Tesis Doctoral del estudiante, seleccionado por su director de tesis y aprobado por el director del Programa de Doctorado. Superado el ECo, el estudiante podrá optar por un título de Maestría en Ingeniería, si no desea continuar con sus estudios doctorales. Los estudiantes que hayan completado de manera exitosa un programa de maestría en una institución de educación acreditada, en Colombia o en el exterior, podrán homologar y convalidar hasta 44 créditos en cursos del programa de Doctorado en Ingeniería y Ciencias Aplicadas.

El director de tesis, nombrado durante o inmediatamente posterior a las rotaciones de investigación, deberá aprobar un plan avanzado de estudios (PAE) de 8 créditos. Cursados y aprobados los 8 créditos del PAE, el estudiante deberá preparar y presentar el Examen de Candidatura (ECa) para evaluar su propuesta de disertación doctoral; una vez apruebe el ECa se convierte en candidato doctoral, y debe trabajar el equivalente a 60 créditos adicionales en la investigación científica relacionada con su propuesta de disertación doctoral.
Al terminar la etapa de disertación, el candidato a doctor deberá defender de manera oral y pública su trabajo ante su Comité Doctoral.

¿Qué esperar como estudiante o profesional graduado de este programa?

Los objetivos educativos de este programa deben garantizar que sus graduados: reconozcan el estado del arte en sus correspondientes campos de estudio; planeen, propongan y defiendan la solución de una hipótesis original y novedosa de investigación y extiendan las fronteras del estado del arte; aporten soluciones

and novel research hypothesis and solution that goes beyond the corresponding state of the art; provide rigorous solutions based on the tools, skills and knowledge that defines their field of study; develop and implement research protocols that assure the conformity to existing standards in the field or contribute to the creation and acceptance of new standards; validate their hypothesis using technically sound methods; integrate view points, methodologies, theories and techniques from at least two complementary fields of study; make a significant theoretical and/or applied contribution, in depth or breadth, to their combined primary and complementary fields of study; prepare and present research proposals for external funding; communicate their scientific conjectures, discoveries and methodologies, orally or in written in Spanish and English, to an expert audience or to a layman one; identify the limitations of their contributions and the potential for at least two new areas of research within their fields, and one outside of it; and critically discuss and consider the ethical and moral implications of their work.

Graduates from this program will be empowered to make a difference, in roles such as: technology innovators; engineering research professors; scientists at international research centers; members of government agencies dedicated to strategic thinking on research and technology innovation policy; scientific consultants in engineering; or entrepreneurs capable of creating and directing new technology-based start-ups.

rigurosas basadas en las herramientas, habilidades y conocimientos que definen su campo de estudio; desarrollen e implementen protocolos de investigación que aseguren la conformidad a estándares existentes en el campo o contribuyan a la creación y aceptación de nuevos estándares; validen su hipótesis usando métodos técnicamente correctos; integren puntos de vista, metodologías, teorías y técnicas de al menos dos disciplinas de estudio complementarias; aporten contribuciones significativas de corte teórico o aplicado, en profundidad o amplitud, al conocimiento combinado de sus ejes de estudio primario y complementario; preparen y presenten propuestas de investigación para financiación externa; comuniquen sus conjeturas científicas, descubrimientos y metodologías, de manera oral o escrita, en español e inglés; identifiquen las limitaciones de sus contribuciones y el potencial de al menos dos nuevas áreas de investigación en su campo de trabajo, y una fuera del mismo; y que discutan y consideren de manera crítica las implicaciones éticas y morales de su trabajo.

Los graduandos de este programa serán empoderados para transformar como innovadores tecnológicos; profesores investigadores en ingeniería; científicos en centros de investigación internacionales; miembros de agencias gubernamentales dedicadas al pensamiento estratégico sobre la innovación en políticas públicas y privadas sobre investigación tecnológica; científicos consultores en ingeniería; o como emprendedores en empresas de base tecnológica.

FOR ADDITIONAL INFORMATION

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Civil and Industrial Engineering Department

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LIST OF PROFESSORS

Dr. Orlando Cundumí Sánchez

Research interests / Intereses de investigación

- Engineering design methodologies.
- Problem solving in multi-disciplinary teams.
- Products for the disabled.
- Product design.

EN Research Summary

Professor Cundumi works on passive and semiactive control system for structures. He has made significant contributions to the development of control devices and control algorithms.

ES Resumen del trabajo investigativo

El profesor Cundumi trabaja en sistemas de control pasivos y semiactivos para estructuras. Ha logrado contribuciones significativas en el desarrollo de equipos de control y algoritmos de control.

Recent publications
Publicaciones recientes

- Cundumi, O., Suárez, L. (2008) Application of a Variable Damping Semi Active Device for the Mitigation of the Seismic Response of Adjacent Structures. Computer-Aided Civil and Infrastructure Engineering 23, 291–308.

- Cundumi, O., Suárez, L. (2007) A New Variable Damping Semi-Active Device Seismic Response Reduction of Civil Structures. Journal of Mechanics of Materials and Structures, Vol. 2, No. 8.

- Cundumi, O., Suárez, L. (2007) Seismic Response Reduction of Stand-Alone and Coupled Structures Using a Variable Damping Device and Semi-Active Control Algorithm. Computational Methods in Structural Dynamics and Earthquake Engineering – COMPDYN, Rethymno, Crete, Greece, 13–16.

- Cundumi, O., Suárez, L. (2003) Simulación Numérica de la Respuesta Sísmica del Sistema Tridimensional Acoplado. Edificio-Rieles-Contrapeso de un Ascensor. Revista Internacional de Desastres Naturales, Accidentes e Infraestructura Civil, Vol. 3, Número 1.

Academic title
Título académico

Assistant Professor

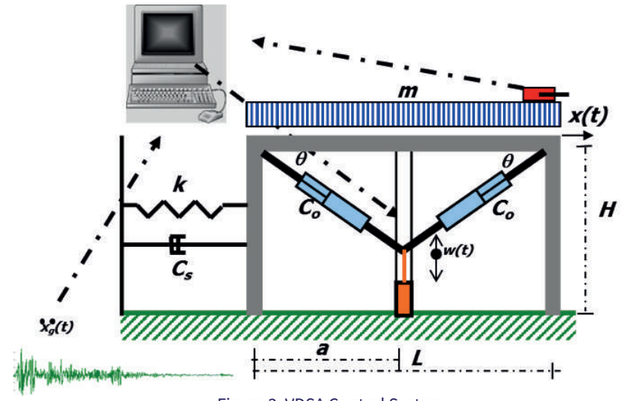

Figure 3. VDSA Control System

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Masters of Engineering (Civil Engineering), Civil Engineering undergraduate.

Education
Educación

▪ 2006: Doctor of Philosophy, Civil Engineering, Universidad de Puerto Rico, Mayagüez, Puerto Rico.

▪ 2003: Master of Science in Engineering, Civil Engineering, Universidad de Puerto Rico, Mayagüez, Puerto Rico.

▪ 1990: Bachelor of Science, Civil Engineering, Universidad del Valle, Cali, Colombia.

Professional experience
Experiencia Profesional

▪ 2016-Present: Professor, Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2011-2016: Specialist Structural Engineering, INGETEC S.A., Bogotá, Colombia.

▪ 2011-2016: Part Time Professor, Engineering Department, Pontificia Universidad Javeriana, Bogotá, Colombia.

▪ 2013-2015: Part Time Professor, Engineering Department, Universidad Santo Tomás de Aquino, Bogotá, Colombia.

▪ 2015-present: Visitant Professor, Master in Seismic Engineering, Engineering Department, Universidad del Quindío, Armenia, Colombia.

▪ 2006-2011: Director and Professor, Engineering Department, Universidad de Puerto Rico, Mayagüez, Puerto Rico.

▪ 2000-2005: Teaching fellow, Universidad de Puerto Rico, Mayagüez, Puerto Rico.

Honors and memberships
Honores y membresías

▪ Member Earthquake Engineering Research Institute (EERI), USA.

▪ Member Asociación de Ingeniería Sísmica de Colombia (AIS).

Current position
Posición actual

Engineering Faculty Dean

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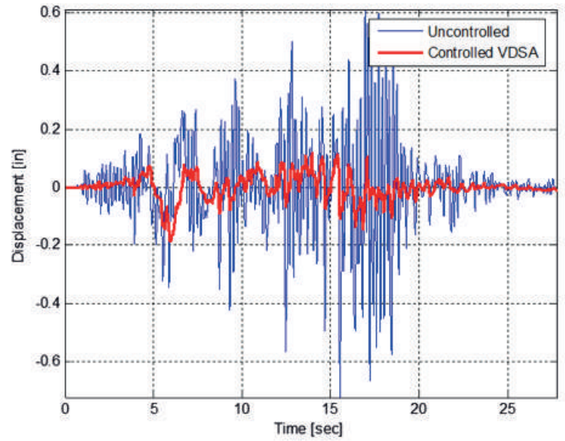

Figure 4. Displacement Record Last Floor - Structure Controlled with VDSA vs. Non-Controlled

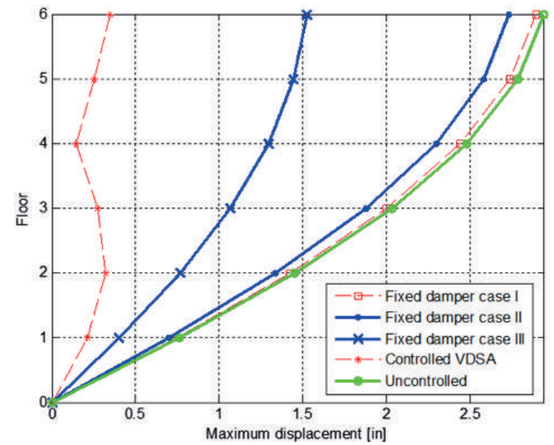

Figure 5. Maximum Displacement for each of the Control Systems

Dr. Olga Lucía Delgadillo Vargas

Research interests /
Intereses de investigación

- Natural language recognition
- Bioinformatics
- Recommendation systems

EN Research Summary

Professor Delgadillo studies the industrialization and transition from traditional to “modern” agriculture from the viewpoint of environmental concerns.

Environmental history added a fundamental question to the interrogation of past agricultural systems and their changing patterns: how sustainable were they and at what scales? ¿How sustainable are the agroecosystems as they confront the challenges of a deteriorating biophysical base, changing climate conditions and the imperative of the intensification of productive systems? What are the recent socio-ecological transitions and what are the implications in the regional territories? ¿How can the past agricultural systems provide a worthy lesson for the contemporary agricultural and energy policies? The approach used by professor Delgadillo is to recover the materiality of history by accounting for water, material, and energy circulation between social and natural systems.

The historical development of agriculture as a regional specificity is the result of an interaction between socioeconomic factors such as work, technology and land tenure, and natural factors such as climate, vegetation and the characteristics of the soil. In this order of ideas, this work tries to integrate the biophysical perspective into the traditional focuses of the agrarian history, until know largely ignored.

She is currently focusing her studies on the Valle del Cauca region, in Colombia.

ES Resumen del trabajo investigativo

La profesora Delgadillo estudia la industrialización y transición de la agricultura tradicional hacia la modernidad, desde la perspectiva de preocupaciones ambientales. La historia ambiental añadió una pregunta fundamental al interrogante de los sistemas agrícolas del pasado y sobre sus patrones de cambio: ¿Qué tan sostenibles eran y a qué escalas? ¿Qué tan sostenibles son los ecosistemas a medida que confrontan retos de deterioro en su base biofísica, cambios de condiciones climáticas y la imperativa intensificación de los sistemas productivos? ¿Cuáles son las transiciones socioecológicas y cuáles son las implicaciones para los territorios regionales?, ¿Cómo pueden los sistemas agriculturales pasados proporcionar lecciones dignas para la agricultura contemporánea y las políticas energéticas? El enfoque de la profesora Delgadillo es recuperar la materialidad de la historia, teniendo en cuenta la circulación de agua, material y energía entre los sistemas naturales y sociales. El desarrollo histórico de la agricultura como una especificidad regional es el resultado de una interacción entre factores socioeconómicos como el trabajo, la tecnología y la tenencia de tierra, y factores naturales como el clima, la vegetación y las características del suelo. En este orden de ideas, este trabajo busca integrar la perspectiva biofísica en los enfoques tradicionales de la historia agraria, hasta ahora ampliamente ignorados.

La profesora Delgadillo enfoca sus estudios actuales en la región del Valle del Cauca, en el suroccidente de Colombia.

Currently sponsored research
Investigación financiada en Curso

Socioecological metabolism of a interandean valley, the geographic valley of the Cauca river, Colombia.

The investigation seeks to understand the historical transformation of the landscape: the directing factors of change in the socio ecological metabolism and capacity of the territory to resist the agricultural development model imposed over the past 150 years, with a central role of sugar cane (grant: Javeriana, Bogotá). transformation of the landscape: the directing factors of change in the socio-ecological metabolism and capacity of the territory to resist the agricultural development model imposed over the past 150 years, with a central role of sugar cane (gran: Javeriana, Bogotá).

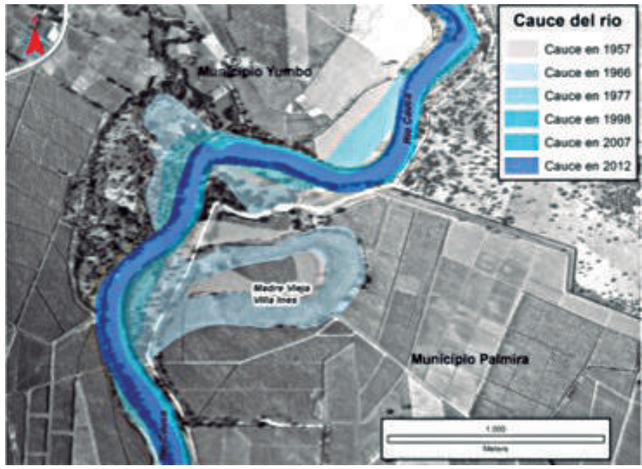

Figure 6. Madrevieja Villa Inés morphodynamics and neighboring areas (1957-2010).

Assembly on the photo FAL 2004, Flight 461, belt 32, photograph 128. Scale approximate 1: 31.300. The most complete cartography available allowed us to observe some changes between 1966 and 1998. The Cauca and Amaime rivers tended to carry out lateral displacements alternating to both margins, even making cuts of several meanders, until forming new madreviejas, especially the well-known Villa Inés, that with the time was dried up and at the moment is planted in sugar cane.

Recent publications
Publicaciones recientes

▪ Joan-Marull, Delgadillo-Vargas, Cattaneo-Claudio, La Rota-María José, Krausmann- Fridolin. Socioecological transition in the Cauca river valley, Colombia (1943–2010): towards an energy–landscape integrated analysis. Reg Environ Change (2018) 18: 1073. https://doi.org/10.1007/s10113-017-1128-2.

▪ Delgadillo-Vargas, O., Garcia-Ruiz, R., Forero-Álvarez, J., (2016). Fertilising techniques and nutrient balances in the agriculture industrialization transition: The case of sugarcane in the Cauca river valley (Colombia), 1943-2010. Agriculture, Ecosystems and Environment, 218, p.150-162.

▪ Valencia, V. H., Delgadillo, O. (2014). La memoria histórica en el corregimiento de Juanchito (Cali, Colombia): lo que recuerdan y olvidan sus gentes y lo que dice y no dice la historia oficial. En: Colombia, Nexus ISSN: 1900-9909 ed: Centro Editorial Universidad Del Valle v.16 fasc.NA p.2–20.

Academic title
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering undergraduate and graduate school, Social Sciences & Humanities School, Economic & Administrative Sciences School.

Education
Educación

▪ 2014: Doctor in Environmental and Rural Studies, Pontificia Universidad Javeriana, Bogotá, Colombia.

▪ 1997: Master's in Landscape Ecology Design and Management, Wye College, University of London, London, UK.

▪ 1995: Agronomist, Universidad del Tolima, Ibagué ,Colombia.

Professional experience
Experiencia Profesional

▪ 2001-Present: Pontificia Universidad Javeriana Cali, Colombia, Facultad de Ingeniería, Associate Professor Civil & Industrial Engineering Department, University Social Responsibility Projects Coordinator (2007-2009), Analysis and Development Assistant (2003–2006), University-Industry relations Coordina-tor (2001-2003).

▪ 2000: FES Fundación Social – Colciencias. Cali, Valle del Cauca, Colombia.Cuclí Cuclí–Pléyade Agreement: Encouraging and Development of Research in the Primary School in Colombia. Regional Coordinator (1999-2000).

▪ 1999: Center for Research on Sustainable Agricultural Production Systems – CIPAV. Professional - Technical Support Team on Sustainable Farming Systems and Management of Natural Resources in four areas of Chocó biogeographic region (Pacific coast of Colombia and Ecuador). WWF-Pacific Project.

▪ 1996: Artesanías de Colombia –FES Foundation, Cali, Valle del Cauca, Colombia. Program Coordinator for Sustainable Management of Natural Resources used in the manufacture of Handicrafts in Colombia.

Honors and memberships
Honores y membresías

Orden al Mérito Académico Javeriano, Pontificia Universidad Javeriana - Puj - Sede Bogotá - octubre de 2014. Mención honorífica por tesis meritoria, Pontificia Universidad Javeriana - Puj - Sede Bogotá - octubre de 2014.

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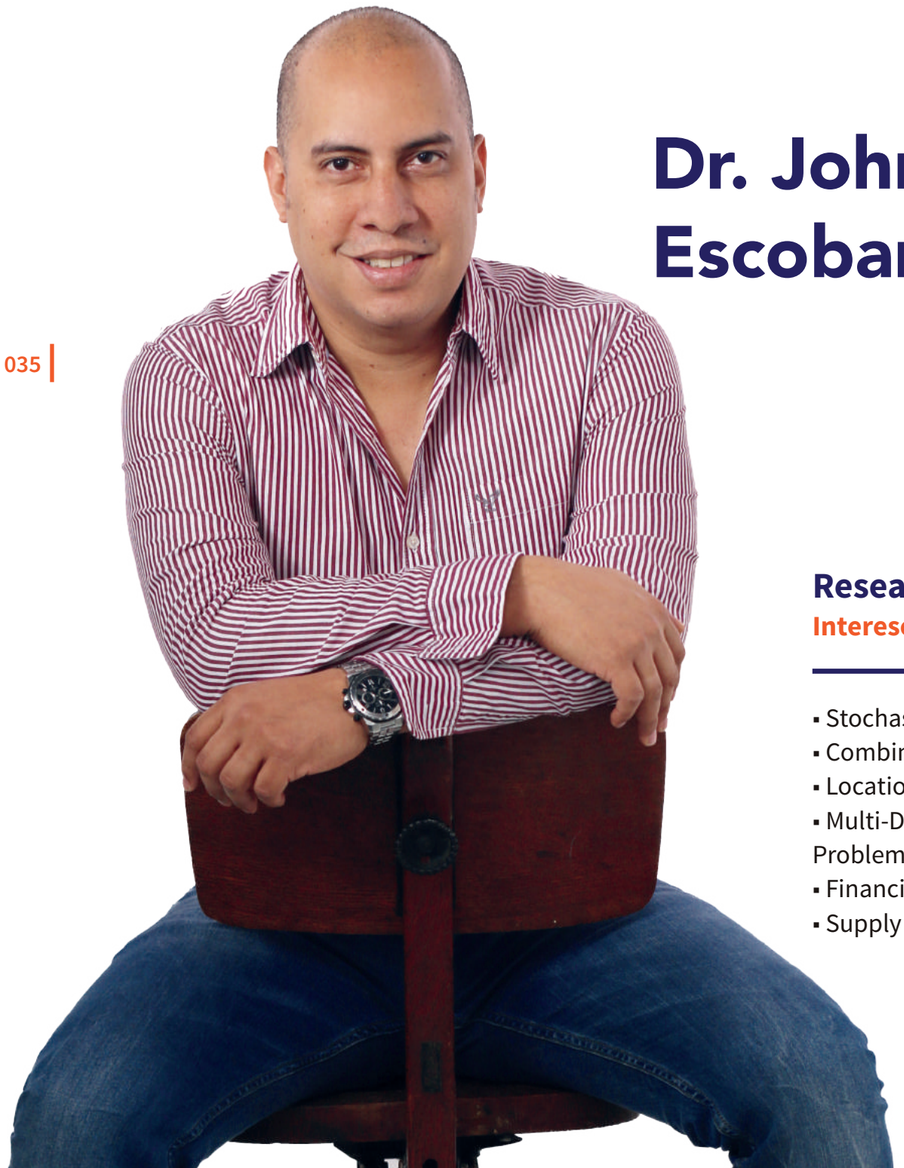

Dr. John Willmer Escobar Velásquez

Research interests / Intereses de investigación

- Stochastic Optimization
- Combinatorial Optimization
- Location-Routing Problems
- Multi-Depot Vehicle Routing Problems
- Financial Risk
- Supply Chain Optimization

EN Research Summary

Professor Escobar holds a joint appointment in Operations Research (Optimization and Simulation) at the Pontificia Universidad Javeriana in Cali and the Universidad del Valle, also in Cali. His research interests include applied operations research, inventory control and warehousing science, transportation and facility location, stochastic optimization and dynamic optimization, and he seeks applications in warehousing, transportation, and distribution networks. Currently, Professor Escobar is working on location-routing and multi-depot vehicle routing problems.

ES Resumen del trabajo investigativo

El profesor Escobar tiene un nombramiento conjunto en Investigación de Operaciones (Optimización y Simulación) en la Pontificia Universidad Javeriana y la Universidad del Valle.
Sus intereses de investigación incluyen investigación de operaciones aplicada, control de inventarios y ciencia de almacenamiento, logística de transporte y localización de recursos, optimización estocástica y dinámica. Aplica los métodos de optimización en problemas de almacenamiento, transporte y redes de distribución. Actualmente, el profesor Escobar trabaja en problemas asociados con la planeación de rutas de localización y en de vehículos en múltiples depósitos.

Currently sponsored research
Investigación financiada en Curso

- Modeling and solution to vehicular routing problems integrated to localization, merchandize loads, and inventory control under real industrial constraints. (Funded by Universidad Javeriana Cali, and Uniandes).

- Electrical vehicles routing optimization and recharging station localization. (Funded by Colciencias).

- Quantitative tools based on heuristic algorithms and mathematical programming techniques for dynamic localization and delivery of medical emergency vehicules (funded by Pontificia Universidad Javeriana Cali and Bogota).

- Deployment of Emergency Medical Vehicles: Assignment, Location and Dynamic Relocation Models. (Research in progress).
Improving health care through TICs (Colciencias, started 2014).

Recent publications
Publicaciones recientes

▪ Santa J.J., Escobar J.W., Granada M., (2016). A multi-objective Pareto ant colony algorithm for the Multi-Depot Vehicle Routing problem with Backhauls. International Journal of Industrial Engineering Computations, 7(1), pp. 35 – 48. ISSN: 1923-2934.

▪ Bolaños, R. I, Granada M., Escobar J.W., (2015). A multiobjective non-dominated sorting genetic algorithm (NSGA-II) for the Multiple Traveling Salesman Problem. Decision Science Letters, 4(4), pp. 559 – 568. ISSN: 1929-5804.

▪ Paz J.C., Orozco J.A., Salinas J.M., Clavijo-Buritica N., Escobar J.W., (2015). Redesign of a supply network by considering stochastic demand. International Journal of Industrial Engineering Computations, 6(4), pp. 521 – 538 ISSN: 1923-2934.

▪ Escobar, J.W.; Linfati, R.; Baldoquin, M.G.; Toth, P. (2014). A Granular Variable Tabu Neighborhood Search for the capacitated location-routing problem. Transportation Research Part B, 67(C), p. 344.

▪ Escobar, J.W.; Linfati, R.; Toth, P.; Baldoquin, M.G.; (2014). A hybrid Granular Tabu Search algorithm for the Multi-Depot Vehicle Routing Problem. Journal of Heuristics, 20(5), p.483 – 509.

Academic title
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Engineering (Industrial Engineering), Bachelor in Industrial Engineering, and Operations Management and Modeling Group (MGO).

Education
Educación

▪ 2013: Ph.D. in Operations Research, University of Bologna, Bologna, Italy

▪ 2008: Master of Science in Industrial Engineering, Universidad del Valle, Cali, Colombia.

▪ 2008: Postgraduate Studies in Finance, Universidad del Valle, Cali, Colombia

▪ 2002: Bachelor of Science in Industrial Engineering, Universidad del Valle, Cali, Colombia.

▪ 2007 – Present: Associate Appointed Professor, Pontificia Universidad Javeriana Cali, Colombia.

▪ 2006 – Present: Part-time Professor, Universidad del Valle, Cali, Colombia.

▪ 2014: Visiting Professor, Engineering and Applied Sciences Doctorate Program, Universidad Tecnológica de Pereira, Colombia.

Professional experience
Experiencia Profesional

▪ 2007 – Present: Associate Appointed Professor, Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2006 – Present: Part-time Professor, Universidad del Valle, Cali, Colombia.

▪ 2014: Visiting Professor, Engineering and Applied Sciences Doctorate Program, Universidad Tecnológica de Pereira, Pereira, Colombia.

Honors and memberships
Honores y membresías

Best in Session Award. Outstanding Research, Global Conference on Business and Finance, San Jose, Costa Rica, May 2012. Scholarship for studying a PhD in Germany given by DAAD Institute (Deutscher Akademischer Austausch Dienst); 3 Years scholarship for PhD studies given by Ministero Istruzione, Università e Ricerca, Italy; 2 Years scholarship for MSc studies given by Universidad del Valle, Colombia; 1 Year scholarship for Postgraduate studies in Finance given by Universidad del Valle, Colombia; Member of Institute for Operations Research and the Management Sciences (INFORMS) since 2010; Member of Working Group on Vehicle Routing and Logistics Optimization (VeRoLog) EURO since 2011; Member of Association of European Operational Research Societies (EURO) since 2012; Member of the board of directors of Sociedad Colombiana de Investigación de Operaciones (ASOCIO) since 2014.

Figure 7. Prof. Escobar iteaching Operations Research to a group of professionals

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Información de contacto

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Engineering Building, No. 2-66

Dr. Jorge Francisco Estela Uribe

Research interests /
Intereses de investigación

- Stochastic Optimization
- Combinatorial Optimization
- Location-Routing Problems
- Multi-Depot Vehicle Routing Problems
- Financial Risk
- Supply Chain Optimization

EN Research Summary

Professor Estela's research involves developing accurate equations of state (EOS) for technical applications in the chemical and process industries, particularly, for polar fluids, such as alcohols, carboxylic acids, amines, refrigerants, and mixtures of those fluids.

This entails, the development of shape-factor models for use in extended corresponding states models (ECS) based on a reference EOS, and the development of Helmholtz plus association models for polar fluids. High accuracy reference data and state-of-the-art optimization algorithms are applied in the EOS development.

The significance of this work stems from obtaining accurate mathematical representations of the thermodynamic surfaces (i.e. EOS), which in turn enable the systematic calculation of thermodynamic properties of interest for practical applications in the chemical and process industries, e.g. model-based process control and simulation.

ES Resumen del trabajo investigativo

El profesor Estela trabaja en el desarrollo de ecuaciones de estados precisas para aplicaciones técnicas en la industria química y de procesos, particularmente, para fluidos polares, como alcoholes, ácidos carboxílicos, aminas, refrigerantes, y mezclas de estos fluidos.

Esto implica, el desarrollo de modelos de factor de forma para uso en modelos de estados correspondientes extendidos (ECS) basados en ecuaciones de estado de referencia, y el desarrollo de modelos de Helmholtz y de asociación para fluidos polares. Datos de referencia de alta precisión y algoritmos de optimización en el estado del arte son aplicados en el desarrollo de las ecuaciones de estado.

La significancia de este trabajo surge de la obtención de representaciones matemáticas precisas de las superficies termodinámicas, que a su turno habilitan el cálculo sistemático de las propiedades termodinámicas de interés para aplicaciones prácticas en la industria química y de procesos, e.g. para el control o la simulación de procesos basados en modelos.

Recent publications
Publicaciones recientes

▪ Estela-Uribe, J. F., (2014). Helmholtz energy and extended corresponding states model for the prediction of thermodynamic properties of mixtures of refrigerants. Fluid Phase Equilibria, Volume: 378, p.60-72.

▪ Estela-Uribe, J. F., (2014). Helmholtz energy and extended corresponding states model for the prediction of thermodynamic properties of refrigerants. Fluid Phase Equilibria, Volume: 369, p.13-32.

▪ Estela-Uribe, J. F., (2013). An improved Helmholtz energy model for non-polar fluids and their mixtures. Part 3: Application to natural gases and related systems. Fluid Phase Equilibria, Volume: 356, p.229-245.

▪ Estela-Uribe, J. F., (2013). An improved Helmholtz energy model for non-polar fluids and their mixtures. Part 2: Application to mixtures of non-polar fluids. Fluid Phase Equilibria, Volume: 354, p.326-343.

▪ Estela-Uribe, J. F., (2013). An improved Helmholtz energy model for non-polar fluids and their mixtures. Part 1: Application to non-polar pure fluids. Fluid Phase Equilibria, Volume: 350, p.1-12.

Estela-Uribe, J. F., (2013). Fluids and their mixtures. Part 3: Application to natural gases and related systems. Fluid Phase Equilibria, Volume: 356, p.229-245.

▪ Estela-Uribe, J. F., (2013). An improved Helmholtz energy model for non-polar fluids and their mixtures. Part 2: Application to mixtures of non-polar fluids. Fluid Phase Equilibria, Volume: 354, p.326-343 .

▪ Estela-Uribe, J. F., (2013). An improved Helmholtz energy model for non-polar fluids and their mixtures. Part 1: Application to non-polar pure fluids. Fluid Phase Equilibria, Volume: 350, p.1-12.

Academic title
Título académico

Full time Professor

Current Position
Posición actual

Civil and industrial engineering department director.

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Engineering, Industrial Engineering, and Clean Production Group (PML).

Education
Educación

▪ 1999: Ph.D., Imperial College Of Science Technology and Medicine, London, UK.

▪ 1991: Specialization in Finance, Universidad del Valle, Cali, Colombia.

▪ 1983: Bachelor of Science in Chemical Engineering, Universidad del Valle, Cali, Colombia.

Professional experience
Experiencia Profesional

1987-Present: Pontificia Universidad Javeriana, Cali, Colombia.

Honors and memberships
Honores y membresías

Professional Council of Chemical Engineering (Colombia), Biennal Research Award from the Pontificia Universidad Javeriana (2013), Silver Medal recognition for 15 years of service at the Pontificia Universidad Javeriana (2007), Outstanding Alum-nus from the School of Engineering at the Universidad del Valle in Cali, Colombia; Committee of Vice-Chancellors and Principals of the Universities of the United Kingdom Scholarship (1997-1999), Colfuturo scholar (1995-1998).

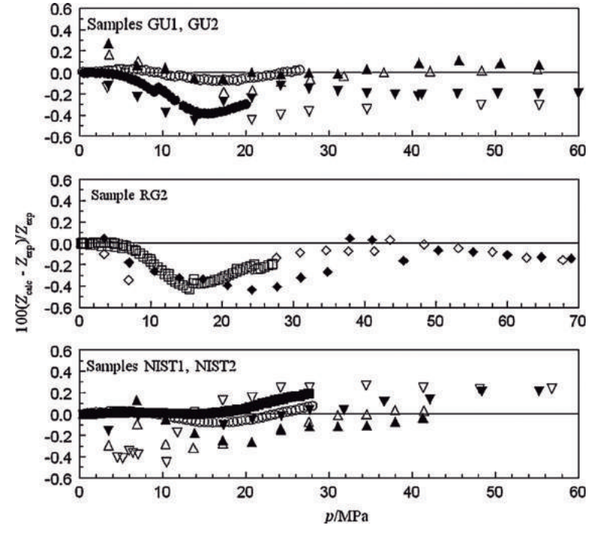

Figure 8. Percentage deviations between experimental compression factors of natural gases from the Groupe Européen de Recherches Gazières (GERG TM 7)

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Dr. María Fernanda García Aladín

Research interests /
Intereses de investigación

- Road security
- Structural modeling of pavement
- Modeling and Characterization of anisotropic materials

EN Research Summary

Professor Garcia's research involves characterization, planning and execution of plans to reduce and prevent public roads and highway security risks. This entails evaluation of structural and environmental risks, as well as transportation security. She is also involved in route planning and design methods for massive transportation systems, including the Integrated System of Mass Transport, from Metrocali, in Cali, Colombia, and an expert in rigid pavements and asphaltic mixtures.

ES Resumen del trabajo investigativo

La profesora García trabaja en el área de seguridad vial. Su investigación se centra en el modelado y análisis de la infraestructura y su equipamiento, el comportamiento humano (conductor, peatón y pasajero) y el desempeño de los vehículos (incluyendo motos y bicicletas). Esto incluye estudios de caracterización en el entorno urbano y rural, el ajuste de parámetros de medición del riesgo y la realización de mapas de riesgo de seguridad vial, la caracterización de materiales para la construcción de la infraestructura y la modelación estructural de los pavimentos y sus mecanismos de deterioro, la influencia de la infraestructura en el comportamiento de los usuarios y en el desempeño del vehículo y el estudio de patologías de la infraestructura que puedan desencadenar riesgo de accidentes.

Currently sponsored research
Investigación financiada en Curso

- Structural modeling of guadua
- Structural modeling of pavemen
- Road security
- Pavements for transit
- Modeling and Characterization of anisotropic materials

Recent publications
Publicaciones recientes

▪ García Aladín, M.F., García, H., Mosquera, J.M., and García, J.J. (2014). The importance of shear in the deflection of bamboo beams. Key Engineering Materials Vol. 600 with the title Non-Conventional Materials and Technologies for Sustainable Engineering. p.87–96.

▪ García Aladín, M.F., García, H., Mosquera, J.M., and García, J.J. (2013). Validity of a transversely isotropic model to represent the anisotropy of Guadua angustilia kunth. 14th International Conference on Non-Conventional Materials and Technologies (14th NOCMAT). João Pessoa.

▪ Calvo Isaza, F.S., Villegas Giraldo, A., García Aladín, M.F. (2011). Estudio de espacios de estacionamiento para la Pontificia Universidad Javeriana Cali. 10° Congreso Colombiano de Ingeniería de Tránsito y Transporte. Medellín.

▪ López, D., García Aladín, M.F. (2011). Estudio de movilidad peatonal y propuesta fun-cional para invidentes en la Pontificia Universidad Javeriana Cali. 10° Congreso Colombiano de Ingeniería de Tránsito y Transporte. Medellín.

▪ Reyes, J.E., Rojas, H.A., Soto, M.C., Gacría Aladín, M.F. (2011). Caracterización de la infraestructura y medición de tiempos de recorrido en las comunas 18, 19 y 20 de la ciudad de Cali para el SITM MIO. 10° Congreso Colombiano de Ingeniería de Tránsito y Transporte. Medellín.

Academic title
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate (2016), Master's of Engineering (Civil Engineering), Bachelor in Civil Engineering, and Seismic Engineering, and Materials and Transportation Research Group.

Education
Educación

▪ 2016: Doctor in Engineering, Materials Engineering, Universidad del Valle, Cali, Colombia.

▪ 2003: Master's in Terrestrial Road Engineering, Universidad del Cauca, Popayán, Colombia.

▪ 2001: Especialist in Terrestrial Roads Engineering, Universidad del Cauca, Popayán, Colombia.

▪ 1997: Bachelor in Civil Engineering, Universidad del Cauca, Popayán, Colombia.

Professional experience
Experiencia Profesional

▪ 2002-Present: Professor, Pontificia Universidad Javeriana Cali, Colombia.

▪ 2006-Present: Invited Professor, Universidad Autónoma Juan Misael Saracho, Science and Technology Faculty.

▪ 1999-2001: Interventor, Fondo Nacional de Caminos Vecinales, Presidencia de la República, Bogotá, Colombia.

▪ 1998: Budget and Construction Control Engineer, Hacienda Santa Bárbara S.A., Palmira, Colombia.

▪ 1996-1997: Credit and Commercial Coordinator, Arkus S.A., Cali, Colombia.

▪ 1993-1996: Quality Control Engineer, Concretos Premezclados S.A., Cali, Colombia

Honors and memberships
Honores y membresías

Recognition for teaching a human excellence by the Pontificia Universidad Javeriana, Cali (2011, 2010, 2009, 2006, 2004), and Academic excellence award from Master's program at the Universidad del Cauca.

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Dr. Adriana Gómez Gómez

Research interests /
Intereses de investigación

- Thin film characterization of mechanical properties
- Characterization of phases in composite materials
- Re-utilization of solid residues

EN Research Summary

Thin films are now pervasive in many applications, including electronic semiconductors, optical devices, and even household items, such as mirrors. They are used to change the surface properties of a substrate material with a thin coating. The properties of thin films depend on the deposition process parameters. Dr. Gómez's work focuses on the non-destructive characterization of the mechanical properties of thin films, by measuring residual stresses from X-ray diffraction (XRD). As opposed to the conventional film deflection techniques to measure the residual stresses in the material, this work uses XRD to determine gradient-based measurements without affecting the sample. Dr. Gómez's group also uses XRD techniques to analyze and characterize the different phases present in a composite material. Accurate characterization is essential for tuning the deposition process in optimizing the film properties. Dr. Gómez has been a pioneer in understanding the effects on mechanical response and morphology of multi-layered thin films and measuring residual stress gradients in thin films.

ES Resumen del trabajo investigativo

Las películas delgadas tienen un uso generalizado en aplicaciones que van desde materiales semiconductores y dispositivos ópticos, hasta ítems para la casa, como espejos. Son usados para cambiar mediante un recubrimiento delgado las propiedades superficiales de un material (sustrato). Las propiedades de las películas delgadas dependen no solo de los precursores químicos empleados sino también de los parámetros del proceso de deposición. La profesora Gómez investiga sobre métodos de caracterización no-destructivos para establecer las propiedades mecánicas en película delgadas. Su técnica principal se basa en la medición de esfuerzos residuales empleando difracción de rayos-X (XRD). A diferencia de las técnicas convencionales basadas en la deflexión para medir los esfuerzos residuales en el material, su trabajo usa XRD para determinar medidas por gradiente sin afectar la muestra. La doctora Gómez también emplea la técnica de XRD para analizar y caracterizar las diferentes fases presentes en materiales compuestos. La caracterización precisa de películas delgadas es esencial para optimizar los procesos de deposición y por ende las propiedades de la película resultante. También ha sido pionera en el estudio y la comprensión de los efectos mecánicos y la morfología en películas delgadas de múltiples capas y en el estudio de gradientes de esfuerzos residuales en recubrimientos duros.

Currently sponsored research
Investigación financiada en Curso

▪ Residual stress measurement in multilayer Cr/CrN thin films.

▪ Aluminum dross characterization formed during production of the AA6063 alloy of Alumina Corporation by the Rietveld Method.

▪ Characterization of aluminum slag generated during the production of AA6063 alloys at the company Alumina using the Rietveld method (grant: Javeriana).

Recent publications
Publicaciones recientes

▪ Arias Mateus, D. F., Gomez Gomez, A., Velez Restrepo, J. M., De Souza, R. M. (2015) A mechanical and tribological study of Cr/CrN multilayer coatings. Países Bajos, Materials Chemistry and Physics, ISSN: 0254-0584, Ed.: Elsevier, v.160 fasc. N/A p.131 - 140.

▪ Escobar Rincón, D., Ospina, R., Gómez Gómez, A., Restrepo Parra, E. (2015) Micros-tructure, residual stress and hardness study of nanocrystalline titanium-zirco-nium nitride films. Ceramics International, 41, p.947-952.

▪ Escobar Rincón, D., Ospina, R., Gómez Gómez, A., Restrepo Parra, E., Arango, P.J. (2014) X-ray microstructural analysis os nanocrystalline Ti-ZrN thin films by diffrac-tion pattern modeling. Materials Characterization, 88, p.119-126.

▪ Mady, C.E., Rodríguez, S.A., Gómez Gómez, A., Martins De Souza, R. (2012) Numerical analysis of different methods to calculate residual stresses in thin films based on instrumented indentation data. Journal of Materials Research, 27, p.1732 - 1741.

▪ Gómez Gómez, A., Candido Recco, A.A., Batista De Lima, N., Gallego Martinez, L., Tschiptschin, A.P., Martins De Souza, R. (2010) Residual stresses in titanium nitride thin films obtained with step variation of substrate bias voltage during depo-sition. Surface &Amp; Coatings Technology, Elsevier, 204(20), p.3228 – 3233.

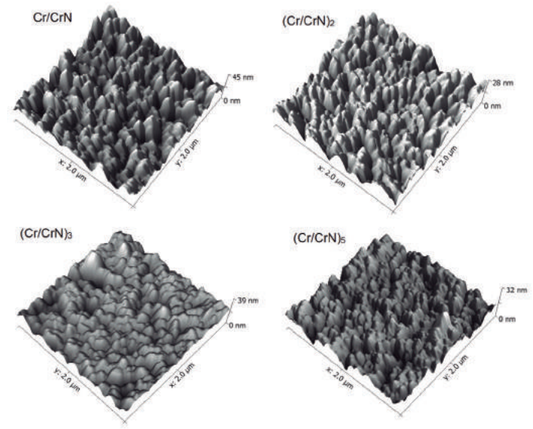

Figure 11. Morphological effect of multiple layers on the grain size of Cr/CrN thin films

Academic title
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Bachelors in Industrial Engineering, and Seismic Engineering, Materials and Transportation research group (SIGMA).

Education
Educación

▪ 2006: Doctor in Metallurgical Engineering, Escola Politécnica, Universidade de Sao Paulo, Sao Paulo, Brazil.

▪ 2000: Bachelor in Mechanical Engineering, Universidad Nacional de Colombia, Medellín, Colombia.

Professional experience
Experiencia Profesional

▪ 2010-Present. Pontificia Universidad Javeriana, Cali-Colombia.

