CRM CENTRE DE RECERCA MATEMÀTICA

EXCELENCIA MARÍA DE MAEZTU 2022 - 2025

CRMATEMÀTICA

STRATEGIC PLAN

2026-2030

Generalitat de Catalunya
CERCA Centres de Recerca de Catalunya
Institut d'Estudis Catalans
UAB Universitat Autònoma de Barcelona
Universitat de Barcelona
UPC Universitat Politècnica de Catalunya BarcelonaTech

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1. THE CRM

Founded in 1984, the Centre de Recerca Matemàtica (CRM) stands as Spain's oldest mathematics research institute. Initially established as part of the Institut d'Estudis Catalans (IEC, the Catalan Academy) within the Universitat Autònoma de Barcelona (UAB), the CRM has since evolved into a consortium comprising the Generalitat de Catalunya (the Catalan Government), the Universitat de Barcelona (UB), the Universitat Politècnica de Catalunya (UPC), alongside the IEC and the UAB. The CRM is part of the CERCA network of research centres promoted by the Catalan Government and holds membership in ERCOM (European Research Centres in Mathematics), a prestigious committee within the European Mathematical Society that connects leading mathematical institutes across Europe.

Since 2009, the CRM's financial resources have been integrated into the public budget of the Catalan Government, with core funding secured through annual contracts. The centre also obtains significant funding through competitive grants from the European Union, the Spanish Ministries, and the Generalitat de Catalunya. The CRM's excellence has been consistently recognized; in 2000, it received the Narcís de Monturiol Plate Award for Scientific and Technological Merit. More recently, in both 2016 and 2020, the Spanish Research Agency (AEI) honored the CRM with the prestigious María de Maeztu Unit of Excellence award, distinguishing the institution for its ambitious strategic research programs at the forefront of mathematical innovation.

As a member of the CERCA network, the CRM is deeply committed to advancing mathematical research across Catalunya and beyond. Its programs not only contribute to scientific progress but also nurture interdisciplinary collaborations that span various levels of expertise, creating a dynamic and fertile ground for innovation and discovery.

This document serves as a roadmap for realizing our vision, outlining the strategies and objectives that will guide our efforts in the years ahead.

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2. OUR MISSION

The Centre de Recerca Matemàtica (CRM) is dedicated to being a global leader in mathematical research, training, and innovation. Established as a hub for excellence, CRM's mission is to advance the field of mathematics by conducting high-impact, high-quality research, fostering interdisciplinary collaboration, and transferring knowledge to address critical global challenges. Through a commitment to rigorous scientific inquiry, innovation, and community engagement, CRM aims to elevate both theoretical and applied mathematics to new heights, ensuring its role as a vital contributor to societal progress.

2.1. KEY OBJECTIVES

01 High-quality research of international standing in mathematics, including a special emphasis on real-world applications carried out in a collaborative or interdisciplinary context.

02 Knowledge transfer based on validated mathematical research, with special emphasis on concrete implementations of justified models that address emergent problems with societal impact.

03 Advanced training in the field of mathematics, through collaboration and synergies with other research institutions.

04 Dissemination of the advances in mathematics within both the wider academic community and society in general.

3. STRUCTURE

The CRM Faculty is integral to the centre's mission of advancing both pure and applied mathematics. They tackle a wide range of mathematical areas, with expertise in: Algebra, Geometry, Topology and Number Theory; Analysis and Partial Differential Equations; and Dynamical Systems and applied topics (Neuroscience; Biology, and Climate Change and Natural Hazards). The CRM push the boundaries of knowledge and produces insights that resonate across other disciplines and several industrial sectors.

The centre has expanded its Faculty by affiliating senior researchers from Catalonia's leading Universities in Mathematics – signing framework agreements with the three of them: Universitat Autònoma de Barcelona (UAB; signed in 2020), Universitat Politècnica de Catalunya (UPC; signed in 2021) and Universitat de Barcelona (UB; signed in 2022).

A key aspect of CRM's structure is its Knowledge Transfer Unit (KTU), which plays a role in connecting the scientific output of the institution with society at large. The KTU facilitates the application of mathematical models and theories to solve real-world problems, bridging the gap between academic research and industry needs. By collaborating with various sectors, the KTU enhances CRM's societal impact, developing innovative solutions in areas such as data science, healthcare, and technology.

The CRM faculty is complemented by a robust support structure. They provide essential services such as project management, human resources and training, and organization of scientific activities as well as internationalization, open science, communication and outreach. Their work facilitate daily management and administration as well as mobilizing CRM novel knowledge, aiding its dissemination to the scientific community and to a broader audience, fostering greater public engagement with the mathematical sciences.

3.1. GOVERNANCE

The governance of the Centre de Recerca Matemàtica (CRM) is structured to ensure efficient management, uphold scientific excellence, and guide the institution in fulfilling its mission to advance mathematical research. Below is an overview of the main governing bodies and committees:

Governing Board

The Governing Board is the highest decision-making body at CRM, bringing together all the institutions that form the consortium of the CRM. It is responsible for the strategic direction, representation, and overall management of the centre. The Governing Board holds all the necessary powers to achieve CRM's foundational goals, overseeing key decisions related to policy, finance, and long-term planning. It plays a crucial role in ensuring that CRM stays aligned with its mission.

Director

The Director is responsible for leading and promoting CRM's research agenda, as well as ensuring that the decisions of the Governing Board are effectively implemented. The Director works closely with the Executive Board to oversee the strategic and operational aspects of the centre's scientific

and administrative functions. The Director plays a central role in guiding CRM's overall vision and scientific mission.

Executive Board

The Executive Board is responsible for both the scientific leadership and operational management of CRM. It combines the functions of daily oversight and strategic execution, implementing the decisions made by the Governing Board. This body manages the coordination of CRM's research activities, ensuring alignment with the centre's mission and strategic goals. The Executive Board fosters collaboration among research groups and monitors the overall progress of the centre's scientific and administrative initiatives.

