

Membership Application to the International Federation of Operational Research Societies

Ecuadorian Mathematical Society



Context: Mathematics and OR in Ecuador:

The beginning of the academic Mathematics history in Ecuador goes back to the year 1869, when the first technical university was founded as a part of the former Central University “Santo Tomás” in Quito. The first Ecuadorian Faculty of Mathematics was a constitutive part of this new higher education institution. For more than a century, courses on Mathematics were offered at universities as support for engineering and similar careers. In 1975 the first Department of Mathematics was created at the -- meanwhile independent -- National Polytechnical University (“Escuela Politécnica Nacional”, EPN) in Quito. The first generation of Ecuadorian mathematicians were educated there and were afterwards supported for graduate studies abroad. After obtaining their Ph.D. degrees at universities in Europe and the United States, some of these mathematicians returned to Ecuador during the 80's. Most of them joined the Department of Mathematics at EPN as professors, while others supported the creation of new careers in mathematics at other Ecuadorian universities.

The Ecuadorian Mathematical Society (“Sociedad Ecuatoriana de Matemática”, SEdeM) was formed in 1967 at the initiative of some enthusiastic professors interested in the fostering of mathematics in Ecuador. Originally, its main goal was the improvement of the quality of education in Mathematics at all levels countrywide. Later on, this goal was broadened, and today SEdeM is expected to provide an environment where Ecuadorian pure and applied mathematicians—as well as other academics and practitioners applying Mathematical Modeling in various fields—can exchange ideas and devise concrete actions aimed at improving the overall conditions for both research and education in Mathematics and related fields in Ecuador. One example of such concrete actions have been the Ecuadorian Conferences on Mathematics and its Applications, organized between 1986 and 2020 by the Department of Mathematics at EPN on a biennial basis, and afterwards yearly at various universities.

Recent years

Research in Applied Mathematics experienced significant growth during the first two decades of the current century, reflected in an increasing number of publications, the establishment of several local master's programs, and the launch of the first PhD program in Applied Mathematics. Accordingly, SEdeM has undergone a remarkable revitalization. A combination of experienced professors and enthusiastic young researchers has actively contributed to the Society's development. From 41 members in 2006, the Ecuadorian Mathematical Society has grown to 94 registered members to date.

Applied Mathematics and Operations Research have been particularly active areas in Ecuador. A major milestone was the establishment of the *Research Center on Mathematical Modeling (ModeMat)* in 2013. The center was created with strong support from the Ecuadorian government and the Escuela Politécnica Nacional (EPN), where it is based. Its mission is to conduct high-quality research in Applied Mathematics and Operations Research, with a particular focus on developing novel mathematical models to address challenges arising in diverse sectors of society (further details are provided below).

SEdeM has also been at the forefront of efforts to integrate Ecuador into the international academic community in fields related to Mathematics and Mathematical Modeling. Ecuador became a full member of the *Unión Matemática de América Latina y el Caribe (UMALCA)* in 2012 and achieved full membership in the *International Mathematical Union (IMU)* in 2014. In both cases, SEdeM acts as the adhering organization representing the country. In addition, SEdeM represents Ecuador in the *Asociación Latino-Iberoamericana de Investigación de Operaciones (ALIO)* and the *International Council for Industrial and Applied Mathematics (ICIAM)*. In this context, we are confident that membership in IFORS will further stimulate the advancement of Applied Mathematical Modeling and Operations Research in Ecuador and offer an excellent opportunity to strengthen collaborative links between Ecuadorian academics and their international peers.

Universities and Education

Although there are 62 universities in Ecuador at the present day, only 10 offer careers related to mathematics. Six of them educate high school mathematics teachers, while the remaining 4 (EPN, ESPOL, UC and USFQ) train future mathematicians for working both in academia and industry.

In recent years, these universities have started several postgraduate programs in areas of applied mathematics. Currently, there are 6 master programs: three in applied statistics, one in operations research and two in mathematical education. The education is highly applied and has an important impact on many sectors of the society: financial institutions, oil industry, education, etc.

The Ecuadorian Mathematical Society and the universities in the country are also deeply involved in the improvement of mathematical education at all levels. Additionally to the master program on mathematical education directed to school teachers and organized by the Universidad Central del Ecuador, mathematicians from different universities are involved in studies about the didactics of mathematics in Ecuadorian schools.

In that spirit, workshops across the country are periodically organized in order to provide up to date trainings on



the teaching of mathematics. The work is in many cases coordinated with the Ministry of Education of Ecuador.

The support to the organization of mathematical contests in elementary and high schools, as a mean for fostering the interest in mathematics among students and the general public, has also been an important activity of SEdeM. The Society itself organizes the *Olimpiada de Matemática*, a yearly national competition for children and teenagers between the 4th and 13th grade, which reached its 20th edition in 2025. This event has experienced a sustained growth in the last decade, both in the number of participants and in the number of their home cities.