▪ 2010. Post-doctoral fellow, Surface Phenomena Laboratory, Universidade de Sao Paulo, Sao Paulo, Brazil.

▪ 1999. Engineering Assistant. Industrias HRV, Ltda, Medellín-Colombia.

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Dr. Juan Carlos Herrera Sánchez

Research interests / Intereses de investigación

- Structural Dynamics
- Nonlinear Dynamic and Static Analysis
- Finite Element Analysis
- Wavelet Analysis
Performance-Based Earthquake Engineering
- Seismic Structural Control

EN Research Summary

Professor Herrera's research interests include dynamic response of buildings, structural earthquake engineering, pushover analysis of reinforced concrete buildings, non-linear time history analysis of structures. His research is focused on global methods for structural damage identification based on the Frequency Response Function – FRF. Professor Herrera also uses Wavelet Transform to analyze seismic ground motions, as part of his work on Structural Earthquake Engineering. His contributions to the field include new indices for structural damage identification.

ES Resumen del trabajo investigativo

Los intereses de investigación del profesor Herrera incluyen la respuesta diná mica de los edificios, ingeniería sísmica estructural, análisis de empuje lateral de edificios de concreto reforzado y análisis cronológico no lineal de estructuras. Su investigación se enfoca en métodos globales para la identificación de daño estructural basados en la Función de Respuesta en Frecuencia (FRF). También utiliza la Transformada Wavelet para el análisis de movimientos sísmicos, como parte de su trabajo en ingeniería sísmica estructural. Entre sus contribuciones al campo se encuentran nuevos índices para la identificación de daño estructural.

Currently sponsored research
Investigación financiada en Curso

Structural Damage Indices based on the FRF.

Recent publications
Publicaciones recientes

▪ Herrera, J.C. (2014) Damage Identification of Structures: As-sessment of the Struc tural condition based on dynamic characteristics, ISBN 978-3-8484-9685-3 Lambert Academic Publishing, Saarbrücken, Germany.

▪ Herrera, J.C. (2013) Structural Damage Indices based on the FRF-Curvature (In Spa nish), Proceedings of the Congress on numerical methods in engineering, ISBN 978-84-941531-4-3, CIMNE, Bilbao, Spain.

▪ Herrera, J. C. (2012) Application of the frequency response function energy for frame damage identification (In Spanish), Proceedings of the XXXV Jornadas Suramericanas de Engenharia Estrutural, Brazil.

▪ Herrera, J. C. (2011) Métodos matriciales para ingenieros con MATLAB, 1a Edición, Sello Editorial Javeriano, ISBN 978-958-8347-52-3, Cali.

Academic title
Título académico

Associate Professor

Education
Educación

▪ 2006: Doctor of Philosophy, Civil Engineering, Universidad de Puerto Rico, Maya-güez, Puerto Rico.

▪ 2004: Master of Engineering, Civil Engineering, Universidad de Puerto Rico, Mayagüez, Puerto Rico.

▪ 1997: Specialist, Structural Engineering, Universidad del Valle, Cali, Colombia.

▪ 1991: Master of Science, Traffic and Transportation Engi-neering, Universidad del Cauca, Popayán, Colombia.

▪ 1988: Bachelor of Science, Civil Engineering, Universidad del Valle, Cali, Colombia.

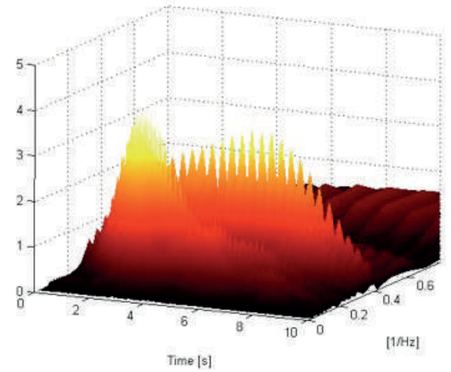

Figure 12. Wavelet Transform Coefficients-Seismic ground motion

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Masters of Civil Engineering, Civil Engineering undergraduate.

Professional experience
Experiencia Profesional

▪ 2007-Present: Pontificia Universidad Javeriana Cali, Colombia.

▪ 2006: Lecturer, Caribbean University of Puerto Rico, Mayagüez, Puerto Rico.

Honors and memberships
Honores y membresías

Member Earthquake Engineering Research Institute (EERI), USA.

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Información de contacto

(+572) 3218200 Ext. 8752

juancherrera@javerianacali.edu.co

Engineering Building, No. 2-59

Dr. Luis Fernando Mecea Mercado

Research interests / Intereses de investigación

- Transportation Demand Modeling and Planning
- Humanitarian Logistics
- Optimization Models of Transport Networks
- Transport Economics and Policies
- Transport Externalities
- Traffic Flow and Safety

EN Research Summary

Professor Macea studies the development of complex models based on operation research, statistics and econometric theory to understand and predict the behavior of users of transport systems, thus allowing its designing and management. He also uses optimization tools and numerical analysis to model transport networks attending to their flows requirements and constraints. Some of his main interests are focus on the economic aspects of transportation as government regulatory policies and the valuation of its negative external effects (congestion, accidents, air pollution, noise and spatial segregation). His current efforts are focused on developing humanitarian logistics models to perform risk analysis as well as to conduct economic evaluation of humanitarian aid operations. One of his most significant contributions to this research field was the design and coding of a vulnerability assessment model of transportation networks for the decision making in humanitarian logistics.

ES Resumen del trabajo investigativo

El profesor Macea estudia el desarrollo de modelos complejos basados en la investigación operativa, la estadística y la teoría econométrica para comprender y predecir el comportamiento de los usuarios de los sistemas de transporte, permitiendo así su diseño y gestión. También utiliza herramientas de optimización y análisis numérico para modelar redes de transporte atendiendo a sus requerimientos de flujos y restricciones. Algunos de sus principales intereses se centran en los aspectos económicos del transporte, como son las políticas reguladoras del gobierno y la valoración de sus efectos negativos (congestión, accidentalidad, contaminación del aire, ruido y segregación espacial). Sus esfuerzos actuales se centran en el desarrollo de modelos de logística humanitaria destinados al análisis de riesgos y a la evaluación económica de las operaciones de ayuda humanitaria. Una de sus contribuciones más significativas a este campo de investigación fue el diseño y codificación de un modelo de evaluación de la vulnerabilidad de las redes de transporte para la toma de decisiones en logística humanitaria.

Recent publications
Publicaciones recientes

▪ Márquez, L. G., Soto, J. J., y Macea, L. F. (2017). Value of a statistical life including systematic variations of users: New empirical evidence in Bogotá. Journal of Transport Economics and Policy, Under review.

▪ Soto, J., Márquez, L. y Macea, L. F. (2017). Modelación hibrida de la elección de estacionamiento en Colombia. Journal of Transportation Research part A. Under review.

▪ Cantillo, V., Macea, L.F., Holguín-Veras, J., Amaya, J. (2017). Assessing economic benefits and costs of humanitarian relief: discrete choice modeling approach. Production and Operations Management, Under review.

▪ Cantillo, Serrano, I., V., Macea, L.F., Holguin-Veras, J. (2017). Advanced econometric models for assessing deprivation costs in humanitarian relief operations. Socio-Economic Planning Sciences. Under review.

▪ Cantillo, V., Macea, L.F., Jaller, M. (2017). Assessing vulnerability of transportation networks for humanitarian relief operations. Networks and Spatial Economics. Under review.

Academic title
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Bachelor in Civil Engineering, Transport Research Group (TRANVÍA), and Operations Management and Modeling Group (MGO).

Education
Educación

▪ Pending 2017: Doctor in Civil Engineering, Transportation Engineering, Universidad del Norte, Barranquilla, Colombia.

▪ 2012: Master's in Civil Engineering, Transportation Engineering, Universidad del Norte, Barranquilla, Colombia.

▪ 2014: Bachelor of Science in Systems Engineering, Universidad de Córdoba, Montería, Colombia.

▪ 2007: Bachelor of Civil Engineering, Universidad de Cartagena, Cartagena, Colombia.

Professional experience
Experiencia Profesional

▪ 2016-Present: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2013-2016: Universidad del Norte, Barranquilla, Colombia.

▪ 2013: Universidad de Sucre, Sincelejo, Colombia.

Honors and memberships
Honores y membresías

Graduate with honors (2007), Civil Engineering Program, Universidad de Cartagena, Cartagena, Colombia.

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Engineering Building, No. 2-30

Dr. Daniel Morillo Torres

Research interests /
Intereses de investigación

- Scheduling problems
- Combinatorial Optimization
- Metaheuristic Algorithms
- Mixed-Integer Linear Programming
- Artificial intelligence
- Multi-objective optimization

EN Research Summary

Professor Morillo has worked in the last years on the optimization of scheduling problems. They consist, in a general way, of determining the optimal allocation of resources to dif- ferent activities that make up a project to achieve a specific objective. For instance, the minimization of the total duration of the project. The activities are subject to resource consumption restrictions and precedence relationships. To solve this problem, Professor Mo- rillo proposed a hybrid Branch and Bound algorithm that includes various heuristic rules to bound the search space. Later, he proposed a genetic algorithm whose main contribution was a new mutation operator. In addition, this research studied the effect of an unwanted phenomenon in the search called the generation of redundant solutions and demonstrated how the mutation operator can be used to combat it. Afterwards, he proposed an extension to the multimodal resource-constrained project scheduling problem, which included two ma- jor contributions: first, a component of energy consumption was included in the activities; and second, a new objective function was proposed, which considered both the minimization of project time and the minimization of energy consumption, but without establishing a multiobjective criterion. Additionally, a library of test problems was proposed to evaluate future solution methods. Finally, Professor Morillo proposed a new evolutionary algorithm that improves the search by focusing on generating neighbourhoods of solutions based on the activity execution modes.

ES Resumen del trabajo investigativo

El profesor Morillo ha trabajado en los últimos años en la optimización de problemas de secuenciación de actividades (scheduling problems). Estos consisten, de manera general, en determinar la asignación óptima de recursos a diferentes actividades que componen un proyecto para alcanzar un objetivo concreto, por ejemplo, minimizar la duración total del proyecto. Las actividades están sujetas a restricciones de consumo de recursos y a relaciones de precedencia. Para la solución del problema, el profesor Morillo propuso un algoritmo de ramificación y acotamiento hibrido que incluye diversas reglas heurísticas para acotar el espacio de búsqueda. Mas adelante, propuso un algoritmo genético cuyo mayor aporte reside en un nuevo operador de mutación. Además, esta investigación estudio el efecto de un fenómeno no deseado en la búsqueda llamado generación de soluciones redundantes y demostró cómo el operador de mutación puede ser usado para combatirlo. Posteriormente, propuso una extensión al problema multimodal de programación de tareas con recursos restringidos, el cual incluyo dos grandes aportes: primero, la inclusión de un componente de consumo energético a las actividades; y segundo, el desarrollo de una nueva función objetivo que consideraba tanto la minimización del tiempo del proyecto, como la minimización del consumo de energia, pero sin establecer un criterio multi-objetivo. Adicionalmente, se propuso una librería de problemas de prueba para evaluar futuros métodos de solución. Finalmente, el profesor Morillo diseño un nuevo algoritmo evolutivo que mejora la búsqueda enfocándose en generar vecindarios de soluciones basados en los modos de ejecución de las actividades.

Recent publications
Publicaciones recientes

▪ Morillo, Daniel, Federico Barber, and Miguel A Salido (2018). “Chromosome Muta- tion vs. Gene Mutation in Evolutive Approaches for Solving the Resource-Constrained Project Scheduling Problem (RCPSP)”. In: Recent Trends and Future Technology in Applied Intelligence, IEA/AIE 2018. Lecture Notes in Computer Science, vol 10868. Ed. by Malek Mouhoub et al. Cham: Springer International Publishing, pp. 601–612. isbn: 978-3-319-92058-0.

▪ Morillo,Daniel,FedericoBarber,andMiguelA. Salido(2017a).“Mode-based vs Activity- based search for a non-redundant resolution of the Multi-mode Resource-Constrained Project Scheduling Problem.” In: Mathematical Problems in Engineering. 2017.Article ID 4627856, p. 15.

Morillo, Daniel, Federico Barber, and Miguel A. Salido (2017b). “Mode List vs Activity List for the Multi-mode Resource Constrained Project Scheduling Problem”. In: ICAPS 2017 workshop on Constraint Satisfaction Techniques for Planning and Scheduling Problems (COPLAS’17). Ed. by Miguel A. Salido and Roman Barták. Pitts- burgh, USA, pp. 38–48.

▪ Morillo Torres, Daniel, Federico Barber, and Miguel A. Salido (2017). “A new model and metaheuristic approach for the energy-based resource-constrained scheduling prob- lem”. In: Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, p. 095440541771173. issn: 0954-4054.

▪ Morillo Torres, Daniel, Luis Fernando Moreno Velásquez, and Francisco javier Diaz Serna (2015). “A branch and bound hybrid algorithm with four deterministic heuris- tics for the resource constrained project scheduling problem (RCPSP)”. In: DYNA- Colombia 82.190, pp. 198–207.

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Operations Management and Modeling Group (MGO); Inteligencia Artificial, Planificacion y Scheduling (AI-GPS).

Education
Educación

▪ 2017: Ph.D. in Informatics at the Universitat Politécnica de Valéncia.

▪ 2012: Master of Science in Systems Engineering at the Universidad Nacional de Colombia, sede-Medellín.

▪ 2010: Bachelor in Industrial Engineering at the Universidad Nacional de Colombia, sede-Medellíin.

Professional experience
Experiencia Profesional

▪ 2018-Present: Assistant Professor, Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2013: Adjunct Professor and Postgraduate Teaching Assistant, Universidad Nacional de Colombia.

Honors and memberships
Honores y membresías

▪ Cum laude thesis granted by the Doctoral School of Universitat Politécnica de Valéncia. Doctorates in overseas, announcement number 728, Colombian Administrative Department of Science, Technology and Innovation (COLCIENCIAS).

▪ ENLAZAMUNDOS program of the High Education Agency (Sapiencia) and the Mayor office of Medellín.

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No se pueden incluir las figuras, pues el texto es muy largo. habría que resumir el resumen del trabajo investigativo tanto en inglés como en español.

Dr. William Andrés Ocampo Duque

Research interests / Intereses de investigación

- Cycle of life analysis
- Risk evaluation
- Fluid thermodynamics modeling
- Clean production

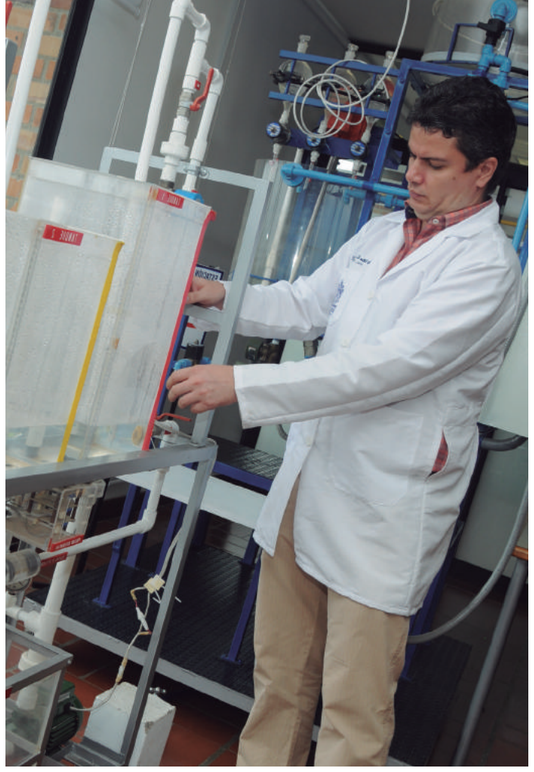
EN Research Summary

Professor Ocampo focuses on the investigation of problems associated with the irreversible environmental impact caused by production activities. Particular interest is placed on those caused by water and air contamination, development of renewable energy sources, and dangerous residues. He uses experimental, analytical and computational methods to characterize the presence of contaminants in the environment and their impact on human and ecosystem's health. Physicochemical and biological processes that must be understood govern the mobility of chemical substances in the environment. Prof. Ocampo has contributed with new models for the evaluation of water and air quality, analytical methods for the control of contamination, and heads the environmental quality laboratory at the Javeriana University with ISO 17025 protocols.

ES Resumen del trabajo investigativo

La investigación del profesor Ocampo se enfoca en problemas asociados con el impacto ambiental irreversible causado por las actividades de producción. De su particular interés son los daños al recurso hídrico y al aire, los residuos contaminantes y el desarrollo de fuentes de energía renovables. Emplea experimentos y métodos analíticos y computacionales para caracterizar la presencia de contaminantes en el ambiente y su impacto sobre la salud humana y del ecosistema. De la misma manera, estudia los procesos físico-químicos y biológicos que deben ser elucidados para comprender la movilidad de sustancias químicas en el ambiente. El profesor ha contribuido con modelos novedosos para la evaluación de la calidad del agua y el aire, y métodos analíticos para el control de la contaminación. Lidera, con protocolos ISO 17025, el laboratorio de calidad ambiental en la Universidad Javeriana.

Figure 14. Proffesor Ocampo setting up a measurement experiment in the industrial process laboratory



Currently sponsored research
Investigación financiada en Curso

▪ Pesticide measurements and characterization Characterization of PCBs in electrical transformer oils

▪ Variables measurement in water quality Toxicological assays

Recent publications
Publicaciones recientes

▪ Sarria-Villa, R., Ocampo-Duque, W., Páez, M., Schuhmacher, M. (2016) Presence of PAHs in water and sediments of the Colombian Cauca River during heavy rain episodes, and implications for risk assessment. Science of the Total Environment, 540, pp. 455-465.

▪ Ocampo-Duque, W., Kumar, V., Schuhmacher, M. (2015) Cambio climático y salud: evaluación de la vulnerabilidad para el dengue en el valle geográfico del río Cauca. En: Colombia, Biomédica: Revista Del Instituto Nacional De Salud. ISSN: 0120-4157 ed: Instituto Nacional de Salud, v.35 fasc.35(Supl.4) p.32 – 34.

▪ Ocampo-Duque, W.A., Colombo, G., Rinaldi, F. (2014) Challenges in Bioenergy Pro-duction from Sugarcane Mills in Developing Countries: A Case Study. Energies, ISSN: 1996-1073, 7, 9 p.5874-5898.

▪ Ocampo-Duque, W.A., Eljarrat, E., Barcelo, D., Baron, E., Gago Ferrro, P., Gorga, M., Rudolph, I., Mendoza, G., Barra, R., Darba, R.M., Paez, M. (2013)Occurrence of hydrophobic organic pollutants (BFRs and UV-filters) in sediments from South America. Chemosphere, ISSN: 0045-6535, 92, 3, p.309-316.

▪ Ocampo-Duque, W.A., Darba, R.M., Eljarrat, E., Barcelo, D., Paez, M., Barra, R. (2013) Fuzzy model for risk assessment of persistent organic pollutants in aquatic ecosystems. Environmental Pollution, ISSN: 0269-7491, 178, p.23-32,.

Academic title
Título académico

Associate Professor

Current position
Posición actual

Environmental research coordinator - LIA

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Engineering, Bachelors in Engineering.

Education
Educación

▪ 2004-2008: Doctor in Chemical Engineering, Rovira i Virgili University.

▪ 2000: Master's in Chemical Engineering, Universidad del Valle, Cali, Colombia

▪ 1995: Bachelor of Science in Chemical Engineering, Universidad del Valle, Cali, Colombia

Professional experience
Experiencia Profesional

▪ 2001-Present: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 1996: Universidad del Valle, Cali, Colombia.

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Dr. Iván Fernando Otálvaro Calle

Research interests / Intereses de investigación

- Coupled problems for mechanical behavior
- Wave propagation in porous materials
- Non-destructive geomaterials testing
- Hidromechanical response of construction and demolition waste

EN Research Summary

Professor Otálvaro's research is focused on mechanical behavior of porous materials, particularly on problems associated with coupled hydraulic and mechanical response, constitutive models and unsaturated geomaterials. Typical applications include: tropical soil profile under rain infiltration and relationship with landslides; levees geomaterial selection; and mechanical and electrical properties relationships. He has contributed with new experimental methods and techniques for characterizing porous materials.

ES Resumen del trabajo investigativo

La investigación del profesor Otálvaro está enfocada en caracterizar el comportamiento mecánico de materiales porosos, particularmente en problemas asociados con el acoplamiento en las respuestas hidráulicas y mecánicas, en el diseño de modelos constitutivos y en geomateriales no saturados. Las aplicaciones típicas de su trabajo incluyen: la extracción de perfil de suelo tropical bajo infiltración por lluvia y su relación con derrumbes, la selección de materiales para diques, y la relación entre las propiedades mecánicas y eléctricas. El profesor Otálvaro ha contribuido con nuevas técnicas y métodos para la caracterización de materiales porosos.

Currently sponsored research
Investigación financiada en Curso

▪ Detection for underground buried objects (DUBO).

▪ Dynamic behavior of construction and demolition waste (CDW) in pavements applications.

▪ Currently coordinating the 2018 Forum on Management and Exploitation of CDW (with CAMACOL Valle, Constructora Bolíivar and LATCO S.A)

Recent publications
Publicaciones recientes

▪ Otalvaro, I.F., Neto, M.P.C., Delage, P., Caicedo, B. (2016) Relationship between soil structure and water retention properties in a residual compacted soil. Engineering Geology, 205, pp. 73-80.

▪ Otálvaro, I.F., Neto, M.P.C., Caicedo, B. (2015) Compressibility and microstructure of compacted laterites. Transportation Geotechnics, 5, pp. 20-34.

▪ Otálvaro, I.F., Cordão-Neto, M.P., Caicedo, B. & Delage, P. Relationship between soil structure and soil water retention properties in a residual compacted soil. Engineering Geology, In press.

▪ Gómez, A.M., Farias, M.M., Cordão-Neto, M.P. & Otálvaro, I.F. (2014). Water Retention Curve and Particle Breakage of Aggregates Recycled from Demolition Waste. Journal of Civil Engineering and Architecture, Vol. 8(9); pp. 1194-1203.

▪ Otálvaro, I.F. & Cordão-Neto, M.P. (2013) Probabilistic analysis of slope stability under infiltration conditions. Advances in Unsaturated Soils Taylor & Francis Group, London, ISBN 978-0-415-62095-6.

Academic title
Título académico

Associate Professor

Current position
Posición actual

Civil Engineering Undergraduate Program Director.

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Civil Engineering, Civil Engineering and Seismic Engineering, Materials and Transportation (SIGMA) research group.

Education
Educación

▪ 2013: Doctor in Geotechnics, Brasilia University, Brasilia, Brasil.

▪ 2005: Master's in Engineering, Geotechnics, Universidad Nacional, Medellín, Colombia.

▪ 2001: Bachelor of Science in Civil Engineering, Universidad Nacional, Medellín, Colombia.

Professional experience
Experiencia Profesional

▪ 2007-Present: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2008, 2009, 2014: Part-time Professor Master of Highway Engineering, Universidad Autónoma Juan Misael Saracho, Tarija, Bolivia.

▪ 2013: Part-time professor, Master of Civil Engineering, Universidad del Valle, Cali, Colombia.

▪ 2006: Instructor, Universidad de Medellín, Medellin, Colombia.

▪ 2007: Instructor, Universidade de Brasilia, Brasil.

▪ 2004-2007: Instructor, Universidad Nacional de Colombia, Medellín, Colombia

▪ 2006: Instructor Master of Engineering – Geotechnics, Universidad Nacional, Medellín, Colombia.

▪ 2002: Instructor, Universidad EAFIT, Medellín, Colombia.

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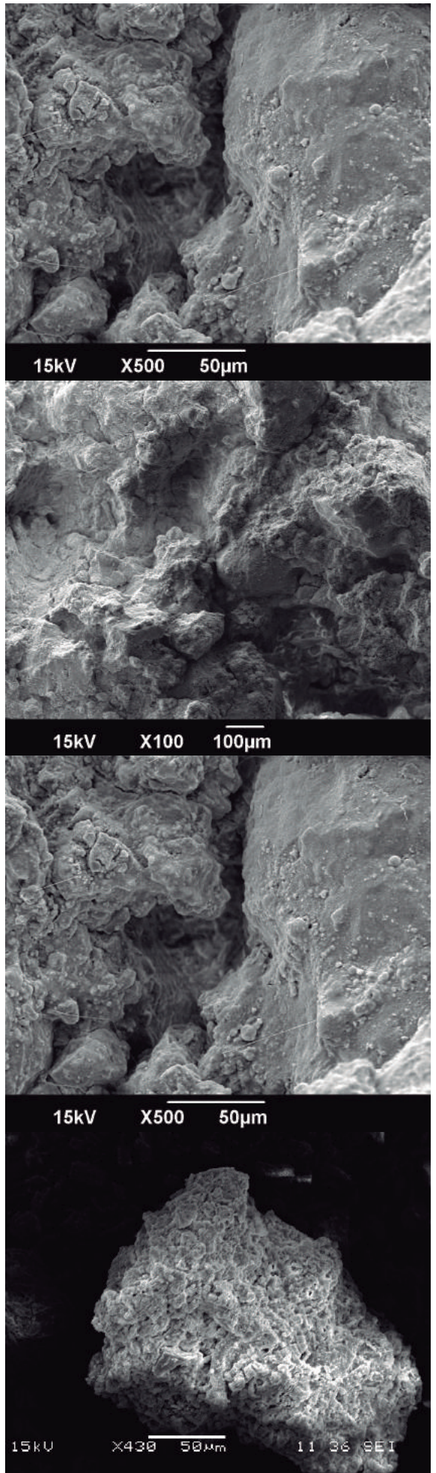

Figure 15. Different multipore geomaterial TEM images (above and below), from which Prof. Otálvaro and his group to study the mechanical and electrical properties to derive constitutive models

Dr. Diego Dario Pérez Ruiz

Research interests / Intereses de investigación

- Clean production.
- New materials for construction and civil engineering.
- Dispersion of contaminants in porous materials.
- Soil behavior and improvement.

EN Research Summary

Professor Perez's research spans the use of recyclable materials, sustainability in geotechnical engineering, expansive and partially saturated soils, improvement of soils, transportation of contaminants in water bodies through porous materials. Prof. Perez works on both constitutive modeling and experimental approaches. He has made significant contributions to the use of recycled materials for improving expansive soils and hydraulic and asphaltic concrete via rubber, fly ash, iron and aluminum filings, residual glass, construction and demolition cull, and vitrified clay.

ES Resumen del trabajo investigativo

El profesor Pérez investiga sobre el uso de materiales reciclables, sostenibilidad en ingeniería geotécnica, suelos expansivos y parcialmente saturados, mejoramiento de suelos, transporte de contaminantes en cuerpos de agua a través de materiales porosos. Trabaja en modelos constitutivos y en aproximaciones experimentales. Ha logrado contribuciones significativas con la aplicación de materiales reciclados en el mejoramiento de suelos expansivos y concretos asfálticos e hidráulicos, incluyendo el uso de residuos de caucho, cenizas volátiles, hierro, aluminio, vidrio, desechos de construcción y demolición, y arcilla vitrificada.

Recent publications
Publicaciones recientes

▪ Serrano-Guzmán, M. F., Pérez-Ruiz, D. D., Solarte, N. C. (2015) Use of ash in hot-dense mixtures: alternative to reduce environmental liabilities. Journal of the Transportation Research Board.

▪ Serrano-Guzmán, M. F., Pérez-Ruiz, D. D., Germán Arias, D. A. y Forero, J. C. (2014) Modelo Físico de Acuífero: su implementación para un curso de aguas subterráneas. Ciencia Exactas y Naturales, 24(48), 209–223.

▪ Serrano-Guzmán, M. F., Pérez-Ruiz, D. D., Sarmiento, C. O. y Grames, F. (2013) Evaluación de las propiedades mecánicas de morteros modificados con ceniza proveniente de la desorción térmica de aguas de la industria petrolera. Cemento y Hormigón. 955, 30 – 34.

▪ Hoyos, L. R., Pérez-Ruiz, D. D. y Puppala, A. J. (2012) A refined true triaxial apparatus for testing unsaturated soils under suction controlled stress paths. ASCE International Journal of Geomechanics, 12(3), 281–291.

▪ Hoyos, L. R., Pérez-Ruiz, D. D. y Puppala, A. J. (2012) Modeling unsaturated soil response under suction controlled true triaxial stress paths. ASCE International Journal of Geomechanics, 12(3), 292–308.

▪ Serrano-Guzmán, M. F., Pérez-Ruiz, D. D. (2011) Use of recycling materials to build paver blocks for low volume roads in developing countries. Journal of the Transportation Research Board, 2205(6), 138–146.

Academic title
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Engineering (Civil emphasis), Bachelor of Science in Civil Engineering, and Contaminants Detection and Remediation (DECOR) research group.

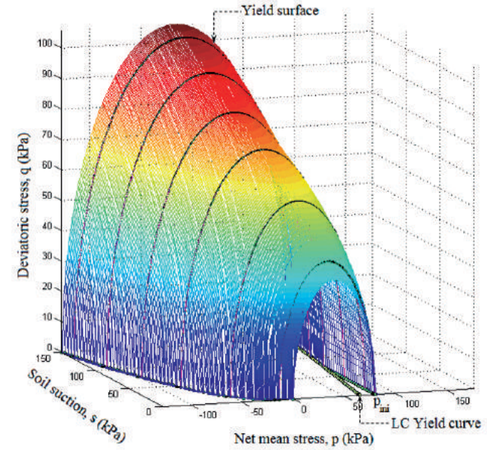

Figure 16. Geomechanical constitutive model from Prof. Perez and his group accurately captures the deviatoric stress response to soil suction and net mean stress

Education
Educación

▪ 2009: Doctor in Civil Engineering, University of Texas, Arlington, Texas, USA.

▪ 1991: Master in Engineering Transport and Transit, Universidad del Cauca, Popayán, Colombia.

▪ 1994: Master in Civil Engineering, Universidad de Puerto Rico, Mayagüez, Puerto Rico.

▪ 1987: Bachelor of Science in Civil Engineering, Universidad del Cauca, Popayán, Colombia.

Professional experience
Experiencia Profesional

▪ 2000-Present: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 1995-2000: Universidad del Cauca, Popayán, Colombia.

▪ 1994: Instituto Colombiano de Geología y Minería.

▪ 1994: Universidad de Puerto Rico, Mayagüez, Puerto Rico.

Honors and memberships
Honores y membresías

Corona Pro Habitat Prize, Corona Foundation, Colombia (2011), and Outstanding graduate student, University of Texas at Arlington, Arlington, Texas, USA.

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Dr. José Luis Ramírez Duque

Research interests /
Intereses de investigación

- Energy efficiency and renewable energy
- Energy management systems (Standard ISO 50001)
- Biotechnology
- Exergy analysis and thermo-economic evaluation of industrial processes
- Multiphase pumping systems
- Modeling and simulation of thermo- hydraulic systems

EN Research Summary

Professor José Luis Ramirez studies Thermodynamics, heat transfer and fluid mechanics application in physical phenomena Modeling and Simulation, which they are important to characterize and evaluate industrial processes. He is also interested in rational energy use and sustainable development. He has conducted research about the following topics: Exergy and thermo-economic analysis of distilleries for ethanol production, renewable energy projects related to the development of technologies for micro-algal biomass production, and performance evaluation of twin-screw multiphase pumps for oil gathering Systems.

ES Resumen del trabajo investigativo

El profesor José Luis Ramírez estudia la aplicación de la termodinámica, la transferencia de calor y la mecánica de fluidos en el modelado y simulación de fenómenos físicos importantes para la caracterización y evaluación de procesos industriales. Además, tiene interés en el uso racional de la energía y el desarrollo sostenible. Ha desarrollado investigaciones en los siguientes temas: Análisis exergético y termo-económico de destilerías para la producción de alcohol carburante, proyectos en energías renovables relacionados con el desarrollo de tecnologías para la producción de biomasa a partir de micro-algas, y evaluar el desempeño de bombas multifásicas de doble tornillo utilizadas en sistemas para la extracción de petróleo.

Recent publications
Publicaciones recientes

▪ Ramirez, J. L., Ramos, M., (2011) Hydrodynamic computational evaluation in solar tubular photobioreactors bends with different cross sections. Revista Ecopetrol, Ct&F - Ciencia, tecnología y futuro, ISSN: 0122-5383 v.4 fasc.4 p.59 - 72, 2011.

▪ Ramírez, J.L., Marin, D., Garcia, C., (2012) Evaluation of microalgal mortality in a centrifugal pump of a tubular photobioreactor. Revista Ingeniería y universidad. ISSN: 0122-5383. v.16 fasc.2 p.333 - 347.

▪ Ramírez, J.L., (2012). Evaluación del uso de biodiesel obtenido a partir de aceite de cocina usado en un motor diésel. Revista El hombre y la máquina, ISSN: 0121-0777, Edición No 40, p 102-110.

▪ Lasso, J., Ramírez, J.L. (2011). Perspectivas generales del efecto del reúso de aguas residuales para riego de cultivos para la producción de Biocombustibles en Colombia. Revista El hombre y la máquina. ISSN: 0121-0777, Edición No 36, p 95-105.

▪ Carranza, Y., Florez, E., Ramírez, J.L., (2014). Estudio sobre la solución del problema de transferencia de calor por convección en un cuerpo tipo cuña. Revista El hombre y la máquina. ISSN: 0121-0777, Edición No 44, p 84-98.

Academic title
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master´s of Engineering, Bachelor in Industrial Engineering.

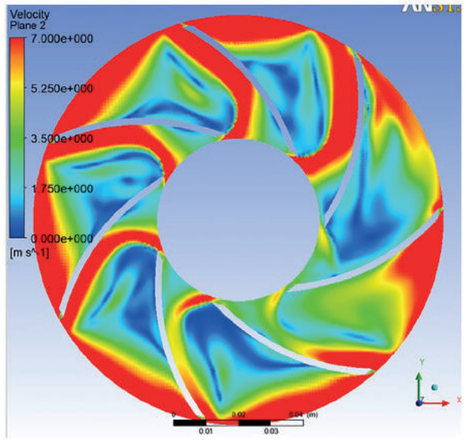

Figure 17. Water velocity on the XY plane in the rotary fluid domain (impeller)

Education
Educación

▪ 2016: Ph.D. in Mechanical Engineering (Energy and Fluids), Universidad de São Paulo, São Paulo, Brasil.

▪ 2008: Master of Science in Mechanical Engineering (Thermal Sciences), Universidad del Valle, Cali, Colombia.

▪ 2002: Bachelor of Science in Mechanical Engineering, Universidad Tecnológica de Pereira, Pereira, Colombia.

Professional experience
Experiencia Profesional

▪ 2016-Actually. Full time professor, Industrial Engineering, Universidad Javeriana, Cali, Colombia.

▪ 2008-2012. Full time professor, Mechanical Engineering, Universidad Autónoma de Occidente, Cali, Colombia.

▪ 2006-2008. Teaching Assistant, Mechanical Engineering, Universidad del Valle, Cali, Colombia.

Honors and memberships
Honores y membresías

PhD Scholarchip in Brasil supported by Petrobras, Brasil. MSc Scholarchip supported by Universidad del Valle, Colombia.

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Engineering Building, No. 2-31

Dr. Manuel Alejandro Rojas Manzano

Research interests /
Intereses de investigación

- Mitigation Strategies for Autogenous Shrinkage in High Strength Concrete
- Use of Alternative and Sustainable Building Materials
- Strengthening of Concrete
- Structures using fiber-reinforced polymer (FRP) composites
- Concrete Building Pathology
- Concrete Technology

EN Research Summary

Professor Rojas's research focuses on the study of strategies for mitigation of autogenous shrinkage in high strength concretes, especially superabsorbent polymers (SAP). In general, it´s oriented to develop studies on characterization, dosage, application, fresh and hardened properties (mechanical, elastic and durability) of conventional and special concretes (high performance concrete, self-compacting concrete, fiber reinforced concrete and others). Additionally, Professor Rojas promotes researches to characterize sustainable alternative materials using different techniques that enable their use to reduce the emission of global warming gases. Another area of interest is the study of the main pathological manifestations and their associates problems that occur and affect the concrete structures in order to avoid their appearance. Finally, professor Rojas study the application of rehabilitation techniques of concrete structures.

ES Resumen del trabajo investigativo

La investigación del profesor Rojas se enfoca en el estudio de estrategias de mitigación de la retracción autógena en concretos de alta resistencia, especialmente los polímeros superabsorbentes (PSA). En términos generales, está orientada en desarrollar estudios sobre caracterización, dosificación, aplicación, propiedades en estado fresco y endurecido (mecánicas, elásticas y de durabilidad) de concretos convencionales y especiales (concreto de alto desempeño, concreto autocompactante, concreto reforzado con fibras, etc.). Adicionalmente, promueve investigaciones con el objetivo de caracterizar y estudiar, por medio de diferentes técnicas, materiales alternativos sostenibles y así viabilizar su utilización para reducir la emisión de gases de calentamiento global. Otra área de interés es el estudio de las principales manifestaciones patológicas que se producen en las estructuras de concreto con el fin de evitar su aparición y aumentar el conocimiento para el correcto diagnóstico de las causas y el origen de los problemas, así como la aplicación de las técnicas de recuperación de esas estructuras.

Recent publications
Publicaciones recientes

▪ Silva, E. F., Moreira, M., Manzano, M. A., Blanco, R. (2016) Case study of permeability-reducing admixture use in anti-flotation slabs - building in Brasilia, Brazil. Journal of Building Pathology and Rehabilitation, ISSN: 2365-3167. In press.

▪ Cunha, T. A., Francinete, P., Manzano, M. A., Aidar, L. A., Borges, J. G., Silva, E. F. (2016) Determination of time zero in high strength concrete containing superabsorbent polymer and nano-silica. Journal of Building Pathology and Rehabilitation, ISSN: 2365-3167. DOI 10.1007/s41024-016-0020-7.

Academic title
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Masters of Engineering (Civil Engineering), Civil Engineering undergraduate and Seismic Engineering, Materials and Transportation (SIGMA) research group.

Education
Educación

▪ 2016: Doctor in Structures and Civil Construction, Universidade de Brasilia, Brasilia, Brasil.

▪ 2012: Master's in Structures and Civil Construction, Universidade de Brasilia, Brasilia, Brasil.

▪ 2011: Specialization in Construction Business Administration, Universidad del Valle, Cali, Colombia.

▪ 2004: Bachelor of Science in Civil Engineering, Universidad del Cauca, Popayán, Colombia.

Figure 18. Peeling-off of Glass Fiber Reinforced Polymer (GFRP) laminate and rupture of concrete beam

Professional experience
Experiencia Profesional

▪ 2016: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2013: Part-time Professor, Universidade de Brasilia, Brasilia, Brasil.

▪ 2005-2011: Constructor Engineer, Comité de Cafeteros del Valle, Cali, Colombia .

Contact information
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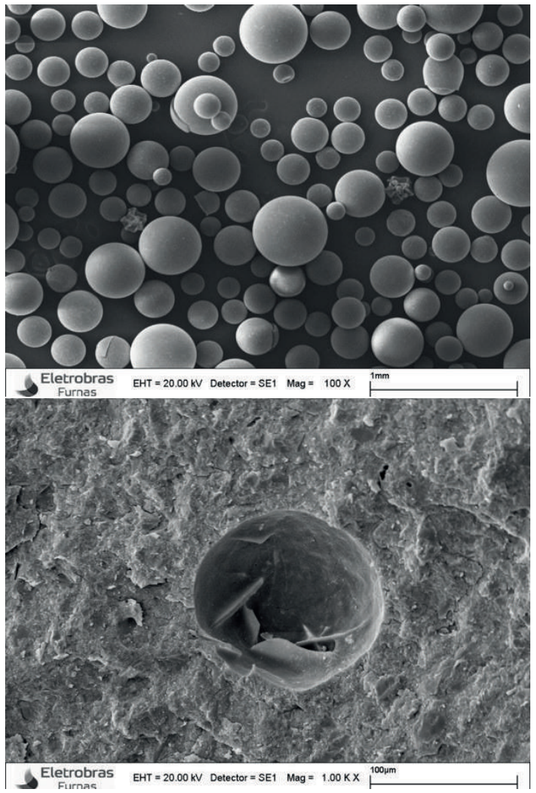

Figure 19.ESEM pictures: a) Superabsorbent Polymer (SAP) in the dry state and b) dry pore left behind by a SAP particle in hardened cement paste after drying

Dr. María Fernanda Serrano Guzmán

Research interests /
Intereses de investigación

- New materials applied in construction
- Utilization of industrial waste
- Cleaner production technologies
- Evaluation of cost control systems
- Programming and private and public procurement
- Influence of logistics in construction management
- Teaching Strategies for Civil Engineering

EN Research Summary

Professor Serrano is the leader of the DeCoR Research Group which focuses on the use of industrial waste for the preparation of asphalt mixtures, concrete and mortar. Additionally, she has conducted research on water quality, soil improvement and remediation, and environmental and groundwater impact studies.

ES Resumen del trabajo investigativo

La profesora Serrano lidera el grupo de investigación DeCoR, enfocado en el uso de desechos materiales para la preparación de mezclas asfálticas, concretos y morteros. También conduce investigaciones sobre calidad de agua, mejoramiento y remediación de suelos, e estudios de impacto sobre acuíferos.

Recent publications
Publicaciones recientes

▪ Serrano Guzmán, M. F., Pérez Ruiz, D. D., Solarte Vanegas, N. C. (2015) Use of ash in hot-dense mixtures, alternative to reduce environmental liabilities. Transportation Research Record. ISSN: 0361-1981, National Research Council, Transportation Research Board, v.2473 fasc.2 p.66-71.

▪ Serrano Guzmán, M. F., Pérez Ruiz, D. D., Solarte Vanegas, N. C. (2014) Compromiso deontológico en los procesos contraactuales: caso concesiones viales en colombia. Reflexiones, Universidad De Costa Rica. ISSN: 1659-2859, v.93 fasc.2 p.143-154.