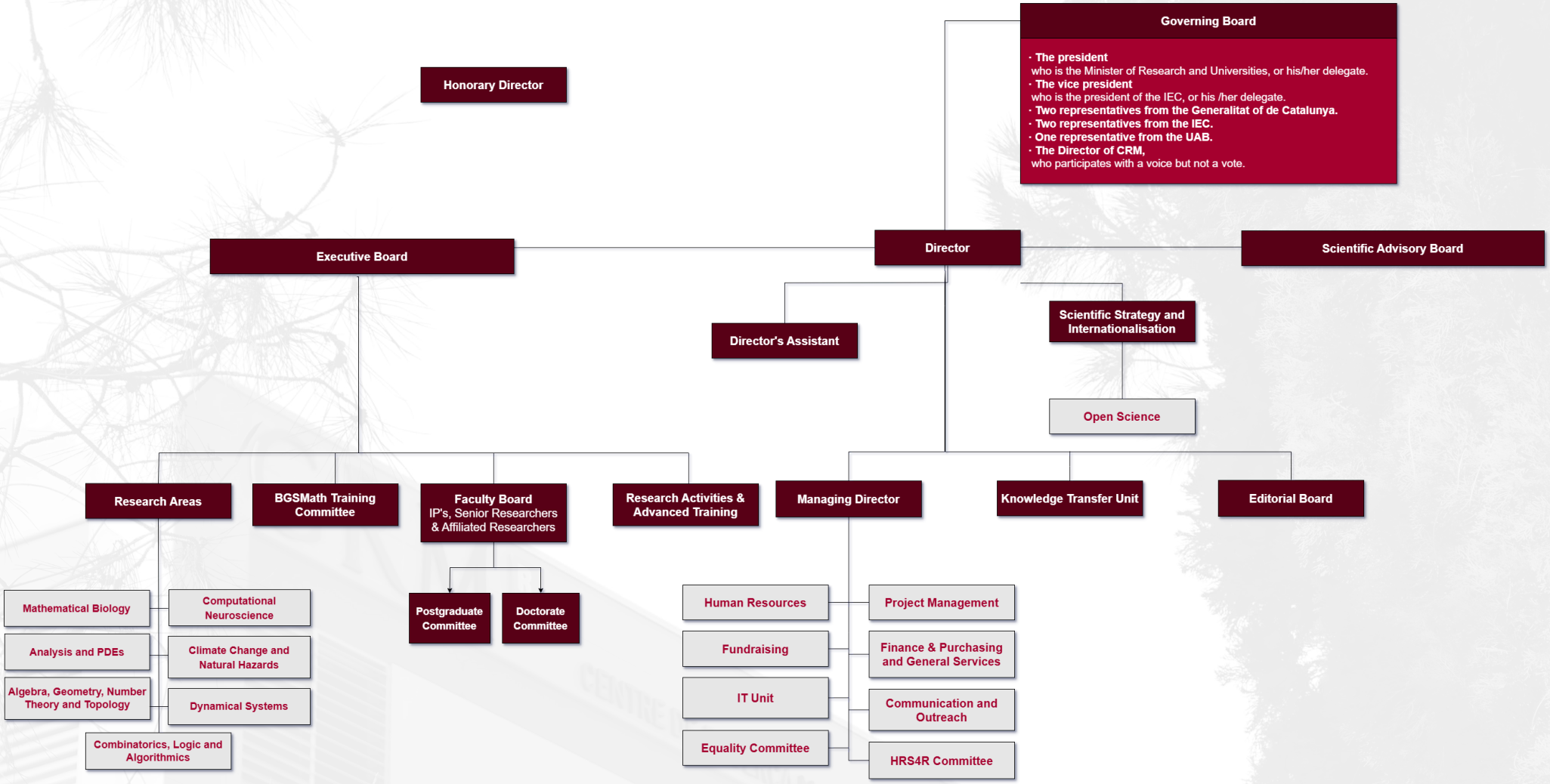
Scientific Advisory Board

Composed of external experts, the Scientific Advisory Board advises the Governing Board on ensuring the highest scientific standards at CRM. It provides independent evaluation of the centre's research programs and offers strategic advice to the Director. The board plays a key role in maintaining the quality and relevance of CRM's scientific activities.

Management

The Management Team handles the day-to-day administrative operations of CRM, providing essential support in project management, human resources, financial administration, and the organization of scientific activities. Their work ensures that the institution runs smoothly, allowing researchers to focus on their scientific endeavors while benefiting from a well-functioning support structure. This team also contributes to CRM's outreach efforts, enhancing its engagement with broader societal and academic communities.

3.2. ORGANIZATION CHART



3.3. CRM RESEARCH GROUPS

4. STATE OF THE CENTRE

During 2021-2024, the CRM has experienced remarkable growth through the agreements with the partner Universities. This has reinforced its position as a leader in mathematical research, which was confirmed with the Maria de Maeztu Unit Of Excellence awarded in 2021. This influx of talent (including 6 ERC Grantees) has cemented the CRM status as a hub for mathematical research, fostering collaboration and elevating the centre´s research and training output both in quality and quantity.

A pivotal milestone during this period was the renewal of the prestigious María de Maeztu Unit of Excellence distinction in 2021. This recognition came with a financial boost of two million euros, enabling the CRM to launch strategic initiatives that have enhanced its research capabilities, broadened its interdisciplinary reach, and solidified its international standing. The María de Maeztu award has been transformative in attracting top international talent, further strengthening the CRM's research excellence.

As part of the strategic plan tied to the award, the CRM has focused on deepening its interdisciplinary work. The award has positioned CRM as a prominent member of SOMMa, the alliance of Spain's leading Centres and Units of Excellence. This participation has significantly enhanced CRM's visibility, opening doors to new collaborations and amplifying its potential impact. Moreover, it fosters the exchange of best practices, strengthening CRM's role within the national and international research landscape.

The CRM's Knowledge Transfer Unit (KTU) has also spearheaded impactful projects, such as optimizing bus networks in partnership with Transports Metropolitans de Barcelona and building bridges to collaborate with institutions such as the Institut de Ciències del Mar (ICM), I2SysBio or Alba Synchrotron. These initiatives highlight the CRM's ability to bridge academic research with real-world applications, expanding its relevance across diverse fields. Through collaborations with industry, public institutions, and other research entities, the CRM continues to fulfil its mission of making mathematics an essential tool for societal advancement.

A Mathematical Agora

Since its founding 40 years ago, the Centre de Recerca Matemàtica has become a global meeting point for intellectual exchange and innovation. By opening its facilities and services to the international mathematical community, the CRM has catalyzed groundbreaking ideas and collaborations. Between 2022 and 2024, the centre hosted over 120 scientific activities, drawing nearly 4,500 participants from around the world. These events ranged from seminars and workshops to international conferences and intensive research programs, reflecting the CRM's commitment to advancing mathematical knowledge. Topics spanned a broad spectrum, including pure and applied mathematics as well as interdisciplinary areas.

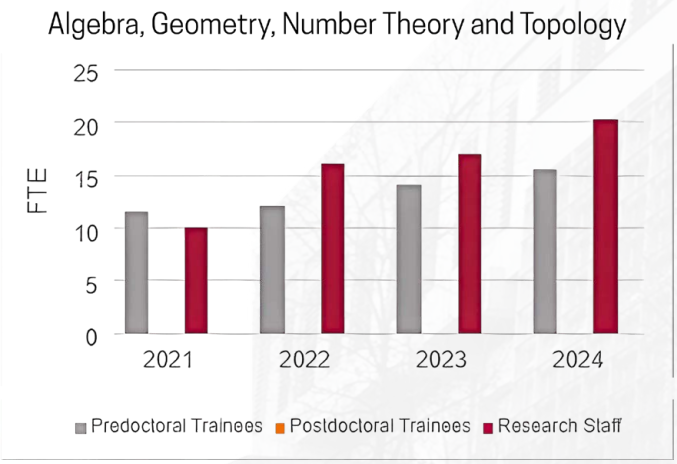
High-profile international conferences brought leading experts together to share the latest breakthroughs, fostering a vibrant atmosphere of intellectual dialogue. Workshops and advanced courses provided early-career researchers with opportunities to engage with established scholars,

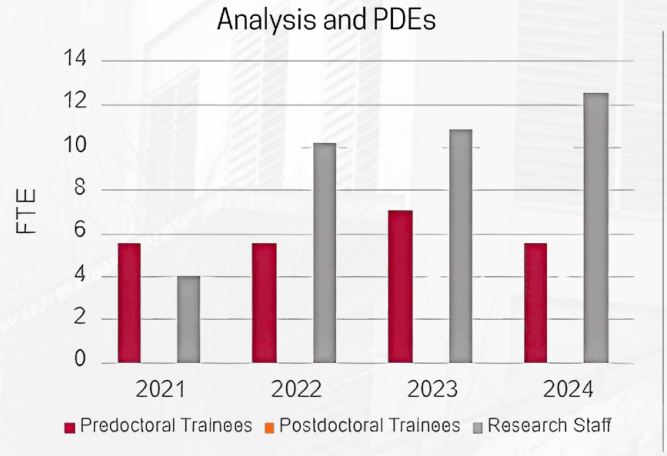
refine their expertise, and gain hands-on experience with cutting-edge mathematical tools. Meanwhile, the CRM's intensive research programs, which lasted weeks or months, encouraged deep collaboration among participants, enabling them to tackle complex challenges and pioneer innovative solutions. Collaboration has been central to the CRM's success. Partnerships with institutions such as SOMMa members (ICMAT, ICM, and CRAG) and the CRG Collaboratorium have facilitated joint events that highlight the centre's interdisciplinary focus. These collaborations amplify the CRM's role as a bridge between disciplines.