Research Center on Mathematical Modeling

As a consequence of the intense positioning strategy of Mathematics and Operations Research within Ecuador, the Research Center on Mathematical Modeling (MODEMAT) was created at the beginning of 2013. The center is a result of the awareness, by the authorities of the EPN and the Ecuadorian Government, of the importance of research in Applied Mathematics and Mathematical Modeling as cornerstones for the development of other scientific and technological areas.

The Research Center on Mathematical Modeling aims to develop new mathematical and computational techniques, and build innovative mathematical models to solve problems arising from different application areas. Currently, the center conducts research projects in four areas:

1. Data Assimilation
2. Operations Research
3. Inverse Problems and Optimization
4. Scientific Machine Learning

The board of the center is shared by the EPN and the Ecuadorian government. The center is affiliated to the EPN but has a countrywide status, which means that researchers from other higher education institutions and public research institutes can get support for project proposals within the research areas identified above. The financial support of the projects may come from different sources.

To ensure that the quality of the research developed at the Center meets international standards, the Center has a Scientific Committee, composed by international prestigious scientists with expertise in the management of similar research centers in other countries. The primary function of the Scientific Committee is to monitor the Center's scientific productivity. The members of the Scientific Committee shall conduct periodic evaluations of the research taking place at the Center, and propose strategic decisions to the board, which may include opening or closing research areas.

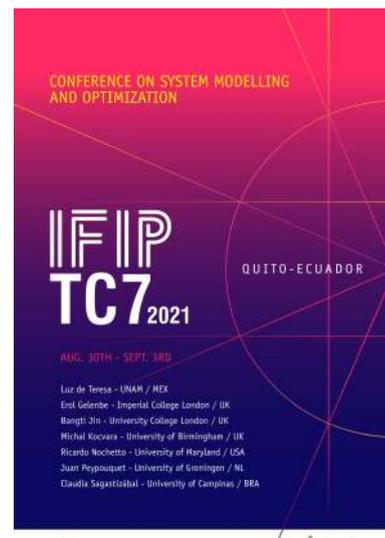
One of the main expected impacts of the center is the fostering of graduate programs in Applied Mathematics. The research projects are formulated in such a way that they constitute a framework for the development of master and doctoral theses. Additionally, through international networking, the center aims to increase the academic mobility, in particular the exchange of researchers and graduate students.

A strategic milestone for the research in Applied Mathematics was the foundation of the National Laboratory of Scientific Computing. The laboratory began its operation with

equipment acquired through two national research projects, and later a powerful blade system was incorporated through agreements with other national institutions. In this way, the center currently manages the country's most important supercomputer for high-performance scientific computing tasks.

Regional impact and international visibility

An important goal of the Society in the last years has been the impulse of Mathematics and Operations Research in the region and the increase in visibility of Ecuadorian contributions worldwide. With that in mind, the Society organized in 2008 the first Latin American Workshop on Optimization and Control (LAWOC), with the aim of gathering Latin American researchers working in these areas and enhance their future scientific collaborations. The meeting had an important regional impact and subsequent versions have been organized in Rosario-Argentina (2010), Valparaíso-Chile (2012), Tandil-Argentina (2016), Quito-Ecuador (2018), Rancagua-Chile (2020) and Córdoba-Argentina (2022). The next LAWOC will take place in Rio de Janeiro-Brazil.



To contribute to the training of undergraduate and graduate students from the Andean region, SEdeM has been involved in the organization of some regional schools in Ecuador.

The first *EMALCA Ecuador* was co-organized with UMALCA in 2010, with block courses on varied mathematical topics taught by Latin-American Professors. In 2013 the first *Escuela de Control y Optimización (ECOPT)* was organized in Quito jointly with faculty of the Universidad Técnica Federico Santa María from Chile. The school hosted students from Colombia, Ecuador, Perú and Chile, who attended block courses on optimization and control topics for two weeks. In 2015 the *XIV Escuela Latinoamericana de Verano de Investigación Operativa (ELAVIO 2015)* was organized at the Escuela Politécnica in Quito. ELAVIO has a long tradition in the region as an important meeting for getting up to date with different topics of Operations Research developed in the region. The 15th Edition in Quito was attended by 66 students from many countries in Latin America and Europe.

Furthermore, SEdeM has supported the organization on international workshops and conferences in Ecuador. In June 2014 the first *Congress on Biomedical Engineering and Mathematical Modelling in Bioscience* took place in Quito. The event was a joint effort of the mathematical and the bioengineering communities to foster this area of knowledge in the region and to position the country as a research spot on these fields. Among the invited speakers were worldwide prestigious mathematicians like Prof. Carlos Castillo-Chávez from Arizona State University.

In September 2021 the *IFIP TC7 Conference on Systems Modeling and Optimization* took place in Quito, co-organized by the International Federation for Information Processing (IFIP), the Research Center for Mathematical Modeling (MODEMAT), and the Ecuadorian Mathematical Society (SEdeM). The conference featured two hundred presentations grouped into 26 mini-symposia, with a total of 274 participants from 31 countries. The organization of this event constituted an important international recognition of the quality of the research carried out in the country.