▪ Serrano Guzmán, M. F., Pérez Ruiz, D. D. (2011) Use of recycled materials to build paver blocks for low-volume roads in developing countries. Transportation Research Record. ISSN: 0361-1981, National Research Council Transportation Research Board, v.2205 fasc.3 p.138-146.

Academic title
Título académico

Assistant Professor

Education
Educación

▪ 2008: Doctor in Civil Engineering, Universidad de Puerto Rico, Mayaguez Campus.

▪ 2007: Magister in Engineering, Universidad de Puerto Rico, Mayaguez Campus.

▪ 1999: Especialization in environmental engineering, Universidad Pontificia Bolivariana, Sectional Bucaramanga.

▪ 1996: Especialization in Construction Project Management, Universidad Industrial de Santander.

▪ 1993: Civil Engineering, Universidad Industrial de Santander.

Professional experience
Experiencia Profesional

▪ 1995-2015: Lecturer, Universidad Pontificia Bolivariana, Bucaramanga. June 1995 - June 2015.

▪ 2008-2015: Director General of Research. Universidad Pontificia Bolivariana. Bucaramanga. January 2008 - June 2015.

▪ 2015: Lecturer, Pontificia Universidad Javeriana, Cali, June 2015.

Honors and memberships
Honores y membresías

▪ Premio Ecopetrol Innovacion 2009. Otorgado por Ecopetrol y el Instituto Colombiano del Petróleo en Bucaramanga.

▪ Premio Coronoa Pro-hábitat, 2011. Otorgado por la organización Corona en Bogotá.

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LIST OF PROFESSORS

Dr. Jaime Alberto Aguilar Zambrano

Research interests / Intereses de investigación

- Engineering design methodologies.
- Problem solving in multi-disciplinary teams.
- Products for the disabled.
- Product design.

EN Research Summary

Professor Aguilar's research focuses on structured engineering design methodologies using interdisciplinary teams working towards a common user- oriented set of goals.

Product design from interdisciplinary teams requires integrating a larger number of methodological viewpoints and expertise in order to validate the effectiveness of the team on the common user-oriented goals. Dr. Aguilar has proposed the Expanded Model of Axiomatic Design, as a converging model between the Theory of Inventive Problem Solving (TRIZ) and Axiomatic Design, as a rational design methodology.

The Expanded Model of Axiomatic Design has been successfully applied to the design of products for the disabled, and is currently being instantiated in other industrial applications.

ES Resumen del trabajo investigativo

El profesor Aguilar investiga sobre metodologías de diseño estructurado en ingeniería, particularmente para diseño a cargo de equipos interdisciplinares trabajando para alcanzar objetivos comunes orientados por el usuario.

El diseño de productos a cargo de equipos interdisciplinares requiere de la integración de un gran número de experticias y puntos de vista metodológicos con el fin de validar su efectividad para lograr objetivos.

El profesor Aguilar ha desarrollado el Modelo de Diseño Axiomático Ampliado, el cual converge entre la Teoría de Solución Inventiva de Problemas (TRIZ) y el Diseño Axiomático, como una metodología racional de diseño.

Ha sido aplicado de manera exitosa en el diseño de productos para personas en condición de discapacidad y actualmente está siendo instanciado en otras aplicaciones industriales.

Currently sponsored research
Investigación financiada en curso

Pilot study of neuro-rehabilitation therapies with assistant technology for patients with motor impairment of the superior limbs of cerebral origin (grant: École Polytechnique Fédérale de Lausanne, France).

Recent publications
Publicaciones recientes

▪ Aguilar Zambrano, J. A., Ochoa Angrino, S., Navarro Newball, A. A. (2015) Gamification in Informal Education Environments: A Case Study. Transforming Learning and IT Management through Gamification. En: Inglaterra ISBN: 978-3-319-18699-3 ed: Springer Publishing Company, p.73-97.

▪ Aguilar Zambrano, J. A. (2015) Designing Suitable Assistive Technology for the Population with Motor Disabilities in Colombia. Technologies for Development. What is Essential?. En: Suiza ISBN: 978-3-319-16246-1 ed: Springer Publishing Company, p.129-136.

▪ Chavarrriaga, R, Hurtado, M.N., Bolaños, M., Loaiza, J.A., Mayor, J.M., Aguilar-Zambrano, J. (2014) Multidisciplinary design of suitable assistive technologies for motor disabilities in Colombia. Global Humanitarian Technology Conference (GHTC), IEEE.

▪ Mónica Alexandra Posso Chulvi, V.A., González-Cruz, M.C., Mulet, E, Aguilar-Zambrano, J.A. (2013) Influence of the type of idea-generation method on the creativity of solutions. Research in Engineering Design, volume 24, Issue 1, pp 33–41.

▪ Ochoa Angrino, S., Aguilar-Zambrano, J.A., Navarro Newball, A.A, Jaramillo Ramírez, A., Henao Romero, L. (2013) Diseño de un escenario educativo para museos con el uso de Triz y Act. Pensamiento Psicológico, 11(2), 71-88.

Academic title
Título académico

Full time Professor

Current position
Posición actual

Engineering Faculty Dean

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master in Engineering, bachelor in Electronic Engineering and Robotics and Automation Group (GAR).

Professional experience
Experiencia Profesional

1994-Present: Pontificia Universidad Javeriana, Cali, Colombia.

Education
Educación

▪ 2010: Doctor in Engineering, Projects and innovation, Universidad Politécnica de Valencia, Valencia, España.

▪ 2006: Specialization in Engineering and Innovation Projects, Universidad Politécnica de Valencia, Valencia, España.

▪ 1997: Master's in Automation, Universidad del Valle, Cali, Colombia.

▪ 1991: Bachelor of Science in Electrical Engineering, Universidad del Valle, Cali, Colombia.

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Información de contacto

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Engineering Building, No. 2-02

Dr. Gloria Inés Álvarez Vargas

Research interests / Intereses de investigación

- Natural language recognition
- Bioinformatics
- Recommendation systems

EN Research Summary

Professor Alvarez does research in automated inductive learning.

She uses grammatical inference methods based on mixing states that produce finite state automata models. She has demonstrated that symbolic in

ductive learning methods (not based on probability) can produce competitive results while enabling a more natural representation of knowledge.

She has contributed new algorithms and applied them to natural language learning, prediction of poliprotein cleavage sites, and automated recommendation.

ES Resumen del trabajo investigativo

La profesora Álvarez investiga sobre aprendizaje automático inductivo. Para ello utiliza métodos de inferencia gramatical basados en mezcla de estados que producen modelos de autómatas de estados finitos.

Ella contiende que los métodos de aprendizaje inductivo simbólicos (no basados en probabilidad) producen resultados competitivos y además permiten una representación más natural del conocimiento.

Ha contribuido con nuevos algoritmos y su aplicación en la solución de problemas de aprendizaje de lenguaje natural, predicción de sitios de clivaje de poliproteínas, y en recomendación automática.

Currently sponsored research
Investigación financiada en curso

Hidden Markov models in natural language recognition. Product configuration and assembly in a software production line (grant: Javeriana).

Recent publications
Publicaciones recientes

▪ Vargas, J.F., Velasco, J.A., Alvarez, G.I., Linares, D.L., Bravo, E. (2015) Automatic segmentation of Potyviridae family polyproteins. International Journal of Bioinformatics Research and Applications, 11 (6), pp. 525-539.

▪ Navarro-Newball, A.A., Loaiza, D., Oviedo, C., (...), Linares, D., Álvarez, G. (2015) Talking to Teo: Video game supported speech therapy. Entertainment Computing, 5 (4), pp. 401-412.

▪ Alvarez, G.I. (2014) Talking to Teo: Video game supported speech therapy. En Colombia, Entertainment Computing. ISSN: 1875-9521 ed: v.5 fasc. p.401–412.

Academic title
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Engineering (Systems and Computer Engineering emphasis), Bachelor in Systems and Computer Engineering, and DESTINO research group.

Education
Educación

▪ 2007: Doctor in Engineering, Universidad Politécnica de Valencia, Valencia, España.

▪ 1994: Masters in Systems and Computation, Universidad de los Andes, Bogotá D.C., Colombia.

▪ 1989: Bachelor in Systems Engineering, Universidad Autónoma de Manizales, Manizales, Colombia.

Professional experience
Experiencia Profesional

▪ 1997-Present: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 1990-1998: Research Coordinator, Universidad Autónoma de Manizales, Colombia.

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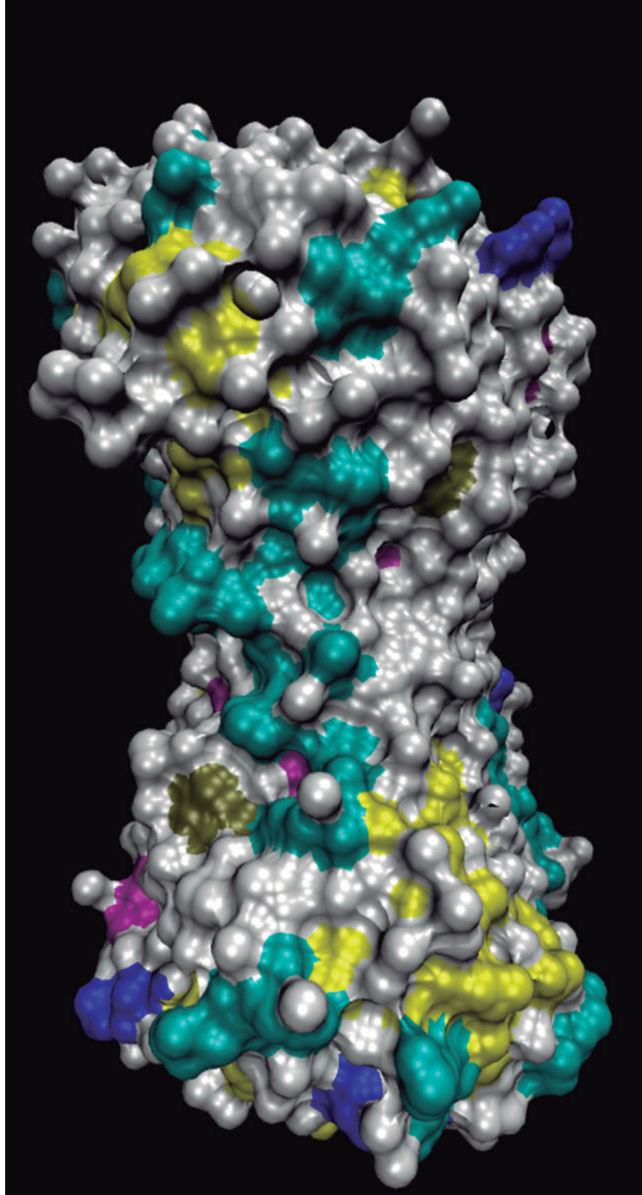

Figure 24. *Automatic segmentation of protein complexes from primary structure. Catalytically active proteases of the tobacco etch virus - TEVp (polyvirus)*

P1/Hc-Pro: 304 | 609 | 305 | 610 | 295 Hc-Pro/P3: 763 | 904 | 992 | 550 | 764 P3/6k1: 1110 | 1134 6k1/Ci: 1163 | 1162 Ci/6k2: 1796 | 1885 | 1978 | 1956 | 2099 6k2/Vpg: 1849 | 1848 | 1850 | 1847 | 1853 Vpg/Nia-Pro: 2037 | 2038 | 2040 | 2039 | 2425 Nia-Pro/Nib: 2234 | 2235 | 2279 | 2236 | 2283 Nib/CP: 2794 | 2800 | 2805 | 2799 | 2793

Dr. Hernán Darío Benítez Restrepo

Research interests / Intereses de investigación

- Pattern recognition
- Thermographics analysis
- Robotics and automation

EN Research Summary

Professor Benítez studies infrared (IR) vision with the long-term goal of making IR imaging systems 'see' as humans do it in the visible spectrum. IR images/video provide valuable information for the interpretation of natural scenes, including but not limited to infrared non-destructive testing in industry and non-invasive human health diagnosis.

Prof. Benítez' group has successfully applied time-dependent thermographic analysis to diagnose the evolution of patients subjected to soft tissue surgeries (e.g. nerves, tendons, muscle, etc.). Prof. Benítez has also proposed and applied a Global Signal to Noise Ratio index that comprehensively evaluates defect detectability, and an IR Image Quality Index that compares visual structural information in infrared images in material samples exposed to loading conditions.

This global approach determines the time at which the majority of the defects become visible in a sample.

ES Resumen del trabajo investigativo

El profesor Benítez estudia la aplicación de la visión infrarroja (IR) con el objetivo de hacer sistemas basados en imágenes que puedan ver lo que percibe el humano en el espectro de luz visible.

Las imágenes y el video en IR proporcionan información valiosa para la interpretación de escenas naturales, incluyendo pruebas no-destructivas en industria o diagnóstico médico no-invasivo de humanos. Ha aplicado exitosamente el análisis termográfico para diagnosticar la evolución de pacientes que han sido quirúrgicamente intervenidos para corregir problemas de tejidos blandos (e.g. nervios, tendones y músculos).

Ha propuesto y aplicado un índice Global de relación señal a ruido para evaluar de manera comprensiva la detección de defectos, y un índice de calidad de imagen IR para comparar información visual estructural en imágenes infrarrojas en muestras de materiales expuestos a condiciones de carga. El enfoque global determina el tiempo en el cual la mayoría de los defectos se hacen visibles en una muestra.

Currently sponsored research
Investigación financiada en curso

Quantitative evaluation of image processing techniques in infrared non destructive testing. Non-reference evaluation of image and video quality.

Evaluation by infrared thermography of the effects of solar photovoltaic panels on roofs heat transfer (Colciencias).

Recent publications
Publicaciones recientes

▪ Ospina-Borras, J.E., Benitez-Restrepo, H.D. (2015) Non-reference quality assessment of infrared images reconstructed by compressive sensing. Proceedings of SPIE - The International Society for Optical Engineering. 9396, 93960V.

▪ Florez-Ospina, J.F., Benitez-Restrepo, H.D. (2015) Toward automatic evaluation of defect detectability in infrared images of composites and honeycomb structures. Infrared Physics and Technology, 71, pp. 99-112.

▪ Ospina-Borras, J.E., Florez-Ospina, J.F., Benitez-Restrepo, H.D., Maldague, X. (2015) Thermal diffusivity estimation with quantitative pulsed phase thermography. Proceedings of SPIE - The International Society for Optical Engineering, 9485, 948512.

▪ Florez-Ospina, J.F., Benitez-Restrepo, H.D. (2014) From local to global analysis of defect detectability in Infrared Non-destructive Testing. Infrared Physics \& Technology. Vol. 63, 211-221.

▪ Estupiñan Roldan, K., Ortega P., M.A., Benitez Restrepo, H.D. (2014) Spatial-temporal features of thermal images for Carpal Tunnel Syndrome detection, Image Processing: Algorithms and Systems XII, edited by Karen O. Egiazarian, Sos S. Agaian, Atanas P. Gotchev, Proc. of SPIE-IS&T. Electronic Imaging, SPIE. Vol. 9019, 90190E.

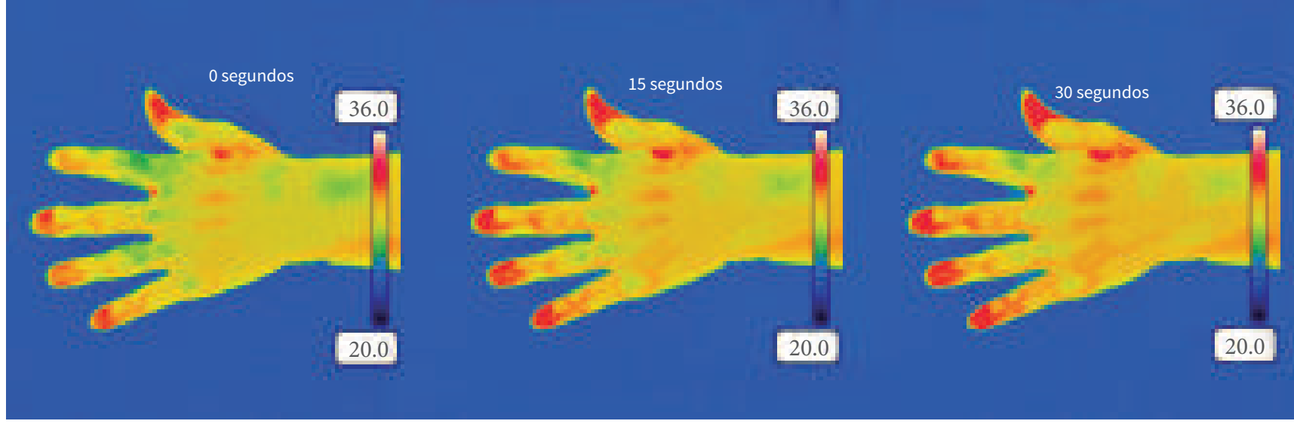

Figure 25. Time-dependent thermographic evolution of patient after open carpal tunnel release surgery provides non-invasive tracking of patients recovery

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Engineering, Bachelor in Electronics Engineering, and Robotics and Automation Group (GAR).

Education
Educación

▪ 2008: Doctor in Engineering, Universidad del Valle, Cali, Colombia.

▪ 2002: Bachelor of Science in Electronics Engineering, Pontificia Universidad Javeriana, Cali, Colombia.

Honors and memberships
Honores y memebresías

▪ Merit scholarship, Ministere de l'Education, du Loisir et du Sport du Québec, Canada (2011).

▪ Honorific mention (Doctorate), Universidad del Valle, Cali, Colombia (2008); Francisco José de Caldas Scholar (Doctoral studies), Colombian government (2004-2007); Institute of Electrical and Electronics Engineers (IEEE) Senior Member; International Society for Optical Engineering (SPIE) member.

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Dr. Jorge Finke Ortiz

Research interests / Intereses de investigación

- Networked systems and control theory
- Data mining in engineering analysis
- Dynamic systems theory and applications
- Strategic thinking

EN Research Summary

Professor Finke's research focuses on the development of techniques for visualizing, modeling and analyzing platforms with large volumes of data.

He uses dynamic systems theory to effectively incorporate the structure and evolution of information into solutions that exploit patterns underlying tangled coupling processes of large-scale networked systems. The main objective of his research is to create fundamental understanding of how distributed decision-making influences the formation of empirical networks to be able to explain (and design) emergent system-level behavior. His theoretical areas of interest also include parallel computing, optimization and game theory; application areas lie at the intersection of engineering and behavioral sciences.

ES Resumen del trabajo investigativo

El foco de investigación del profesor Finke es el desarrollo de técnicas de visualización, modelado y análisis de problemas de ingeniería que dependan de grandes volúmenes de datos.

Utiliza la teoría de sistemas dinámicos para incorporar de manera efectiva la información dependiente de estructura y tiempo en las soluciones.

Esto significa generar soluciones que explotan la comprensión de los patrones subyacentes en sistemas de gran escala con procesos distribuidos y que conllevan al diseño de mecanismos locales con información de tiempo embebida para generar redes con propiedades estructurales globales. Ha aplicado de manera exitosa estas estrategias en el análisis de sistemas socio-tecnológicos de gran escala para la toma estratégica de decisiones.

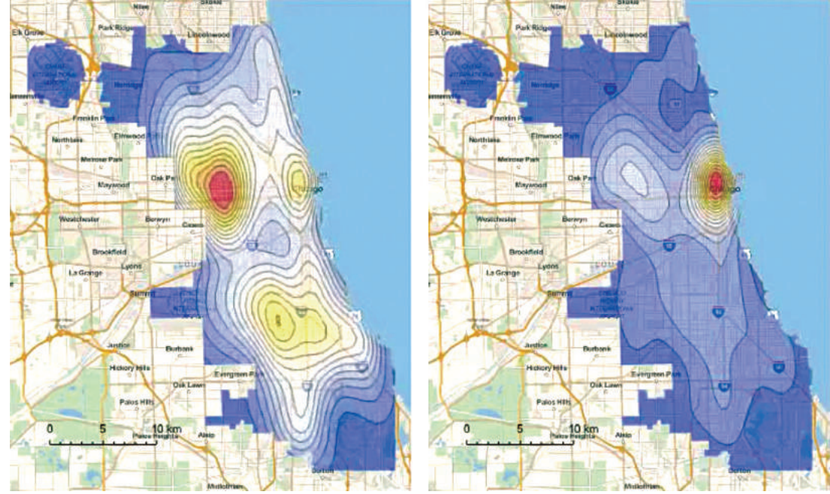

Figure 26. Analysis of the evolution of areas that have high crime intensity (left plot)and the location of police cameras (right plot) for the City of Chicago, IL.

Currently sponsored research
Investigación financiada en curso

Development of information network models for capturing the underlying mechanisms in socio-technological systems. Structural patterns in criminal behavior (grant: Javeriana).

Academic title
Título académico

Full Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Engineering, Bachelor in Electronics Engineering, and Robotics and Automation Group (GAR).

Education
Educación

- 2007: Ph.D. in Control Theory, Department of Electrical and Computer Engineering, The Ohio State University, Ohio, United States.

- 2004: Master's in Control Theory, Department of Electrical and Computer Engineering, The Ohio State University, Ohio, United States.

- 2003: Bachelor of Science in Control Theory, The Ohio State University, Ohio, USA.

Professional experience
Experiencia Profesional

2008-Present: Pontificia Universidad Javeriana, Cali, Colombia.

Honors and memberships
Honores y memebresías

Institute of Electrical and Electronics Engineering (IEEE) member; International Federation of Automatic Control (IFAC) technical committee member for the Conference on Technology, Culture and International Stability.

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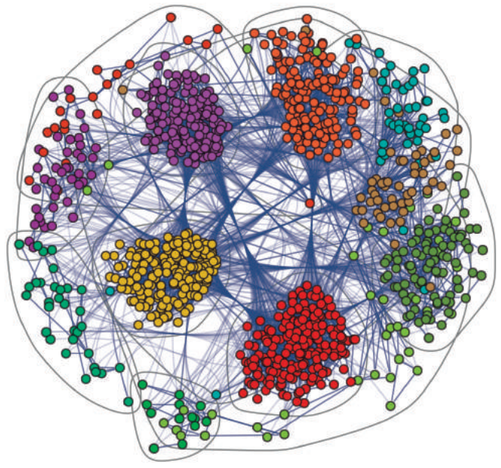

Figure 26. Dynamic clustering techniques applied to the dynamics of illegal human activities and behavior

Recent publications
Publicaciones recientes

- Moriano, P., and Finke, J. (2013)On the formation of structure in growing networks. Journal of Statistical Mechanics: Theory and Experiment, vol. 2013, iss. 06, p.P06010.
- Guerrero, K., Finke, J. (2013) On the Formation of Community Structures from Ho-mophilic Relationships. Proceedings of the American Control Conference. 1088-1093.
- Moriano, P. and Finke, J. (2012) Power-law weighted networks from local attachments. EPL (Europhysics Letters), vol. 99, iss. 1, p. 18002.
Finke, J. (2012) A legal perspective on the use of models in the fight against corruption. South Carolina Journal Of International Law And Business, ISSN: 1936-4334 , 8, p.267-296.

Dr. Andrés Jaramillo Botero

Research interests / Intereses de investigación

- Engineering design methodologies.
- Problem solving in multi-disciplinary teams.
- Products for the disabled.
- Product design.

EN Research Summary

Professor Jaramillo's research involves understanding materials properties and phenomena that emanate from the nanometer scale, and how to optimize and control them for the development of novel processes, materials, devices and systems.

He works on first-principles quantum mechanics based theory and computational methods that can be used to predict what experiments are currently unable to measure, or to perform in-silico design and experimental steering. He is a member of Xaveriana University honor society and its Engineering Faculty, a Research Scientist in the Chemistry and Chemical Engineering division at Caltech and the Director of Multiscale Science and Simulation at the Materials and Process Simulation Center at Caltech, where he has been the PI and Co-PI on numerous US government and industry funded research projects.

This has included NASA-JPL (Jet Propulsion Laboratory) programs on the effects of hypervelocity impact in space and space instrumentation design, US Department of Energy (NNSA and LLNL) on materials for extreme environments, inertial confinement fusion, novel nano-porous materials for renewable energy storage, US Department of Defense (DARPA, ARL, DURIP) on low-temperature growth of hard crystalline thin films and light-weight shock resistant material shields, US Department of Transportation (FHWA) on the molecular origin of cement fracture and hydration kinetics, National Science Foundation (MRI and CMMI programs) on cartilage tissue engineering and DNA-based electronics, Samsung Electronics (South Korea) on 4th generation DNA sequencing nano-devices, Toshiba (Japan) on atomic characterization of amorphous semiconductors, DOW Chemical on colloidal thin films, and Intel Corporation on novel dielectric materials beyond silicon dioxide.

Professor Jaramillo is currently working on solving the self-assembly gap at the mesoscale for bottom-up manufacturing, and in the characterization and design of new nano-structured materials from agricultural organic waste for: energy harvesting and storage, soft tissue engineering, and greenhouse gas sequestration.

His contributions span multiple fields, including high-performance robotics, high-performance computer algorithms and architectures, nanoscale science and engineering, and first-principles based simulation methods, to name a few.

ES Resumen del trabajo investigativo

La investigación del profesor Jaramillo involucra comprender las propiedades y los fenómenos de la materia que emanan de la escala nanométrica, y apunta hacia su control y optimización para el desarrollo de nuevos materiales, dispositivos, sistemas y procesos. Él trabaja en teoría y métodos basados en los primeros principios de la mecánica cuántica y en su aplicación para predecir lo que actualmente no se puede medir de manera experimental, para diseño in-silico de nuevos materiales y procesos, o para guiar la exploración experimental.

Él es miembro del cuadro de honor de la Universidad Javeriana, profesor Titular de la misma institución, e investigador científico en la división de química e ingeniería química y director de la unidad de Ciencia de Multiescala y Simulación del Centro de Simulación de Materiales y Procesos del Instituto Tecnológico de California (Caltech).

Ha sido investigador principal y coinvestigador principal en numerosos proyectos de Gobierno e industria, entre otros, con el Laboratorio de Propulsión a Chorro de NASA (JPL) en programas relacionados con los efectos de los impactos a hipervelocidades en el espacio y el diseño de instrumentos críticos en diversas misiones, con el departamento de energía (DOE, NNSA) de Estados Unidos, en la caracterización y el diseño de materiales para condiciones extremas, fusión por confinamiento inercial, materiales nanoporosos para almacenamiento de energía renovable y células de combustible por hidrógeno, con el departamento de defensa de los Estados Unidos (DOD, DARPA, ARL) en el crecimiento de películas duras a bajas temperaturas y materiales de alta resistencia a impactos, con el departamento de transporte (DOD, FHWA) de los Estados Unidos, en estudios fundamentales sobre el origen de fracturas y la cinética de hidratación del cemento Portland, con la Fundación de Ciencia Nacional de los Estados Unidos (NSF, CMMI) en ingeniería de tejidos para cartílago articular y electrónica basada en ADN, con Samsung Electronics (Korea) en el diseño de nanosecuenciadores de ADN de 4a generación (libres de química), con Toshiba (Japón) en la caracterización de materiales semiconductores amorfos, con DOW Chemical en películas delgadas basadas en coloides, y con Intel Corporation en la caracterización in-silico de nuevos materiales dieléctricos que superen las limitaciones del dióxido de silicio.

El profesor Jaramillo trabaja actualmente en soluciones al problema de autoensamble en la meso-escala para procesos de manufactura de abajo-hacia-arriba, en la caracterización y diseño de nuevos materiales nanoestructurados a partir de desechos orgánicos para generación y almacenamiento de energía renovable, ingeniería de tejidos con capacidad de carga viscoelástica, y materiales nano-porosos para secuestración de gases tóxicos y de efecto invernadero.

Sus contribuciones abarcan múltiples campos, entre ellos robótica de manipuladores de alto rendimiento, arquitecturas y algoritmos computacionales de alto rendimiento, ingeniería y ciencia de nanoescala, y métodos de primeros principios para la simulación dinámica de sistemas desde la nanoescala, entre otras.

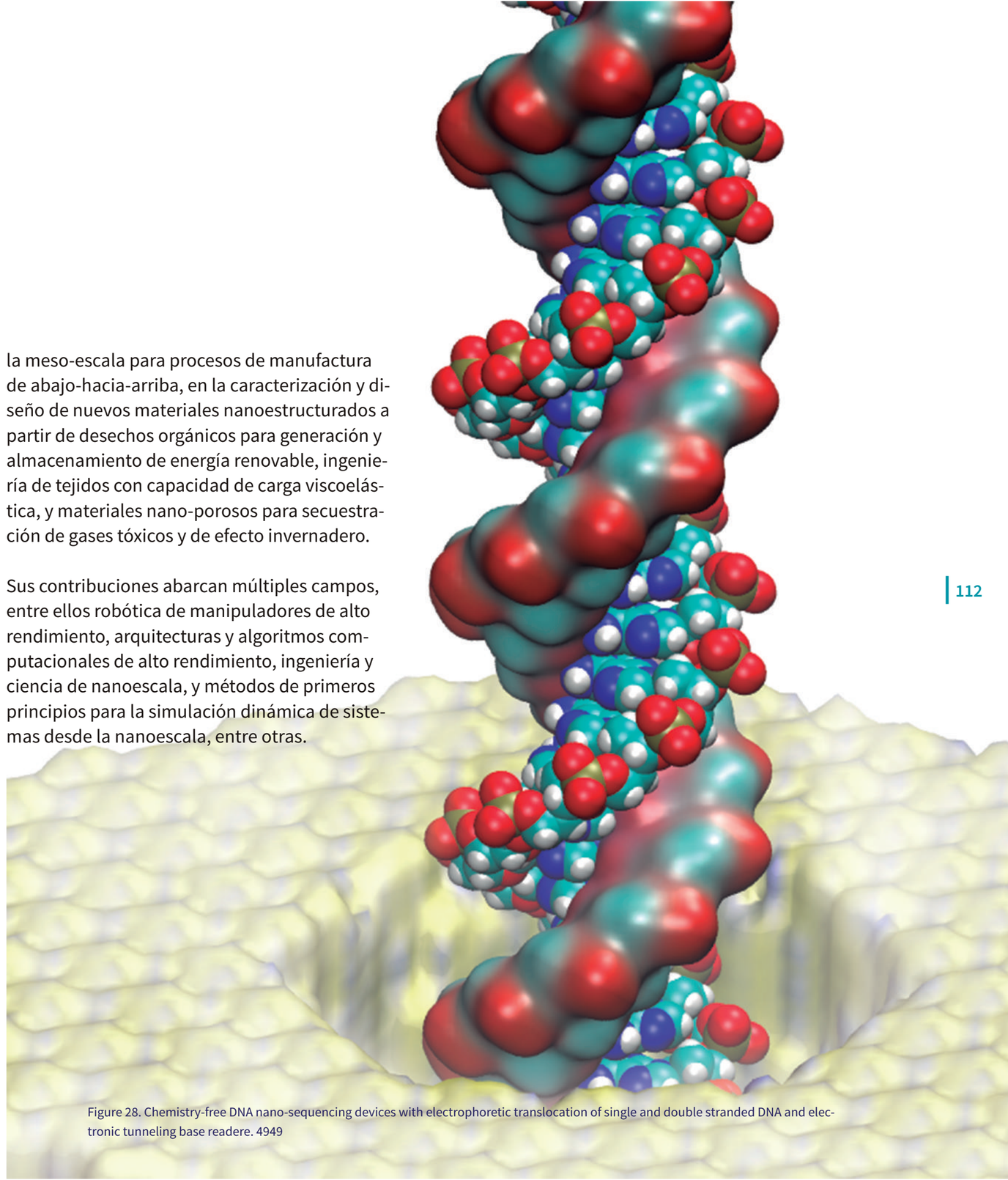

Figure 28. Chemistry-free DNA nano-sequencing devices with electrophoretic translocation of single and double stranded DNA and electronic tunneling base readere. 4949

Currently sponsored research
Investigación financiada en curso

- First-principles multiscale simulation methods (US-Caltech)
- Active nano-scale devices for DNA sequencing (Samsung)
- Characterization of materials in extremes (US-DOE)
- Low-temperature crystalline thin film growth (US-DARPA)
- High resolution phenotyping and sucrose nano-sensors (CIAT)
- Molecular mechanisms for improved piezoelectric response in PVDF matrices with ZnO and TiO2 nanoparticles (PUJ-Uniandes)

Recent publications
Publicaciones recientes

- Nidzworski, D., Siuzdak,K., Niedziałkowski, P., Bogdanowicz*, R., Sobaszek, M, Ryl, J., Weiher, P., Sawczak, M., Wnuk, E., Goddard, W.A., Jaramillo-Botero*, A, and Ossowski, T. “A novel ultrasensitive biosensor for influenza virus detection”, Accepted Scientific Reports (Nature group), Nov. 2017.

- Fortunelli, A., Goddard III, W.A., Sementa, L., Barcaro, G., Negreiros, F.R., Jaramillo-Botero, A. (2015) The atomistic origin of the extraordinary oxygen reduction activity of Pt3Ni7 fuel cell catalysts. Royal Society Chem. Sci., DOI: 10.1039/C5SC00840A.

- Jaramillo-Botero, Xiao, H., A., Theofanis, P.L., Goddard III, W.A. (2015) Non-adiabatic dynamics modeling framework for materials in extreme conditions. Mechanics of Materials. Elsevier, 10.1016/j.mechmat.

- An, Q., Jaramillo-Botero, A., Liu, W.G, Goddard III, W.A. (2015) Reaction Pathways of GaN (0001) Growth from Trimethylgallium and Ammonia versus Triethylgallium and Hydrazine Using First Principle Calculations. J. Phys. Chem. C, DOI: 10.1021/jp5116405.

Academic title
Título académico

Full time Professor (Xaverian Honor Order)

Current position
Posición actual

Engineering and Applied Sciences Doctorate program director

Program/group affiliations
Afiliaciones

Doctorate in Engineering at the Pontificia Universidad Javeriana, Chemistry and Chemical Engineering California Institute of Technology (Caltech), Robotics and Automation (GAR) and Nanoscale Science and Engineering research groups.

Education
Educación

2004-2005: Postdoctoral scholar in Nanoscale Science (NSF Fellow), California Institute of Technology (Caltech), Materials and Process Simulation Center, Pasadena, California, USA.

2002: NSF Fellow in Nanoscale Science and Engineering (NSF Fellow), University of California at Los Angeles (UCLA), Institute of Pure and Applied Mathematics (IPAM), Los Angeles, California, USA.

1995-1998: Doctor in Engineering (Multibody Dynamics), Universidad Politécnica de Valencia, Valencia, España.

1988-1989: Master’s of Science in Computer Science (Fulbright Scholar), State University of New York, Binghamton, New York, USA.

1983-1986: Bachelor of Science in Electrical Engineering, Boston University, Boston, Massachusetts, USA.

Professional experience
Experiencia Profesional

- 1990-Present: Pontificia Universidad Javeriana, Professor, Engineering Faculty, Cali, Colombia.

- 2006-Present: California Institute of Technology, Scientist, Director of Multiscale Science at the Materials and Process Simulation Center, Chemistry and Chemical Engineering Division, Pasadena, California, USA 1996-1997: Jet Propulsion Laboratory (NASA) and California Institute of Technology, Invited Faculty Associate and Researcher, Pasadena, California, USA.

- 1992-1993: Agency of Industrial Science and Technology, Mechanical Engineering Laboratory, Invited Researcher (JITA Fellow), Robotics and Autonomous Machinery Division, Tsukuba, Ibaraki, Japan.

- 1988: Sistemas de Tecnología Avanzada (Digital Equipment Corporation), Support Engineer and acting manager, Cali, Colombia.

- 1986-1987: Sincrón Diseño Electrónico, Design Engineer, Cali, Colombia.

Honors and memberships

Honores y memebresías

Extraordinary ability alien for scientific merits (EB-1) in Nanoscale Dynamics in the USA (2005), US National Science Foundation (NSF) Fellow (2002) in Nanoscale Science and Engineering at the Institute of Pure and Applied Mathematics (IPAM) of the University of California at Los Angeles (UCLA), NSF Fellow (2004-2005) in Computational Nanotechnology and Molecular Science at the California Institute of Technology (Caltech), “2001 Scientific Merit” awardee from the Colombian Engineering Association (Valle, 2001), “2001 Outstanding Young Professional” awardee for contributions to health and technology from the International Junior Chamber (Cali), inductee into the Honor Order of the Pontificia Universidad Javeriana (2000), listed in “Outstanding Scientists of the XX Century” by the IBC, Cambridge, UK (2000); NSF-NPACI (US National Partnership for Advanced Computational Infrastructure) Fellow at the San Diego Supercomputing Center (1997); Research Fellow in Advanced Robotics from the Japanese Industrial Technology Association (JITA) and the Agency of Industrial Science and Technology (AIST) (1992-1993) at the Japanese Mechanical Engineering Laboratory in Tsukuba, Japan; Japanese International Cooperation Agency (JICA) scholar (1992) in Tsukuba, Japan; and Fulbright Scholar in New York, USA (1988-1989).

Senior member of the Institute of Electrical and Electronics Engineers (IEEE), American Physics Society (APS) member, American Association for the Advanced of Science (AAAS) member, and Association for Computing Machinery (ACM) member. Peer reviewer for the US NSF, Department of Energy (DOE), Department of Defense (DOD), the International Federation of Automatic Control (IFAC), the Ibero-American Program Science and Technology for Development (CYTED), Colciencias, and multiple ISI/Scopus level journals.

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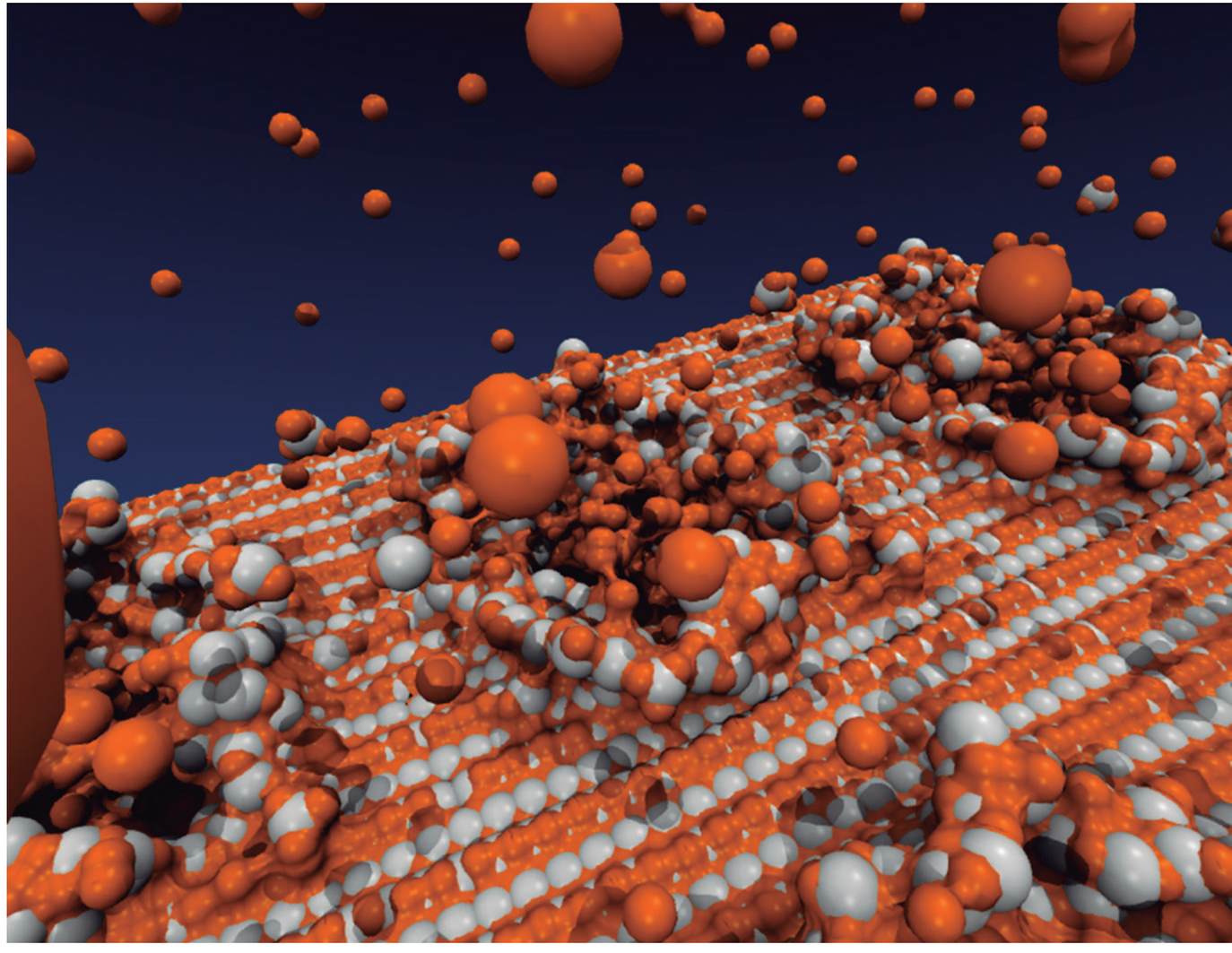
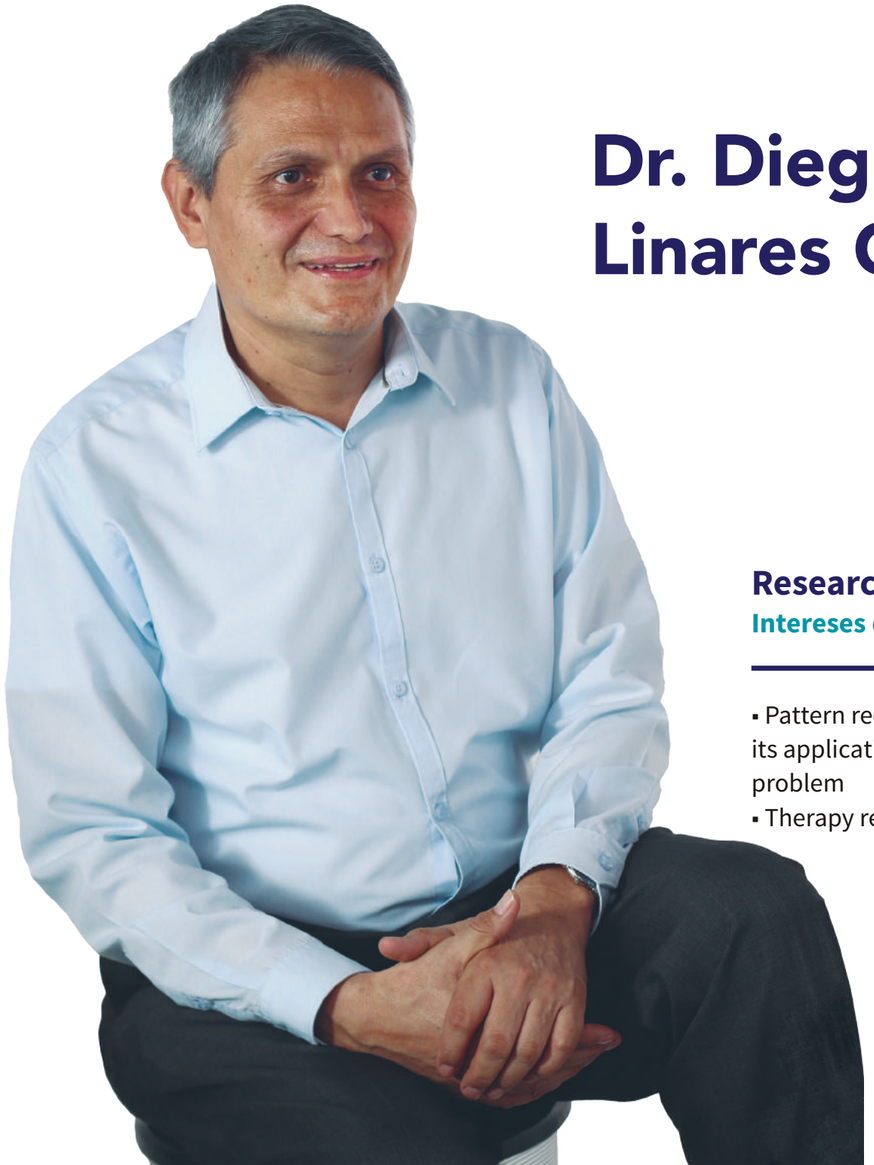


Figure 29. Water cluster impacts on titanium dioxide surfaes from NASA’s Cassini-Hyugens Ion and Neutral Mass Spectrometer (INMS) shows titanium sublimation pump that alters spectral data (Phys. Rev. Letters (PRL), 109, 213201, 2012)



Dr. Diego Luis Linares Ospina

Research interests / Intereses de investigación

- Pattern recognition and its application in real world problem
- Therapy rehabilitation

EN Research Summary

Professor Linares has been working on creating and developing software that allows children with disabilities to take advantage of technology.