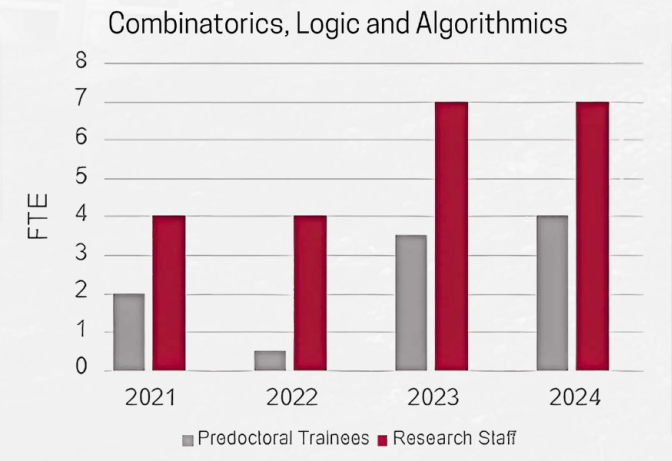
The past three years have showcased the CRM's resilience, adaptability, and ambition. By building on its achievements and addressing ongoing challenges, the CRM is well-positioned to advance its strategic goals. With a strong foundation of interdisciplinary collaboration, a commitment to societal impact, and an expanding network of partnerships, the CRM is poised to remain a global leader in mathematical research and innovation for years to come.

