Institutul de Statistică Matematică şi Matematică Aplicată
"Gheorghe Mihoc – Caius Iacob" al Academiei Române
Calea 13 Septembrie, nr. 13, sector 5, 050711 Bucureşti
Tel. 021 318 2433 Fax 021 318 2439
E-mail: office@ismma.ro

STRATEGY

of "Gheorghe Mihoc – Caius Iacob" Institute of Mathematical Statistics and Applied Mathematics of the Romanian Academy

for the period 2025-2029

Contents

I. General considerations

For the period of 2025-2029, the strategy of "Gheorghe Mihoc – Caius Iacob" Institute of Mathematical Statistics and Applied Mathematics of the Romanian Academy (ISMMA) aims to contribute to the continuous enhancement of the scientific research and training, as well as the professional development processes organized by the institute

The strategy project contains major objectives that are to be pursued and achieved within the next four years. An institute is an extremely complex organism that cannot be subjected to sudden changes due to radical decisions. Moreover, the experience of recent years shows that the process of change generated by a perpetual, sudden, and sometimes, an unassumed reform by the academic community can be a major obstacle to the progress of scientific research, because it leads to instability and unpredictability.

Due to these reasons, the project aims to preserve everything that worked well during the period 2020-2024, correct observed dysfunctions, and capitalize on foreseen opportunities. With the support of the Scientific Council, the director will be responsible for the implementation of the strategy.

The present strategy provides the principles, objectives, and a summary of the measures proposed to be implemented for the aforementioned period, 2025-2029.

The below decisions and actions are based on an examination of the previous period's strategic experiences as well as a prospective assessment of ISMMA research capacity and perspectives.

The strategy is based on the following principles, in accordance with the research priorities set out in the national R&D&I strategy, and, in particular, with the National Strategy for Research, Innovation and Smart Specialization 2021-2027, developed by the Ministry of Research, Innovation and Digitization:

P1. The research environment must possess clear and stable regulations, as well as international benchmarks of excellence, in order to foster collaboration and competition.

P2. The internationalization of the scientific research: the scientific creation is done under the sign of international collaboration and cooperation.

P3. Credibility of the public-private partnership: supporting and encouraging public-private collaboration for participation in innovation projects and capitalizing on the results

P4. Smart specialization priorities require defining and consolidating areas of high competence, where there are real or potential comparative advantages: the development of research in cutting-edge areas.

In this context, the fundamental research will remain a priority within the Strategy, by including the mathematical fields related to ISMMA, and by being a source for frontier and interdisciplinary research. Applied mathematics par excellence has the capability to provide results for achieving the above goals.

Moreover, based on these principles, there were selected priority subfields that involved interdisciplinary research and development activities beyond traditional disciplinary boundaries in order to become competitive at a national and global level.

Considering the aforementioned statements, the current project is founded on three fundamental principles: mission, tradition, and managerial vision.

II. Mission and tradition

The "Gheorghe Mihoc – Caius Iacob" Institute of Mathematical **S**tatistics and Applied Mathematics of the Romanian Academy (ISMMA) was established in December 2001, by the union of the Institute of Applied Mathematics with the Center of Mathematical Statistics. ISMMA's mission is to conduct and promote fundamental research in applied mathematics, mathematical statistics and probabilities, with research directions in partial differential equations and optimal control, variational methods, mathematical modeling, analysis and control of mathematical models in life sciences, environment, and economic sciences, analytical and numerical methods in the study of fluid movement, stochastic analysis, Markov processes, statistical models, mathematical programming models and optimization.