His research is on language models - mathematical tools to help process and recognize natural speech, perform optical character recognition (OCR), and other similar signal processing more effectively. Currently, professor Linares applies these techniques in the design of video games to help children with severe hearing impairments with therapy.

ES Resumen del trabajo investigativo

El profesor Linares trabaja en la creación y el desarrollo de software para permitir el aprovechamiento de las ventajas de la tecnología a niños con discapacidades.

Investiga sobre modelos de lenguaje y herramientas matemáticas para ayudar en el procesamiento y el reconocimientos del habla natural, realizar reconocimiento ópticos de caracteres, y otros tipos de procesamiento de señales de manera más efectivamente. Actualmente, el profesor Linares aplica estas técnicas en el diseño de video juegos para ayudar en la terapia de niños con discapacidades auditivas severas.

Figure 30. Software platform designed by the DESTINO research group for auditory therapy used at the Institute for Blind and Deaf Children in Cali, Colombia

Currently sponsored research
Investigación financiada en curso

Interactive telemedicine platform for improving the access to rehabilitation processes in speech for children with impaired hearing (Colciencias).

Recent publications
Publicaciones recientes

▪ Vargas, J.F., Velasco, J.A., Alvarez, G.I., Linares, D.L., Bravo, E. (2015) Automatic segmentation of Potyviridae family polyproteins. International Journal of Bioinformatics Research and Applications, 11 (6), pp. 525-539.

▪ Navarro-Newball, A.A., Loaiza, D., Oviedo, C., (...), Linares, D., Álvarez, G. (2014) Talking to Teo: Video game supported speech therapy. Entertainment Computing, 5 (4), pp. 401-412.

▪ Vargas, J., Velasco, J.A., Alvarez, G.I., Linares, D.L., Bravo, E. (2014) False positive reduction in automatic segmentation system. Advances in Intelligent Systems and Computing, 232, pp. 103-108.

▪ Linares Ospina, D.L., Navarro Newball, A.A., Alvarez, G.I., Loaiza, D.F., Oviedo Santacruz, C.P., Portilla Cordoba, A.Y., Castillo Savedra, A. (2013) A Video Game Pro-totype for Speech Rehabilitation. 5th International Conference on Games and Virtual Worlds for Serious Applications (VS-GAMES) A Video Game Prototype for Speech Rehabilitation. En: Estados Unidos ISBN: 978-1 4799-0965-0 ed: IEEE Xplore digital library.

▪ Sanchez, J.A., Benedi, J.M., Linares Ospina, D.L. (2005) Performance of a SCFG-Based Language Model with Training Data Sets of Increasing Size. En: Alemania Lecture Notes In Computer Science ISSN: 0302-9743 ed: Springer v.3523 fasc.1 p.586–594.

Academic title
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Engineering, Bachelor in Electronics Engineering, and DESTINO research group.

Education
Educación

▪ 2003: Doctorate, Universidad Politécnica de Valencia, Valencia, España.

▪ 1991: Bachelor Computer Science, Pontificia Universidad Javeriana, Cali, Colombia.

Professional experience
Experiencia Profesional

Director of the research, development and innovation office.
Professor of Artificial intelligence, data structure and Programming, Electronic and computer department.

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Dr. Alexander Martínez Álvarez

Research interests / Intereses de investigación

- Aerial and terrestrial robotics.
- Cooperative robotics and control.
- Nonlinear control.

EN Research Summary

Professor Martínez is currently working on using nonlinear control techniques for collision free navigation and control of a fleet of mobile robots.

The current application of interest is on precision agriculture and sustainable urban development.

He's currently working on using nonlinear control techniques for collision free navigation and control of a fleet of mobile robots (UAV and UGV).

Past contributions have been focused on modeling and control of mobile robots, both in terms of attitude stabilization of aerial robots, such as the global.

ES Resumen del trabajo investigativo

El Profesor Martínez investiga sobre el uso de técnicas de control no lineal para la navegación libre de colisiones y el control de flotas de robots móviles.

Actualmente, aplica dichas técnicas para la planeación de trayectorias de flotas robóticas en agricultura de precisión y desarrollo urbano sostenible, así como a la navegación libre de colisiones de flotas con UAVs (Vehículos Aéreos no Tripulados) y UGV (Vehículos Terrestres no Tripulados). El profesor Martínez ha contribuido con técnicas novedosas en robótica móvil, específicamente en la estabilización de actitud de robots aéreos.

Currently sponsored research
Investigación financiada en curso

Nonlinear control applied to cooperative robot navigation (UPM, Spain).

Recent publications
Publicaciones recientes

▪ Barrientos, A., Colorado, J., del Cerro, J., Martínez, A., Rossi, C., Sanz, D., Valente, J. (2011) Aerial remote sensing in agriculture: a practical approach to area coverage and path planning for fleets of mini aerial robots. Journal of field robotics. Volume 28. Issue 5. Pages 667-689. ISSN: 1556-4967 (1556-4959 Paper).

▪ Barrientos, A., Colorado, J., Martínez, A., Lafaverges, B., Valente, J. (2010) Mini-Quadrotor Attitude Control Based On Hybrid Backstepping & Frenet-Serret Theory. Proceedings of IEEE International Conference on Robotics and Automation. ICRA 2010. Anchorage, Alaska. Pages 1617 – 1622. ISBN: 978-1-4244-5038-1.

▪ Barrientos, A., Colorado, J., Martínez, A., Valente, J. (2010) Rotary-wing mav modeling & control for indoor scenarios. Proceedings of IEEE – International Conference on Industrial Technology. IEEE-ICIT 2010. Viña del Mar, Valparaiso, Chile. Pages: 1455-1460.

▪ Martínez, A., Barrientos, A., Diaz, A., Lafont, P., Colorado, J., Castedo, L, Gonzalez, R. Polymeric piezoelectric sensors and remote communication for detection of bruxism. Proceedings of IEEE – International Conference on Industrial Technology. IEEE-ICIT 2010. 14 -17 March 2010. Viña del Mar, Valparaiso, Chile. Pages: 230 – 235.

▪ Del-Cerro, J., Barrientos, A., and Martínez, A. (2009) Modelling and control prototyping of unmanned helicopters. Universidad Politécnica de Madrid – Robotics and Cybernetics Group – España. Chapter book in Aerial Vehicles. Edited by: Thanh Mung Lam, ISBN 978-953-7619-41-1. Hard.

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate (2016), Master's of Engineering, Bachelor in Electronics Engineering, and Robotics and Automation research group (GAR).

Education
Educación

▪ 2016: Doctor in Automation and Robotics, Polytechnic University of Madrid, España.

▪ 2007: Advanced Studies Diploma on Automation and Robotics, Polytechnic University of Madrid, Madrid, España.

▪ 2000: Master's in Automation, Universidad del Valle, Cali, Colombia.

▪ 1994: Bachelor of Science in Electrical Engineer, Universidad del Valle, Cali, Colombia.

Professional experience
Experiencia Profesional

▪ 1999-Present: Associate Professor, Department of Electronics and Computer Science, Engineering School, Pontificia Universidad Javeriana, Cali, Colombia.

▪ 1995-1998: Assistant Professor, Engineering School, Universidad Autónoma de Occidente, Cali, Colombia.

▪ 1994: Instructor, Electrical Engineering School, Universidad del Valle, Cali, Colombia.

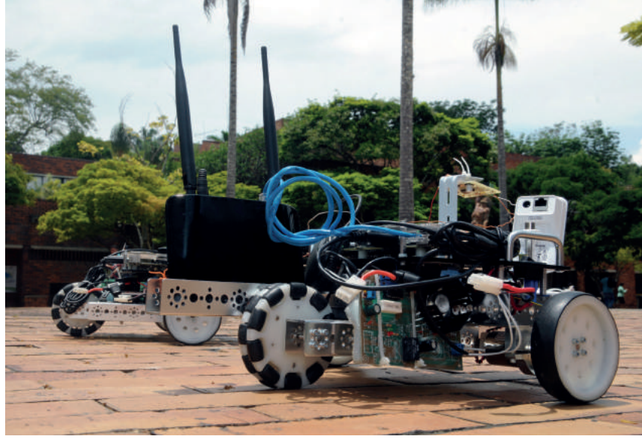

Figure 31. Left. Terrestrial tricycles under collective navigation, bottom: aereal quatri-rotor in fixed Cartesian position.

Figure 32. Rigth. Automated Guided Vehicle (AGV) control and navigation

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Dr. Dimas Mavares Terán

Research interests / Intereses de investigación

▪ Debe listar los interéses de investigación, no en párrafo.

EN Research Summary

I took as my bachelor's project the application of several signal strength estimation over open areas in wireless communication systems. At my master degree, I combine computational electromag- netics with artificial intelligence. I applied an spatial transformation, some kind of distortion of space, to the finite differences method for the transversal section of an open transmission line. To establish parameters of such spatial transformation, Genetic Algorithms were applied. Therefore, characteristic impedance of the line could be calculated using a fraction of the computational ef- fort in comparison with finite elements method. At the Universidad de Cantabria, in Santander, Spain, I joined the Department of Communication Systems, working with the Group of Engineering Systems, Antennas and Propagation (GISAR). I had the opportunity to collaborate in field mea- surement campaigns both in indoors and outdoors environment, to characterize wireless channels. I worked under the direction of professor Rafael P. Torres, applying space-time coding in realistic conditions to MIMO systems. My doctoral thesis consisted in a way to combine different orthogo- nal space-time codes to get high spectral efficiency in the presence of time-varying and correlated wireless channels. I proposed a space-time code selection strategy, consisting in selecting the most appropriate equivalent SISO channel, using a variable number of antennas, and therefore, different space-time codes.

ES Resumen del trabajo investigativo

Durante mis estudios de pregrado en ingeniería electrónica tome como proyecto de grado la aplicación de distintos métodos de estimación de campo eléctrico sobre áreas abiertas en sistemas de comunicación inalámbrica, para su aplicación en telefonía rural. Apliqué el método de Okumura para estimación de campo, adaptándolo a las condiciones topográficas de Venezuela. Más tarde seleccioné un programa de maestría dirigido al estudio de líneas de transmisión, en el cual pude combinar el electromagnetismo computacional con la inteligencia artificial. Apliqué una transformación espacial, un tipo de distorsion del espacio, al método de diferencias finitas sobre la sección transversal de una línea de transmisió abierta. Para establecer los parámetros de tal transformación espacial, se aplicaron Algoritmos Genéticos. De esta forma, la impedancia característica de la línea podría calcularse utilizando una fracción del esfuerzo computacional en comparación con el método de elementos finitos.
En la Universidad de Cantabria, en Santander, España, me incorporé al Departamento de Sistemas de Comunicación, trabajando con el Grupo de Sistemas de Ingeniería, Antenas y Propagación (GI- SAR). Tuve la oportunidad de colaborar en campanas de medición de campo tanto en interiores como en exteriores para caracterizar canales inalámbricos. Trabajé bajo la dirección del profesor Rafael P. Torres, aplicando codificación espacio-temporal en condiciones realistas a sistemas MIMO. Mi tesis doctoral consistio en una forma de combinar diferentes códigos espacio-tiempo ortogona- les para obtener una alta eficiencia espectral en presencia de canales inalámbricos para sistemas vehiculares, correlados y variantes en el tiempo. Propuse una estrategia de selecci ón de c ódigos espacio-tiempo, consistente en seleccionar el canal SISO equivalente más apropiado, utilizando un número variable de antenas, y por lo tanto, diferentes códigos espacio-tiempo.

Recent publications
Publicaciones recientes

▪ Candotti, K., Mavares, D.,Metodología de Selección de Parámetros en Algoritmos de Optimización Metaheurísticos , REDIP - Revista Digital de Investigación y Postgrado, Vol 6, No 2 (2016).

▪ Mavares, D., Velasquez, R., Candotti, K., Huerta, M. Space-Time Code Selection Using Channel Prediction . APCASE 2015, Asia-Pacific Conference on Computer Aided System Engineering.

▪ Alvarez, M., Mavares, D.,Reactores Biopelícula de Lecho Móvil: Estado del Arte , REDIP - Revista Digital de Investigación y Postgrado, Vol 5, No 3 (2015).

▪ Candotti, K., Mavares, D., Velasquez , R. Comparación de Métodos Metaheur ísticos de Optimización: Recocido Simulado, Algoritmos Genéticos y Búsqueda del Cuco , Universidad, Ciencia y Tecnologíia UNEXPO, vol. 18, N71, 2014.

▪ Mavares, D. and Candotti, K. Entorno de Simulación para Sistemas de Comunicaciones Inalámbricos de Alta Capacidad Usando MATLAB, Universidad, Ciencia y Tecnologíia UNEXPO, vol. 16, N64, Jan. 2013.

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Robotics and Automation research group (GAR)

Education
Educación

▪ 2006: Doctor in Channel estimation techniques and adaptive space-time coding selection in transmit diversity systemss, Universidad de Cantabria, España.

▪ 1998: Magister in Electronic Engineering. Universidad Simón Bolivar, Venezuela.

▪ 1994: Bachelor of Science in Electronic Engineer. UNEXPO, Venezuela.

Professional experience
Experiencia Profesional

La experiencia profesional debe ir de acurdo al formato de todos los profesoes por orden cronológico.

Honors and memberships
Honores y memebresías

Awarded Papers. Best paper of The Sixth International Conference on Digital Telecommunications (ICDT 2011), Budapest, Hungary, Apr. 2011. Level I at the Researcher Promotion Program, (Programa de Promoción al Investigador - PPI). Venezuela. Meritorious professor level II. Comisión Nacional del Sistema para el Reconocimiento de Méritos a los Profesores de las Universidades Nacionales (National Commission for the System of Recognition of National University Professor). Venezuela, Nov. 2000. Highest Undergraduate class rank in Electronic Engineering Department, UNEXPO, period 1993-1994. Award for Academic Excellence, UNEXPO, editions 2009, 2010 and 2011.

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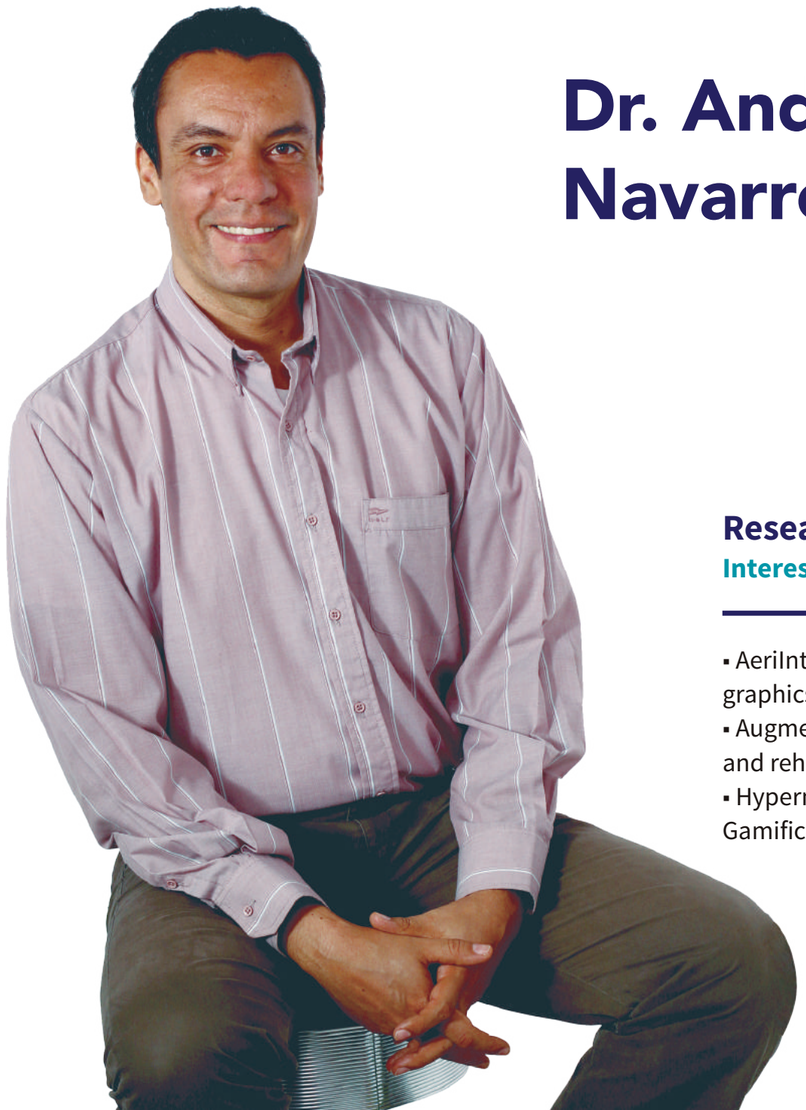

Dr. Andrés Adolfo Navarro Newball

Research interests / Intereses de investigación

- AeriInteractive computer graphics systems
- Augmented reality in learning and rehabilitation processes
- Hypermedia narrative Gamification

EN Research Summary

Professor Professor Navarro Newball's research involves the use of computer graphics and other human-computer interfaces to improve learning and therapeutic processes, from augmented realities in complex cultural contents (e.g. museums), through surgical navigation systems, to videogames in rehabilitation. Dr. Navarro has identified important contradictions associated with the use of interactive TIC systems for training and education, including a lack of systems integration that impede adequate threading of knowledge, and inadequate interfaces, among others. He argues for the need to personalize knowledge understanding when relying on human-computer interactions and for technology-independence to avoid unnecessary noise and overhead in communications. He has led multiple efforts on the creation of software systems that can transparently (i.e. technology-agnostic) aid in learning and rehabilitation of children, under normal or special circumstances (e.g. auditory, visual, or other perceptive losses). Such systems rely on interactive videogames that use natural language interfaces, adapt to the learning progression, and promote autonomous rehabilitation.

ES Resumen del trabajo investigativo

El profesor Navarro investiga sobre la aplicación de la computación gráfica y otras formas de interface hombre-máquina para mejorar los procesos de aprendizaje y terapia, desde realidades aumentadas en contextos culturales complejos (e.g. museos), o sistemas de navegación quirúrgica, hasta videojuegos en la rehabilitación de pacientes. Ha identificado importantes contradicciones asociadas con el uso de sistemas TIC interactivos para entrenamiento y educación, incluyendo la falta de integración de sistemas que impide una adecuada ilación del conocimiento y la falta de interfaces adecuadas, entre otras. El argumenta la necesidad no solo de personalizar la comprensión de conocimiento en la interacción humano-máquina sino tamién la necesidad de hacer el proceso de aprendizaje agnóstico de tecnológica para evitar ruido y sobrecostos en el mismo. Ha liderado múltiples esfuerzos para la creación de softwares que permiten ayudar en procesos de aprendizaje y rehabilitación de niños, bajo condiciones normales o en circunstancias especiales (e.g. pérdida auditiva, visual u otros problemas perceptivos). Dichos sistemas emplean videojuegos interactivos con interfaces en lenguaje natural que se adaptan a la progresión en el aprendizaje y promueven la rehabilitación autónoma.

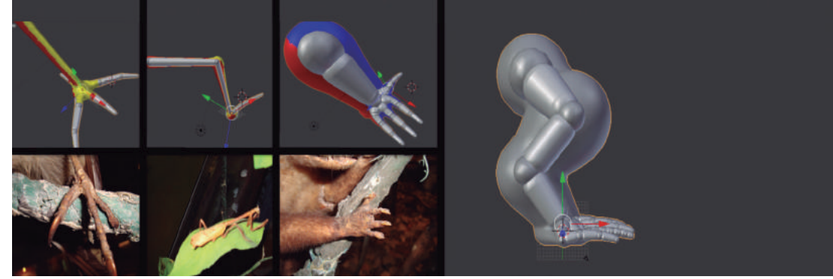

Figure 33.Systematic 3D modeling of living animals enable simulation of their natural motion in time and space.

Currently sponsored research
Investigación financiada en curso

Development of a data and interaction model for projects of Museum I+D+C group. Reviews the display and usability aspects supported by a database which is based on the display spatiotemporal. (University Complutense) Universal design for technological inclusion. Focusing on users with mobility limitations in their superior limbs. (Ocean Browser CC, University of Southern Denmark).

Recent publications
Publicaciones recientes

▪ Navarro-Newball, A.A., Moreno, I., Prakash, E., (...), Mejìa, J.D., Loaiza, D.F. (2015) Gesture based human motion and game principles to aid understanding of science and cultural practices. Multimedia Tools and Applications, ISSN: 1380-7501, Springer.

▪ Navarro Newball, A.A., Moreno Sánchez, I. (2015) Redefinition of ICTs in the museum: From invasive to inclusive discourse. Complutum, 26 (2), pp. 219-228.

▪ Moreno Sánchez, I., Navarro Newball, A.A. (2015) The hidden city. Toledo, a transmedia communication laboratory. Opcion, 31, pp. 806-827.

▪ Navarro-Newball, A.A., Loaiza, D., Oviedo, C., (...), Linares, D., Álvarez, G. (2014) Talking to Teo: Video game supported speech therapy. Entertainment Computing, 5 (4), pp. 401-412.

▪ Ventes, C. C., Navarro-Newball, A. A., Velasco, D. A., Prakash, E. C. (2014) A Programming Library for Creating Tangible User Interfaces. En: Singapore, GSTF Journal on Computing (JoC) Vol.4 No.1, 23-32, ISSN: 2251-3043 DOI: 10.5176/2251-3043_4.1.304.

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Engineering, Bachelor in Systems and Computer Engineering.

Education
Educación

▪ 2015: Postdoctoral research in Information Sciences, Universidad Complutense de Madrid, España.

▪ 2010: Doctor in Computer Science, University of Otago, Dunedin, New Zealand.

▪ 2001: Specialization in Computer Networks and Communications, Universidad ICESI, Cali, Colombia.

▪ 1998: Master of Science in Computer Graphics and Virtual, University Of Hull, Hull, UK.

▪ 1994: Bachelor in Engineering Systems and Computation, Pontificia Universidad Javeriana, Cali, Colombia..

Professional experience
Experiencia Profesional

▪ 2004: Part-time Professor, Universidad ICESI, Cali, Colombia.

▪ 1996: Pontificia Universidad Javeriana, Cali, Colombia.

Honors and memberships
Honores y memebresías

Outstanding professor recognition, Pontificia Universidad Javeriana (2012); Silver medal award for 15 years of service at the Pontificia Universidad Javeriana, Cali, Colombia (2010); University of Otago Scholar, Dunedin, New Zeland (2008); Colfu-turo Scholar, Colombia (2008); "Best in Show Award", Royal Society of Medicine, talk at the Telemed &e-Health Forum, London, UK (2006); Coimbra Group Scholar, Universita Degli Studi Di Siena, Siena, Italy (2006); Honorific mention for academic performance and undergraduate thesis, Pontificia Universidad Javeriana, Cali, Colombia (1994); Program Committee Member CGAT and VSGames conferences; Association for Computing Machinery (ACM) member. Blog: aannewball.wordpress.com; Skype: aannewball-puj; Twitter: @aannewball. Other networks: LinkedIn; ResearchGate; Microsoft Educator Network; ORCID: 0000-0002-4231-8661; ResearcherID: K-8401-2014.

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Engineering Building, No. 2-07

Dr. Alejandro Paz Parra

Research interests / Intereses de investigación

- Electric machinery
- Efficiency in energy conversion processes
- Electromagnetic compatibility
- Bayesian networks applications

EN Research Summary

Professor Paz's research is focused on energy conversion processes and electric machinery. Particularly on diagnosis of electric machinery, electric power quality and power generation. He believes it is critical to harmonize automation with efficient energy conversion processes in order to improve the sustainability of environmental friendly production processes. His studies and develops novel techniques to diagnose electrical machines for predictive and preventive maintenance. He focuses on the development of systematic methods that are implemented in the form of stochastic expert systems. The premise being that existing approaches erroneously assume that specific symptoms appear automtically in the presence of specific faults, which leads to credible predictions in only 1/3 of the faults and the remaining 2/3 to false positives that cause unnecessary interruption to productions lines. Professor has recently proposed a new form of diagnostics tool that combines stochastic and probabilistic methods with multi-parametric non-invasive analysis of electric motors, which accurately predictits state and identifies its short, medium and long-term probability of failure.

ES Resumen del trabajo investigativo

El profesor Paz investiga los procesos de conversión de energía, particularmente en máquinas eléctricas. Su trabajo se enfoca en el diagnóstico de estados en máquinas eléctricas, la calidad de la potencia eléctrica y su generación. El profesor Paz es pionero en el desarrollo de técnicas y métodos para el diagnóstico de máquinas eléctricas como instrumentos de mantenimiento predictivo y preventivo, en particular basados en sistemas expertos estocásticos. Los métodos existentes asumen de manera errada que síntomas específicos aparecen de manera automática bajo la presencia de fallas específicas, lo cual permite tener credibilidad en la predicción de solo una tercera parte de las fallas y conlleva a dos terceras partes de falsos positivos que causan la interrupción innecesaria de los sistemas productivos. Entre sus contribuciones importantes están técnicas novedosas que combinan los métodos estadísticos y probabilísticos con análisis multi paramétrico no invasivo de motores eléctricos para predecir de manera precisa el estado general de un motor eléctrico de corriente alterna (AC) e identificar su probabilidad de falla en el corto, mediano y largo plazo.

Currently sponsored research
Investigación financiada en curso

▪ DC/AC Electric motors fault diagnosis (funded by Javeriana).
▪ Three phase squirrel cage induction motors diagnosis trough expert systems based on bayesian networks (funded by Univalle).

Recent publications
Publicaciones recientes

▪ Paz Parra, A., Oslinger, J.L., Palacios Peñaranda, J.A. (2014) Diagnóstico de fallas estatóricas en motores de inducción de jaula de ardilla por medio de la corriente de secuencia negativa. Bogota D.C.: Sello editorial Javeriano, Ingeniería y Universidad, Vol. 18, págs. 159-176. ISBN:0123-2126.

▪ Paz Parra, A., Lozano Espinoza, C., Valencia, M.V. (2014) A state variable model for considering the power inductor DC resistance on the open loop performance of a buck-boost DC to DC converter. Journal of Multidisciplinary Engineering Science and Technology (JMEST). 1(3).

▪ Paz Parra, A. et al. (2013) Stator fault diagnosis on squirrel cage induction motors by ESA and EPVA. Bogota D.C.: IEEE, 2013. Proceedings of the 2013 Workshop in power electronics and power quality applications PEPQA. 978-1-4799-1006-9.

▪ Diaz, D., Amaya Enciso., M.C., Paz Parra, A. (2012) Inter-turn Short-circuit Analysis in an induction machine by finite elements method and field tests. Marseille, France: IEEE Industrial Electronics Society. Proceedings of the IEEE XXth International Conference on Electrical Machines ICEM. ISBN: 978-1-4673-0141-1.

▪ Paz Parra, A., Cadavid, H., Costa, A.A., Amaya Enciso, M.C., Palacios Peñaranda, J. (2005) Identification of the synchronous machine parameters by the simulation of frequency domain tests using finite-elements method and considering magnetic saturation. International Symposium on Electromagnetic Fields ISEF .

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate (2016), Master's of Engineering (Electronics emphasis), Bachelor of Electronics Engineering, and Robotics and Automation (GAR) research group.

Education
Educación

▪ 2016: Doctorate of Engineering, Universidad del Valle, Cali, Colombia.

▪ 2004: Master of Electric Power Generation, Universidad del Valle, Cali, Colombia.

▪ 1996: Electric Engineering, Universidad del Valle, Cali, Colombia.

Figure 34. Professor Paz standing near the power controller for a battery of industrial AC induction motors.

Professional experience
Experiencia Profesional

▪ 1998-Present: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2000: Universidad del Valle, Cali, Colombia.

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Dr. María Constanza Pabón Burbano

Research interests / Intereses de investigación

- Data Management Systems, particularly data models, database query languages, and information integration
- Software Engineering, particularly software product line engineering

EN Research Summary

Professor Pabón's research focuses on proposing and developing database query languages and mechanisms with the aim to facilitate to end users query formulation. In particular, query formulation over graph data models. Graph models have gained relevance for its use on the web, on knowledge representation, and for integration of heterogeneos data sources.

ES Resumen del trabajo investigativo

El trabajo de investigación de la Profesora Pabón se enfoca en proponer y desarrollar lenguajes y mecanismos de consulta en bases de datos que faciliten al usuario final la formulación de las consultas. En particular se ha trabajado en consultas sobre modelos de datos basados en grafos. Los modelos de grafos han tenido especial relevancia en los últimos años por su uso en la web, la representación del conocimiento y para la integración de fuentes de datos heterogéneas.

Recent publications
Publicaciones recientes

▪ Pabón, M.C., Collazos, C.A. (2015) A Visual query language for data graphs: An approach from the user-centered design. ACM International Conference Proceeding Series, 07-09-September-2015, a49.

▪ Pabón, M.C., Roncancio, C., Millán, M. (2014) Graph management to improve querying of health and social data. HEALTHINF 2014 - 7th International Conference on Health Informatics, Proceedings; Part of 7th International Joint Conference on Biomedical Engineering Systems and Technologies, BIOSTEC, pp. 343-350.

▪ Pabón M., Roncancio C., and Millán M. (2014) Graph Data Transformations and Querying. Procs. of the Intl. C* Conf. on Computer Science & Software Engineering (C3S2E), ACM Press.

▪ Pabón, M., Montoya, G., Millán, M. (2013) Mediation and graph data models for medical data integration. Procs. of the XXXIX Latin American Computing Conference (CLEI), IEEE.

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Doctorate in Engineering, Computer Engineering undergraduate.

Education
Educación

▪ 2016: Ph.D. on Engineering with emphasis on Computer Science, Universidad del Valle, Cali, Colombia.

▪ 2000: MBA, Universidad del Valle, Cali, Colombia.

Professional experience
Experiencia Profesional

▪ 2001-present: Teacher, Electronics and Computer Science Department, Pontificia Universidad Javeriana, Cali, Colombia.

▪ 1995–2001: Software Development Project Coordinator, Financiera FES, Cali, Colombia.

▪ 1992–1995: Software Analyst and Developer, Transportes Expreso Palmira, Cali, Colombia.

Contact information
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Engineering Building, No. 2-48

Dr. Ana Victoria Prados Arboleda

Research interests / Intereses de investigación

- Sustainable design
- Implications of technology
- Engineering ethics and professional responsibility
- Engineering education
- Public policy related to engineering

EN Research Summary

Professor Prados is interested in understanding the impact of technology on the world, especially in areas that determine the quality of life for humans and the societal development. She focuses particularly on the environmental, economic, social and cultural aspects, expecting to contribute to the improvement of these fields through sustainable technology design and through training of engineers able to initiate and sustain rigorous dialog between the technical savvy and those concerned with ethical and aesthetics reflection.

ES Resumen del trabajo investigativo

La profesora Prados está interesada en develar los impactos de la tecnología en el mundo, especialmente en los ámbitos que determinan la calidad de vida de los seres humanos y el desarrollo de su sociedad. Centra especialmente su interés en los ámbitos ambiental, económico, social y cultural. Espera contribuir a que la tecnología mejore el estado de dichos ámbitos mediante el diseño sostenible y la formación de ingenieros capaces de poner en diálogo, de manera rigurosa y profunda, la cosmovisión propugnada por las ciencias y tecnologías y la que proviene de la reflexión ética y estética.

Currently sponsored research
Investigación financiada en curso

▪ PatternPrados, A.V., Rivera, L.R., Londoño, S. L., Cortés, M. J. (2015) Saint Ignatius of Loyola´s Spiritual Exercises as a Recursive Experience. En Beckstead, Zachary (Ed.). Cultural Psychology of recursive processes.

▪ Prados, A.V., Rivera, L.R. (2012) Mapa de competencias para orientar a la sostenibilidad la formación de ingenieros. Hoyer, Hans y Cukierman, Urierl (ed.) WEEF 2012 Foro mundial de educación en ingeniería. Argentina: Editorial de la Universidad Tecnológica Nacional. ISBN 978-987-1896-03-5.

Recent publications
Publicaciones recientes

▪ Patterns of teachers teaching performance in three universities of AUSJAL and its relationship with learning outcomes, as a basis for the development of a teaching training model.

▪ Prados, A.V., Rivera, L.R. (2008) Impacto de las tecnologías de la información y la comunicación (TIC) en la educación superior en América Latina y el Caribe. p. 267-311. En Tünnermann, Carlos (ed.). La educación superior en América Latina y el Caribe: diez años después de la Conferencia Mundial de 1998. Colombia: UNESCO. ISBN 978-958-8347-09-7.

Academic tittle
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Engineering, and Bachelor of Electronics Engineering.

Education
Educación

▪ 2012: Doctor in Human and Social Sciences, Universidad Pontificia Comillas, Madrid, España.

▪ 2000: Bachelor in Electronics Engineering, Pontificia Universidad Javeriana, Cali, Colombia.

Professional experience
Experiencia Profesional

▪ 1999-Present: Pontificia Universidad Javeriana Cali Colombia.

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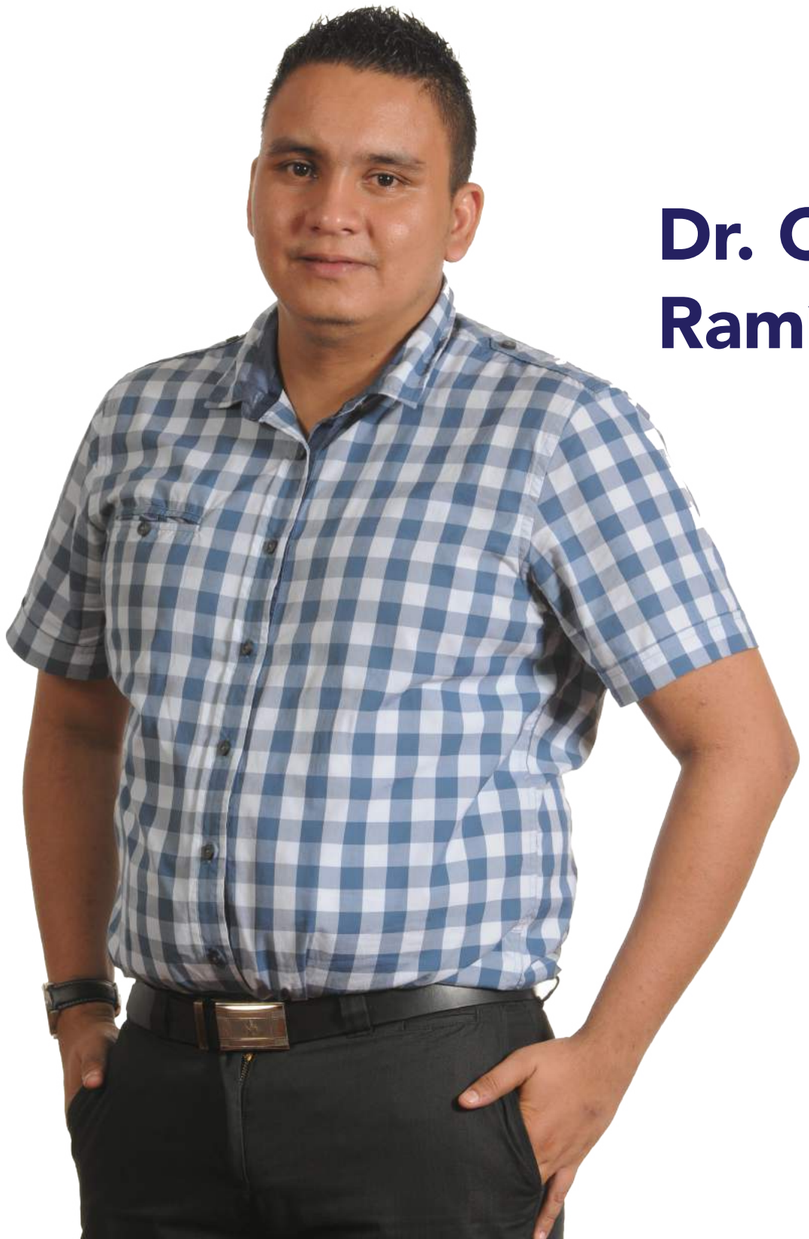

Dr. Carlos Alberto Ramírez Restrepo

Research interests / Intereses de investigación

- Algorithms
- Concurrency theory, Logic
- Formal methods for system modeling and implementation
- Functional and Constraint programming

EN Research Summary

Professor Ramirez is interested to study the application and usage of formal models and concurrency theory in the analysis, construction and deployment of Distributed Systems (grid computing, cloud computing, internet of things) and complex systems. He is also interested in the study of algorithms, programming languages and paradigms (theory and practice), constraint programming and competitive programming.

ES Resumen del trabajo investigativo

El Profesor Ramirez está interesado en estudiar el uso y aplicación de modelos formales y teoría de concurrencia en el análisis, construcción y despliegue de sistemas distribuidos (computación grid, computación en la nube, internet de las cosas) y sistemas complejos. También está interesado en el estudio de algoritmos, lenguajes y paradigmas de programación (teoría y práctica), programación por restricciones y la programación competitiva.

Currently sponsored research
Investigación financiada en curso

▪ Rewriting Logic Sematics for grid computing systems and properties verification by using Maude (Programa de Nuevos Doctores PUJ).

Academic tittle
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

AVISPA research group.

Recent publications
Publicaciones recientes

▪ Ramírez Restrepo, Carlos Alberto & Pérez, Jorge & Aranda, Jesus & Diaz Juan F. Towards Formal Interaction-Based Models of Grid Computing Infrastructures. In Mauricio Ayala-Rincón, Eduardo Bonelli and Ian Mackie: Proceedings 9th International Workshop on Developments in Computational Models (DCM 2013), Buenos Aires, Argentina, 26 August 2013, Electronic Proceedings in Theoretical Computer Science 144, pp. 57–72.

Education
Educación

▪ Doctorate of Engineering, Computer Science, Universidad del Valle, Cali, Colombia.

▪ 2009: Bachelor of Engineering, Computer Science, Universidad del Valle, Cali, Colombia.

Honors and memebresías
Honores y memebresías

BFrancisco José de Caldas Scholar (Doctoral studies), Colombian government (2009-2013).

Professional experience
Experiencia Profesional

▪ 2018-Current: Assistant Professor at Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2017: Full-time Professor at Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2015-2016: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2013-2017: Universidad del Valle, Cali, Colombia.

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Engineering Building, No. 2-39

Dr. Luis Roberto Rivera Mazuera

Research interests / Intereses de investigación

- Sustainable design
- Implications of technology
- Engineering ethics and professional responsibility
- Engineering education
- History of technology

Technology and science

EN Research Summary

Professor Rivera is interested in understanding the impact of technology on the world, especially in areas that determine the quality of life for humans and the societal development. He focuses particularly on the history of science and technology. He expects to contribute to the improvement of these fields through sustainable technology design and through training of engineers able to initiate and sustain rigorous dialog between the technical savvy and those concerned with ethical and aesthetics reflection.