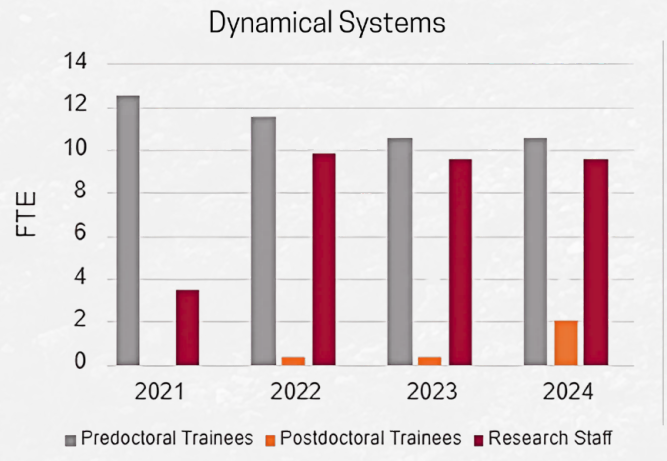
4. 1. KEY FIGURES

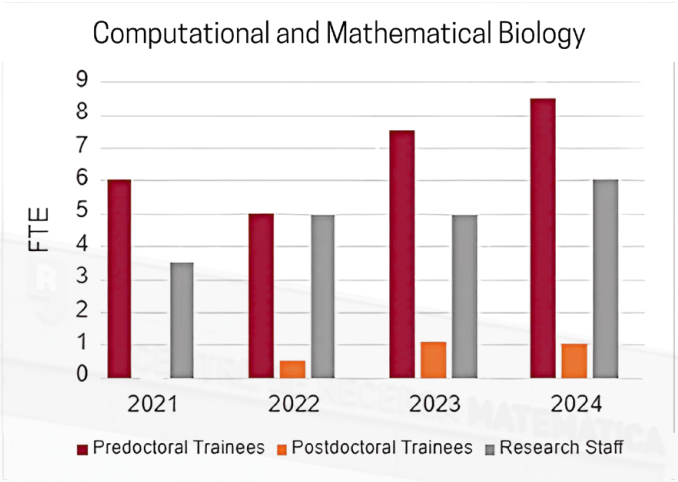
Research Staff

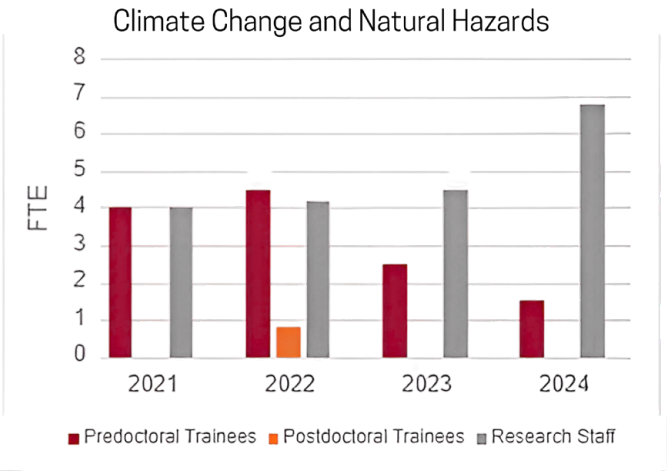


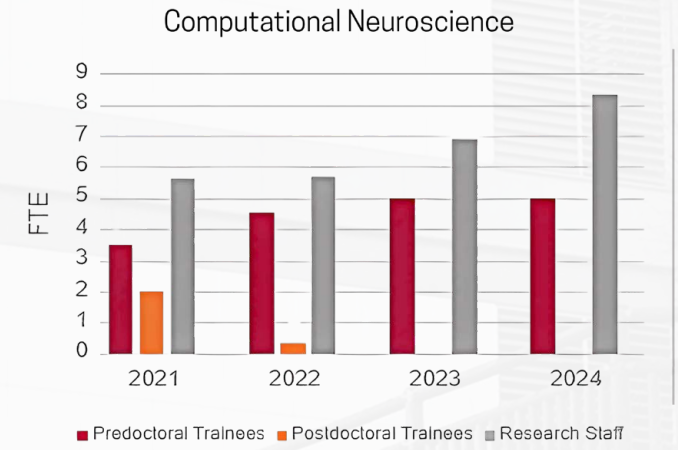




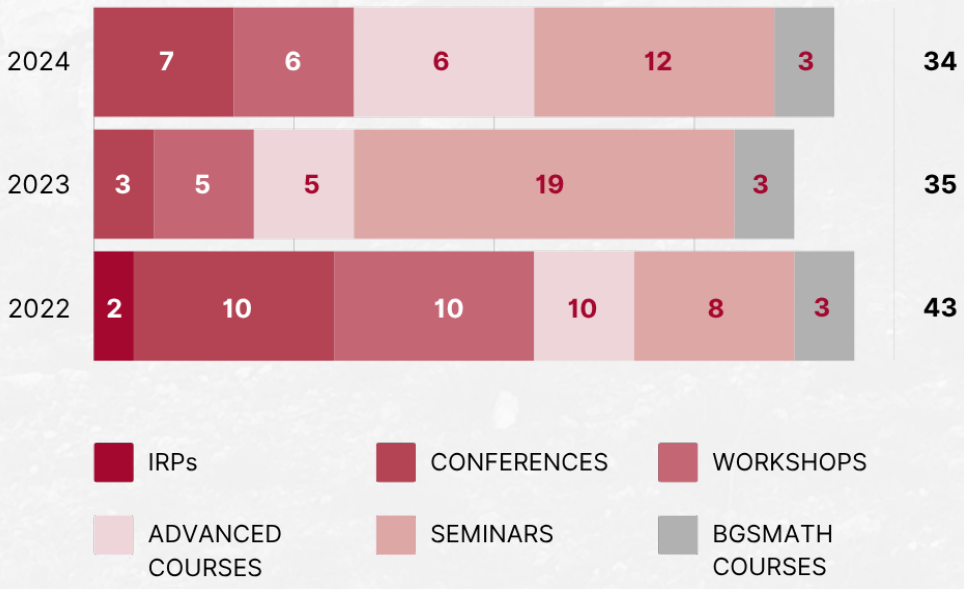




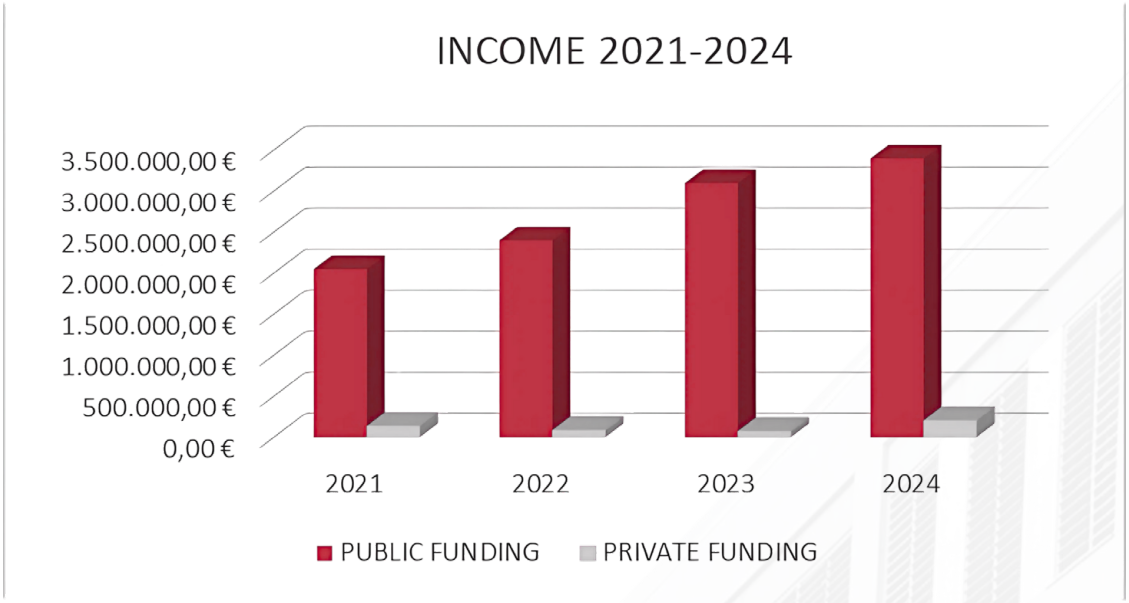


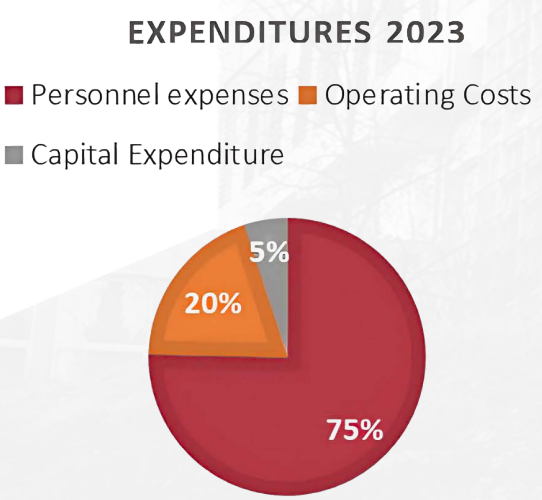


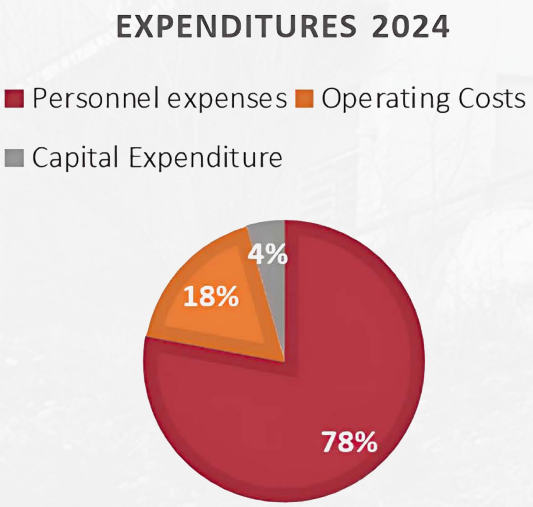
Scientific Activities



Funding


INCOME 2021-2024
3.500.000,00 €
3.000.000,00 €
2.500.000,00 €
2.000.000,00 €
1.500.000,00 €
1.000.000,00 €
500.000,00 €
0,00 €
2021
2022
2023
2024
PUBLIC FUNDING
PRIVATE FUNDING


EXPENDITURES 2023
Personnel expenses
Operating Costs
Capital Expenditure
5%
20%
75%


EXPENDITURES 2024
Personnel expenses
Operating Costs
Capital Expenditure
4%
18%
78%

5. SWOT Analysis

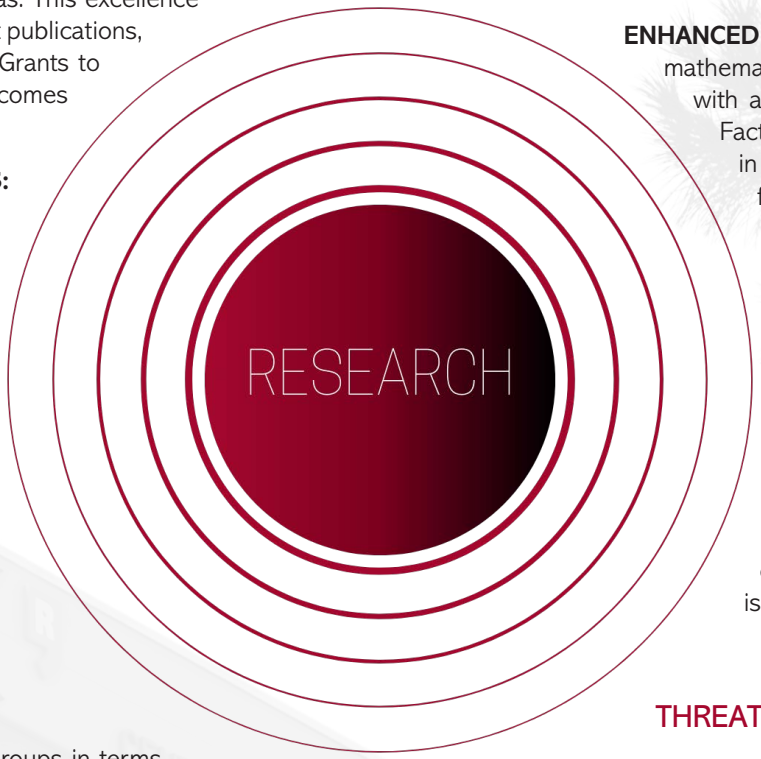
STRENGTHS

SCIENTIFIC OUTPUT: The scientific production of CRM staff is world-class according to international standards, standing out for quality of peer-reviewed articles (period 2020-2024, consistently > 75% Q1 recognized journals with robust practices) and a productivity benchmarked with similar institutions (BCAM, ICMAT, InstMat-Toulouse).