III. Managerial vision

ISMMA aims to become a European center of excellence in applied mathematics, contributing significantly to high-level scientific research, training new generations of researchers, and supporting evidence-based approaches to societal challenges. The activities of the institute, as a

fundamental research institute of the Romanian Academy, should be organized on the following principles:

a. The development of our own research activities within the context of European and international priorities;
b. Increased contributions of applied mathematics from ISMMA to the progress of the frontier knowledge, in order to achieve regional leadership at the frontier of science and technology, by stimulating frontier clusters;
c. The achievement of the status of an institution of excellence by carrying out fundamental scientific research of major importance;
d. The expansion of the role of applied mathematics research in society, with the aim of responding to the concrete requirements of the economic environment and the public sector, addressing economic and societal issues through innovative solutions, and providing expertise in the development of public policies;
e. Support for the aspiration to excellence in research at the frontier of knowledge, provided by the internationalization of the Romanian research, as well as by international evaluation, mobility and partnerships, identification of promising research themes, and "exploratory workshops";
f. The active participation in the National Research and Development Plans and Priority Programs of the Romanian Academy;
g. The establishment of an active partnership with education and other institutions for the development of interdisciplinary research;
h. Participation in national research projects and calls, as well as those launched by research organizations at the international level, in order to attract funding and create a competitive framework for carrying out advanced scientific research activities for the researchers of the institute.;
i. The intensification of the dissemination of research findings and the encouragement of their publication under the Open Access standard;
j. Promotion of the Romanian Academy's prestige.

IV. Current status of ISMMA

From 2020 until now, we have attempted to accomplish the proposed managerial objectives for the activity period 2020-2024, and achieved the following:

- The institute has reorganized its administrative structure into three collectives relevant to its research directions: partial differential equations and applications in sciences; statistical inference, statistical control, and optimization; probabilities and stochastic processes. At present, these collectives have 17, 14 and 7 researchers, respectively, i.e., a total number of 38 researchers. At the end of 2023, three vacant positions were lost due to the fact that the employment contests were blocked exactly during the period when the positions were put out for competition;
- During the past four years, vacant research positions have been put up for competition.. As a result, the institute attracted five young individuals, comprising of PhD students and post-doctoral researchers. Moreover, the quality of the human resource was improved by recruiting five senior researchers with a very good scientific reputation;
- A general scientific seminar was organized, and a connection with the diaspora was established, by inviting Romanian researchers from abroad to hold seminars. Foreign researchers were also invited to visit the institute, as well.
- Collaborations with the Faculty of Mathematics and Computer Science – Bucharest, Politehnica University of Bucharest, and the Institute of Mathematics of the Romanian Academy (IMAR) were strengthened;
- The enhancement of the computing facilities of the institute was pursued by acquiring a new server, new computers, and new software, as well as updating the existing ones;
- The design of the new website was completed, and the ongoing updating of the website has been monitored;
- A series of online preprints of the institute was established;
- The doctoral activity was revitalized; ISMMA received the approval for the habilitation of some researchers and teaching staff through the Institute.
- The Financial Collective underwent a restructuring process, and we have successfully sought and obtained the establishment of a secretary position, which had been vacant for

more than a decade. Additionally, a competition was held for the recruitment of a secretary for the institute, which resulted in the enhancement of internal operations, collaboration among departments, and collaboration between management and researchers.

- Last but not least, the normative acts of the institute, ROF, RI, and the Ethics Commission regulation, as well as other acts and procedures were elaborated and updated.

This strategy aims to improve the general activity carried out in ISMMA, in order to achieve the above objectives. The decisions and actions to be described below are based on an examination of the strategic experiences accumulated during the previous period, as well as a prospective assessment of the research capacity and perspectives in ISMMA.

V. Strategic objectives

1.Improving the quality and visibility of scientific research results.
2.Strengthening international cooperation and participation in European projects (e.g. Horizon Europe, COST).
3.Integrating fundamental research with relevant applications for society and the economy (e.g. health, environment, digitalization).
4.Supporting and developing young researchers through doctoral and postdoctoral programs, mentoring and international exposure.
5.Promoting academic integrity, ethics and a transparent and inclusive research environment, aligned with European standards (e.g. HRS4R).