ES Resumen del trabajo investigativo

El profesor Rivera está interesado en develar los impactos de la tecnología en el mundo, especialmente en los ámbitos que determinan la calidad de vida de los seres humanos y el desarrollo de su sociedad. Centra especialmente su interés en la historia de la ciencia y la tecnología. Espera contribuir a que la tecnología mejore el estado de dichos ámbitos mediante el diseño sostenible y la formación de ingenieros capaces de poner en diálogo, de manera rigurosa y profunda, la cosmovisión propugnada por las ciencias y tecnologías y la que proviene de la reflexión ética y estética.

Currently sponsored research
Investigación financiada en curso

▪ Patterns of teachers teaching performance in three universities of AUSJAL and its relationship with learning outcomes, as a basis for the development of a teaching training model..

Recent publications
Publicaciones recientes

▪ Prados, A.V., Rivera, L.R., Londoño, S. L., Cortés, M. J. (2015) Saint Ignatius of Loyola´s Spiritual Exercises as a Recursive Experience. En Beckstead, Zachary (Ed.). Cultural Psychology of recursive processes.

▪ Prados, A.V., Rivera, L.R. (2012) Mapa de competencias para orientar a la sostenibilidad la formación de ingenieros. Hoyer, Hans y Cukierman, Urierl (ed.) WEEF 2012 Foro mundial de educación en ingeniería. Argentina: Editorial de la Universidad Tecnológica Nacional. ISBN 978-987-1896-03-5.

▪ Prados, A.V., Rivera, L.R. (2008) Impacto de las tecnologías de la información y la comunicación (TIC) en la educación superior en América Latina y el Caribe. p. 267-311. En Tünnermann, Carlos (ed.). La educación superior en América Latina y el Caribe: diez años después de la Conferencia Mundial de 1998. Colombia: UNESCO. ISBN 978-958-8347-09-7.

Academic tittle
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Electronics engineering undergraduate program director

Education
Educación

▪ 2012: Doctor in Human and Social Sciences, Universidad Pontificia Comillas, Madrid, España.

▪ 2002: Master's in Education, Pontificia Universidad Javeriana Cali, Cali, Colombia.

▪ 1993: Bachelor of Electronic Engineering, Pontificia Universidad Javeriana, Bogotá, Colombia.

Professional experience
Experiencia Profesional

▪ 1999-Present: Pontificia Universidad Javeriana Cali Colombia.

▪ 1995-1999: IBM de Colombia.

▪ 1994-1995: Pontificia Universidad Javeriana Cali Colombia.

Honors and memberships
Honores y memebresías

Summa Cum Laude (Doctorate), Universidad de Comillas, Spain (2012); Institute of Electrical and Electronics Engineers (IEEE) Circuits and Systems Society member.

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Engineering Building, No. 2-08

Dr. Hernán Camilo Rocha Niño

Research interests / Intereses de investigación

- Rewrite-based deductive and algorithmic verification
- Safety-critical systems, including autonomy languages
- Logic, computational logic, and formal methods in computer science
- Algorithms

EN Research Summary

Professor Rocha main research interests are on techniques for building reliable software systems. In particular, he is interested in rewriting logic applied to formal methods: specification of safety-critical systems and autonomy languages; both deductive and algorithmic verification; decision procedures and their combination for several logics.
He is also interested in algorithms and software engineering. Currently, professor is working on developing combined techniques for symbolic execution and verification of open systems. Specifically, he is working in rewriting modulo SMT (Satisfiability Modulo Theories), a general technique for specifying and verifying robotic systems, protocols, and -- in general -- safety-critical systems in rewriting logic. This technique and its supporting tools have been successfully used to prove safety properties of PLEXIL – a programming language developed by NASA for automation targeted at future space missions. Prof. Rocha is also currently working on optimization algorithms for kidney exchange programs.

ES Resumen del trabajo investigativo

Los principales intereses de investigación del profesor Rocha se centran en técnicas para la construcción de sistemas de software confiable. En particular, está interesado en reescribir la lógica aplicada a los métodos formales: especificación de sistemas de seguridad crítica y lenguajes de autonomía; verificación tanto deductiva como algorítmica; procedimientos de decisión y su combinación para varias lógicas. También está interesado en los algoritmos y la ingeniería de software.
Actualmente, el profesor está trabajando en el desarrollo de técnicas combinadas para la ejecución simbólica y verificación de sistemas abiertos. Específicamente, está trabajando en la reescritura del módulo SMT (Teoría del Modulo de la Satisfabilidad), una técnica general para especificar y verificar sistemas robóticos, protocolos y, en general, sistemas de seguridad crítica en la lógica de la reescritura. Esta técnica y sus herramientas de apoyo se han utilizado con éxito para demostrar las propiedades de seguridad de PLEXIL - un lenguaje de programación desarrollado por la NASA para la automatización dirigida a futuras misiones espaciales. El Prof. Rocha también está trabajando actualmente en lgoritmos de optimización para programas de intercambio renal.

Currently sponsored research
Investigación financiada en curso

▪ Extensible Symbolic Analysis Modulo SMT: Combining the Powers of Rewriting, Narrowing, and SMT Solving in Maude (Colciencias). Optimization models and algorithms for cycle-based kidney exchange programs. Calculational Axiomatic Set Theory.

Recent publications
Publicaciones recientes

▪ Rocha, C. (2015) The Formal System of Dijkstra and Scholten. Lecture Notes in Computer Science (LNCS), volume 9200.

▪ Gutierrez, R., Meseguer, J., Rocha, C. (2015) Order-sorted Equality Enrichments modulo Axioms. Science of Computer Programming (SCP), 99 (1).

▪ Rocha, C., Meseguer, J., Muñoz, C. (2014) Rewriting Modulo SMT and Open System Analysis. Lecture Notes in Computer Science (LNCS), volume 8663.
▪ Rocha, C., Muñoz, C. (2014) Syncrhonous Set Relations in Rewriting Logic. Science of Computer Programming (SCP), 92(B).

▪ Rocha, C., Meseguer, J. (2014) Mechanical Analysis of Reliable Communication Using the Maude Invariant Analyzer Tool in the Alternating Bit Protocol. Lecture Notes in Computer Science (LNCS), volume 8373.

Academic tittle
Título académico

Associate Professor

Current position
Posición actual

Master's of engineering with emphasis in computer science coordinator

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Engineering, Bachelor of Systems and Computer Engineering, and AVISPA research group.

Education
Educación

▪ 2012: Ph.D. in Computer Science, University of Illinois, Urbana, USA
▪ 2012: M.Sc. in Mathematics, University of Illinois, Urbana, USA

▪ 2005: M.Sc. in Computer Science and Engineering, Univesidad de los Andes, Bogotá, Colombia

▪ 2002: Bachelor of Science in Computer Science and Engineering, Univesidad de los Andes, Bogotá, Colombia

Professional experience
Experiencia Profesional

▪ 2016-Current: Associate Professor at Pontificia Universidad Javeriana, Cali, Colombia

▪ 2002-2015: Assitant Professor at Escuela Colombiana de Ingeniería Julio Garavito, Bogotá, Colombia

▪ 2006-2012: Research Assistant, Formal Methods and Declarative Languages Laboratory, University of Illinois, Urbana, USA

Honors and memberships
Honores y memebresías

Francisco José de Caldas Scholar (Doctoral studies), Colombian government (2006-2012). Program committee member of: 11th Workshop on Logical and Semantic Frameworks, with Applications, 2016 11th Computing Colombian Conference, 2016; 10th Workshop on Logical and Semantic Frameworks, with Applications, 2015; 10th Computing Colombian Conference, 2015; 4th International Workshop on Formal Techniques for Safety-Critical Systems, 2015; 24th International Joint Conference on Artificial Intelligence, 2015; 12th International Conference on Formal Aspects of Component Software, 2015; 12th International Conference on Theoretical Aspects of Computing, 2015.

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Dr. Camilo Rueda Calderón

Research interests /
Intereses de investigación

- Concurrency theory, Logic
- Formal methods for system modeling and implementation
- Computer supported music composition and performance
- Functional and Constraint programming

EN Research Summary

Professor Rueda's research interests are mainly in the area of the use of formalims and tools for modeling and verifying interactive systems. There are two main formalisms he privileges in his research, one derived from the "correct by construction" software development paradigm (essentially based on predicate calculus specification of system properties), and the other coming from concurrency theory, namely the formal calculi of concurrent processes.
In the first, he is interested in finding ways to make the paradigm accessible to the mainstream software development practitioners by offering provably correct translations between a formal system model in the correct by construction paradigm and a fully specified computer program in some mainstream language.

In the second, the goal is being able to model and verify systems in very complex interaction contexts. Among the variety of calculi proposed for this, he is most interested in those capable of performing computation under partial information and having some formal logic equivalence, such as the so-called concurrent constraints calculi (CCP). The application of this theoretical work I consider mostly is in the field of multimedia interaction, for example, the coordination of human and computers in musical performance, such as in a computers involved in music improvisation scenarios.
His third line of research is the use of languages and techniques derived from constraint programming for solving combinatorial problems. In particular, in approaching the declarative modeling convenience of constraint programming to the solution of real-world engineering problems.

ES Resumen del trabajo investigativo

La investigación del profesor Rueda está orientada al uso de formalismos y herramientas para modelado y verificación de sistemas interactivos. Él privilegia dos formalismos en su investigación, uno derivado del paradigma de desarrollo de software 'correcto por construcción' (esencialmente basado en la especificación de propiedades del sistema mediante el cálculo de predicados), y el otro proveniente de la teoría de concurrencia, es decir el cálculo formal de procesos concurrentes. En el primero, el profesor Rueda está interesado en encontrar formas para hacer el paradigma más accesible a los desarrolladores de software ofreciéndoles traducciones probadas como correctas entre un modelo de sistema formal y un programa de computador especificado completamente en algún lenguaje de programación de la corriente principal. En el segundo, el objetivo es poder modelar y verificar sistemas en contextos de interacción complejos. Entre la variedad de cálculos propuestos para esto, se interesa en aquellos capaces de realizar computación bajo información parcial y con equivalencias lógicas formales, como los llamados cálculos concurrentes por restricciones (CCP). Aplica este trabajo teórico en el campo de la interacción multimediada, por ejemplo, en la coordinación del rendimiento musical entre humanos y computadores, como en escenarios de improvisación musical que involucran computadores. La tercera línea de interés investigativo para el profesor Rueda, es el uso de lenguajes y técnicas derivadas de la programación por restricciones para resolver problemas combinatorios. En particular, su interés está enfocado en la conveniencia de modelos declarativos de la programación por restricciones a la solución de problemas de la ingeniería en contexto.

Currently sponsored research
Investigación financiada en curso

Using Logic and CCP calculi to model different notions of space and time in music interaction. Proving formally in the Coq proof assistant the correctness of the whole translation between an Event-B "correct by construction" model and the corresponding JML specified Java program. Using constraint programming to automatically find values of constants of a JML/Java translation of an Event-B model, that satisfy the axioms specified in the model.
Linking the protocol synchronization language of "session types" to CCP formal calculi. Furthermore, translating session types specified protocols to an Event-B model.
MUSICAL - MUsic and Spatial Interaction with Constraints, Algebra and Logic: foundations and applications (Brasilian research support agency, Brasil).

Recent publications
Publicaciones recientes

▪ Rueda, C., Catano, N., Wahls, T., Rivera, V. A. (2015) Code generation for Event-B. En: Alemania, International Journal On Software Tools for Technology. Transfer ISSN: 1433-2779 ed: v.17 fasc. N/A p.3 – 23.

▪ Toro, M., Rueda, C., Agón, C., Assayag, G. (2015) NTCCRT: A concurrent constraint framework for soft real-time music interaction. Journal of Theoretical and Applied Information Technology, 82 (1), pp. 184-193.

▪ Arias, J., Desainte-Catherine, M., Olarte, C., Rueda, C. (2015) Foundations for Reliable and Flexible Interactive Multimedia Scores. MCM 2015: 29-41.

▪ Haar, S., Perchy, S., Rueda, C., Valencia, F. D. (2015) An algebraic view of space/belief and extrusion/utterance for concurrency/epistemic logic. PPDP 2015: 161-172.

▪ Toro, M., Desainte-Catherine, M., Rueda, C. (2014) Formal semantics for interactive music scores: a framework to design, specify properties and execute interacti-ve scenarios. Journal of Mathematics and Music, Vol 8(1).

Academic tittle
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Engineering (Computer Engineering emphasis), Bachelor of Systems and Computing Engineering, and AVISPA research group.

Education
Educación

- 1977: Degree in Electrical Engineering (DEE), Massachusetts Institute of Technology (MIT), Boston, Massachusetts, USA.
- 1974: Master of Science in Computer Science, Massachusetts Institute of Technology (MIT), Boston, Massachusetts, USA.
- 1972: Bachelor of Systems and Computer Engineering, Universidad de Los Andes, Bogotá, Colombia.

Professional experience
Experiencia Profesional

- 2014: Emeritus professor, Universidad Javeriana-Cali, Colombia.
- 2008-2014: Full time professor, Universidad Javeriana-Cali, Colombia.
- 2014: Invited professor, Federal University of Rio Grande Do Norte, Brasil.
- 2013: Invited professor, Université Pierre et Marie Curie, Paris, France.
- 2012-2013-2014: Invited researcher, Ecole Polytechnique, Paris, France.
- 1990-1994, 1998, 2005, 2011, 2012: Invited researcher, Institut de Recherche/Coordination Acoustique-Musique (IRCAM), Paris, France.
- 2011-2012: Invited researcher, Université de Bordeaux I, France.
- 2012: Invited researcher, University of Madeira, Portugal.

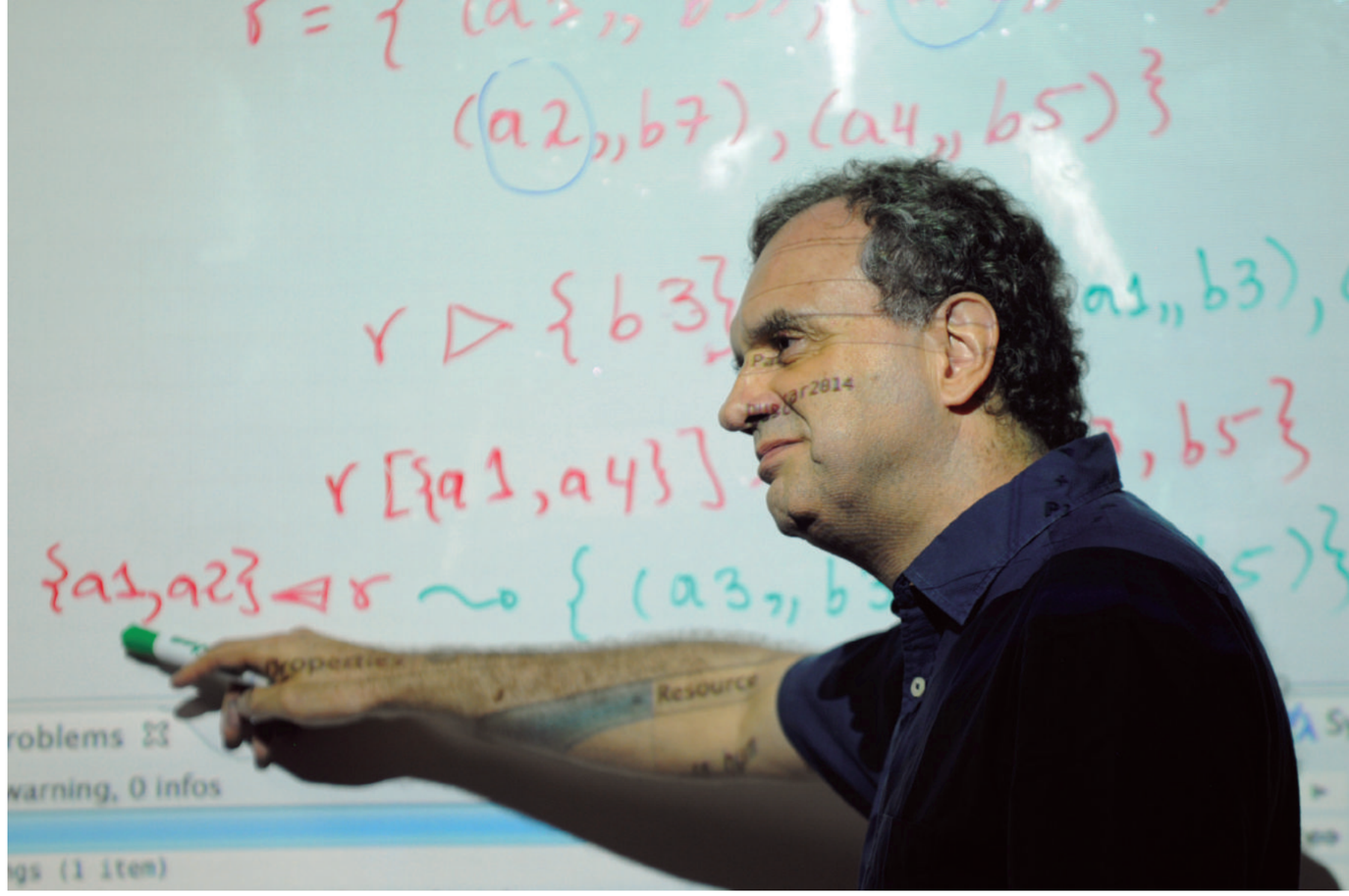

Figure 29. Water cluster impacts on titanium dioxide surfaes from NASA's Cassini-Hyugens Ion and Neutral Mass Spectrometer (INMS) shows titanium sublimation pump that alters spectral data (Phys. Rev. Letters (PRL), 109, 213201, 2012)

Honors and memberships
Honores y memebresías

Emeritus Professor, Pontificia Universidad Javeriana Cali, Colombia (2014)

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Engineering Building, No. 2-42

Dr. Gernando Mauricio Sarria Montemiranda

Research interests / Intereses de investigación

- Information retrieval, pattern recognition (classification and regression by means of feature extraction), machine learning (supervised and unsupervised techniques such as k-NN, Decision trees, Naive Bayes, and SVM), and data mining (clustering and association using k-means)
- Concurrency, constraint programming, process calculi, and logics
- Computer music and Computer assisted composition Teaching/learning methodologies

EN Research Summary

Professor Sarria's research involves developing new constraint programming languages based on process calculi, exploring novel teaching/learning methodologies for computer science materials, and developing new theories and tools for solving problems in Security Protocols, Biology and Multimedia Semantic Interaction. He is currently applying artificial intelligence techniques at the intersection of machine learning, pattern recognition and data mining for Computational Characterization of Salsa Music. He is developing a novel approach to perform data mining on a big set of Salsa songs to build a system that models this musical genre and recognizes and classifies them using machine-learning techniques. He has contributed new constraint programming software solutions for enterprises, including the programming language Cordial, and most recently formal models of time musical processes that are currently being applied to characterize, understand and classify musical genres (particularly Salsa).

ES Resumen del trabajo investigativo

El profesor Sarria investiga el desarrollo de nuevos lenguajes de programación por restricciones basados en cálculos de procesos, la exploración de nuevas metodologías para la enseñanza de las ciencias de la computación, y en el desarrollo de nuevas teorías y herramientas para la solución de problemas en protocolos de seguridad, biología e interacción semántica en multimedia. El profesor Sarria aplica técnicas de inteligencia artificial en la intersección con el aprendizaje de máquinas, reconocimiento de patrones, y minería de datos para la caracterización computacional de la Salsa. Está desarrollando un nuevas estrategias para realizar minería de datos sobre conjuntos de datos grandes en canciones de Salsa para construir un sistema que modela el género y lo clasifica mediante técnicas de aprendizaje de máquina. El profesor Sarria ha contribuido soluciones de software para programación por restricciones en empresas, incluyendo el lenguaje de programación Cordial, y modelos formales de procesos musicales temporales que están siendo aplicados actualmente para caracterizar, comprender y clasificar diferentes géneros musicales.

Currently sponsored research
Investigación financiada en curso

Computational Characterization of Salsa Music, a project funded by three universities in Cali, Colombia. An approach to perform data mining on a big set of songs and thus to built a system that models this musical genre and recognizes and classifies old and new Salsa songs using machine learning techniques.

Recent publications
Publicaciones recientes

▪ Prados, A. V., Roberto, L., Sarria, G. M. (2015) Competences that facilitate the achievement of the objectives of an introductory programming course. World Engineering Education Forum (WEEF2015). Florence, Italy.

▪ Sarria, G. M., Mora, M. J. (2014) Introducción a la Programación. Lulu Press.

▪ Sarria, G.M., (2013) Survey of Computational Calculi used in Musical Applications. Ingenieria y Competitividad. 15(2):103-114. Universidad del Valle.

▪ Perchy, A. Sarria, G.M. (2013) Building models of musical compositions using process algebras. 39th Latinamerican Conference on Informatics (CLEI2013). Naiguata, Venezuela.

▪ Martinez, J.C., Sarria G.M. (2013) Didactic and Interdisciplinary Experiences in a Software Engineering Course. 43rd IEEE/ASEE Frontiers in Education Conference (FiE2013). Oklahoma City, OK, USA.

Academic tittle
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Masters of Engineering, Bachelor of Computer and Systems Engineering, and Automated audio digital signal processing and classification methods and computational techniques.

Education
Educación

▪ 2008: Doctorate of Engineering, Computer Science, Universidad del Valle, Cali, Colombia.

▪ 2001: Bachelor of Engineering, Computer Science, Pontificia Universidad Javeriana, Cali, Colombia.

Professional experience
Experiencia Profesional

▪ 2014: Associate Professor, Pontificia Universidad Javeriana Cali, Colombia.

▪ 2012: Assistant Professor, Pontificia Universidad Javeriana Cali, Colombia.

▪ 2007: Instructor, Pontificia Universidad Javeriana Cali, Colombia.

▪ 2004: Researcher and Developer, Institut de Recherche et Coordination Acoustique/Musique (IRCAM), Paris, France.

▪ 2002: Teaching assistant, Universidad del Valle, Cali, Colombia.

Figure 36.Professor Sarria researching at the intersection between music and artificial intelligence

Honors and memberships
Honores y memebresías

Association for Computing Machinery (ACM) - Professional Member; Colombian Computation Society (SCo2) member.

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Dr. Eugenio Tamura Morimitsu

Research interests / Intereses de investigación

- Real-Time systems
- Embedded systems
- High-Performance Computing
- Executable Specifications
- Testing and Verification

EN Research Summary

Professor Tamura's research interest is primarily based on custom computing. In particular, dealing with specialized computing platforms tailored to tackle specific applications that are otherwise impossible to solve with conventional, off-the-shelf computing platforms. Custom computer architectures, including parallel systems, hardware accelerators, and reconfigurable hardware platforms, are able to adapt to problems that are not amenable to conventional computers. His contributions have been focused in improving the estimation of predictability in real-time embedded systems, by designing customized locking caches and techniques to choose the instructions that should be locked to maximize performance. He is currently working on distributed computing architectures and adaptive hardware.

ES Resumen del trabajo investigativo

El profesor Tamura trabaja en computación a la medida. De manera concreta, en plataformas de computación especializadas para aplicaciones específicas que de otra manera serían imposibles de abordar con plataformas de computo convencionales. Las arquitecturas de cómputo paralelas, los aceleradores de hardware y las plataformas de hardware reconfigurable, pueden adaptarse a problemas que no son dóciles a la computación convencional. Sus contribuciones se han enfocado en mejorar la estimación de previsibilidad en sistemas de tiempo real embebidos, mediante el diseño a la medida de caches protegidos y técnicas de acceso rápido a datos para la selección de instrucciones que deben ser bloqueadas para maximizar el rendimiento. El profesor Tamura está actualmente trabajando en arquitecturas de cómputo distribuidas y hardware adaptivo.

Currently sponsored research
Investigación financiada en curso

financiada en curso
Adaptive Systems using (Partial) Reconfigurable Computing.
High-Level Synthesis.
Common Information Model, CIM, for EPSA (grant: EPSA).
Centro de Excelencia y Apropiación en Internet de las Cosas (www.cea-iot.org), funded by Ministry of Industry and Commerce).

Recent publications
Publicaciones recientes

▪ Hissami, A., Pretel, A., Tamura, E. (2014) A Numerical Solution for Wootters Correlation. Communications in Computer and Information Science. Volume 485, pp. 221-235. Springer.

▪ Martí-Campoy, A., Rodríguez-Ballester, F., Tamura Morimitsu, E., Ors, R. (2011) An algorithm for deciding minimal cache sizes in real-time systems. Proceedings of the 13th annual conference on Genetic and evolutionary computation. Pp. 1163-1170. ACM.

▪ Martí Campoy, A., Tamura, E., Rodríguez-Ballester, F., Serrano, J.J. (2009) Parallel Implementation of a Genetic Algorithm Using a Grid. Proceedings of The 2009 International Conference on Grid Computing & Applications. Pp. 92-98. CSREA Press.

▪ Tamura, E., Busquets-Mataix, J.V., Martí Campoy, A. (2007) Towards predictable, high-performance memory hierarchies in fixed-priority preemptive multitasking real-time systems. Proceedings of the 15th International Conference on Real-Time and Network Systems, RTNS'07. Institut National Polytechnique de Lorraine, pp. 75-84.

▪ Martí Campoy, A., Tamura, E., Saez, S., Rodríguez, F., Busquets-Mataix, J.V. (2005) On using locking caches in embedded real-time systems. Embedded Software and Systems, pp. 150-159.

Academic tittle
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Doctorate in Engineering, Master's in Engineering and, Electronic Engineering undergraduate program and and Automation and Control research.

Education
Educación

▪ 2008: Doctorate of Engineering, Computer Science, Universidad del Valle, Cali, Colombia.

▪ 2001: Bachelor of Engineering, Computer Science, Pontificia Universidad Javeriana, Cali, Colombia.

Professional experience
Experiencia Profesional

▪ 1995-Present: Associate Professor, Department of Electronics and Computer Science, Engineering School, Pontificia Universidad Javeriana, Cali, Colombia.

▪ 1994: Part time Instructor, Engineering School, Pontificia Universidad Javeriana, Cali, Colombia.

▪ 1990: Research Assistant, Electronics Engineering division, Universidad del Cauca, Popayán, Colombia.

Honors and memberships
Honores y memebresías

Honorific mention for undergraduate thesis, Electronics and Telecommunications Engineering, Universidad del Cauca, Popayán, Colombia (1990); Distinguished professor recognition, Engineering Faculty, Pontificia Universidad Javeriana, Cali, Colombia (2002); Colombian Engineering Faculty Association award (ACOFI) 2002; Outstanding Cum Laude (Doctorate), Universidad Politécnica de Valencia, Valencia, Spain (2008); Member Institute of Electrical and Electronics Engineers (IEEE).

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Figure 37. Professor Tamura configuring our HPC cluster through its administration console

Dr. Luis Eduardo Tobón Llano

Research interests / Intereses de investigación

- Computational electromagnetics
- Bioacoustic signal analysis in ecosystems health
- Underground object detection and characterization (anti-personal mines)

EN Research Summary

Professor Tobon's research involves using continuum level modeling and simulation to characterize complex electromagnetic systems and phenomena (Maxwell's equations). He focuses on reducing the computational complexity of FETD methods to characterize electrically resolved structures on large-scale systems, with explicit and implicit temporal integration, based on computational domain decomposition. The applications span from 3D microelectronics, from nanometers to millimeters, design of wide band antennas interacting with large electrically active structures, and dispersive media detection (e.g. anti-personal land mines, improvised explosive devises). Other research interests involve the use of orthogonal functions to perform signal analysis for classification problems. Among these, we are currently studying sound as a means to diagnose health in ecosystems.

ES Resumen del trabajo investigativo

El trabajo del profesor Tobón se basa en el diseño y la aplicación de modelos continuos de simulación para caracterizar sistemas y fenómenos electromagnéticos (basados en las ecuaciones de Maxwell). Su foco está en reducir la complejidad computacional de los métodos FETD para caracterizar estructuras eléctricas en sistemas de gran envergadura, con integración temporal implícita y explícita, basado en la descomposición del dominio computacional. Él aplica estos métodos en el diseño y la caracterización de sistemas microelectrónicos en 3D, desde la escala de los nanómetros hasta la escala de los milímetros, en el diseño de antenas de banda ancha interactuando con estructuras eléctricamente activas y en la detección de medios dispersos (e.g. minas anti personales y otros dispositivos explosivos improvisados). El profesor también investiga sobre el uso de funciones ortogonales para el análisis de señales en problemas de clasificación. Actualmente está estudiando el análisis de señales de sonido para el diagnóstico de la salud de sistemas ecológicos.

Currently sponsored research
Investigación financiada en curso

Detection of underground buried objects, DUBO (grant: Javeriana).

Recent publications
Publicaciones recientes

▪ Tobon Llano, L. E. (2015) Efficient Noniterative Implicit Time-Stepping Scheme Based on E and B Fields for Sequential DG-FETD Systems. En: Estados Unidos. IEEE Transactions on Components Packaging and Manufacturing Technology. ISSN: 2156-3950 ed: v.5 fasc.12 p.1839–1849.

▪ Tobon Llano, L. E. (2015) Mixed Spectral-Element Method for 3-D Maxwell's Eigenvalue Problem. En: Estados Unidos. IEEE Transactions on Microwave Theory and Techniques. ISSN: 0018-9480 ed: v.63 fasc.2 p.317-325.

▪ Tobón, L. E., Ren, Q. and Liu, Q. H. (2015) A new efficient 3D Discontinuous Galerkin Time Domain (DGTD) method for large and multiscale electromagnetic simulations. Journal of Computational Physics.

▪ Tobón, L. E., Ren, Q., and Liu, Q. H. (2014) Spectral-Prism Element for Multi-Scale Layered Package-Chip Co-Simulations Using the Discontinuous Galerkin Time-Domain Method. Electromagnetics 34, no. 3-4, pp270-285.
Ren, Q.; Tobón, L. E.; Liu, Q. H. (2013) A new 2D non-spurious discontinuous galerkin finite element time domain (DG-FETD) method for Maxwell's equations. Progress In Electromagnetics Research, Vol. 143, pp 385-404.

Academic tittle
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Bachelor of Electronics Engineering, and Robotics and Automation (GAR) research group.

Current position
Posición actual

▪ Graduate programs director (specializations and master's), Engineering Faculty

▪ Master's of engineering with emphasis in electronics coordinator

Education
Educación

▪ 2013: Ph.D. in Electrical and Computer Engineering, Duke University, Raleight, North Carolina, USA.

▪ 2007: Master in Materials Science, Universidad del Quindio, Armenia, Colombia.

▪ 2002: Bachelor in Electronics Engineering, Universidad del Quindio, Armenia, Colombia.

Professional experience
Experiencia Profesional

▪ 2007 - Present: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2012–2013, Research Assistant, Duke University, Raleight, North Carolina, USA.

▪ 2011: Developer, Wave Computation Technology, Inc., Durham, North Carolina, USA.

▪ 2003–2007: Lecturer in Engineering, Universidad del Quindío, Armenia, Colombia.

Honors and memberships
Honores y memebresías

Best Paper Award, IEEE Transactions on Components, Packaging and Manufacturing Technology, Electrical Performance of Integrated Systems Category (2011); graduate with honors, Engineering Faculty, 50 year Universidad del Quindio Anniversary (2010); Fulbright-Colciencias Scholar ((2008); Young Investigator Scholar (Colciencias-BID, 2002); Institute of Electrical and Electronics Engineers member; Applied Computational Electromagnetics Society (ACES) member; Colombian Engineers Association (ACIEM); peer reviewer for IEEE Antennas and Wireless Propagation Letters, IEEE Transactions on Microwave Theory and Techniques, IEEE Transactions on Antennas and Propagation, and the Applied Computational Electromagnetics Journal.

Contact information
Información de contacto

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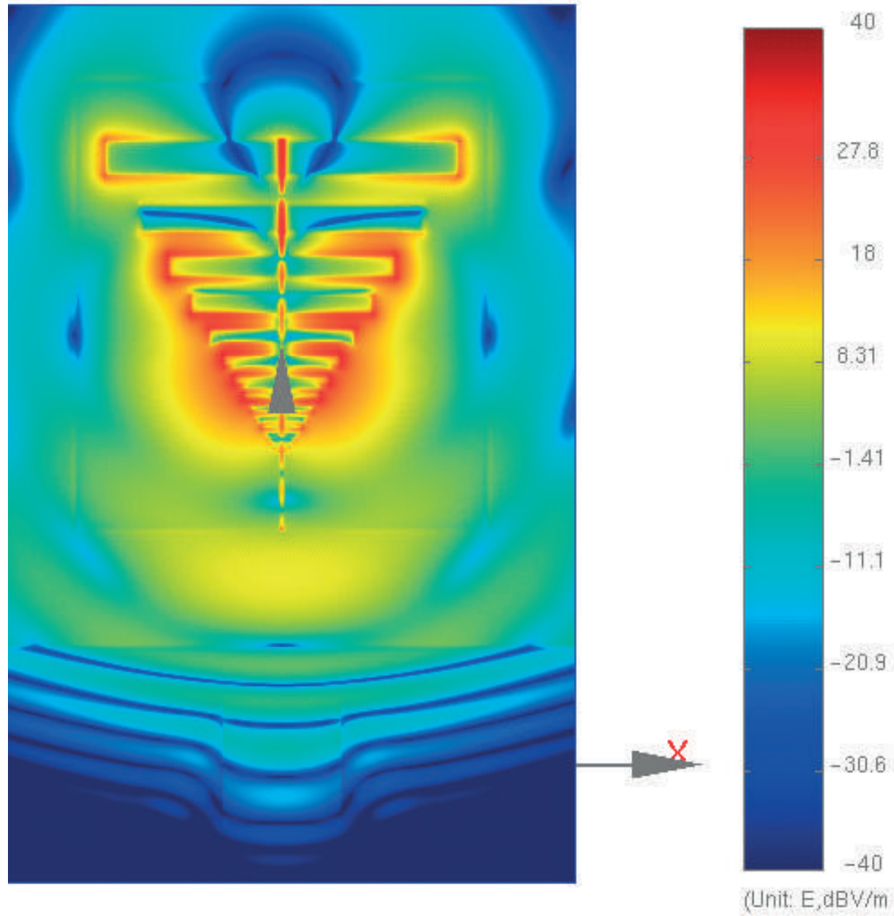

Figure 38. Radiation pattern of a printed log-periodic dipole antenna designed for anti-personnel landmine detection

Dr. Frank Darwin Valencia Posso

Research interests / Intereses de investigación

- Concurrency Theory
- Logic for Computer Science
- Constraint-based Formalisms
- Formal Methods in computer science

EN Research Summary

Frank Valencia's main interests are within Formal Methods in Computer Science, in particular Concurrency Theory and Logic. He has published results on the computational expressiveness of well-stablished process calculi such as CCS (Calculus of Communicating Systems), the π-calculus and CCP (Concurrent Constraint Programming). In particular, he has given expressiveness distinctions between dynamic and static scope as well as replication and recursion in CCS and CCP, a Chomsky-like hierarchy of fragments of CCS, separation results for linear and persistent fragments of the π-calculus, and the Büchi-automata characterization of timed CCP. He has established new connections between the areas of concurrency theory and logic by providing first-order, temporal and epistemic logic interpretations of concurrent phenomena such as mobile, timed and spatial behavior. He has used these connections to prove new results in these areas such as the decidability of the observational equivalence for several fragments of the π-calculus and the decidability of satisfiability for the existential fragment of first-order temporal logic. He has been one of the originators of constraint-based process calculi for analyzing timed, mobile, spatial and epistemic behavior in concurrent systems. Over a decade ago he published work on search and consistency algorithms for CSP (Constraint Satisfaction Problems), and introduced the notion of Infinite (or unbounded) CSP. The professor has published over 50 articles in international peer-reviewed venues.

ES Resumen del trabajo investigativo

Los intereses principales de Frank Valencia se encuentran dentro de los métodos formales en ciencias de la computación, particularmente en la teoría de la concurrencia y lógica. Ha publicado resultados sobre la expresividad computacional de cálculos de procesos bien establecidos, como el cálculo de sistemas de comunicación (CCS por sus siglas en inglés), el π-cálculo y la programación de restricciones concurrentes (CCP por sus siglas en inglés). En particular, ha dado distinciones de expresividad entre el ámbito dinámico y el estático, así como la replicación y recursión en CCS y CCP, una jerarquía similar a Chomsky de fragmentos de CCS, separación de los resultados para los fragmentos lineales y persistentes del π-cálculo, y la caracterización Büchi-autómata de tiempo CCP. Ha establecido nuevas conexiones entre las áreas de la teoría de la concurrencia y la lógica proporcionando interpretaciones de lógica de primer orden, temporal y epistémica de fenómenos concurrentes como el comportamiento móvil, el temporizado y el espacial. Ha utilizado estas conexiones para probar nuevos resultados en estas áreas, tales como la decidibilidad de la equivalencia observacional para varios fragmentos del π-cálculo y la decidibilidad de la satisfacibilidad para el fragmento existencial de la lógica temporal de primer orden. Ha sido uno de los creadores de cálculos de procesos basados en restricciones para analizar el comportamiento temporal, móvil, espacial y epistémico en sistemas concurrentes. Hace más de una década publicó trabajos sobre algoritmos de búsqueda y consistencia para problemas de satisfacción de restricciones (CSP por sus siglas en inglés), e introdujo la noción del CSP Infinito (o no Ilimitado). El profesor ha publicado más de 50 artículos en lugares internacionales revisados por pares.

Currently sponsored research
Investigación financiada en curso

- Project d-spaces: modeling of spatial concurrent systems (social networks) (digiteo, france). Project verification of epistemic distributed systems (inria, france).

- Project classic: concurrency, logic and algebra for social and spatial interactive computation (colciencias, puj cali, ecole polytechnique).

- Project music and spatial interaction with constraints, algebra and logic: foundations and applications (urfn brazil, puj, ecole polytechnique france).

- Project anr 12is02001 blin project on co-inductive methods pace (basic lab china, inria france, univ. Of bologna italy).

Recent publications
Publicaciones recientes

- Pino, L. F., Aristizábal, A. A., Bonchi, F., Valencia, F. D. (2015) Weak CCP bisimilarity with strong procedures. Sci. Comput. Program. 100: 84-104.

- Pino, L. F., Bonchi, F., Valencia, F. D. (2015) Efficient algorithms for program equivalence for confluent concurrent constraint programming. Sci. Comput. Program. 111: 135-155.

- Gadducci, F., Santini, F., Pino, L. F., Valencia, F. D. (2015) A Labelled Semantics for Soft Concurrent Constraint Programming. COORDINATION 2015: 133-149.

- Haar, S., Perchy, S., Rueda, C., Valencia, F. D. (2015) An algebraic view of space/belief and extrusion/utterance for concurrency/epistemic logic. PPDP: 161-172.

- Pino, L. F., Bonchi, F., Valencia, F. D. (2014) A Behavioral Congruence for Concurrent Constraint Programming with Nondeterministic Choice. ICTAC: 351-368.

Academic tittle
Título académico

▪ Associate Professor.

▪ Senior Researcher at CNRS (The French National Centre for Scientific Research) at Ecole Polytechnique de Paris.

Current position
Posición actual

▪ Graduate programs director (specializations and master's), Engineering Faculty

▪ Master's in engineering with emphasis in electronics coordinator

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Master's of Engineering (Computer Engineering emphasis), Bachelor in Systems and Computing Engineering, and AVISPA research group. Laboratory of Computer Science at Ecole Polytechnique Paris and INRIA Team Comete.

Education
Educación

▪ 2004: Postdoctoral scholar University of Uppsala, Sweden.

▪ 2002: PhD in Computer Science from Aarhus University, Denmark.

▪ 2002: Masters in Computer Science from Aarhus University, Denmark.

▪ 1998: BSc in Computer Science and Engineering from La Pontificia Universidad Javeriana de Cali, Colombia.

Professional experience
Experiencia Profesional

▪ 2007 - Present: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2012–2013, Research Assistant, Duke University, Raleight, North Carolina, USA.

▪ 2011: Developer, Wave Computation Technology, Inc., Durham, North Carolina, USA.

▪ 2003–2007: Lecturer in Engineering, Universidad del Quindío, Armenia, Colombia.

Honors and memberships
Honores y memebresías

Full Fellowship Doctoral Grant University of Aarhus, Denmark. Best Paper Award at the 13 International Conference of Logic Programming. PC Member of: 13th ICTAC International Colloquium on Theoretical Aspects of Computing, 2016; 19th International Symposium on Principles and Practice of Declarative Programming (PPDP 2015), 2016; 2th ICTAC International Colloquium on Theoretical Aspects of Computing, 2016; 18th International Symposium on Principles and Practice of Declarative Programming (PPDP 2015), 2015; 17th International Symposium on Principles and Practice of Declarative Programming (PPDP 2015), 2015.

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Natural Sciences and Mathematics Department

DIRECTOR

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SECRETARY

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PONTIFICIA UNIVERSIDAD JAVERIANA, EDIFICIO INGENIERÍA

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LIST OF PROFESSORS

Dr. Abel Álvarez Bustos

Research interests / Intereses de investigación

- Numerical methods in partial differential equation
- Mathematical modeling
- Hyperbolic equations.

EN Research Summary

Professor Abel's research focuses on the mathematical modeling and the computational methods for the numerical approach of the solutions in fluid dynamic models in heterogeneous porous media. His research covers the development of new numerical methods to hyperbolic partial differential equations with applications in non-conventional transport systems in one a two dimensions. This type of studies have a large applicability to various areas of the engineering, in particular to the enhanced oil recovery and aquifer decontamination. In addition to this, these methodes can be applied in other contexts such as the approach to the equations system of Euler by executing small variations.