EXCELLENCE IN RESEARCH: CRM's Faculty includes many internationally recognized research groups across a broad range of mathematical areas. This excellence is shown by a strong scientific output, numerous high-impact publications, and the awarding of 8 European Research Council (ERC) Grants to CRM researchers in the past decade. Additional recognition comes from several prestigious scientific awards.

APPROPRIATE ENVIRONMENT TO FOSTER SYNERGIES: The development experienced by CRM during the 2020-2024 period has contributed to shaping a dynamic research environment. It brings together researchers under one roof, encouraging interactions and synergies between fundamental and applied research disciplines, and facilitating interdisciplinary collaboration.

NETWORK OF COLLABORATORS: The percentage of CRM co-authored papers (67% in 2023; 68% in 2024) with colleagues in international organizations (vs total number of papers) in the period of reference are alike those of the benchmarked institutes in Spain (ICMAT, BCAM) and France (IM-Toulouse).



WEAKNESSES

SMALL GROUPS: The CRM has relatively small research groups in terms of number of junior researchers (doctoral and postdoctoral staff). NOTE: The size of research groups in 2021-2024 (applied mathematics, as they are more fragmented and sparse) has been benchmarked with the size of similar groups at BCAM or IM-Toulouse.

LACK OF EXPERTISE IN AI+MATH: While CRM currently hosts leading research groups in diverse areas of Mathematics, it still lacks dedicated research groups in emerging fields in the interaction between Mathematics and Artificial Intelligence, a rapidly growing area of strategic importance. Addressing this gap is essential to maintaining leadership in the evolving global research landscape.

OPPORTUNITIES

GROWING FOCUS ON INTERDISCIPLINARY SCIENCE: Interdisciplinary science is increasingly prioritized in science policy. The wide range of topics and applications across CRM groups creates opportunities to develop interdisciplinary projects with other institutions and connect diverse CRM teams, thereby expanding existing research lines.

ENHANCED PUBLIC PERCEPTION OF MATHEMATICS: In recent years, mathematics has gained greater societal visibility and appreciation, with a growing recognition of its relevance in various domains. Factors such as increased media coverage, rising enrollment in mathematics-related degrees, and heightened demand for mathematicians across industries could drive stronger political support and increased funding opportunities for mathematical research.

EXPANDING CROSS-DISCIPLINARY COLLABORATIONS: An opportunity arising from the first two: This recognition is propelling the connection at research level between mathematics and other discipline (Examples: life and marine sciences, becoming more quantitative since 20 years ago, examples of CRG, EMBL and ICM-CSIC scientific roadmaps, demanding new techniques to make sense of data) and it is expected to contribute to regard mathematical research as a fundamental issue and mathematics as more accessible and useful.

THREATS

COMPETITION FROM EMERGING SCIENTIFIC FIELDS: The emergence of neighbouring topics (European Commission – massive funding for initiatives such as Artificial Intelligence Factories; quantum computing) in science can capture resources and interest that would otherwise be addressed to mathematical research. This competition for funding, visibility and talent can reduce growth and development opportunities.

IMPACT OF RETIRING SENIOR FACULTY: The ongoing wave of retirements of affiliated faculty members could hinder CRM ability to keep its leadership in key research areas.

STRENGTHS

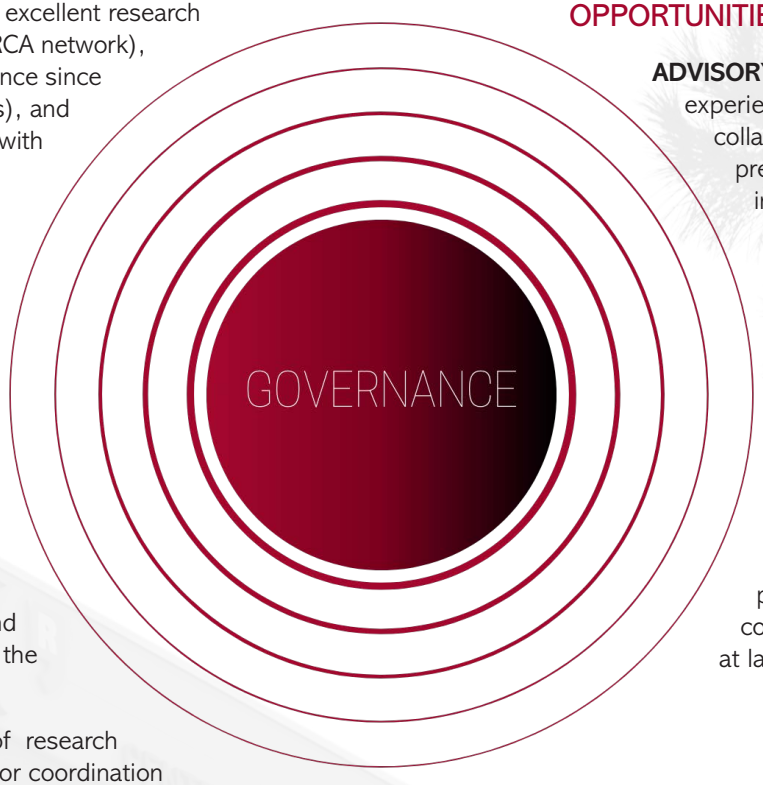
INSTITUTIONAL RECOGNITION: CRM is recognized as an excellent research centre at the Catalan level (member since 2011 of the iCERCA network), Spanish level (member of SOMMA Centres/Units of Excellence since 2015, with participation in mathematical-focused networks), and international level (member of ERCOM, and agreements with CRM-Montreal and CIMPA).

UNIVERSITY PARTNERSHIPS: CRM has reinforced recently its institutional collaborations through the signing of new strategic framework agreements with the UAB and the UPC (2021) and the UB (2022). These partnerships facilitate close collaboration, promote joint initiatives, and enhance mutual trust across institutions.

WEAKNESSES

INFLUENCE ON DECISION-MAKING: CRM has very limited influence over the decision-making processes of trustees, including the Catalan Government, universities, and the IEC, as well as funding organizations that are critical to the centre's development.

DISPERSION OF RESEARCH STAFF: The distribution of research staff across three separate campuses presents challenges for coordination and communication.



OPPORTUNITIES

ADVISORY BOARD EXPERTISE: CRM can take advantage of the experience and networks of its Scientific Advisory Board to foster collaborations with external experts, enhance its international presence, and benefit from insights into global research and innovation systems.

PROXIMITY TO LEADING RESEARCH INSTITUTIONS: The centre's strategic location in the Barcelona area provides opportunities for synergies with other renowned SO/MdM research centres such as CRG, BarcelonaBeta, ICFO, CRAG, CREAF, ICTA, ICMAB, ICN2, IBEC. These connections foster interdisciplinary projects, enhancing CRM's impact and visibility.

THREATS

POLITICAL INSTABILITY: Changing, not very stable, political situation at regional/national/European levels, which could affect science policy and priorities and research funding at large, including requirements of operational adaptation.