VI. Priority research directions

Differential equations and dynamical systems applied to real-world problems.
Mathematical modeling in environmental sciences, medicine and engineering.
Optimization and control theory for complex systems.
Computational methods and numerical analysis for big data.
Development of artificial intelligence models and applications.

Mathematical statistics and inference, with applications in life sciences, economics and artificial intelligence.

Stochastic processes and probabilistic modeling.

Developing AI models and applications.

Data mining.

VII. General objectives:

- The reorganization of the administrative structure of the institute;
- The control of achieving the research objectives approved by the Romanian Academy;
- The organization of monthly scientific conferences;
- The management and monitoring of ongoing activities within ISMMA..
- The revitalization of activities related to doctoral studies at ISMMA, within the "School of Advanced Studies of the Romanian Academy" (SCOSAAR);
- The organization of international scientific events (conferences, workshops);
- The improvement of the personnel scheme, and its accurate and continuous evaluation..
- The consolidation and improvement of existing international collaborations and the establishment of new ones with national institutions or worldwide, financed by national and/or European resources, including those from the Romanian Academy.
- The effective utilization and consolidation of the existing material base in the research activity, including computer network and conference rooms.
- Support for young researchers to obtain national or European grants;
- A systematic attraction of extra-budgetary funds through the institutes participation in national competitions for grants and research projects.

VIII. Administrative management

- The optimization of the institute's structure, by creating two departments, one for applied mathematics and one for statistics and probability, possibly divided into several collectives (a measure that can be achieved under the condition of finding researchers willing to assume the role of heads of departments or collectives).
- This would ensure a fair distribution of researchers, better control of the activity, and a better flow of information between the researchers and the management of the institute, thus facilitating a more effective administrative management;
- Constant attention to updating the institute's web page, in order to increase ISMMA's visibility;
- The analysis of research risks and the identification of solutions to mitigate their effects.

Deadline: 2025; permanent

Director

IX. Scientific management

- A scientific objective that shall be pursued is to consolidate the two basic collectives of the institute, specifically partial differential equations and control, and mathematical statistics. Also, we aim to revitalize the collective of stochastic processes and stochastic equations. An important aspect is the establishment of a team with expertise in deep learning, especially with regard to prospecting participation in interdisciplinary projects.
- With the Scientific Council, we will review and adapt the criteria for annual evaluation of researchers.
- The establishment of minimal criteria for the annual evaluation of the institute's scientific activity, with a focus on including article publication in the stream of international scientific publications. This will encourage a relevant, high-quality scientific production that will be published in at least honorable journals.

- It is estimated that the introduction of minimal criteria for evaluating activities will promote cooperation within research collectives, explore new research directions, initiate new collaborations, and ultimately lead to increased visibility.;
- The periodic monitoring of the activities of researchers during the meetings of the Scientific Council;
- The organization of monthly institute conferences, as well as the encouragement of research group seminars.;
- The revival of the activity of doctoral studies in ISMMA by accepting new habilitated researchers as doctoral supervisors;
- One current fundamental aspect of the research activities is the collaboration among institutions. We will continue to conclude scientific agreements with other institutes and universities from Romania and abroad, as well as organizing joint scientific events.

Deadline: permanent

Directors

X. Personnel management

- To the extent that the legislation allows, the recruitment of both young and established researchers will be ensured, especially in the fields of equations with partial derivatives, control, analysis and stochastic equations, numerical analysis, and deep learning;
- The rejuvenation of staff at ISMMA and the attraction of researchers with perspectives on specialization in frontier and smart specialization areas;
- The encouragement of the collaboration between researchers from different collectives of the institute;
- The implementation of more meticulous evaluation criteria will result in a more precise selection for promoting existing staff within the institute.
- The pursuit of immediate promotions for ISMMA's young people with very good results, given the limitations imposed by the various laws.