ES Resumen del trabajo investigativo

El profesor Abel está interesado en la modelación matemática y en los métodos computacionales para la numérical aproximación de las soluciones en modelos de dinámica de fluidos en medios porosos heterogéneos. Su investigación cubre el desarrollo de nuevos métodos numéricos para ecuaciones diferenciales hiperbólicas parciales (escalar y sistemas) con aplicaciones en el transporte no convencional en una y dos dimensiones. Este tipo de estudios tiene una gran aplicabilidad en las áreas de ingeniería, en especial, en la recuperación terciara de petróleo y la descontaminación de acuíferos. Adicionalmente, realizando pequeñas variaciones, estos métodos pueden aplicarse en otros contextos como la aproximación del sistema de ecuaciones de Euler.

Dr. Abel
Alvarez Bustos

Recent publications
Publicaciones recientes

▪ Abreu, E. C., Bustos, A. A., Lambert, W. A unsplitting finite volume method for medels with stiff relaxation source term. Bulletin Brazilian Mathematical Society feb. Vol 47 No 1. 2016.

▪ Abreu, E. C., Bustos, A. A., Lambert, W. Non-monotonic traveling wave and computational solutions for gas dynamics Euler equations with stiff relaxation source terms. Computers & Mathematics with Applications. Computers & Mathematics with Applications (1987). , v.70, p.2155-2176 - , 2015.

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Undergraduate programs and Applied Mathematics and Statistics (EMA) group

Education
Educación

▪ 2015: Doctor in Applied Matheamtical, University of Campinas, Department of Applied Mathematics, UNICAMP, Campinas, Brazil.

▪ 2009: Master of Science in Mathematics, Universidad Nacional de Colombia, Bogotá, Colombia.

▪ 2004: Bachelor in Mathematics, Universidad Pedagógica Nacional de Colombia, Bogotá, Colombia.

Professional experience
Experiencia Profesional

▪ 2017 - January: Associate professor, Department of Natural Science and Mathematics, Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2015 -2016: Researcher in the Laboratório Nacional de Computação Científica, Petropolis Brazil.

▪ 2009-2011: Associate professor, Department of Natural Science, Universidad Manuela Beltran, Bogotá, Colombia.

▪ 2007-2009: Assistant professor, Department of Mathematics, Universidad Nacional de Colombia, Bogotá, Colombia

Honors and memberships
Honores y membresías

▪ The São Paulo Research Foundation FAPESP Scholarship, Brasil (2011-2015). Brasil government and The Laboratorio Nacional de Computacão Científica (LNCC), Scholarship. Brasil (2015-2016)

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Dr. Diana Haidive Bueno Carreño

Research interests /
Intereses de investigación

- Error-correcting coding theor
- Algebraic codes
- Abelian codes.
- Algebraic function fields

EN Research Summary

Professor Diana works on error-correcting coding theory (coding theory, for short), a sub-field of information theory. Coding theory intersects mathematics and engineering, with applications to many areas of communication such as satellite and cellular phone transmission, data storage, etc. The main challenge in coding theory is to find codes having the largest number of words and error-correcting capabilities for optimum communication efficiency. Constructing such optimal codes is still an open problem. In practice, one or two parameters are fixed in order to find codes having the best possible value for the other(s) parameter(s).

She develops techniques to design and construct codes whose parameters satisfy specific coding and error correcting needs. Specifically, development of techniques for computing bounds for the minimum distance of algebraic codes as well as for designing and constructing codes with certain parameters. All this from the study of the current bounds and the analysis of their construction, based on algebraic coding theory and techniques she developed. She is also interested
in the study of classic codes such as Reed-Solomon, Goppa, etc. with the aim of extending them to multiple variables.
Her work involves studying the properties of codes and their fitness for specific applications, including data compression, cryptography, error-correction and network coding.

Dr. Diana Haidive
Bueno Carreño

ES Resumen del trabajo investigativo

La profesora Bueno trabaja en teoría de códigos, un sub campo de la teoría de la información. La teoría de códigos intersecta las matemáticas y la ingeniería, con aplicaciones a muchas áreas de comunicación como las transmisiones satelitales y celulares, el almacenamiento de datos, entre otros. El principal reto de la teoría de códigos es encontrar códigos que tengan el mayor número de palabras y capacidad de corrección de errores para una comunicación eficiente. La construcción de tales códigos es aún un problema abierto. En la práctica, se fijan uno o dos parámetros con el fin de encontrar códigos que tengan el mejor valor posible para los otros parámetros. Ella desarrolla técnicas de diseño y construcción de códigos cuyos parámetros satisfacen necesidades específicas de codificación y corrección de errores. Específicamente, el desarrollo de técnicas para calcular cotas para la distancia mínima de los códigos algebraicos y para el diseño y la construcción de códigos con parámetros determinados. Todo esto a partir del estudio de las cotas existentes y el análisis de su construcción, basado en la teoría de códigos algebraicos y sus propias técnicas. Ella también está interesada en el estudio de códigos clásicos como Reed-Solomon, Goppa, entre otros, con el propósito de extenderlos a múltiples variables. Su trabajo involucra el estudio de las propiedades de los códigos y su aptitud para aplicaciones específicas, incluyendo compresión de datos, criptografía, corrección de errores y codificación de redes (network coding).

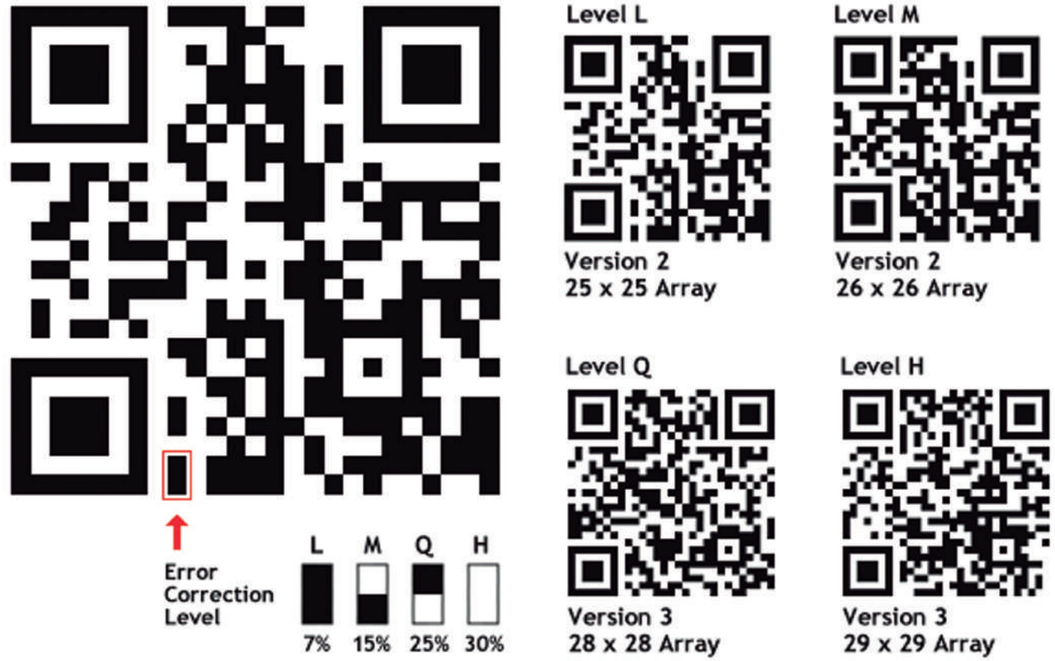

Figure 39. Reed-Solomon Error Correction algorithm on QR code (7% error correction example shown)

Currently sponsored research
Investigación financiada en curso

Group rings, partial actions and algebraic methods in error correcting codes and symbolic dynamics. Funded by the Spanish Ministry of Economics and Competitiveness under grant MTM2012-35240.

Dr. Diana Haidive
Bueno Carreño

Recent publications
Publicaciones recientes

▪ Bernal, J.J., Bueno-Carreño, D.H., Simón, J.J. (2016) Apparent distance and a notion of bch multivariate codes. IEEE Transactions on Information Theory, 62 (2), 7366569, pp. 655-668.

▪ Bernal, J.J., Bueno-Carreño, D.H., Simón, J.J. (2016) Cyclic and BCH Codes whose Minimum Distance Equals their Maximum BCH bound. Advances in Mathematics of Communications, vol. 10, Issue 2, pp. 459 - 474.

▪ Bueno-Carreño, D.H., Bernal, J.J. and Simón, J.J. "A characterization of cyclic codes whose minimum distance equals their maximum BCH bound." Extended abstract en ACA 2013 Proceedings, pp. 109 -113.

▪ Bueno-Carreño, D.H., Bernal, J.J. and Simón, J.J. "Computing the Camion's multivariate BCH bound." Extended abstract en ITW-Sevilla 2013 Proceedings, pp. 355-359.

Academic title
Título académico

Full time Professor

Current position
Posición actual

Mathematics undergraduate program director

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate and Undergraduate programs

Professional experience
Experiencia Profesional

▪ 2008: Present: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2008: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2007: Universidad del Valle, Cali, Colombia.

▪ 2003: Universidad Industrial de Santander, Bucaramanga, Colombia.

Honors and memberships
Honores y membresías

▪ Cum Laude (mathematics undergraduate), Universidad de Santander, Bucaramanga, Colombia (2002); Francisco José de Caldas doctoral scholar, Colombian government (2009); Outstanding Cum Laude (Doctorate), Universidad de Murcia, Murcia, Spain (2014).

Contact information
Información de contacto

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Engineering Building, No. 2-09

Dr. Nicola Sian Flanagan

Research interests /
Intereses de investigación

- Evolutionary biology
- Molecular ecology
- Conservation genetic

EN Research Summary

Professor Flanagan is an evolutionary biologist applying molecular ecology and conservation genetics approaches for biodiversity conservation and ecosystem restoration in the neo-tropics. She has a broad taxonomic experience, including birds, insects and plants, and actively participates in programs for community based conservation, with emphasis on vanilla as a component for sustainable forest-based agro-ecosystems. She has contributed biotechnology applications for conservation of neo-tropical orchid diversity.

ES Resumen del trabajo investigativo

La profesora Flanagan es una bióloga evolucionista que aplica métodos de ecología molecular y genética de la conservación para la conservación de la biodiversidad y la restauración de ecosistemas neotropicales. Tiene una experiencia amplia en taxonomía, incluyendo pájaros, insectos y plantas, y participa de manera activa en programas comunitarios, con énfasis en la vainilla como componente para la sostenibilidad de agro-ecosistemas basados en bosques. Ha contribuido con aplicaciones en biotecnología para la conservación de la diversidad de las orquídeas neotropicales.

Currently sponsored research
Investigación financiada en curso

Effect of heterogeneous matrices in fragmented habitats on functional connectivity in hunting ants, ecosystem service providers in a rural coffee landscape of northern Valle del Cauca (Colciencias), and Ecological and evolutionary relations between orchids (Orchidaceae: Catasetinae y Stanhopeinae) and its pollenizers, the euglossine bees (Apidae: Euglossini), in the Amazonic region of Putumayo and Pacific Nariño, Colombia (Colciencias).

Recent publications
Publicaciones recientes

▪ Molineros Hurtado, F. H., Gonzalez Mina, R. T., Flanagan, N. S., Otero, J. T. (2014) Vanilla rivasii (Orchidaceae), a new species from the Colombian Pacific Region. En: Costa Rica, Lankesteriana. ISSN: 1409-3871 ed: v.13 fasc.3 p.353-357.

▪ Flanagan, N. S., Mosquera Espinosa, A. T., Otero Ospina, J. T. (2013) Tropical orchid mycorrhizae: potential applications in orchid conservation, commercialization, and beyond. En: Costa Rica, Lankesteriana. ISSN: 1409-3871 ed: v.13 fasc.1 p.57-63.

▪ Otero, J.T., Flanagan, N.S., Herre, E. Allen et al. (2007) Widespread mycorrhizal specificity correlates to mycorrhizal function in the neotropical, epiphytic orchid Ionopsis utricularioides (Orchidaceae). American Journal of Botany, 94, 12, pp. 1944-1950.

▪ Flanagan, N.S., Peakall, R., Clements, M.A. et al. (2007) Identification of the endangered Australian orchid Microtis angusii using an allele-specific PCR assay Conservation Genetics, 8, 3, pp. 721-725.

▪ Flanagan, N.S., Peakall, R., Clements, M.A. et al. (2006) Conservation of taxonomically difficult species: the case of the Australian orchid, Microtis angusii. Conservation Genetics, 7, 6, pp. 847-859.

Academic title
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Bachelor in Biology, and Orchids and Vegetable Ecology (OESV), and Biodiversity Conversation Group (Lead).

Education
Educación

▪ 1998: Doctor in Biology, University of East Anglia, Norwich,UK.

▪ 1993: Bachelor of Science in Biology University of Leeds, Leeds, UK.

Professional experience
Experiencia Profesional

▪ 2010–Present: Professor, Pontificia Universidad Javeriana, Departament of Natural Science and Mathematics, Cali, Colombia.

▪ 2009: Postdoctoral Research Fellow (Visiting), Consultative Group on International Agricultural Research (CIAT), Genetic resources of vanilla, Cali, Colombia.

▪ 2006: Postdoctoral Research Associate, Australian National University, Canberra, Australia.

▪ 2003: Postdoctoral Researcher, Universidad de Puerto Rico at Rio Piedras, Departament of Biological Science, San Juan, Puerto Rico.

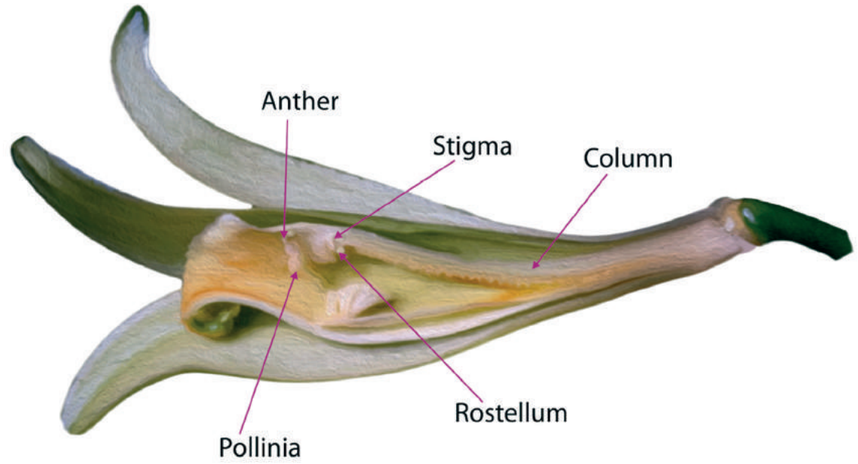

Figure 41. Parts of an orchid flower of the Vanilla gender

Honors and memberships
Honores y membresías

Colombian Botanical Association member; Professional Council of Biology member; Society for Conservation Biology member; Association for Tropical Biology and Conservation member; and Latinamerican Botanical Association member

Contact information
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nsflanagan@javerianacali.edu.co

Guayacanes Building, 3rd floor,
biology offices

Dr. Isabel Cristina García Arboleda

Research interests / Intereses de investigación

- Nonlinear fiber optics
- Statistical inference for stochastic processes
- Mathematical Statistics and Probability
- Specifically asymptotic methods in probability and statistics: Branching processes
- Time series
- Dependent data
- U-statistics
- Change point problems
- Spatial models

EN Research Summary

Professor Garcia's research lie in the fields of statistical inference for stochastic processes. Her current research projects are to investigate the interactions between Dependence and asymptotic methods in order to describe the behaviour of some types of populations. For example, individuous, electricity prices, etc.
Overall, her current and future research projects reflect her strong interest in a broader research agenda that seeks to study methods to detect change point in a data set characterized with dependence. Some applications of her work could be in finance, economy, biology, physics and engineering.

ES Resumen del trabajo investigativo

La investigación de la profesora García se enmarca en el campo de la inferencia estadística para los procesos estocásticos. Sus proyectos investigan la interacción entre la dependencia y los métodos asintóticos, con el fin de describir el comportamiento de algunos tipos de poblaciones; por ejemplo, especies, precios de electricidad, etc.
En general, sus proyectos de investigación actuales y futuros reflejan su gran interés en una agenda de investigación más amplia que busca estudiar métodos para detectar puntos de cambio en un conjunto de datos caracterizado por la dependencia. Algunas aplicaciones de su trabajo podrían ser en finanzas, economía, biología, física e ingeniería

Currently sponsored research
Investigación financiada en curso

Project: Change point detection in mean of short memory process.
Collaborative Research Center SFB 823. Statistical modeling of nonlinear dynamic processes, Germany.

Recent publications
Publicaciones recientes

▪ Dehling, H., Fried, R., Garcia, I., Wendler, M. (2015) Change-point detection under dependence based on two-sample U-statistics. Asymptotic Laws and Methods in Stochastics: A Volume in Honour of Miklós Csörg”o. 195-220. García, I., Klüppelberg, C., Müller, G. (2011) Estimation of stable CARMA models with an application to electricity spot prices. Statistical Modelling. 11 (5), 447-470.

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate and Undergraduate programs. Statistics area.

Education
Educación

▪ Pending 2017: Dr. rer.nat. candidate, Ruhr University Bochum, Bochum, Germany.

▪ 2008: Master in Sciences with speciality in Probability and Statistics, Centro de Investigación en Matemáticas CIMAT A.C., Guanajuato, México.

▪ 2003: Bachelor in Mathematics, Universidad de Antioquia, Medellín, Colombia.

Figure 42. Singapore new electricity market: daily spot prices from 1 january 2005 to 30 september 2008, overlaid by the estimated trend and seasonal curve

Professional experience
Experiencia Profesional

▪ 2016: Part time assistant professor Universidad del Valle. Fullt time professor Universidad Santiago de Cali, Cali, Colombia.

▪ 2010-2015: Academic staff Lehrstuhl XII Stochastik, Ruhr University Bochum, Bochum, Germany.

▪ 2009: Full time professor visitor, Universidad de Antioquia, Medellín, Colombia.

▪ 2008: Junior academic visitor, Technische Universitaet Muenchen, Munich, Germany.

▪ 2007: Instructor professor, Universidad de Guanajuato, Guanajuato, México.

▪ 2003-2005: Instructor professor, Universidad de Antioquia, Medellín, Colombia.

Honors and memberships
Honores y memebresías

Grants: CIM Integrated experts, Centre for International Migration and Development, awarded from 2017 to 2018; COLFUTURO awarded from 2013 to 2014; European Science Foundation, ESF. Advanced Mathematical Methods for Finance, awarded in 2008; Centro de Investigación en Matemáticas, CIMAT A.C., awarded from 2006 to 2007; Banco Industrial Colombiano awarded from 1997 to 2003; ICETEX awarded from 1991 to 1996; Member of Sociedad Colombiana de Estadística since 2015.

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Engineering Building, No. 1-33

Dr. Mariluz Gómez Rodríguez

Research interests / Intereses de investigación

- Biology of chromatin
- Epigenetics
- Epigenetic mechanisms

EN Research Summary

Professor Gómez's research is focused in the epigenetic markers, molecules that are transmitted during cell division that lead to changes in gene expression without changing the DNA sequence information (e.g. histones and their post-translational modifications). Therefore, epigenetic markers are molecules that provide memory to essential processes such as development, cell differentiation and the renewal of adult stem cells. Understanding how these molecules will allow the development of translational applications such as anti-inflammatory agents, anti-cancer agents and cell reprogramming for therapeutic purposes.

ES Resumen del trabajo investigativo

La investigación de la profesora Gómez se centra en los marcadores epigenéticos, moléculas que se transmiten durante la división celular que conducen a cambios en la expresión génica sin cambiar la información de la secuencia de ADN (e.g. las histonas y sus modificaciones postraslacionales). Por lo tanto, los marcadores epigenéticos son moléculas que proporcionan memoria a los procesos esenciales como el desarrollo, la diferenciación celular y la renovación de las células madre adultas. Comprender cómo estas moléculas permitirán el desarrollo de aplicaciones traslacionales tales como agentes antiinflamatorios, agentes anticancerígenos y reprogramación de células con fines terapéuticos.

Recent publications
Publicaciones recientes

▪ Gómez-Rodríguez, M., Jansen, L. E.T. (2013) Basic properties of epigenetic systems: lessons from the centromere. Current Opinion in Genetics & Development. 23(2): 219-227.

▪ Bodor, D. L., Gómez-Rodríguez, M., Moreno, N., Jansen, L. E.T. (2012) Analysis of protein turnover by quantitative SNAP-based pulse-chase imaging. Current Protocols in Cell Biology. Chapter 8: Unit8.8.

▪ Bergmann, J.H., Gómez-Rodríguez, M., Martins, N.M.C., Kimura, H., Kelly, D.A., Masumoto, H., Larionov, V., Jansen, L.E.T., Earnshaw, W.C. (2011) Epigenetic engineering shows H3K4me2 is required for HJURP targeting and CENP-A assembly on a synthetic human kinetochore. EMBO Journal. 30(2):328-340.

▪ Gutiérrez, S.J., Gómez, M., Rey, J.A., Ochoa, M., Gutiérrez, S.M., Prieto, J.C. (2010) Polymorphisms of the noggin gene and mandibular micrognathia: a first approximation. Acta Odontológica Latinoamericana 23(1):13-19.

Academic title
Título académico

Full Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Undergraduate Program of Biology and research group of Conservation & Biotechnology.

Education
Educación

▪ 2013: Ph.D. in Molecular Biology. Instituto Gulbenkian de Ciências, Universidade Nova de Lisboa. Oeiras, Portugal.

▪ 2001: Master of Biology, in Human Genetics. Pontificia Universidad Javeriana, Bogotá D.C., Colombia.

▪ 1998: Bacteriologist. Pontificia Universidad Javeriana, Bogotá D.C., Colombia.

Professional experience
Experiencia Profesional

▪ 2015-Present: Associate Professor, Department of Natural Sciences & Mathematics. Pontificia Universidad Javeriana. Cali, Colombia.

▪ 2008-2013: Ph.D. Student, Laboratory for Epigenetic Mechanisms, Instituto Gulbenkian de Ciências. Oeiras, Portugal.

▪ 2002-2003: Research Assistant, Department of Biochemistry & Molecular Biology. Oklahoma University Health Science Center. Oklahoma, USA.

▪ 2001-2015: Assistant Professor, Centro de Investigaciones Odontológicas. Pontificia Universidad Javeriana. Bogotá D.C., Colombia.

▪ 1999-2001: Research Assistant, Instituto de Genética Humana, Pontificia Universidad Javeriana. Bogotá D.C., Colombia.

Honors and memberships
Honores y memebresías

PhD Scholarship, Fundaçao para a Ciência e a Tecnologia (FCT) (2008).

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Dr. Mauricio Jaramillo Ayerbe

Research interests /
Intereses de investigación

- Air quality
- Spectroscopic observations of stratospheric gases

EN Research Summary

Professor Jaramillo's research focuses on characterization, understanding and improvement strategies for air quality in Cali and the Cauca Valley Department, in Colombia. He develops and applies mathematical models for atmospheric contaminant dispersions, noise pollution, and emission factors for different manufacturing activities. These models are used to map emissions and analyze potential improvement scenarios. Prof. Jaramillo is leading the design of an integrated air quality index for Colombian cities, which will enable more accurate diagnosis of emission sources and stronger legislation to protect the health of our urban populations. He is a recognized leader in the field and his work a reference for the local and national environmental protection agencies, including The Corporación Regional Autónoma del Valle del Cauca (CVC), The Administrative Department for Environmental Management (DAGMA), and The National Center for Clean Production and Environmental Technologies (CNPMLTA).

ES Resumen del trabajo investigativo

El profesor Jaramillo Ayerbe enfoca su trabajo en la caracterización, la comprensión y el mejoramiento de estrategias para la calidad del aire en Cali y la región del Valle del Cauca, en Colombia. Desarrolla y aplica modelos matemáticos para describir la dispersión de contaminantes atmosféricos, la polución por ruido y los factores de emisión de diversas actividades manufactureras. Estos modelos son usados para mapear las emisiones y analizar escenarios de potencial mejora. Él está liderando el diseño de un índice de calidad integrado para las ciudades colombianas, que permitirá no solo hacer un diagnóstico más preciso de las fuentes de emisión, sino apoyar nueva legislación para la protección de la salud humana en poblaciones urbanas. El profesor es un reconocido líder en el campo y su trabajo sirve de referencia local y nacional para las agencias de protección ambiental, incluyendo la Corporación Regional Autónoma del Valle del Cauca (CVC), el Departamento Administrativo de Gestión y Manejo Ambiental (DAGMA) y el Centro Nacional de Producción Más Limpia y Tecnologías Ambientales (CNPMPLTA).

Dr. Mauricio
Jaramillo Ayerbe

Currently sponsored research
Investigación financiada en curso

▪ Integrated air quality index for Colombian cities.
▪ Noise pollution sources and inventory in Cali, Colombia.

Recent publications
Publicaciones recientes

▪ Jaramillo, M., González, D., Núñez, M.E., (2009). Portilla, G.E. Índice integrado de calidad del aire para ciudades colombianas Revista Facultad de Ingeniería Universidad de Antioquia. No. 48, junio de 2009, pp. 97-106, ISSN 0120-6230.

▪ Jaramillo, M., González, D., Núñez, M.E., Portilla, G., Lucio, J. (2007) Análisis de series de tiempo univariante aplicando la metodología de Box-Jenkins para la predicción del ozono en la ciudad de Cali, Colombia. Revista Facultad de Ingeniería Universidad de Antioquia. No. 39, pp. 79-88, ISSN 0120-6230.

▪ Jaramillo, M., Cabrera, M.E., Ocampo Duque, W.A., Pérez Ruiz, D.D., Portilla, G. (2006) Modelación fotoquímica del ozono en Cali-Yumbo. Revista de la Escuela Colombiana de Ingeniería. Año 16 N° 63, pp.22-27, ISSN 0121-5132.

▪ Jaramillo, M., Núñez, M.E., Ocampo, W.A., Pérez, D.D., Portilla, G. (2005) Estudio de la dispersión a largo plazo de contaminantes atmosféricos criterio en la zona de Cali-Yumbo mediante un modelo gaussiano. Epiciclos. Vol. 4 No. 1, pp. 39-58, ISSN 1657-5636.

▪ Bastidas, A.E., Rodríguez, E., Jaramillo, M., Solarte, E. (2004) Simulation of scattering properties of urban aerosols observed in Popayan – Colombia. Proceedings of the 22nd International Laser Radar Conference. ESA SP–561, Gelsomina Pappalardo and Aldo Amodeo, Editors. European Space Agency (ESA) Publications Division, ESTEC, Noordwijk, The Netherlands, pp. 483-486, ISSN 0379-6566, ISBN 92-9092-872-7.

Academic title
Título académico

Full time Professor (Xaverian Honor Order)

Current position
Posición actual

Engineering and Applied Sciences Doctorate, Bachelors in Engineering and Clean Production (PML) research group.

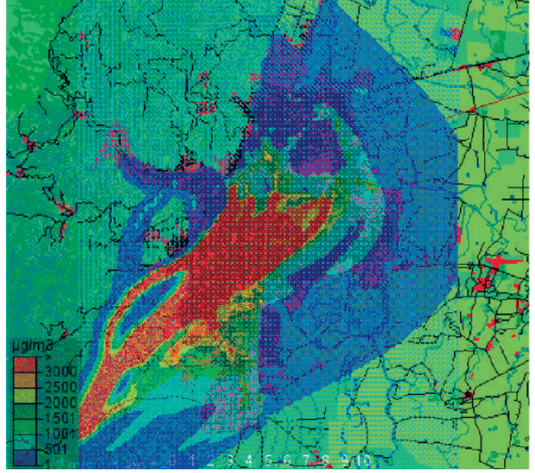

Figure 44. CO dispersion modelling by mobile sources in Cali, Colombia

Education
Educación

▪ 1988-1990: Postdoctoral Scholar in Physics, State University of New York at Stony Brook (Stony Brook, NY, USA.).

▪ 1988: Doctor of Philosophy (Ph.D.) in Physics, State University of New York at Stony Brook (Stony Brook, NY, USA.).

▪ 1978: Master of Science (M.S.) in Physics, Massachusetts Institute of Technology (M.I.T.) (Cambridge, MA, USA).

▪ 1978: Bachelor of Science (B.S.) in Physics, Massachusetts Institute of Technology (M.I.T.) (Cambridge, MA, USA).

▪ 1981-1983: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 1979-1981: Universidad de los Andes, Bogotá, Colombia.

Professional experience
Experiencia Profesional

▪ 1990-Present: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 1984-1990: State University of New York at Stony Brook, New York, United States.

Honors and memberships
Honores y memebresías

Antartic Service Medal from the US-NSF (1987), San Francisco Javier Medal from the Pontificia Universidad Javeriana at Cali (2001).

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Dr. Gustavo Habib Kattan Kattan

Research interests /
Intereses de investigación

- Conservation biology

EN Research Summary

Colombia is one of few megadiverse countries. In an area that spans less than 1% of the continental surface of the planet, Colombia has between 15-20% of the diversity of species in different taxonomic groups, such as birds and plants. Unfortunately, this biological richness is threatened by the different human activities like deforestation, dehydration of humid zones, contamination, introduction of invasive species, and climate change. Professor Kattan's research focuses on understanding the evolutionary and ecological factors that generate this diversity, such as how the biodiversity is affected by human activities and how they can be restored. Colombia's position in the tropical zone is a determining factor, but in particular the formation and current configuration of the Andean mountains constitutes a crucial element in the diversification of the different lineages and the conformation of biotic communities at regional and local scales. To understand the actual patterns of biological diversity it is necessary to understand how the evolutionary and ecological processes interact as a function of space and time, and how the anthropogenic processes that transform the natural landscape affect them. He wants to elucidate how the factors that operate at the level of organisms are integrated in the population dynamics that translates in the assembly of sets of species or communities at a local scale, which can be altered by regional environmental gradients. On the other hand, the biogeographic processes at larger spatial and temporal scales have generated a regional biota, which determines the set of species available to conform the local communities by colonization and extinction processes. Understanding the local and regional interactions is key to predicting and mitigating the impact of human activities on the biota. These studies are based on field work and predictive models.

ES Resumen del trabajo investigativo

Colombia es uno de los países biológicamente megadiversos. En un área que abarca menos del 1% de la superficie continental del planeta, nuestro país posee entre 15% y 20% de la diversidad de especies en diferentes grupos taxonómicos, tales como aves y plantas. Lamentablemente, esta riqueza biológica está amenazada por actividades humanas como deforestación, desecación de humedales, contaminación, introducción de especies invasoras y cambio climático. La investigación del profesor Kattan se enfoca en entender los factores evolutivos y ecológicos que generan esa diversidad, cómo la biodiversidad se ve afectada por las actividades humanas y cómo se puede restaurar. La posición de Colombia en la zona tropical es un factor determinante, pero en particular la formación y actual configuración de la cordillera de los Andes constituye un elemento crucial en la diversificación de los distintos linajes y la conformación de comunidades bióticas a escala regional y local. Para entender los patrones actuales de diversidad biológica es necesario conocer cómo interactúan los procesos evolutivos y ecológicos en distintas escalas espaciales y temporales, y cómo se ven afectados por los procesos antropogénicos de transformación del paisaje natural. Su investigación busca, además, dilucidar la forma en que los factores que operan a nivel organísmico se integran en unas dinámicas poblacionales que se traducen en el ensamblaje de conjuntos de especies o comunidades a escala local, las cuales pueden cambiar de acuerdo a gradientes ambientales regionales. Por otra parte, los procesos biogeográficos a grandes escalas espaciales y temporales han generado una biota regional, lo cual determina el conjunto de especies disponible para conformar las comunidades locales por procesos de colonización y extinción. La comprensión de esta interacción entre lo local y lo regional es clave para entender, predecir y mitigar los impactos de las actividades humanas sobre la biota. Estos estudios se adelantan por medio de investigación de campo que cuantifica estos fenómenos y por la construcción de modelos predictivos (redes) que buscan identificar las variables claves y sus interacciones.

Recent publications
Publicaciones recientes

▪ Palacio, R., Valderrama, C., Kattan, G. H. (2016) Generalist species have a central role in a highly diverse plant-frugivore network. Biotropica 48:349-355.

▪ Kattan, G.H., Tello, S.A., Giraldo, M., Cadena, C.D. (2016) Neotropical bird evolution and 100 years of the enduring ideas of Frank M. Chapman. Biological Journal of the Linnean Society, 117 (3), pp. 407-413.

▪ Kattan, G. H., Muñoz, M. C., Kikuchi, D. W. (2016) Population densities of curassows, guans and chachalacas (Cracidae): effects of body size, habitat, season and hunting. The Condor: Ornithological Applications. 118:24-32.

▪ Kattan, G.H., Roncancio, N., Banguera, Y., (...), Marín, O.H., Muñoz, M.C. (2014) Spatial variation in population density of an endemic and endangered bird, the Cauca Guan (Penelope perspicax). Tropical Conservation Science. 7 (1), pp. 161-170.

▪ Murcia, C., Aronson, J., Kattan, G.H., (...), Dixon, K., Simberloff, D. (2014) A critique of the 'novel ecosystem' concept. Trends in Ecology and Evolution. 29 (10), pp. 548-553.

▪ Ramírez, L. M., Botero-Botero, A., Kattan, G. H. (2014) Distribution and abundance of Torrent Duck (Merganetta armata) in the Quindío River, Colombia. Boletín Científico Museo de Historia Natural U. de Caldas. 18:172-180.

Natural Sciences
and Mathematics
Department

Dr. Gustavo Habib
Kattan Kattan

Currently sponsored research
Investigación financiada en curso

Characterization of the pairwise interaction networks in the Andean forests, to determine its robustness or vulnerability and characterize the biota response to climate change. Models and methods for cost-effectively monitoring the biodiversity and inform conservation processes. Climate change impact on birds (grant: Javeriana).

Academic title
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Bachelor in Biology, and Population Ecology and Biodiversity (EPB) research group.

Education
Educación

- 1993: Ph.D. in Biology, University of Florida, Gainesville, USA.
- 1987: Master of Science in Biology, University of Florida, Gainesville, USA.
- 1983: Bachelor in Biology with Emphasis in Zoology, Universidad del Valle, Cali, Colombia.

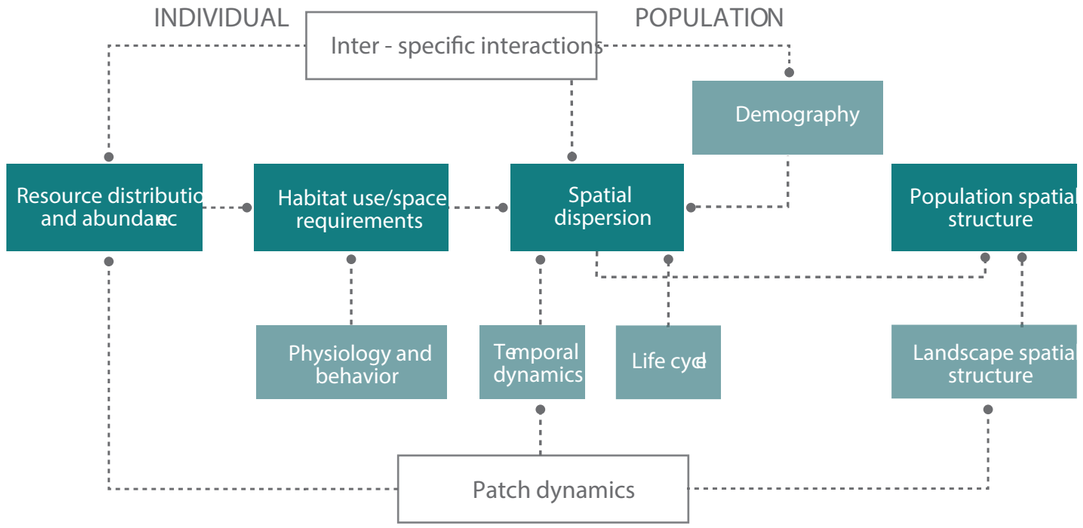

Figure 45. Conceptual model that illustrates how factors that operate at the level of individuals or populations, determine the spatial structure of populations in the landscape

Professional experience
Experiencia Profesional

- 2012-Present: Associate Professor, Natural Science and Mathematics Department, Pontificia Universidad Javeriana, Cali, Colombia.
- 2009-2012: Biology undergraduate program director, Pontificia Universidad Javeriana, Cali, Colombia.
- 2003-2007: for Colombian program in biodiversity conservation director, Wildlife Conservation Society, Cali, Colombia.
- 1994-2002: Ecologist of the Wildlife Conservation Society, New York, USA.
Others (prior): Associate Researcher, Instituto Vallecaucano de Investigaciones.
- Científicas, Inciva and C. F. Lehmann Natural Science Museum, Cali, Colombia, and Scholar in Biology at the Smithsonian Tropical Research Institute, Panama City, Panama.

Dr. Gustavo Habib
Kattan Kattan

Honors and memberships
Honores y memebresías

Recognized by the Great Britain's Whitley Fund for Nature for his contributions to conservation through the Regional System of Protected Areas of the Colombian Coffee Growing Region (2006), Award for Excellence in Tropical Biology from the international organization Association for Tropical Biology and Conservation (2006).

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biology offices

Figure 46. Right. Professor Kattan conducting behavioral studies with a Roadside Hawk Rupornis magnirostris

Dr. Mateo López Victoria

Research interests / Intereses de investigación

- Conservation
- Biogeography (mostly from remote island ecosystems)

EN Research Summary

Professor López-Victoria has done research at different scales, from organisms to communities. Particular effort during his first ten years of research was oriented to coral reefs and adjacent ecosystems (seagrass beds and mangroves), mostly in the Caribbean. During the last ten years he has been focused on both marine and island ecology and biogeography, mostly in the Pacific. Current research projects include competition for space among coral reef organisms (i.e., encrusting excavating sponges vs. stony corals), coral reef development under suboptimal conditions (as potential source of information to be used for coral reef restoration, using resilient species or populations of keystone species), ecology and biogeography of insular fauna (i.e., food web of Malpelo Island, ecology and impact of introduced species in oceanic islands). He has done collaborative research with scientists from Germany (where he lived for seven years), the UK, Australia, USA, Mexico, and Taiwan.

ES Resumen del trabajo investigativo

El profesor López-Victoria ha realizado investigaciones a diferentes escalas, desde los organismos a las comunidades. Un esfuerzo especial durante sus primeros diez años de investigación se orientó a los arrecifes de coral y los ecosistemas adyacentes (lechos de algas marinas y manglares), sobre todo en el Caribe. Durante los últimos diez años se ha centrado en la ecología y biogeografía insular y marina, sobre todo en el Pacífico. Sus proyectos de investigación actuales incluyen la competencia por el espacio entre los organismos de los arrecifes de coral (es decir, las esponjas incrustantes frente a los corales pétreos-excavar), el desarrollo de arrecifes de coral en condiciones sub-óptimas (como potencial fuente de información que se utilizará para la restauración de los arrecifes de coral, utilizando especies resistentes o poblaciones de especies clave), ecología y biogeografía de la fauna insular (es decir, la red alimentaria de la isla de Malpelo, la ecología y el impacto de las especies introducidas en las islas oceánicas). Él ha hecho la investigación en colaboración con científicos de Alemania (donde vivió durante siete años), del Reino Unido, Australia, EE.UU., México y Taiwán.

Figure 47. Long-term studies of interactions among coral reef organisms let us discriminate between natural dynamics (i.e, seasonal fluctuations) and man-induced changes that affect these strategic ecosystems. Professor López shown in picture

Currently sponsored research
Investigación financiada en curso

Sclerochronology of surviving corals from Cartagena Bay.
Ecology of terrestrial and marine organisms from Malpelo Island.

Recent publications
Publicaciones recientes

▪ Marulanda-Gómez, A., López-Victoria, M., Zea, S. (2016) Current status of coral takeover by an encrusting excavating sponge in a Caribbean reef. Marine Ecology (manuscript MAE-2275 in press).

▪ López-Victoria, M., Daza, J.M. (2015) The endangered species Aristelliger georgeensis (Squamata: Sphaerodactylidae) in Roncador Cay, Colombian Caribbean. Acta Biológica Colombiana. 20(3): 221-224.

▪ López-Victoria, M., Rodríguez-Moreno, M., Zapata, F.A. (2014) A paradoxical reef from Varadero, Cartagena Bay, Colombia. Coral Reefs DOI 10.1007/s00338-014-1246.

▪ González-Román, R.D., López-Victoria, M. and Silverstone-Sopkin, P.A. (2014) Flora terrestre de la isla Malpelo (Colombia), Pacífico Oriental Tropical. Rev. Biol. Trop. 62(1): 327-336.

▪ López-Victoria, M., Jurczyk, M. and Wolters, V. (2013) Notes on the ecology of the Colombian Leaf-toed Gecko (Phyllodactylus transversalis), endemic to Malpelo Island. Bol. Invest. Mar. Cost. 42(2): 133-141.

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Biology Program, Department of Natural Sciences and Mathematics. Research Group in Ecology of Coral Reefs. Research Group in Conservation and Biotechnology.

Education
Educación

▪ 2012: Post-Doctoral scholar “Just’us: Junior Science and Teaching Units”, Justus-Liebig de Giessen University, Gieben, Hesse, Germany.

▪ 2009: Doctor in Biology, Justus-Liebig de Giessen University, Gieben, Hesse, Germany.

▪ 2003: Master of Science in Marine Biology, Universidad Nacional de Colombia, Santa Marta, Colombia.

▪ 1999: Bachelor of Science in Biology (Marine Biology), Universidad del Valle, Cali, Colombia.

Professional experience
Experiencia Profesional

▪ 2012-Present Associate Professor, Department of Natural Sciences and Mathematics, Biology Program, Pontificia Universidad Javeriana Cali, Colombia.

▪ 2009-2012 Junior Teacher and Science Unit-Just´us (Post-Doctoral Program at the Justus-Liebig University in Giessen, Germany.

▪ 2005-2009 Teacher Assistant (Ph.D.-Student) at the Justus-Liebig University in Giessen, Germany. 2012-Present Associate Professor, Department of Natural Sciences and Mathematics, Biology Program, Pontificia Universidad Javeriana Cali, Colombia.