STRENGTHS

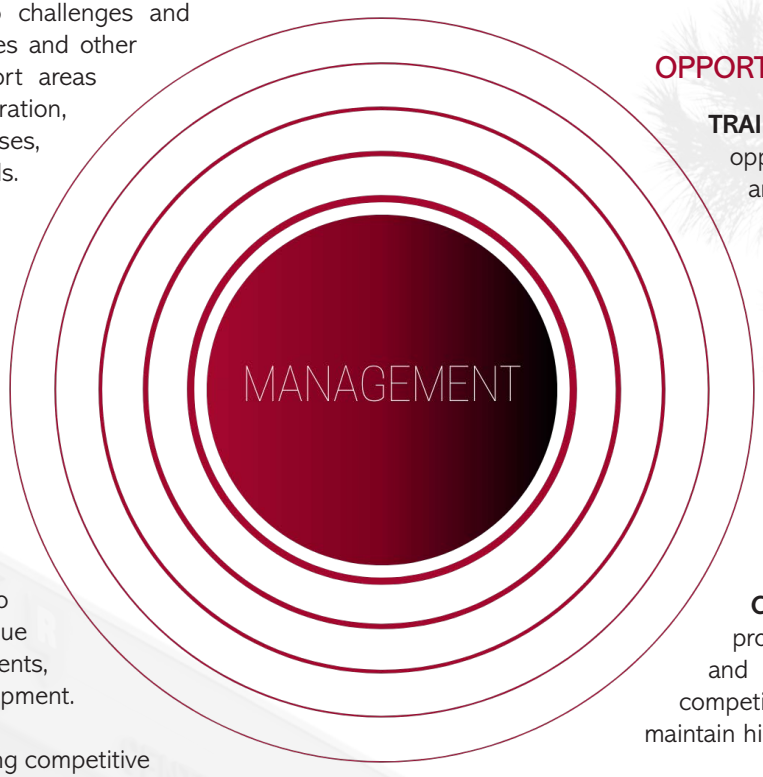
MANAGEMENT STRUCTURE: The current management structure and size provide CRM with the flexibility to respond quickly to challenges and changes, offering a competitive advantage over universities and other centralized organizations. This agility extends to support areas such as open science, event organization, proposal preparation, and streamlined hiring and procurement processes, allowing CRM to adapt efficiently to evolving needs.

SUPPORT AND MANAGEMENT TEAM: CRM benefits from a highly committed and responsible support and management team that has successfully navigated significant growth between 2021 and 2024, as well as changes in top leadership.

WEAKNESSES

STAFFING STRUCTURE: The support and administration team is primarily composed of one-person units working collaboratively on shared tasks. However, this can lead to occasional workload imbalances, continuity challenges due to staff rotation, difficulties in implementing improvements, and limited opportunities for professional development.

UNCOMPETITIVE SALARIES: CRM has difficulties in offering competitive salaries to hire experienced senior researchers to lead groups in emerging topics.



OPPORTUNITIES

TRAINING AND RESKILLING INITIATIVES: CRM has the opportunity to leverage existing funding options to implement an annual training and reskilling plan. Such initiatives can enhance workforce capabilities, foster individual career growth, and create a more motivating work environment.

THREATS

LEGAL FRAMEWORK: Changes in national labor laws and financial regulations, such as Spain's 2022 labor and Science Law reforms, may impose new administrative complexities and unforeseen increases in labor costs, posing challenges to CRM's operational efficiency.

COMPETITION FOR TALENT: Competition for qualified professionals from other research centres, both within Spain and internationally, as well as from the private sector. This competition could impact the centre's ability to retain top talent and maintain high service standards.

STRENGTHS

COMPETITIVE FUNDING: CRM has successfully secured institutional competitive funding through its María de Maeztu (MdM) applications.

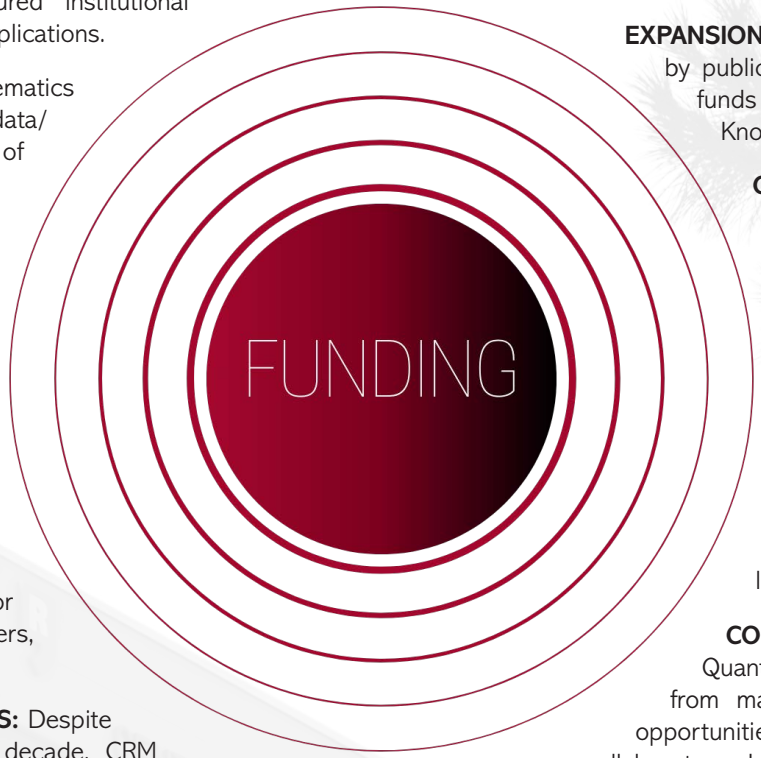
FUNDING OPPORTUNITIES: The pervasiveness of mathematics into other disciplines, which are concerned about data/quantitative approaches, have diversified the possibilities of funding for CRM collaborative research.

WEAKNESSES

DEPENDENCE ON NON-COMPETITIVE FUNDING: More dependent on non-competitive funding from Trustees than could be desirable. The non-competitive funds are not growing to adapt to new requirements and emerging needs (growing centre through affiliations, for instance).

SCOPE OF COMPETITIVE FUNDING APPLICATIONS: Competitive funding applications can only be institutional or otherwise, they are limited by the number of hired researchers, whose resources are managed by CRM.

PARTICIPATION IN INTERNATIONAL FUNDING SCHEMES: Despite CRM members' success in obtaining ERCs in the last decade, CRM engagement in large-scale international collaborative funding schemes remains below potential. Expanding this participation is essential to scale CRM's influence and access critical resources.



OPPORTUNITIES

SEVERO OCHOA CENTRE OF EXCELLENCE APPLICATION: CRM's recent growth positions it as a strong candidate for the Severo Ochoa Call by the Spanish Research Agency. Achieving this recognition could substantially increase funding (potentially doubling current MdM figures) and further establish CRM as a global leader in mathematical research and training.

EXPANSION OF SPONSORED RESEARCH: Sponsored research by public and private entities could increase the non-competitive funds obtained by CRM (contracts to carry out projects led by Knowledge Transfer Unit, hired researchers).

COMMERCIAL UTILIZATION OF INFRASTRUCTURE: CRM infrastructures (neuroscience lab, currently) could be exploited for commercial purposes.

THREATS

POLITICAL UNCERTAINTY AND FUNDING INSTABILITY: Political changes can affect significantly the access to (competitive and non-competitive) public funding. The Next Generation funds are finishing in 2026 without any clear continuation, for instance, at Spanish level.