Deadline: permanent

Director

XI. Management of the material base and financial resources

• The current research infrastructure is composed of a network of computers equipped with professional applications and proprietary software used in mathematical modeling, statistical analysis and mathematical simulation: Mathematica, COMSOL, STATISTICA, R, ARCGIS, ASTERIX, as well as other software, for example for mathematical editing: Scientific Workplace. This infrastructure supports the fundamental scientific research activities of the organization, focused on complex data processing, numerical simulations and the development of predictive models.

The degree of development of the infrastructure is average, in the sense that it allows the development of current activities very well. However, we can note that it does not fully meet the requirements raised by the new study directions that we want to develop in the institute, especially those related to advanced research in artificial intelligence and complex calculations.

The organization has an infrastructure development strategy and has formulated an investment plan aimed at:

o Modernization of existing equipment (workstations, laptops, peripherals);

o Updating and expanding software licenses;

o Acquisition of a high-performance computing server, with multiple GPU units, for processing massive data, simulations and AI;

o Implementation of IT security, virtualization and resource management solutions.

o These measures will synchronize the technological capacity of the institute with the current requirements of international scientific research, directly contributing to achieving the organization's objectives.

• Investment Plan for the Expansion and Modernization of Research Infrastructure

1. Context and Justification

The current infrastructure, although functional, requires significant expansion and modernization to support the increasing volume and complexity of research activities, in accordance with the mission and objectives of the institution.

2. Investment objectives

• Increasing data processing and analysis capacity.

• Supporting advanced research in the field of artificial intelligence and mathematical simulations.

• Ensuring a secure, high-performance and flexible IT environment for research teams.

• Creating a modern base for the future development of the digital research infrastructure.

3. Component 1: Modernization of existing IT equipment

• Acquisition of desktop and portable units (high-performance workstations, laptops for researchers).

• Peripheral equipment: monitors, printers, scanners, backup solutions.

• Updating existing software: upgrade to current versions for already used applications, such as: Mathematica, COMSOL, STATISTICA, R, ARCGIS, ASTERIX, Adobe Acrobat Professional, ScientificWorkplace.

4. Component 2: Expansion of computing infrastructure

• Acquisition of a high-performance server (HPC), equipped with specialized GPU cards:

  o For training AI models;

  o Processing large datasets;

  o Running numerical simulations.

• Expansion of the internal network for efficient connectivity between computing systems.

5. Component 3: Additional software solutions

• Software packages for statistics and advanced numerical computing:

  o Acquisition of specialized modules;

  o Extension of existing licenses.

• Operating systems for new equipment.

• Solutions for securing access and monitoring resources.

• Software for virtualization and virtual machine management.

6. Estimated impact by implementing this plan:

• A significant increase in computational research capacity will be ensured.

• The efficiency of research teams will be improved through access to modern equipment and software.

• A sustainable, scalable and adaptable infrastructure will be created for national and international research projects.

Other objectives:

- The re-evaluation of the material base and a more efficient use of materials;
- Interventions with the Romanian Academy to show the need to get funding for the material base, especially for the participation of researchers in scientific events, at least within Romania, and for inviting other researchers from Romania and abroad to participate in the institute's events.

Deadline: permanent

Directors, Chief accountant

XII. Quality assurance

One of the strategic objectives and activities for the upcoming years is the establishment and enhancement of a quality management system:

- The creation of databases at the institute, collective, and other compartment levels that encompass fundamental data on quality standards and national, European, and international legal regulations pertaining to quality, with a particular emphasis on academic quality in scientific research, and the continuous updating of this information.
- The review of the ongoing implementation and application of quality management procedures at the collective level, as well as the hierarchical reporting of review results and conclusions;
- Regular updates of the quality management protocols to ensure alignment with any external or internal factors that require modifications .

Deadline: permanent

Directors

To summarize, our objective is to establish a management style that encompasses not only directors but also department heads, groups, and even some researchers, in order to hold them accountable and enhance their level of involvement in the institute's operations.

All employees will receive training aimed at achieving the presumptive objectives, and the director will oversee their accomplishments in a transparent manner.