▪ 2009-2012 Junior Teacher and Science Unit-Just´us (Post-Doctoral Program at the Justus-Liebig University in Giessen, Germany. 2005-2009 Teacher Assistant (Ph.D.-Student) at the Justus-Liebig University in Giessen, Germany.

Honors and memberships
Honores y membresías

▪ 2012-2015 Beneficiary of the “Returning Expert Program”, Centre for International Migration and Development, Germany.

▪ 2012-to date. Member of the Research Group in Ecology of Coral Reefs (an initiative of Universidad del Valle and Pontificia Universidad Javeriana Cali).

Young Investigator award from the Administrative Department of Science, Technology and Innovation, Colciencias (2002), Scholar from the Mono Hernandez Scholarship program on Initiative of Threatened Species (2003), Scholar from the German Service of Academic Exchange (DAAD) (2005), Scholar from the Post-doctoral program Just´us,Universitat Giessen (November 2009), Returning Experts from Germany Program (CIM), German Agency for Technical Cooperation (January, 2013).

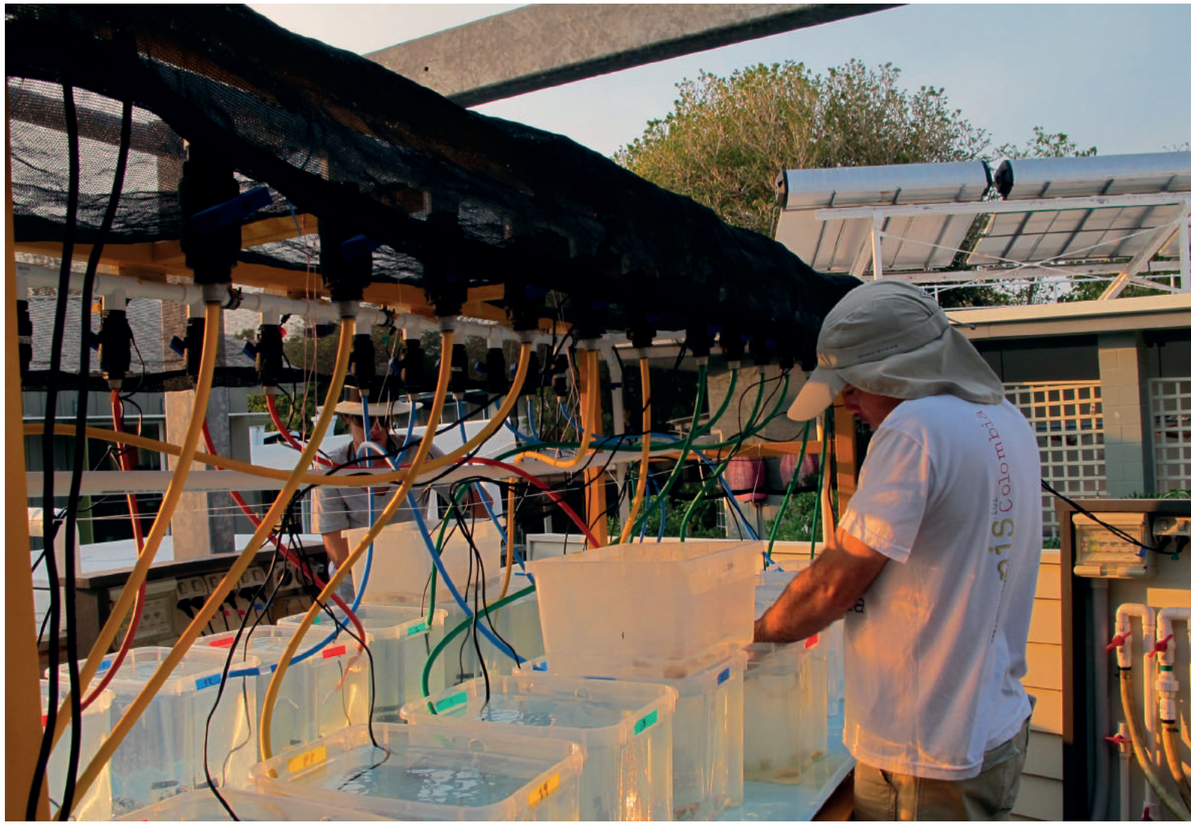

Figure 48. The scientific and systematic studies of marine ecosystems under different climate change scenarios provide the information needed to face the environmental challenges in conservation and restoration associated with global warming

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Información de contacto

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Guayacanes Building, 3rd floor,
biology offices

Dr. Ana Teresa Mosquera Espinosa

Research interests / Intereses de investigación

- Interactions between microorganisms and plants, among microorganisms, and between microorganisms and insect pests.

EN Research Summary

Professor Mosquera is an agronomic engineer. Her studies have focused on finding alternatives for plant health management in agricultural crops, to minimize the use of synthetic chemicals. She is especially interested in interactions between microorganisms and plants, among microorganisms, and between microorganisms and insect pests. Specific research topics include: isolation and identification of mycorrhizal fungi and endophytic fungi of orchids for conservation and sustainable use of species with commercial potential; characterization of arbuscular mycorrhiza fungi for plant nutrition and protection; recuperation of eroded soils; etiology of plant diseases and biocontrol with antagonistic fungi; identification of plant parasitic nematodes associated with crops and their management; bioprospecting of orchid mycorrhizal fungi as agents of biocontrol against soilborne plant diseases; and microbial control of insect pests of crops. She has also worked on agroecology for crop production, giving support to rural and ethnic communities in the departments of Valle del Cauca, Cauca y Boyacá. In her future research projects in the Biology Program, she will incorporate microorganisms from natural environments to develop integrated management strategies for agroecology, as well as restoration and conservation of terrestrial ecosystems.

Dr. Ana Teresa
Mosquera Espinosa

ES Resumen del trabajo investigativo

La profesora Mosquera es ingeniera agrónoma y sus estudios se han centrado en buscar alternativas para el manejo fitosanitario de cultivos agrícolas para minimizar el uso de productos químicos de síntesis. Tiene especial interés en la interacción microorganismo-planta, microorganismo- microorganismo y microorganismo-insecto plaga, de donde se desprenden temas específicos de investigación como: aislamiento e identificación de hongos micorrízicos y hongos endófitos de orquídeas para la conservación y uso sostenible de algunas especies de interés comercial; caracterización de morfotipos de hongos micorrízicos arbusculares para la nutrición y fitoprotección de plantas, como también, para la recuperación de suelos erosionados; etiología de enfermedades fungosas y su biocontrol con hongos antagonistas; identificación de fitonematodos asociados a cultivos agrícolas y su manejo integrado; bioprospección con hongos micorrízicos de orquídeas como agentes de biocontrol contra hongos patógeno del suelo; control microbiológico de insectos plaga en cultivos agrícolas. También ha desarrollado trabajo de producción agrícola con prácticas agroecológica, dando apoyo a grupos campesinos y étnicos en los departamentos de Valle del Cauca, Cauca y Boyacá. Con los trabajos de investigación que pondrá en marcha como parte del Programa de Biología, busca incorporar elementos microbianos identificado en condiciones silvestres, para desarrollar planes de manejo integrado en la producción alimentaria con prácticas agroecológicas, como también, la recuperación y conservación de ecosistemas terrestres.durante siete años), del Reino Unido, Australia, EE.UU., México y Taiwán.

Recent publications
Publicaciones recientes

▪ Otero, J. T., Mosquera-Espinosa, A. T., Flanagan, N. (2013) Tropical orchid mycorrhizae: Potential applications in orchid conservation, commercialization, and beyond. Lankesteriana 13(1-2): 57-63.

▪ Mosquera-Espinosa, A. T., Bayman, P., Prado, G., Gómez-Carabalí, A., Otero, J. T. (2013) The double life of Ceratobasidium: orchid mycorrhizal fungi and their potential for biocontrol of Rhizoctonia solani sheath blight of rice. Mycologia. 105:141-150.

▪ Bayman, P., Mosquera-Espinosa, A. T., Porras-Alfaro, A. (2011) Micorrhizal Relationships of Vanilla and Prospects for Biocontrol of Root Rots. Handbook of Vanilla Science and Technology. First Editions. Edited by Daphana Havkin-Frenkel and Faith C. Belanger. © 2010 by Blackwell Publishing Ltd. ISBN-10: 1405193255 / ISBN-13: 978-1405193252.

Academic title
Título académico

Assistant Professor

Dr. Ana Teresa
Mosquera Espinosa

Program/group affiliations
Afiliaciones

Asociación Colombiana de Fitopatología y Ciencias Afines (Ascolfi); Asociación de Ingenieros Agrónomos del Valle (Asiava).

Education
Educación

▪ 2011: Doctor en Ciencias Agropecuarias, Universidad Nacional de Colombia, Palmira, Colombia.

▪ 2001: Master of Science Crop Protection, Univeridad de Puerto Rico, Mayagüez, Puerto Rico.

▪ 1995: Ingeniería Agrónoma, Universidad Nacional de Colombia, Palmira, Colombia.

Professional experience
Experiencia Profesional

▪ 2015- Present: Pontificia Universidad Javeriana, Biology Program, Cali, Colombia.

▪ 2013 – 2015: Universidad Pedagógica y Tecnológica de Colombia, Agricultural Engineering, Tunja, Colombia. Plant pathologist in charge of the Plant Diagnostics Laboratory (Agricultural Sciences Faculty). Assistant Professor.

▪ 2012-2013: Pontificia Universidad Javeriana, Biology Program, Cali, Colombia.

▪ 2012-2013: Universidad Nacional de Colombia, Palmira, Postgraduate, Agricultural Sciences Faculty. Courses: Agricultural nematology. Teaching faculty (contract).

▪ 2003-2007: Universidad del Pacífico, Buenaventura, Agronomy in the Humid Tropics Program.

▪ 2011: Private consultant. Phytopathologist, Vegetal Diagnosis Laboratory. Instituto Colombiano Agropecuario (ICA). Efficacy tests of synthetic fungicides for control of coffee leaf rust. Andina de Negocios S.A-ANDINESA.

▪ 2002-2013: Private consultant, Tech transfer to small farmers in agroecology for crop production.

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biology offices

Dr. Daniel Elias Núñez López

Research interests / Intereses de investigación

- Dynamics of economic models
- Stability and Dynamics of Hamiltonian Systems
- Applied Stochastic Calculus

EN Research Summary

Professor Nuñez works on mathematical techniques for analyzing the stability of Hamiltonian systems (i.e. a Hamiltonian system is a mathematical formalism developed by Hamilton to describe the dynamical evolution equations of a physical system). Currently, these techniques have been refined for systems that have no integrable solutions using non-linear analysis methods and an improved understanding of stability conditions.

He focuses on extending these techniques to study problems in celestial mechanics, control systems, vortex dynamics, ecological environments, economic models and other areas of applied interest (e.g. periodic solutions for 3-body interactions.) Him with his group have made important contributions to magnetic stabilization models of terrestrial satellites, forced and inverted pendulums, oscillators with variable mass, among others.

ES Resumen del trabajo investigativo

El professor Núñez trabaja en técnicas matemáticas para analizar la estabilidad de los sistemas hamiltonianos, es decir, aquellos que describen las ecuaciones de evolución dinámica de sistemas físicos empleando componentes de energía.

Estas técnicas han sido refinadas para sistemas que no tienen soluciones integrables empleando métodos de análisis no lineal y una comprensión mejorada de las condiciones de estabilidad. Él se enfoca en la extensión de estas técnicas para estudiar problemas de la mecánica celeste, sistemas de control, dinámica de vórtices, ambientes ecológicos, modelos económicos y otras áreas de interés aplicado (e.g. soluciones periódicas a interacciones de 3 cuerpos). Con su grupo han contribuido al campo con nuevos modelos de estabilización magnética para satélites terrestres, péndulos forzados e invertidos, osciladores de masa variable, entre otros.

Dr. Daniel Elías
Núñez López

Currently sponsored research
Investigación financiada en curso

Dynamics of nonlinear oscillations in MEMS
Stability of periodic motions in Restricted Three Body Problems

Academic title
Título académico

Assistant Professor

Recent publications
Publicaciones recientes

▪ Núñez, D., Rivera, A., Rossodivita, G. (2016) Stability of odd periodic Solutions in a resonant oscillator. Annali di Matematica Pura ed Applicata. ISSN: DOI 10.1007/s10231-016-0580-9.

▪ Núñez, D., Rivera, A. (2016) Twist periodic solutions in the relativistic driven harmonic oscillator. Abstract and Applied Analysis. ISSN: 1687-0409.

▪ Núñez, D., Rivera, A. (2015) Quantifying Poincare's Continuation Method for Nonlinear Oscillators. Abstract and Applied Analysis. ISSN: 1687-0409 ed: v.2015 fasc. p.1-10.

▪ Núñez, D., Rivera, A. (2014) Quantifyng The Poincaré Continuation Theorem in Driven Nonlinear Oscillators, preprint.

▪ Colucci, R., Núñez, D. (2013) Periodic Orbits for a Three-Dimensional Biological Differential Systems. Abstract and Applied Analysis. ISSN: 1687-0409 ed: v.2013 fasc. N/A p.1-11.

Program/group affiliations
Afiliaciones

Dynamical Systems Group. Instituto de Matemáticas de La Universidad de Sevilla España (IMUS).

Education
Educación

▪ 2001: Doctor in Mathematics, Universidad de Granada, Granada, España.

▪ 1991: Bachelor in Mathematics, Universidad del Zulia, Maracaibo, Venezuela.

Professional experience
Experiencia Profesional

▪ 2012-Present: Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2014: Universidad del Zulia, Maracaibo, Venezuela.

Honors and memberships
Honores y membresías

Intercampus program Scholar (1996); Venezuelan investigator promotion program (2002, 2004, 2006, 2008, 2010), Venezuela. Outstanding Cum Laude (Doctorate), Spain (1991); Fonacit scholar (Doctoral program, 1996-2001); "Francisco Eugenio Bustamante" Award at the Universidad del Zulia, Maracaibo, Venezuela (2005, 2006); Best Scientific Publication award, Universidad del Zulia (2004); Recognition from the Experimental Sciences Faculty for lead work in the Divulgaciones Matemáticas magazine (2003-2006); "Jesús Enrique Lossada" University Merit Order, Universidad del Zulia, Maracaibo, Venezuela (2008).

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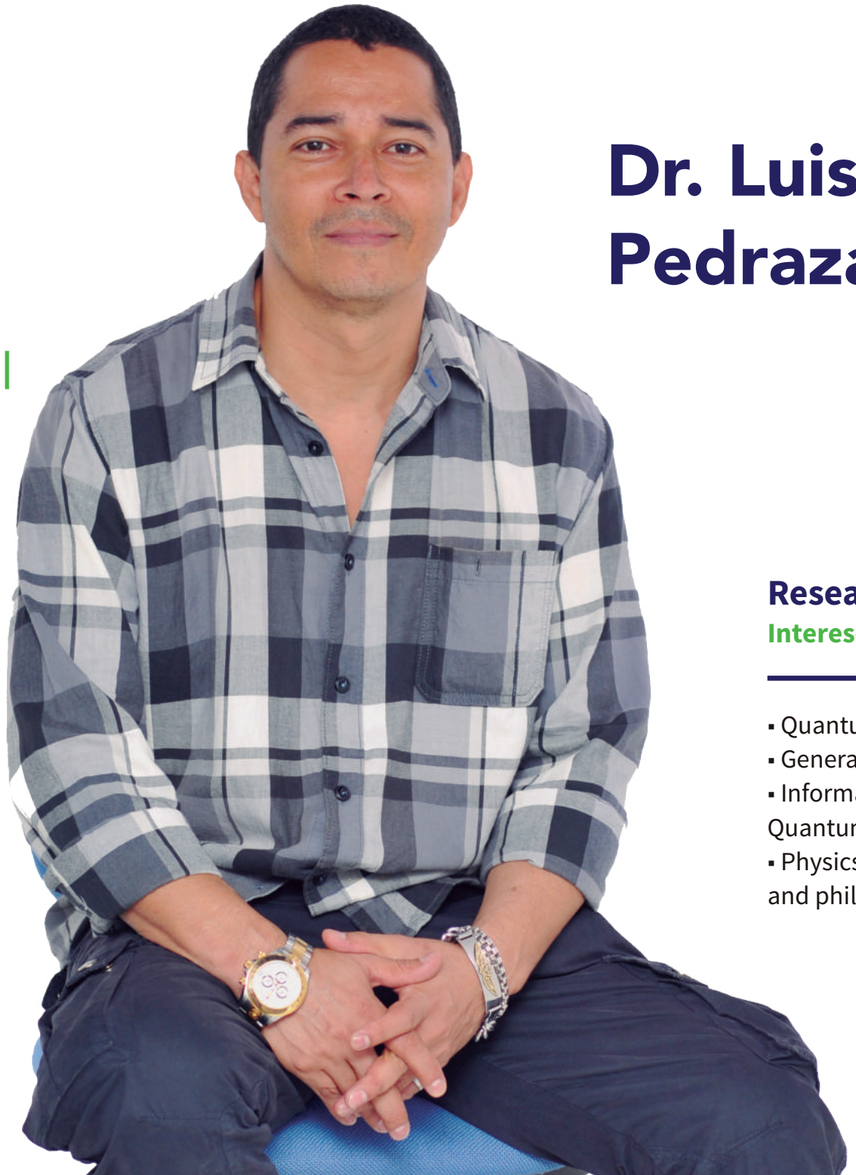

Dr. Luis Gerardo Pedraza Saavedra

Research interests /
Intereses de investigación

- Quantum field theory
- General Relativity theory
- Information theory and Quantum Computing
- Physics education, history and philosophy

EN Research Summary

Professor Pedraza investigates the consequences of different mathematical formalisms in quantum theories of measurement of physics unification programs. His current effort is focused on the constraints on measurability of one component of the free quantum electromagnetic field and its relevance with respect to the energy-time indetermination. Such constraints are obtained with the Feynman's formalism of restricted integrals. Their fundamental aspect is confirmed because the condition associated with a measurement of the field has the form of the energy-time indeterminant relationship. This indeterminant condition is imposed on the field as a condition for detectability and applied to the analysis of how an exploratory near-field scanning microscope operates. He believes that thought experiments provide an avenue for testing the compatibility of concepts in situations that are simple enough to permit a comprehensive analysis. Current measurement technology is so precise that quantum effects become the main cause of restrictions in sensitivity. He has made multiple contributions to the field, including the study and comparison of the orders of magnitude between critical electromagnetic fields and their consequence when measuring information about the electromagnetic field.

Dr. Luis Gerardo
Pedraza Saavedra

ES Resumen del trabajo investigativo

El profesor Pedraza está trabajando en comprender las consecuencias del uso de diferentes formalismos matemáticos en las teorías cuánticas de medición, en programas de unificación de la física. Su esfuerzo actual está enfocado en las restricciones de medición de una componente del campo electromagnético cuántico libre y su relevancia con respecto a la indeterminación energía-tiempo. Dichas restricciones se obtienen con el formalismo de las integrales restringidas de Feynman. Su aspecto fundamental se confirmará por el hecho de que la condición asociada a la medición del campo tiene la forma de la relación de indeterminación energía-tiempo. Dicha relación de indeterminación energía-tiempo se impone al campo como condición para ser detectable y se aplicará entonces al análisis de cómo es que funciona el microscopio de exploración de campo próximo (Near-Field Scanning Microscope). Él considera que los experimentos mentales proporcionan una estrategia para probar la compatibilidad de conceptos en situaciones que son suficientemente sencillas para permitir un análisis comprensivo. La tecnología de medición actual es tan precisa que los efectos cuánticos se convierten en la principal causa de restricción a la sensibilidad de la medida. Ha logrado múltiples contribuciones al campo, incluyendo el estudio y la comparación de los órdenes de magnitud entre campos electromagnéticos críticos y su consecuencia sobre la medida de información sobre el campo mismo.

Currently sponsored research
Investigación financiada en curso

- 2017-2018: Anti-EPR Before EPR: Physics Reality Criteria of Landau-Peierls and Einstein-Podolsky-Rosen.
- 2016-2017: Interpretation, Representation and Explanation in Some Thought Experiments in Physics.

Academic title
Título académico

Full Time Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Bachelors in Engineering, and Quantum Computation and Information (CIC) research group.

Education
Educación

- 2012-2013: Postdoctoral scholar in Physics, University of Puerto Rico, Mayagüez, Puerto Rico.
- 2000: Doctor in Physics, Universidad del Valle, Cali, Colombia.
- 1995: Master's in Physics, Universidad del Valle, Cali, Colombia.
- 1992: Bachelor in Physics, Universidad del Valle, Cali, Colombia.

Recent publications
Publicaciones recientes

▪ Pedraza, L. G. (2016) Interpretación, representación y explicación en algunos experimentos de pensamiento en física. Interpretación, Representación y Explicación, Colección Artes y Humanidades. Departamento de Filosofía, Programa Editorial Universidad del Valle, en prensa, Cali, Colombia.

▪ Pedraza, L. G., Bejarano, L. F. (2015) La complementariedad en teoría cuántica de campos, en problemas contemporáneos. Filosofía de la Ciencia, Colección Artes y Humanidades. Departamento de Filosofía, Programa Editorial Universidad del Valle, ISBN 978-958-765-166-9, Cali, Colombia, p. 167.

▪ Pedraza, L. G., Bejarano, L. F. (2014) La Complementariedad en Teoría Cuántica de Campos. Problemas Contemporáneos en Filosofía de la Ciencia. Germán Guerrero Pino y Luz Marina Duque (compiladores), Colección Artes y Humanidades, Universidad del Valle, Cali, Colombia.

▪ Pedraza, L.G., Bejarano, L. F. (2013) Crítica a la enseñanza de la medición del campo electromagnético en algunos libros universitarios famosos de postgrado. Latin American and Caribbean Journal of Engineering Education. 7(1), pp. 1-42.

▪ Pedraza, L. G. (2013) Algunos errores en la enseñanza de los formalismos mecánico cuánticos. II Encuentro Internacional Sobre la Enseñanza de las Ciencias Exactas y Naturales, Universidad Católica de Pereira, Pereira, Colombia, pp. 147-158, Memorias, ISBN 978-958-8487-22-9.

Professional experience
Experiencia Profesional

▪ 1996-Present. Full time Physics Professor, Pontificia Universidad Javeriana, Cali, Colombia.

▪ 1998-2001: Part-time Assistant Professor, Universidad ICESI, Cali, Colombia.

▪ 1997-1998: Part-time Assistant Professor, Universidad San Buenaventura, Cali, Colombia.

▪ 1994-1995: Instructor Professor, Universidad Autónoma de Occidente, Cali, Colombia.

Honors and memberships
Honores y membresías

Scholar Mazda Foundation for Arts and Science (1994); Distinguished professor recognition at the Pontificia Universidad Javeriana, Cali, Colombia (2002,2007,2009,2010); Silver medal award for more than 15 years of service at the Pontificia Universidad Javeriana, Cali, Colombia (2012); member UNESCO (United Nations Educational, Scientific and Cultural Organization); Colombia Physics Society member; Colombian Physics Engineering Society member; Colombia Pedagogy Network member; Iberoamerican Pedagogy Network member.

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Dr. Mauricio Alberto Quimbaya Gómez

Research interests /
Intereses de investigación

- Bionformatics
- Cell cycle regulation in Arabidopsis thaliana
- Cell cycle deregulation and its causal relation with carcinogenesis

EN Research Summary

Professor Quimbaya do cancer research, specifically focus on how physiological signals and signaling pathways that affect cellular proliferation are directly or indirectly associated with the molecular machinery that controls cell cycle regulation. He wants to understand the molecular mechanisms that regulate cell cycle progression and their possible functional alternations during carcinogenesis. He designs and apply different integrative strategies that use diverse computational tools to elucidate new molecular components that regulate cell cycle progression. Similarly, he searchs for new associative dynamics among the fundamental cell cycle elements that may have a direct effect on the initiation or progress of the carcinogenic process.

He apply forward and reverse genetics strategies in Arabidopsis thaliana for the identification of novel genes and proteins that could be directly associated with cell cycle regulation. Concomitantly, he perform comparative genomics in order establish direct phylogenetic associations between the found genes in Arabidopsis and its human counterparts whose probable function in cell cycle regulation also in humans could be associated with cancer origin or progression when altered.

His lab is equipped to follow an experimental pipeline using Arabidopsis thaliana as well, it is designed to use cancer cell lines, cell biology tools and RNAi technology for identifying and characterizing new regulatory genes associated with cell cycle and cancer progression

Dr. Mauricio Alberto
Quimbaya Gómez

ES Resumen del trabajo investigativo

El profesor Quimbaya investiga sobre el cáncer, específicamente, en cómo las señales fisiológicas y las vías de señalización que afectan la proliferación celular están directa o indirectamente asociadas con la maquinaria molecular que controla el progreso del ciclo celular. Se enfoca en comprender los mecanismos moleculares que regulan la acción del ciclo celular y sus posibles alteraciones funcionales para identificar y caracterizar como la proliferación celular se altera durante el desarrollo de un proceso carciongénico.

Emplea una estrategia integrativa que abarca diferentes herramientas computacionales para elucidar los componentes moleculares que regulan el ciclo celular y busca dinámicas asociativas entre los elementos fundamentales que podrían tener un efecto directo sobre la iniciación o el progreso del proceso cancerígeno. El profesor usa la planta modelo como un modelo experimental para la identificación de genes relacionados con el ciclo celular, usando genética directa e inversa. Basado en estrategias de biología celular y técnicas de RNAi, su laboratorio cuenta con la infraestructura necesaria para el trabajo con líneas celulares específicas, utilizadas para identificar y caracterizar nuevos genes regulatorios del ciclo celular y su potencial relación con el proceso cancerígeno.

Recent publications
Publicaciones recientes

▪ Quimbaya, M., Raspe, E., Denecker, G. et al. (2014) Deregulation of the Replisome Factor MCMBP Prompts Oncogenesis in colorectal carcinomas through chromosomal instability. Neoplasia,16 (9), pp. 694-709.

▪ Quimbaya, M., Vandepoele, K., Raspe, E. et al. (2012) Identification of putative cancer genes through data integration and comparative genomics between plants and humans. Cellular And Molecular Life Sciences. 69 (12) , pp. 2041-2055.

▪ Takahashi, N., Quimbaya, M., Schubert, V. et al. (2010) The MCM-Binding Protein ETG1 aids sister chromatid cohesion required for postreplicative homologous recombination repair. Plos Genetics, 6(1).

▪ Vandepoele, K., Quimbaya, M., Casneuf, T. et al. (2009) Unraveling transcriptional control in Arabidopsis using cis-regulatory elements and coexpression networks. Plant Physiology. 150 (2), pp.535-546.

▪ Quimbaya, M. (2004) Establishment of a phenotypic screening test for the identification of aluminum tolerance genes using Arabidopsis thaliana as a biological model. Acta Biológica Colombiana. 9, pp. 33-44.

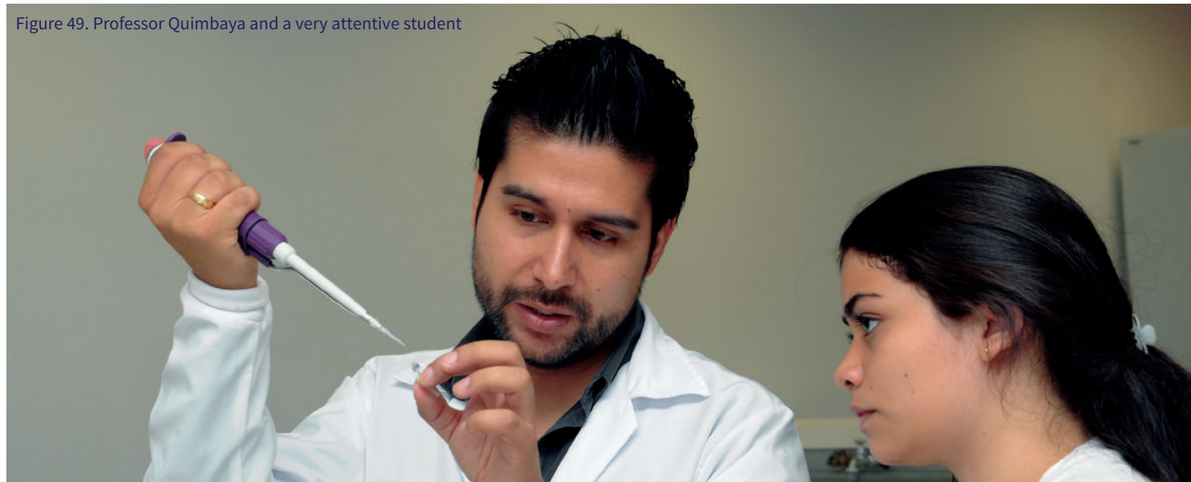

Figure 49. Professor Quimbaya and a very attentive student

Dr. Mauricio Alberto
Quimbaya Gómez

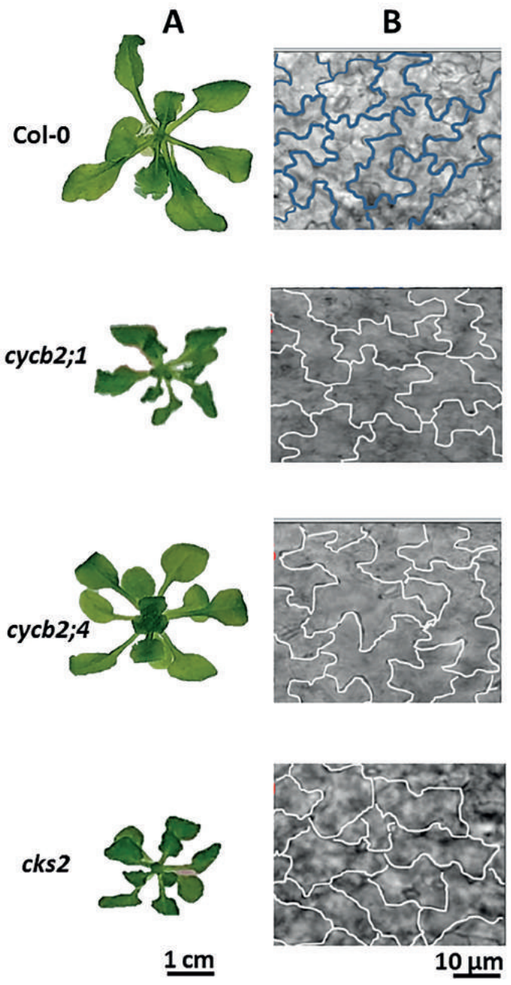

Figure 50. In the model plant Arabidopsis thaliana specific cell cycle knocked-down mutants (cycb2;1, cycb2;4 and cks2) exhibit different morphological and cellular phenotypes when compared with the control (Col-0) plant

Academic title
Título académico

Associate Professor

Currently sponsored research
Investigación financiada en curso

Biology undergraduate program director.

Program/group affiliations
Afiliaciones

Doctorate in Engineering, undergraduate program in Biology, and Biology research group.

Education
Educación

- 2011: Ph.D. in Biotechnology, Ghent University, in association with the Vlaams Instituut voor Biotechnologie (VIB), Ghent, Belgium.
- 2004: Biologist, Universidad Nacional, Bogotá D.C., Colombia.

Professional experience
Experiencia Profesional

- 2012: Associate professor, Pontificia Universidad Javeriana, Cali, Colombia.
- 2012: Adjunct lecturer, Universidad del Rosario, Bogotá, Colombia.
- 2007-2011: Research assistant, Vlaams Instituut voor Biotechnologie (VIB), Ghent, Belgium.
- 2004-2006: Research assistant, International Center for Tropical Agriculture (CIAT), Cali, Colombia.

Figure 51. Cell biology students work at lab setting up a qPCR experiment to quantify gene expression in different Arabidopsis mutant plants

Honors and memberships
Honores y membresías

Belgium and Flanders government Scholar, Vlaams Instituut voor Biotechnologie (VIB) international Ph.D. program in life sciences supported by different Belgian universities (http://www.vib.be/en/training/international-phd-program/Pages/Previous-selections.aspx).

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Figure 52. In vitro growing of Arabidopsis thaliana cell cycle mutants. A selection procedure is being performed in which only mutant plants carrying a specific transgene survive under the conditions of the selection medium

Dr. Oscar de Jesús Ramírez Góngora

Research interests /
Intereses de investigación

- Nonlinear fiber optics
- Supercontinuum laser light applications
- Biophotonics metrology

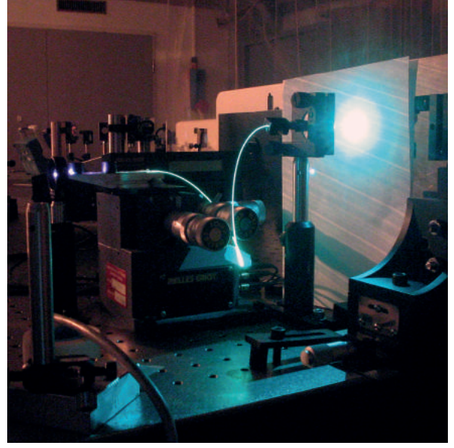
EN Research Summary

Professor Ramírez-Góngora is doing research in the field of fiber optics with emphasis on the nonlinear dynamics of ultrashort laser pulses while they propagate in a photonic crystal fiber. Today he is particularly interested in the characterization and uses of a Supercontinuum Laser Light Source (SLLS). There are a wide range of fundamental implications & technological applications that are now emerging from basic and applied research on this light source, some recent developments about SLLS uses, include and are not limited to: optical clocks, spectroscopy, telecommunications, material characterization, optical coherence tomography and microscopy apparatus, and many more.
Currently professor is working towards the construction of a proposal to establish a Supercontinuum Laser Light Source Laboratory (SLLS) at PUJ-Cali, with capabilities to do basic and applied research and also to serve as a metrology reference laboratory for many other R&D groups and local industry.

ES Resumen del trabajo investigativo

El profesor Ramírez-Góngora realiza investigación en el campo de las fibras ópticas con interés en la dinámica no lineal de pulsos ultracortos, mientras ellos se propagan en una fibra de cristal fotónico. Hoy día él está particularmente interesado en la caracterización y usos de la fuente de luz láser súper continua (SLLS). Existe un gran potencial de implicaciones fundamentales y aplicaciones tecnológicas que se encuentran emergiendo fruto de la actual y efervescente investigación fundamental y aplicada basada en esta fuente laser súper continua, algunos de los desarrollos recientes no se limitan e incluyen entre otros a: los relojes ópticos, la espectroscopía, las telecomunicaciones, la caracterización de materiales, la tomografía óptica de luz coherente y la microscopía entre otras muchas.
Actualmente al profesor trabaja hacia la construcción de una propuesta de investigación en la que se le propondrá a la PUJ-Cali, montar un laboratorio de investigación de la Fuente de Luz Laser Supercontinua (SLLS), que tenga las capacidades para realizar investigación básica y aplicada en el que a su vez permita el uso como laboratorio de referencia metrológica para otros grupos de R&D y a la industria local.

Dr. Óscar de Jesús
Ramírez Góngora



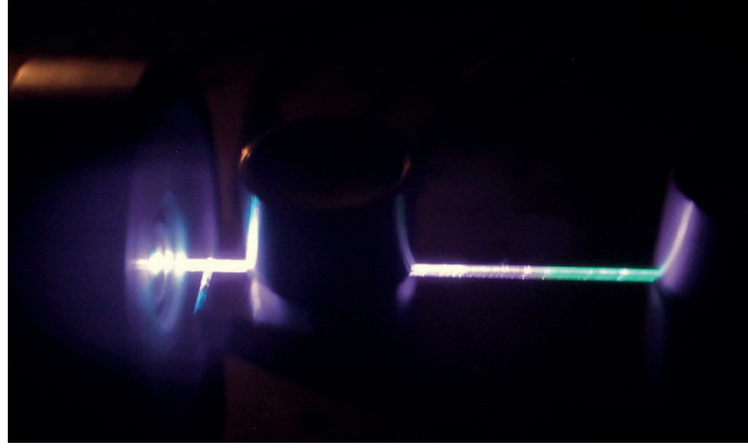


Figure 53 and 54. Testing the modular invariance property for the cut-off rule in linear logic with subexponentials

Recent publications
Publicaciones recientes

▪ Couairon, A., Brambilla, E., Corti, T., Majus, D., Ramírez-Góngora, O. D. J., Kolesik, M. (2011) Practitioner's guide to laser pulse propagation models and simulation. The European Physical Journal Special Topics. 199(1), 5-76.

▪ Ramírez-Góngora, O. D. J., Abachi, S. (1995) Inclusive u and b-Quark production cross sections in ppbar collisions at sqrt(s) = 1.8 TV. En: Colombia, Physical Review Letters. ISSN: 0031-9007 ed: The American Physical Society, v.74 fasc.18 p.3548 - 3552.

▪ Ramírez-Góngora, O. D. J., Abachi, S. (1995) Observation of the Top Quark. En: Estados Unidos, Physical Review Letters. ISSN: 0031-9007 ed: The American Physical Society, v.74 fasc.14 p.2632 - 2637.

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Doctorate in Engineering, undergraduate program in Biology, and Biology research group.

Education
Educación

▪ 2016: Doctor of Science in Physics, Universidad del Valle, Cali, Colombia.

▪ 1994: Master of Science in Physics, University of Puerto Rico, Mayagüez, Puerto Rico.

▪ 1989: Bachelor in Physics, Universidad del Valle, Cali, Colombia.

Professional experience
Experiencia Profesional

▪ 1998-Present. Assistant Professor of Physics, Pontificia Universidad Javeriana, Cali, Colombia.

▪ 1999-2006: Professor of Physics, Universidad ICESI, Cali, Colombia.

▪ 2005-2006: Professor of Physics, Universidad Libre, Cali, Colombia.

▪ 1996-2000: Professor of Mathematics & Material Science, Universidad del Valle, Cali, Colombia.

▪ 1996-2000: Head of Length Metrology Lab at MetroCalidad, Universidad del Vale, Cali, Colombia.

▪ 1994: Teaching Assistant at University of Illinois at Chicago, Chicago, Illinois, USA.

▪ 1993-1994: Research Assistant at Fermi National Accelerator Laboratory, Batvia, Illinois, USA.

▪ 1989-1992: Teaching Assistant at University of Puerto Rico, Mayagüez, Puerto Rico.

Honors and memberships
Honores y membresías

Society Red Colombiana de Óptica, SRCO. Optical Society of America, OSA

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Dr. Carlos Ernesto Ramírez Ovalle

Research interests /
Intereses de investigación

- Linear logic
- Categorical semantics
- Proof theory
- Type theory
- Discrete math and applications

EN Research Summary

The Professor Ramirez focuses his investigation on the use of categorical models for the construction of extension semantics of linear logic. Though the problem of constructing a categorical semantics has been already well studied for the case of intuitionist logic, even, intuitionist linear logic, in the measure that extensions of the same one construct themselves as in the case of linear logic with subexponential, there is had now the need to rely on structures more general that they should realize of the suitable interpretation of the new extensions in categorical terms. This carries to that the systems of types for the correspondence Curry-Howard realize also of these categorical interpretations.
Actually the professor is dedicated at the integration of categorical semantics with models theory and the use of the graphical language of 2 - category for the interpretation of the subexponential in linear logic with subexponential

ES Resumen del trabajo investigativo

El Profesor Ramírez centra su investigación en el empleo de modelos categóricos para la construcción de semántica de extensión de lógica lineal. Aunque el problema de construir una semántica categórica ya está bien estudiado para el caso de lógica intuicionista, más aún, lógica lineal intuicionista, o en el caso de extensiones de esta misma como en el caso de lógica lineal con subexponenciales, es necesario entonces confiar en estructuras más generales que ellos permitan dar cuenta de la interpretación conveniente de las nuevas extensiones en términoscategóricos. Esto lleva a esto los sistemas de tipos para la correspondencia Curry-Holard también en una estas interpretación categórica conveniente.
Actualmente el profesor es dedicado en la integración de semántica categórica con la teoría de modelos y el empleo de la lenguaje gráfico de 2 - la categoría para la interpretación de subexponenciales en la lógica lineal con subexponenciales SELL, así como en la integración de la teoría grafos y la topología algebráica en la determinación de propiedades de materiales cristalinos.

Dr. Carlos Ernesto
Ramírez Ovalle

Recent publications
Publicaciones recientes

▪ Ramírez, C. E. (2014) Semántica categórica para subexponenciales en SELL. Revista Integración, [S.l.], v. 32, n. 1, p. 39-54.

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Masters of Engineering, applied mathematics undergraduate.

Education
Educación

▪ 2016-Present: Professor, Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2005-2012: Professor Universidad ICESI, Cali, Colombia.

▪ 2010-2012: Professor Institución universitaria Antonio José Camacho, Cali, Colombia.

▪ 2015-2016: Professor Universidad Santiago de Cali, Cali, Colombia.

Honors and memberships
Honores y membresías

Best graduate promotion 2005 Bachelor of Science, Mathematics

Contact information
Información de contacto

(+572) 3218200 Ext. 802

carlosovalle@javerianacali.edu.co

Engineering Building, No. 1-06

Dr. Andrés Mauricio Rivera Acevedo

Research interests / Intereses de investigación

- Qualitative theory of differential equations
- Stability and dynamics in Hamiltonian Systems

EN Research Summary

Professor Rivera's research focuses on the use of concepts of mathematical analysis and differential equations in order to understand physical, biological and economic problems. He uses mathematical tools like Perturbation theory, Bifurcation theory, Piecewise linear systems and Global Continuation Methods to predict and explain the complex motion of various dynamical systems, most of them coming from nonlinear oscillators such as satellites (In Celestial Mechanics: Restricted N-body problems), Nonlinear circuits with passive elements (e.g. Memristors, which behave as a resistance with non-linear memory by relate electric charge with magnetic flux). His contributions include the analytic proof of the existence of a family of even and periodic solutions bifurcates from the equilibrium solution in a Generalized Sitnikov (N+1)-body problem (A special case of the restricted (N+1) - body problem) that's includes the Sitnikov problem. The proof of the existence of at least three limit cycles in discontinuous piecewise linear systems with two zones and a straight line of discontinuity of Saddle-Focus type. In driven nonlinear oscillators with parametric external force, he obtains a quantification of the interval where the linear stability of periodic solutions obtains as bifurcations of the trivial one is guarantee.