COMPETITION FOR FUNDING: The rise fields such as Quantum Computing and AI may divert resources and attention from mathematical research, limiting growth and development opportunities. However, this also presents an opportunity for CRM to collaborate and open new research lines.

ECONOMIC FLUCTUATIONS: Economic changes can significantly affect the access to non-competitive funding, in terms of contracts with companies and other sectors, for instance.

NEXT FRAMEWORK PROGRAMME: The next EU Framework Programme (FP10) has been announced but is due to start in 2028. The exact scope and final implementation of the programme may affect Excellence Funds, which are crucial to fund mathematical research.

STRENGTHS

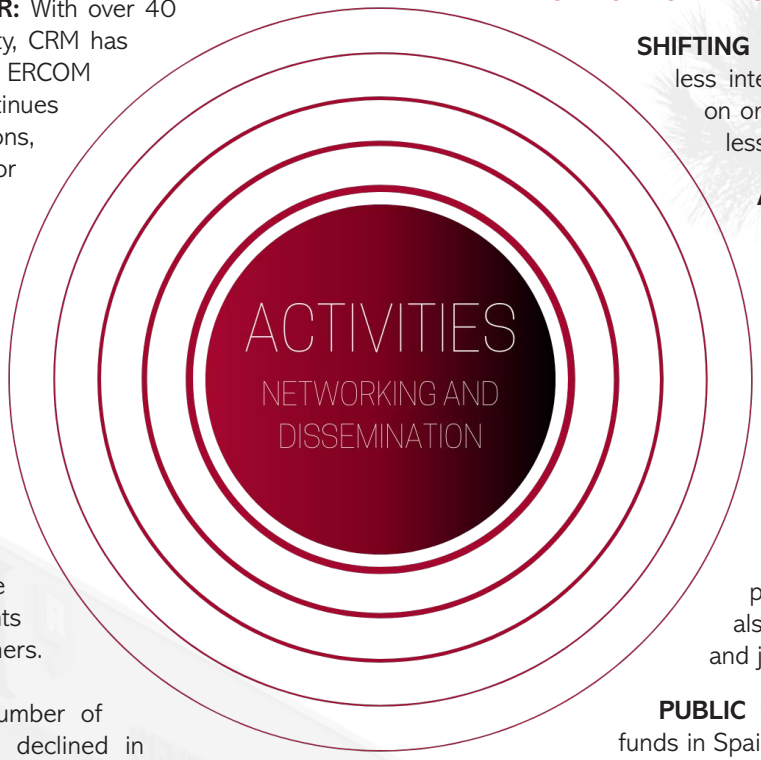
INTERNATIONAL PRESTIGE AS ACTIVITIES ORGANISER: With over 40 years of experience organizing high-level scientific activity, CRM has earned strong international recognition. It is a member of ERCOM (European Research Centres on Mathematics) and continues expanding its global network through new collaborations, including recent agreements with the International Centre for Pure and Applied Mathematics (CIMPA) and CRM-Montreal.

FACILITIES AND RESOURCES: CRM facilities, human and material/broadcasting resources are excellent to organize world-class intensive research programmes (comprising conferences/workshops/courses), host visitors or standalone events.

WEAKNESSES

LIMITED CAPACITY: CRM lacks the capacity to host large-scale international conferences due to the absence of an auditorium larger than 100 participants and limited office space for visiting researchers.

DECLINE IN INTERNATIONAL PARTICIPANTS: The number of international participants at CRM-organized events has declined in 2022-2023.



OPPORTUNITIES

SHIFTING EVENT TRENDS: The Catalan mathematical community is less interested in intensive research programmes (several months on one focus) and more interested in shorter events (1 week or less).

ALLIANCES IN EMERGING FIELDS: Alliances (example: BCN-Collaboratorium) in emergent research areas such as quantitative biology; robust artificial intelligence, data science and applications could be seized to organize joint visitors' programmes and events.

THREATS

GROWING COMPETITION CONCERNING ACTIVITIES ORGANIZATION: Competitors (other ERCOM centres in Spain, for instance) have increased. They could attract potential activities, as well as financial support. This can be also considered as an opportunity by establishing agreements and joint ventures.

PUBLIC FUNDING LIMITATIONS: The rules of the use of public funds in Spain are very restrictive when covering necessary expenses for events and meetings.

STRENGTHS

EXPANDING DIGITAL PRESENCE: CRM has strengthened its online presence through active engagement on social media platforms such as X, LinkedIn, Instagram, and YouTube. The increasing number of followers reflects a growing public interest in mathematics and enhances CRM's ability to reach a broader audience.

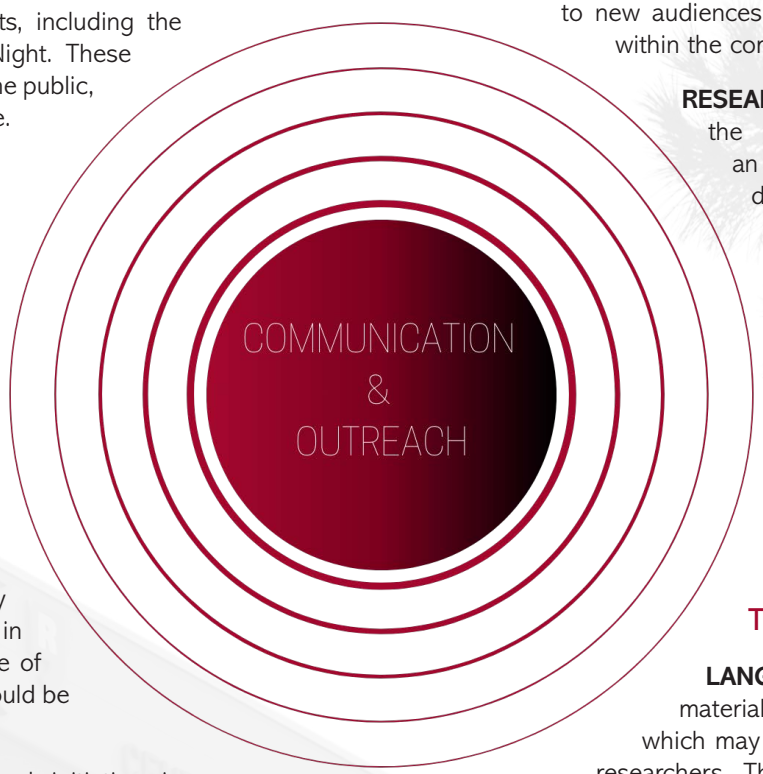
ACTIVE PARTICIPATION IN OUTREACH EVENTS: CRM maintains a well-structured agenda of participation in popular public outreach events, including the Barcelona Science Festival and European Researchers' Night. These recurring events play a crucial role in connecting CRM with the public, making mathematics more accessible to a diverse audience.

WEAKNESSES

LIMITED PRESENCE IN TRADITIONAL MEDIA: While CRM has a strong digital footprint, its visibility in traditional media outlets such as radio, television, and newspapers remains limited. This gap restricts CRM's ability to reach broader, non-digital audiences and capitalize on the credibility associated with mainstream media.

DUAL AFFILIATION VISIBILITY: The relatively recent dual-membership model, where faculty members are affiliated with both CRM and universities, presents challenges in outreach. Many researchers may not yet fully identify with CRM, impacting their willingness to engage in public communication efforts. Furthermore, the correct use of dual affiliations in media appearances and press releases could be improved to enhance institutional visibility.