ES Resumen del trabajo investigativo

El profesor Rivera estudia la existencia y estabilidad de soluciones periódicas en problemas de 3 cuerpos restringidos como, por ejemplo, en la interacción entre 3 cuerpos espaciales en mecánica celeste. Su investigación cubre el estudio cualitativo de sistemas lineales a trozos en modelos electromecánicos, incluyendo circuitos no-lineales con elementos pasivos (e.g. Memristores, que se comportan como una resistencia con memoria no-lineal mediante la relación entre carga eléctrica con flujo magnético). Ha contribuido de manera significativa a plantear soluciones generalizadas al problema de Sitnikov, un caso especial del problema de 3 cuerpos restringidos que permite movimientos oscilatorios, donde el número de cuerpos primarios es arbitrario y emana de los casos circulares y en equilibrio.

Currently sponsored research
Investigación financiada en curso

▪ Existence and stability of periodic solutions in a Comb-drive actuator. Supported by Capital-Semilla (2015-2016) Pontificia Universidad Javeriana-Cali.

▪ Stability of periodic motions in Restricted Three Body Problems. Supported by Capital-Semilla (2015-2016) Pontificia Universidad Javeriana-Cali.

Recent publications
Publicaciones recientes

▪ Rivera, A., Núñez, D., Rossodivita, G. (2016) Stability of odd periodic Solutions in a resonant oscillator. Annali di Matematica Pura ed Applicata. ISSN: 1618-1891. DOI 10.1007/s10231-016-0580-9.

▪ Rivera, A., Núñez, D. (2016) Twist periodic solutions in the relativistic driven harmonic oscillator. Abstract and Applied Analysis. ISSN 1687-0409. Vol.

▪ Rivera, A., Núñez, D. (2015) Quantifying Poincare's Continuation Method for Nonlinear Oscillators. Abstract and Applied Analysis. ISSN 1687-0409. Vol. No1 pp 1-12.

▪ Rivera, A. et al. (2015) Getting three limit Cycles through simultaneous local and global bifurcations in piecewise linear Filippov systems. Proceedings XXIV Congress on differential equations and applications. ISBN: 978-84-9828-527-7. Vol. No1 pp 715-178. Cadiz, Spain.

Academic title
Título académico

Associate Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Bachelors in Engineering.

Figure 56. Professor Rivera in front of the board reflecting his research

Education
Educación

▪ 2013: Postdoctoral scholar in Applied Mathematics, Universidad de Sevilla, Sevilla, España.

▪ 2012: Doctor in Physics and Mathematics, Universidad de Granada, Granada, España.

▪ 2004-2007: Master's in Mathematical Sciences, Universidad del Valle, Cali, Colombia.

▪ 1999-2003: Bachelor in Mathematics, Universidad del Valle, Cali, Colombia.

Profesional experience
Honores y membresías

Outstanding Cumm-Laude graduate, Universidad de Granada, Granada, España (2012); Carolina Foundation Scholar (2007); Training and research scholar, ISAS International School for Advanced Studies, SISSA, Italy (2006); Best ranked undergraduate, Universidad del Valle, Cali, Colombia (2003).

Honors and memberships
Honores y membresías

Outstanding Cumm-Laude graduate, Universidad de Granada, Granada, España (2012); Carolina Foundation Scholar (2007); Training and research scholar, ISAS International School for Advanced Studies, SISSA, Italy (2006); Best ranked undergraduate, Universidad del Valle, Cali, Colombia (2003).

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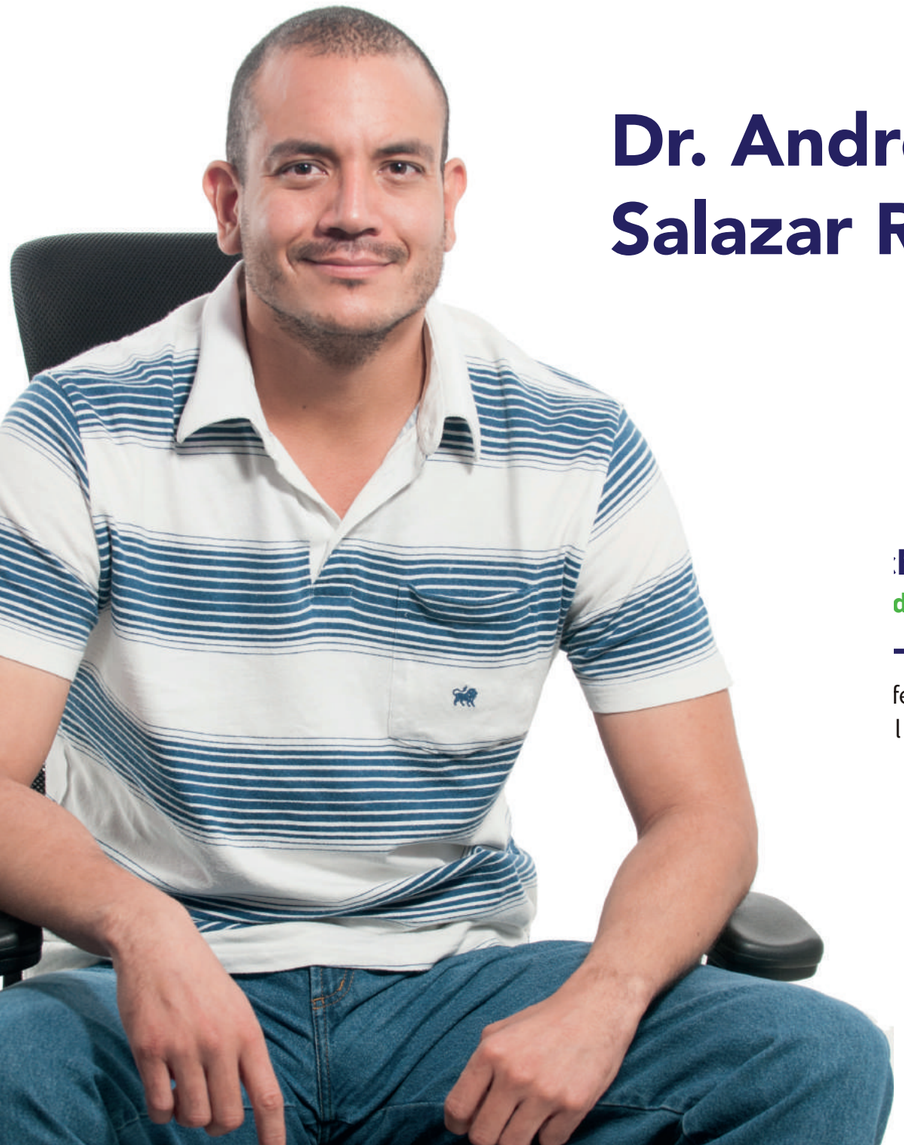

Dr. Andrés Mauricio Salazar Rojas

h interests / de investigación

ferential Equations
l Analysis

EN Research Summary

Professor Salazar's research involves qualitative characterization of elastic structure properties using numerical simulations and analytical techniques based on partial differential equations. He studies the set of critical points and the curvature of solutions to elliptic problems with zero boundary conditions.

ES Resumen del trabajo investigativo

El profesor Salazar emplea herramientas analíticas y numéricas para caracterizar las propiedades cualitativas de la solución a problemas elípticos de orden dos y cuatro, como: la configuración del conjunto de puntos críticos y la curvatura de las curvas de nivel de la solución de los problemas, en relación con la geometría del dominio sobre el que estos se resuelven. Sus trabajos tienen una particular relación con el análisis matemático de la deflexión de estructuras elásticas.

Dr. Andrés Mauricio
Salazar Rojas

Recent publications
Publicaciones recientes

▪ Arango, J., Gomez, A., Salazar, A. (2014). Critical points and curvature in circular clamped plates. Electronic Journal of Differential Equations. 2014 (218), 1-13.

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Bachelor in Applied Mathematics, and Applied Mathematics and Statistics (EMA) group.

Education
Educación

▪ Pending 2017: Doctor in Mathematical Sciences, Universidad del Valle, Cali, Colombia.

▪ 2011: Master's in Mathematical Sciences, Universidad del Valle, Cali, Colombia.

▪ 2007: Bachelor in Mathematics, Universidad del Valle, Cali, Colombia.

Profesional experience
Honores y membresías

▪ 2012 - Present. Pontificia Universidad Javeriana Cali, Colombia.

▪ 2009. Universidad del Valle, Cali, Colombia.

▪ 2007. Universidad de San Buenaventura, Cali, Colombia.

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Engineering Building, No. 1-31

Dr. Henry Fabián tobar Tosse

Research interests / ntereses de investigación

- Structure and function of :he human genome
- Genetic variants and its genomic associations
- Non-lineal models for genome study
- Congenital diseases
- Translational genomics

EN Research Summary

Professor Tobar studies the structure and function of the human genome, based on mathematical and statistical descriptions, where the emergent properties could be associated to biomedical and biotechnological approaches. He contends that decoding the structural organization of the genomic elements shows periodic properties associated with molecular processes that have inherent applicability in medicine and biotechnology.

ES Resumen del trabajo investigativo

La investigación del profesor Tobar estudia la estructura y función del genoma humano, basado en descripciones matemáticas y estadísticas, donde las propiedades emergentes pueden asociarse con enfoques de la biomedicina o la biotecnología. Sostiene que la decodificación de la estructura organizacional de los elementos genómicos muestra propiedades periódicas asociadas con procesos moleculares que tienen aplicabilidad inherente en medicina y biotecnología.

Dr. Henry Fabián
Tobar Tosse

Currently sponsored research
Investigación financiada en curso

▪ Modeling structural genomic elements based on the exploration of palindromes and functional association.

In-Silico exploration of genomics associations among rare diseases: a bioinformatics approach for the identification of genomics susceptibility focuses.

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Medical Doctor Undergraduate (Health Sciences Faculty), and Biotechnology research group.

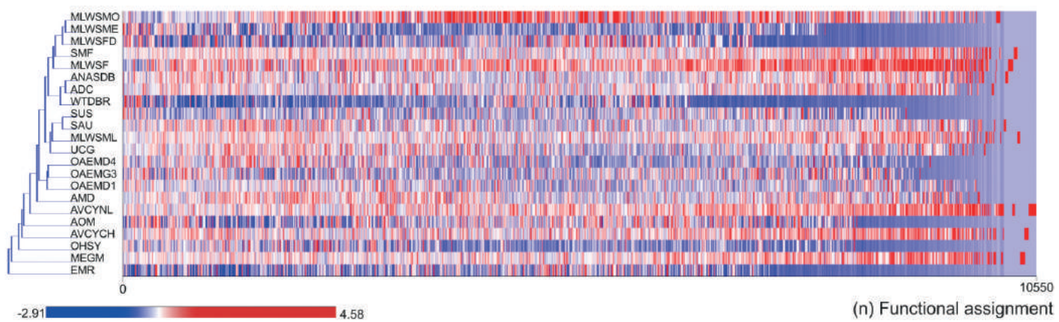

Figure. 57. Hierarchical tree constructed by functional assignments from genomes and metagenomes

Recent publications
Publicaciones recientes

▪ Hurtado, P. M., Tobar-Tosse, F., Osorio, J., Orozco, L., Moreno, F. (2015) Amelogénesis imperfecta: Revisión de la literatura. Revista Estomatología. 23(1).

▪ Zúñiga, A., Tobar-Tosse, F. (2015) Vaginosis bacteriana por Gardnerella vaginalis: Nuevas enseñanzas desde la ecología molecular. Salutem Scientia Spiritus. 1(1).

▪ Tobar-Tosse, F., Moreno, P.A. (2015) Functional insights for common organizations of transposable elements (COTEs) in human genome. Submitted to Genome Research.

▪ Tobar-Tosse, F., Rodriguez, A.C., Velez, P.E., Zambrano, M.M., Moreno, P.A. (2013) Exploration of noncoding sequences in metagenomes. PloS one. 8(3).

▪ Moreno, P.A., Vélez, P.E., Martínez, E., Garreta, L.E., Díaz, N., Amador, S., Tischer, I., Gutiérrez, J.M., Naik, A.k., Tobar, F., García, F. (2011) The human genome: a multi-fractal analysis. BMC Genomics. 12-506.

Natural Sciences
and Mathematics
Department

Dr. Henry Fabián
Tobar Tosse

Education
Educación

- 2013: Doctor in Biomedical Sciences, Universidad del Valle, Cali, Colombia.

- 2007: Bachelor of Science in Biology, Universidad del Cauca, Popayán, Colombia.

Profesional experience
Honores y membresías

- 2013-Present: Department of Basic Sciences for Health, Pontificia Universidad Javeriana, Cali, Colombia.

- 2011: Bioinformatics and biocomputational group, Universidad del Valle, Cali, Colombia.

- 2010: Colombian Center for Genomics and Bioinformatics of Extreme Environments GeBiX Colciencias Scholar.

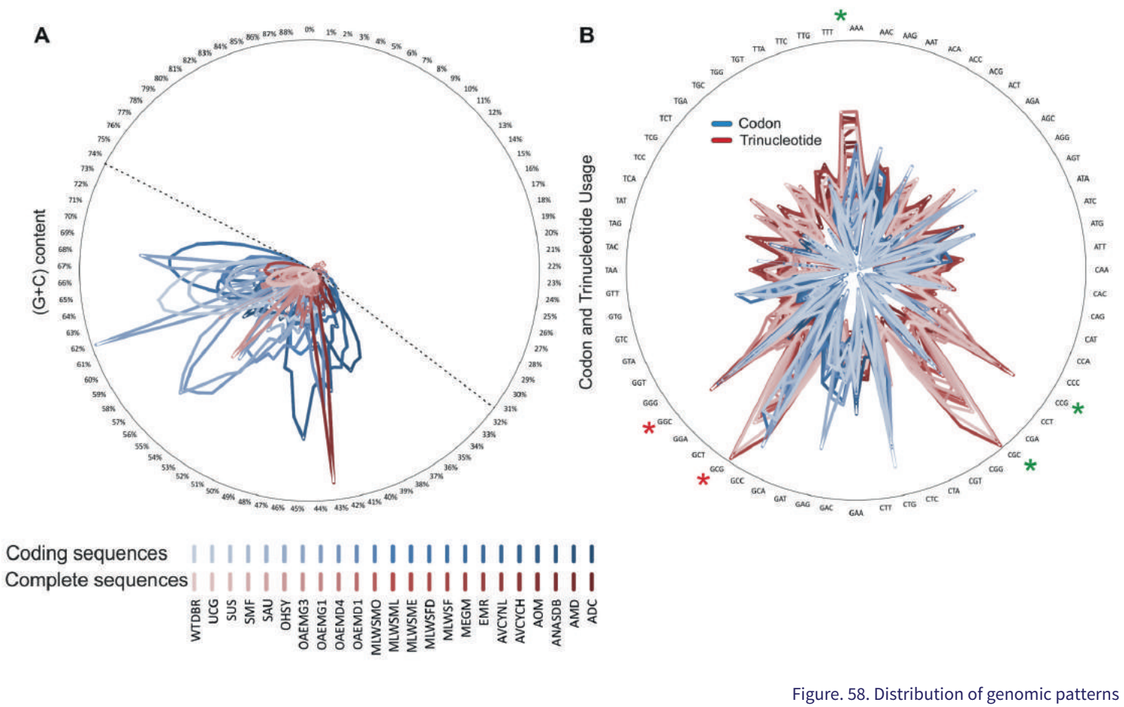

Figure. 58. Distribution of genomic patterns identified in coding-sequences from genomes and metagenomes.

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ftobar@javerianacali.edu.co

Basic Health Sciences Department,
“Lago” Building

Dr. Luisa Fernanda Vargas Jiménez

Research interests / Intereses de investigación

- Partial Differential Equations and applications
- Numerical analysis

EN Research Summary

I am currently working with partial differential equations. My research is developed in two lines, a theoretical one, dedicated mostly to the characteristics of the equations, well-posedness that is the demonstration of existence, uniqueness and continuous dependence of solutions and an applied one, that is, to approach the solutions theoretical using numerical methods.
In particular, I work in a coupled system of non-linear Schrödinger equations, which is well known for applications in non-linear optics and phenomena related to Bose-Einstein condensates.
In addition, taking into account that in general, this type of systems does not have explicit solutions, spectral methods are considered to have approximate solutions, mainly due to their high order of accuracy. Also, for certain problems, spectral methods are very adapted and efficient discretization schemes and are very useful for the analysis of error and convergence. Numerical experiments are carried out as part of the investigation, which allows to illustrate the accuracy of the determined numerical solutions.

ES Resumen del trabajo investigativo

Actualmente trabajo con ecuaciones diferenciales parciales. Mis investigaciones se desarrollan en dos líneas, una teórica, dedicada principalmente a la caracterización de las ecuaciones, la demostración de la existencia, unicidad y dependencia continua de las soluciones y una línea aplicada, en la que se estudia la aproximación de las soluciones teóricas, usando métodos espectrales.
En particular, trabajo en un sistema acoplado de ecuaciones de Schrödinger no lineales, que tiene importantes aplicaciones en óptica no lineal y fenómenos relacionados con los condensados de Bose-Einstein. Además, teniendo en cuenta que en general, este tipo de sistemas no tienen soluciones explícitas, se consideran métodos numéricos espectrales que permitan plantear soluciones aproximadas, a las cuales se les hace el respectivo análisis de error y convergencia. Este tipo de métodos se consideran principalmente debido a su orden de convergencia. Además, para ciertos problemas, los métodos espectrales son muy eficientes para plantear los esquemas discretos correspondientes.
Como parte de la investigación se realizan experimentos numéricos, los cuales permiten ilustrar la precisión de las soluciones numéricas determinadas.

Recent publications
Publicaciones recientes

▪ Vargas, L.F., Hinestroza, D., (2007) A generalized Tikhonov regularization using two parameters applied to linear inverse ill posed problems. Revista De Ciencias ISSN: 0121-1935. ed: Universidad del Valle. v.11 fasc.N/A p.16 - 25,2007, DOI.

▪ Muñoz, J.C., Vargas, L.F., (2016) Error analysis of a Fourier-Galerkin method applied to the Schrödinger equation. Applicable Analysis. An International Journal ISSN: 0003-6811 ed: v.95 fasc.N/A p.156 - 173 ,2016, DOI: 10.1080/00036811.2014.999767

▪ Muñoz, J.C., Vargas, L.F., (2017) Analysis of a Galerkin approach applied to a system of coupled Schrödinger equations. Journal Of Computational And Applied Mathematics ISSN: 0377-0427 ed: v.313 fasc.N/A p.318| - 342 ,2017, DOI: https://doi.org/10.1016/j.cam.2016.09.030

Academic title
Título académico

Assistant Professor

Education
Educación

▪ 2016: Doctor in Mathematical Sciences, Universidad del Valle, Cali, Colombia.

▪ 2011: Master's in Mathematical Sciences, Universidad del Valle, Cali, Colombia.

▪ 2005: Bachrlor in Mathematics, Universidad del Valle, Cali, Colombia.

Profesional experience
Honores y membresías

▪ 2015-Present. Pontificia Universidad Javeriana, Cali, Colombia.

▪ 2016-2017: Universidad Santiago de Cali, Cali, Colombia.

▪ 2005-2010: Universidad del Valle, Cali, Colombia.

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(+572) 3218200 Ext. 8974

lfvargas@javerianacali.edu.co

Engineering Building, No. 1-07

Dr. Drochs Pretty Valencia Ochoa

Research interests / Intereses de investigación

- Fundamental Electrochemistry
- Chemical and Biochemical Sensors
- Electroanalysis
- Computational Electrochemistry and simulation
- Graphene and News Materials
- Materials and its potential applications.

EN Research Summary

The interest of Valencia's professor focuses on various themes of materials sciences, molecular electrochemistry and surfaces, supramolecular and materials electrochemistry, on the electrochemistry of carbon nanostructures, carbon nanotubes and graphene and their exploitation in energy-related applications. Current work also focuses on electrochemistry in fabrication of nanoelectrodes, Immobilization of redox active complexes onto electrode surfaces, electrodes modification for the development of diagnostic tools for virus and the setup of new electroanalytical procedures for the detection of natural and artificial medicaments. In addition, Valencia's professor has several scientific collaborations with academic research groups in Mexico, Brazil, Argentina, Spain, German, England and Colombian. Reviewer for journals including, among others, Electroanal. Chem. J. Electrochem. Soc., Electrochem Comm. Quimica Nova.

ES Resumen del trabajo investigativo

Los intereses investigativos del profesor Valencia son entre otros ciencia de los materiales, electroquímica molecular y sobre superficies, mecanismos de transferencia de electrón en diferentes tipos de superficies, modificación de electrodos con grafeno y otros materiales para aplicación en reducción electroquímica de hidrógeno. Además, actualmente el trabajo del profesor Valencia se basa en fabricación de nanolelectrodos, inmovilización de complejos sobre superficies para el desarrollo de nuevas herramientas para diagnóstico de virus y medicamentos. Además de estas investigaciones el profesor valencia colabora con grupos de investigación en México, Brasil, Argentina, España, Alemania, Inglaterra y Colombia.

Recent publications
Publicaciones recientes

▪ Emerson Coy, Luis Yate, Drochss P. Valencia, Willian Aperador, Katarzyna Siuzdak, Pau Torruella, Eduardo Azanza, Sonia Estrade, Igor Iatsunskyi, Francesca Peiro, Xixiang Zhang, Javier Tejada, and Ronald F. Ziolo, High Electrocatalytic Response of a Mechanically Enhanced NbC Nanocomposite Electrode Toward Hydrogen Evolution Reaction ACS Applied Materials & Interfaces 2017 9 (36), 30872-30879 DOI: 10.1021/acsami.7b10317.

▪ Valencia, D. P.; Galgano, P. D.; El Seoud, O. A.; Bertotti, M. Simple approach to calculate micelle aggregation numbers de ionic liquid-based surfactants: electrochemical behavior de aggregate-solubilized ferrocene studied by microelectrode voltammetry. J. Electrochem. Soc., 2014. 161 (10) p. H660-H662 ISSN 1945-7111.
Valencia, D. P.; de Souza, A. P. R.; Gonçales, V. R.; Antonio, J. L. S.; Cordoba de Torresi, S. I.;

▪ Bertotti, M From a planar electrode to a random assembly of microelectrodes: A new approach based on the electrochemical reduction de 5-bromo-1,10-phenanthroline at gold electrodes. Electrochem. Commun., 2014. 38 p. 32-35. ISSN 1388-2481 01/01/2014

▪ Electrochemistry Communications ISSN: 1388-2481 ed: v.38 fasc.N/A p.32 - 35 ,2014, DOI: From a planar electrode to a random assembly of microelectrodes: A new approach based on the electrochemical reduction of 5-bromo-1, 10-phenanthroline at gold electrodes

▪ Valencia, D. P.; Astudillo, P. D.; Galano, A.; Gonzalez, F. J., Self-Dicarboxylation de trichloroacetic acid redox catalyzed by trichloroacetate ions in acetonitrile solutions. Org. Biomol. Chem., 2013. 11 p. 318-325. ISSN:1477-0539

Education
Educación

▪ 2016: Postdoctoral Research III in Electrochemistry and new materials from Universidade Federal de Saõ Luis de Maranhão (UFMA), São Luis de Maranhão (Brasil), Chemistry Departament. Supervisor- Prof. Dr. Flavio Damos, Designed nanomaterial for electrochemical sensors.

▪ 2015: Postdoctoral Research II in Analytical Electrochemistry from Universidade de Saõ Paulo (USP), São Paulo (Brasil). Chemistry Departament. Supervisor- Prof. Dr. Mauro Bertotti, Surface modified electrodes; new synthetic strategies and applications. Chemical sensing and testing theories de electron transfer.

▪ 2012: Postdoctoral research I in Materials Science. from Universidad Autónoma Metropolitana, México, D.F., México. Materials Departament . Supervisor- Prof. Dr. Manuel Palomar Pardave, Surface modified electrodes; new synthetic strategies and applications. Chemical sensing and testing theories de electron transfer.

▪ 2012: PhD in science specializing in chemical sciences from Center for Research and Advanced Studies of the National - Cinvestav México D.F. (México). Chemistry departament. Research interest: Electrochemistry and materials. Supervisor - Prof. Dr. Felipe González (fgonzale@cinvestav.mx). Tesis Estudio de la relación entre el coeficiente de difusión y la masa molecular. Aplicación del modelo en la determinación de la estequiometria de complejos de asociación.

▪ 2005: Bachelor of Science in Chemistry at the National University of Colombia, Bogotá, Colombia

Profesional experience
Honores y membresías

▪ 2017- Current: Full time Researh and assistant Professor, Pontificia Universidad Javeriana de Cali, Colombia.

▪ 2016-2017: Full time Research and associate Professor,Universidad Santiago de Cali, Cali, Colombia. 2017. Universidad de Valencia/Spain Visiting professor.

▪ 2016: Research Partial time, Universidad Militar Nueva Granada, Bogotá. 2016: 2016. Universidad Konrad Lorenz, Bogotá Colombia. Professor Partial.

▪ 2015 - 2016: Postdoctoral Research, CAPESP fellowship. Designed nanomaterial (grafeno) for electrochemical sensors, Universidade Federal de Saõ Luis de Maranhão (UFMA).

▪ 2015: Universidad Nacional de Asunción, (Paraguay), Facultad de ciencias exactas y naturales, Departamento de química. Prof. Dr. Organic advances Chemistry.

▪ 2013: Universidade de Saõ Paulo, São Paulo (Brasil). Auxiliar Professor Chemistry Departament.. Curso: QFL 1200 – Química Analítica.

▪ 2012: Universidade de Saõ Paulo, São Paulo (Brasil). Professor 7a escuela de electroquímica.

▪ 2012: Universidad Autónoma Metropolitana, México, D.F., México. Departamento de ciencia de Materiales. Área de investigación: Ciencia de los materiales, Química Analítica y Electroquí. Investigador Postdoctoral, PROMEP fellowship.

Currently sponsored research
Investigación financiada en curso

▪ Development of a bio-electrochemical sensor based on the immobilization of peptide derived from HPV-L1.
Electrocatalytic Response of a Mechanically Nanocomposite Electrode for Hydrogen Evolution Reaction
Chemistry for cleaned production (Seedbed project)

Academic title
Título académico

Assistant Professor

Program/group affiliations
Afiliaciones

Engineering and Applied Sciences Doctorate, Bachelors in Engineering and Clean Production (PML) research group

Honors and memberships
Honores y membresías

nternational Society of electrochemistry (2014)

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Professors working towards their Ph.D. in 2018

CIED

Civil and Industrial Engineering Department

Maria Isabel Díaz Vega

Professor Díaz's research is focused on the study of problems associated to project management in custom software development. Her aim is to identify and apply the underlying dynamic variables involved, along with uncertainty quantification strategies, to develop predictive methodologies.

ECSD

Electronics and Computer Science Department

Manuel Vicente Valencia D.

Professor Valencia is working on energy efficiency, particularly on machine control for air conditioning systems (induction motors). The motivation for this is to reduce the significant penalties in energy consumption due to these systems. An estimated 60% in industry and 70% in the commercial sectors is attributed to this source of consumption of electrical power. Professor Valencia's contribution stems from optimizing the relationship between the control action and the load.

Luisa Fernanda Rincón P.

Professor Rincon's research is focused on software product lines. Has worked in configuring and cssembling software products proyects. Between her most recently researchs are: Methods to identify corrections of defects on product line models (2015); An ontological rule-based approach for analyzing dead and false optional features in feature models (2014); and identifying dead features and their causes in product line models: an ontological approach (2014).

Maribell Sacanamboy F.

Professor Sacanamboy's research interests are digital design and digital communications. This last focused on turbo coding.

NSMD

Natural Sciences and Mathematics Department

Andrés Felipe Amador R.

His investigation lines are focused on numerical methods and diffuse topology. Has devepeloped proyects on destruction of chaotic bands and detection of chaos by wave number and has made researches on codimension-two big-bang bifurcation in a zad-controlled boost dc-dc converter.

The importance of these areas lays in the development of mathematical abilities and their use to understand the history and applications of science.

José Eduardo Tofiño P.

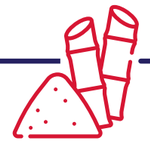
Professor Tofiño works in the field of history and epistemology of mathematics, particularly on the study of the foundations and evolution of mathematics during the period 1850-1918. He has focused in the area of set theory and logic, specifically in the lesson axiom and the well-ordering theorem.

Hugo Fernando Pardo P.

Professor Pardo's research is focused on mathematics education. Particularly on the problems associated with representation systems (i.e. algebraic, analytic, and numeric) in the learning process of 1st and 2nd order differential equations. This is critical in engineering and science education to enable conceptual understanding of mathematical concepts and derivation of models associated with reality. Traditionally, figurative schemes involve applying recipes and consequently rely on memory. In this work, the focus is on operative schemes in which the abstractions of concepts thread the learning process.

Students 2015 - 2018

2015 Cohort



Andrea Molina Cortés

Use of phenolic compounds and products of Maillard reaction derived from sugarcane to obtain products with added value: Antioxidant and anticancer potential of molasses and vinasses.

Molasses and vinasses are two of the major by-products derived from the sugarcane agroindustry. Numerous studies show how these matrices present significant contents of bioactive molecules such as phenolic compounds (PCs) and Maillard Reaction products (MRPs), which have revealed interesting antioxidant properties in vitro.

Thanks to this evidence, a relationship has been established between the antioxidant capacity of these compounds, and their influence on the phenomena derived from oxidative stress in human cells, such as DNA damage and oncogenesis.

However, despite the demonstrated free-radical scavenging capabilities of extracts from molasses and vinasses, it is necessary to explore the biological responses of the cells subjected to these extracts to identify the metabolic pathways most affected by PCs and MRPs, so that this allows laying the foundations to understand the mechanisms involved in the antineoplastic effects attributed to this type of compounds. In this sense, the objective of our research is to perform a transcriptomic analysis of the differential growth of cell lines treated with PCs and MRPs extracted from two by-products of sugar and ethanol production (molasses and vinasses).

From these results, we expect to determine, by experimental and bioinformatics methods, the relationship with the antioxidant and anticancer response induced by the action of these compounds.

Fernando Barraza Alvarado

Model collaborative knowledge for management Documentation Software Architecture

Define a model to generate recommendations on documenting the architecture of software systems.

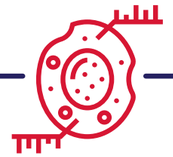
The model should consider the domain of software application and an existing standard of software architecture documentation.

On the model it should be possible to implement different types of recommendations using machine learning algorithms which use data sets data sets of documentation of the architecture of different software systems available in a software development community.

It wanted that recommendations attending software architects in the design decisions to be taken when they are in the process of design of architecture as well as maintaining of related documentation.

These recommendations should then reflect best design practices that the community of architects arranged in a network reflected on their designs.

It is expected that the model led in practice to a tool, help minimize maintenance, diagnosis and improvement problems of software systems which fall in the architecture of such systems, thus reducing development costs associated with these processes in an organization or company that develops software.



Pedro Miguel Hernández Acosta

Evaluation of potential therapeutic strategies for the treatment of inborn errors of metabolism

Congenital metabolic diseases are, together, a large group of genetic diseases that occur in children with an increasing impact on infant morbidity and mortality worldwide.

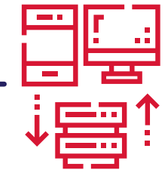
The lack of interest of pharmacological laboratories to invest in research and development of potential therapeutic strategies for the treatment of these diseases, given the small number of people born with this condition, it means that, these patients generate irreversible consequences long-term leading to a deterioration in the quality of life of patients and/or premature deaths.

This is the reason why in the investigation that develops into the doctorate is to develop and evaluate new therapeutic strategies for the treatment of disease.

The first step of the research is based on the modeling of the mutant proteins and genes coding for proteins responsible of generating the pathology, this in order to determine the effect that causes the mutation on protein structure.

The second step is to evaluate possible strategies to correct the mutation and/or stabilize the mutant protein, so that it can recover its cellular function and stop the progression of the disease.

2016 Cohort



Andrés Sebastián Rudqvist Valencia

Model-Driven, Formally Checked Platform for IoT

The Internet of Things (IoT) promises a high impact transformation for our society. However, given the high heterogeneity of components usually employed in a typical solution.

The development of secure, reliable and interoperable IoT solutions is still a challenge, specially when the time to market dimension is taken into account. Many approaches have been developed to provide interoperable IoT solutions; an important effort in this area is the development of the IoT-A Reference Architecture initiative. Regarding security, the use of formal methods constitutes a very promising way to approach the matter. My doctoral work is centered in the proposal of an IoT development process that, starting from system requirements we could use standard and proven modeling languages such as Business Process Modeling Notation (BPMN) and Specification and Description Language (SDL) to describe the behavior of the Information and Operations Technologies (IT and OT, respectively) subsystems inside an enterprise. Then, by combining the specifications with device specific configuration and a scheme of convention over configuration, obtain a running system.

Also based on the BPMN and SDL models compile them to a formal language based on rewriting logic to verify the system.

Julieth Irene Murillo Silva

Secretome role of Leishmania panamensis in the modulation of host cell factors and its relation to the clinical phenotype of cutaneous Leishmaniasis

The Leishmaniasis is an endemic disease in tropical regions, with 350 million people in 88 countries at risk of developing one of the forms of the disease. It is caused by Es causada por Leishmania spp, intracellular parasites of a wide variety of phagocytic mammalian cells, such as macrophages, neutrophils, dendritic cells etc. Clinical manifestations depend largely on the type of the infecting species and the immune status of the host; cutaneous leishmaniasis (CL), mucocutaneous (MCL) and visceral (VL), are the main presentations of the disease. In Colombia the clinical spectrum of CL caused by L. (viannia.)Panamensis is quite broad, in spite of being a single species. The high percentage of failure of chemotherapy promotes the search for strategies that contribute to improved treatment.

However, the vast ignorance of the mechanisms and molecules that underlie the relationship Leishmania-host, hinders the efforts in this direction. Therefore, in this proposal for doctoral research, is presented as main objective to determine the role of secretome of L. (V.) Panamensis, and its importance in the modulation of host cell factors in order to understand its impact on the clinical phenotype of infection.

It is hoped that from above can to explore and propose novel strategies for studying host-pathogen interactions in relation to the clinical manifestations of infection.

Addressing this issue will take place through the integration of two traditional disciplines such as cell biology of infection, recreated in models in vitro and computational models and bioinformatics tools of computer science.

Juan Carlos Romero Reina

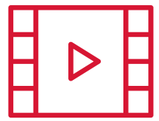
Network theory (or graph theory) and dynamical systems to understand the behavior of real-world interconnected systems

Developing analytical frameworks for the detection of anomalous events in large et of data is of increasing interest in trying to automate economic and financial rocesses. However, little has been done to develop theoretical frameworks that enhance our understanding on how detection algorithms perform across ultiple domains. Is an algorithm that performs well for Platform A (e.g. amazon, which sells various types of products) suitable for Platform B (e.g., a specialized platform like E*Trade, which focuses on foreign exchange currency trading)? What are the underlying assumptions (e.g., on the dynamics of regular users and the types of anomalies) under which a class of detection algorithms can guarantee certain performance metrics (e.g., in terms of the percentage of false positives/negatives)? Trying to address these questions, recent efforts have focused on identifying structural configurations observed in empirical data. For example, consider a etwork representing transactions between users. A link between two nodes describes a bilateral service agreement, and the addition of nodes to the network describes new users engaging in transactions. The lofty aim of network models is to capture regularities among users as a coherent emergent interaction phenomenon (e.g., to describe the regular profile of users based on recurrent relationships present in the network).

These models capture topological features underlying the collective behavior of users participating in a dynamic process, which quantifies the interactions within and across groups of users (e.g, the way in which users relate to others, or how sets of users with similar patterns of relationships are connected to the rest of the network).Network models arise fundamental questions about the detection problem.

Doanomalous events frequently occur at particular locations within the network? What properties differentiate these locations from the rest of the network? Are there particular configurations of links, nodes, or sub-networks that point to the occurrence of anomalous events? What level of aggregation captures the dynamics under which algorithms can best reveal the occurrence of anomalous events? My research proposes an anomaly detection framework based on network models, where deviations from average structural properties serve as detection criteria.

2017 Cohort



Roger Alfonso Gomez Nieto

Robust video trackers against In-capture and Pos-capture distortions using Video Quality Assessment based on Natural Scene Statistics

Video tracking methods that explicitly include strategies to make them robust to in-capture and post-capture video distortions, have not been widely explored.

The existing body of work has studied different image factors that affect tracking performance, including occlusion, clutter, confusion, object shape, unstable speed and zooming, etc., that affect 'video quality'.

While these conditions do affect tracking performance, there is no clear distinction between the scene-dependent challenges like occlusion, clutter, etc., and the challenges imposed by quality impairments from capture, compression, processing, transmission, etc.

My doctoral research work is focused with the latter interpretation of quality, as it affects video tracking performance. Our main goal is to design and test explicitly robust video object tracking algorithms in spite of in-capture and pos-capture distortions.

Jan Alejandro Medina

On Estimating Formation Mechanisms in Mixed Attachment Networks

Over the past decade, a wide range of dynamical models have been introduced to explain how mechanisms for establishing and removing links explain emerging topological outcomes in empirical networks (e.g., patterns of high clustering and power-law degree distributions).

To assess their predictive power, the mechanisms that underlie such network models must be formally validated.

My research introduces a general approach for estimating the degree of prevalence of attachment and response mechanisms in growing networks. The proposed approach determines the prevalence based on the analytical properties of a likelihood function. I expect this will allows us to quantify the variability in the configuration of mechanisms as topological outcomes of empirical networks evolve over time.

Sergio Ramírez Rico

Develop an efficient implementation for verifying bisimulation for SCCP

Process calculi are linguistic formalisms from concurrency theory for expressing and analyzing concurrent systems.

Nevertheless, the systems we identify have aspects that cannot be expressed with the traditional process calculi, and require the introduction of new concepts.

In particular, we need to express agents posting and querying information in the presence of spatial hierarchies for sharing information and knowledge. Our research strategy is to develop a conservative extension of SCCP calculi that captures more faithfully the systems under consideration. D-SPACES extends SCCP, itself an extension of CCP (Concurrent Constraint Programming), by adding the ability to specify agents, and spatial and epistemic interactions between them.

Our work takes the challenging task of developing the underlying theory and machine-assisted tools for verifying concurrent systems specified in D-SPACES.

2018 Cohort

Hernando Mosquera

Modeling of a multi-user audiovisual system of adaptive interaction in semi-controlled environments

The research will focus on the bio-inspired modeling of an adaptive human-machine interface that allows multi-modal dialogues with multiple users simultaneously in semi-controlled environments, based on voice commands and body gestures using machine learning techniques and digital signal processing.

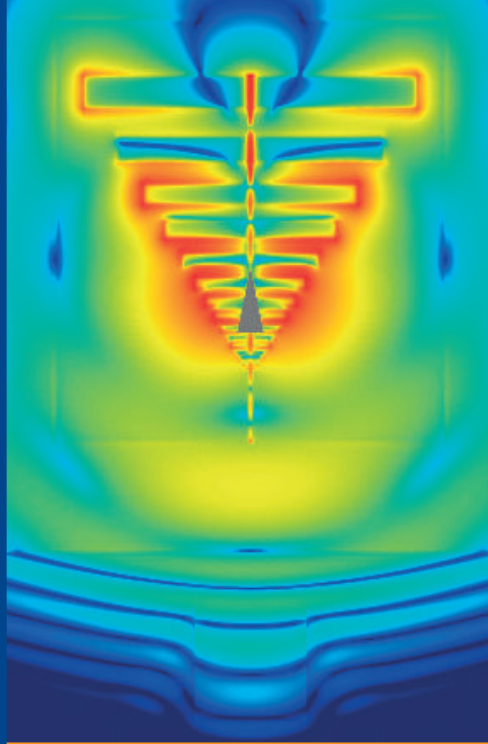
To achieve this goal, computer science is considered as a primary area and life sciences as a secondary area, seeking behaviors in the biology and cellular interaction that allow modeling the aforementioned system.

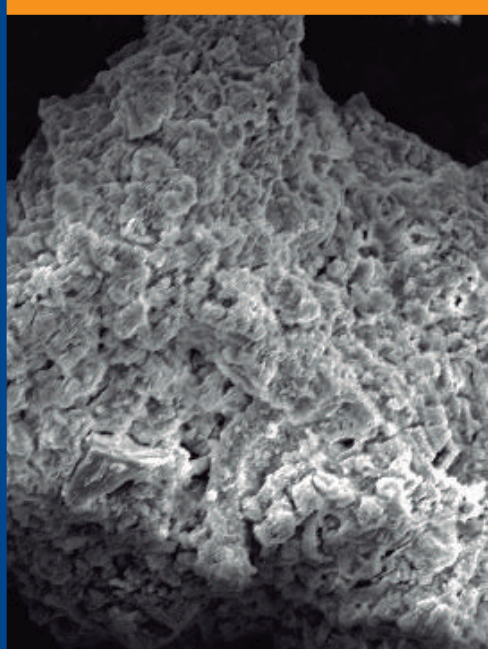
Mónica Piedad Sánchez

Stable operation range with bifurcations and nonlinear control techniques for the atomic force microscope system

My work is focused on control methods that aim to mitigate or suppress the effects of nonlinearities in atomic force microscopy (AFM), and in enhancing the resolution of current AFM systems using nanoscale-resolved actuators.

Due to its diverse applications currently in Electronics, at the level of nanotechnology, this research will be tackled mathematically using techniques from Dynamic Systems.





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