RESEARCH STAFF PARTICIPATION: Participation in outreach initiatives is not evenly distributed across CRM's research groups. A small number of researchers, often from the same groups, tend to take on the majority of outreach responsibilities. Since many of these activities occur on weekends and on a volunteer basis, broader engagement across all CRM research lines is needed to fully leverage the centre's wealth of expertise and ensure a more diverse public offering.



OPPORTUNITIES

INDUSTRY: Partnerships with industrial stakeholders through CRM's KTU present a valuable opportunity to showcase real-world applications of mathematical research. These collaborations can generate compelling communication content.

PRIVATE FOUNDATIONS: Engagement with private institutions such as La Pedrera Foundation offers opportunities to expand CRM's outreach initiatives, providing access to new audiences and additional resources that can amplify CRM's impact within the community.

RESEARCH EVALUATION FRAMEWORKS: The adoption of the principles outlined in the CoARA agreement presents an opportunity for CRM to enhance its position in research dissemination. As the evaluation criteria for researchers evolve to value outreach and communication efforts, CRM can leverage this shift to encourage greater participation from researchers.

FUNDING PROGRAMS: Various public funding schemes, such as those provided by FECyT (Fundación Española para la Ciencia y la Tecnología) and Joan Oró (GenCat), present opportunities to secure financial support for outreach initiatives. Successful grant applications could help sustain and expand CRM's outreach efforts.

THREATS

LANGUAGE BARRIERS: The majority of CRM's outreach materials and activities are conducted in Catalan and Spanish, which may pose challenges in attracting and integrating international researchers. This limitation could reduce the centre's global outreach potential and create difficulties in communicating research outcomes to a wider, international audience.

TECHNOLOGICAL CHANGES: The evolving landscape of digital communication, including advances in artificial intelligence and emerging platforms, requires continuous adaptation of CRM's communication strategies. Failure to stay up to date with these changes could result in reduced effectiveness and diminished reach of CRM's outreach efforts at both national and international levels.

STRENGTHS

KNOWLEDGE TRANSFER NETWORKS: The participation of the CRM in national and international networks focused on knowledge transfer (such as MATH-IN, ECMI). This reinforces the centre´s capabilities (visibility, connections, networking) to provide solutions to social challenges.

KNOWLEDGE TRANSFER EXPERTISE: Excellent, wide knowledge base at CRG complemented by the technical skills at KTU team, which covers aspects such as modelling, simulation, data analysis and optimization.

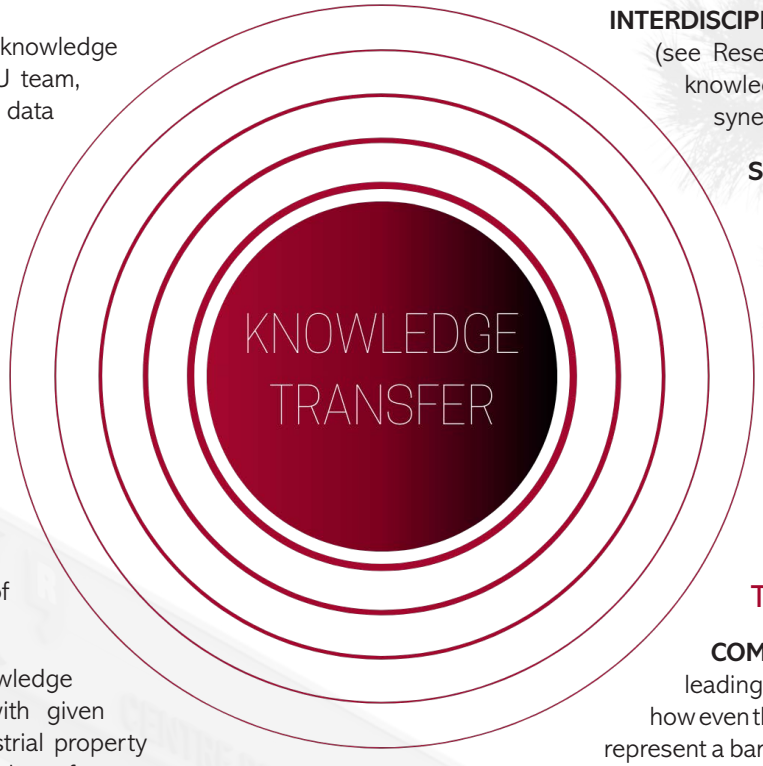
FLEXIBLE AND INNOVATIVE APPROACH: Flexibility in knowledge generation and transfer, open to participation in innovation projects which can further the impact of mathematics in many sectors proven by recent/ ongoing projects on smart cities, biotechnology, or food technology.

WEAKNESSES

ENGAGEMENT ACROSS RESEARCH GROUPS: Engagement with CRM's KTU is currently uneven across research groups, in part due to the fundamental nature of their research.

LACK OF STABILITY: Lack of steady structure for Knowledge Transfer Unit (permanent, full-time human resources with given expertise). This affects, for instance, intellectual and industrial property protection and management (including licensing), in particular software.

ABSTRACT RESEARCH FOCUS: A significant part of CRM research groups focusses on very fundamental, abstract mathematics. The impact pathway is long and difficult for such cases even through collaboration with other institutions as "intermediaries" (such as Computer Vision Centre or Institute of Marine Sciences).



OPPORTUNITIES

INTERDISCIPLINARY AND CONSORTIA-BASED PROGRAMS: Preparing and submitting competitive consortia-like projects. CRM can participate on emergent topics (examples MATHIA or MATH ModOnFire proposals) which can get funded through calls that require interaction across sectors and generating socio-economic impact in the mid-term.

INTERDISCIPLINARY RESEARCH TRENDS: Interdisciplinary research (see Research section) as a growing trend. The wide and diverse knowledge base across CRM could facilitate the creation of internal synergies, as a first step.

SUSTAINABILITY INITIATIVES: UN Sustainability objectives, green-by-design, and other initiatives in research and innovation policy. KTU could contribute to CRM research base to focus on such long-term objectives.

DEMAND FOR MATHEMATICAL EXPERTISE: Non-academic sectors require modelling and simulation competences in a growing fashion (i.e. data-based decision-making, industry 4.0) and demand training and recruitment of highly-skilled professionals, through schemes such as Industrial Doctoral programmes.

THREATS

COMPETITION FROM OTHER RESEARCH CENTRES: Other leading research centres can be perceived as offering similar know how even they are not equivalent, by industry and non-experts. This could represent a barrier to CRM to access to collaborative projects and contracts.

EVOLVING INTELLECTUAL PROPERTY LANDSCAPE: Changing intellectual property regulations / open software requirements for research.

STRENGTHS

STRONG INTERNATIONAL TALENT ATTRACTION: Capabilities for international talent attraction: Postdocs calls (with mobility conditions) are usually getting more than a sufficient number of talented candidates. (MdM 2022-2023 calls).

ESTABLISHED DOCTORAL TRAINING PROGRAMMES: Advanced doctoral education is a key focus at CRM, delivered primarily through its Training Unit, the Barcelona Graduate School of Mathematics. This unit runs a high-level training programme that regularly hosts advanced courses, the Hypathia summer School, joint junior meetings, providing undergraduate and graduate students with continuous exposure to cutting-edge research.

CONSISTENT DOCTORAL TRAINING OUTPUT: Consistent training capacity at doctoral level: 15-16 theses/ year, supervised by one of our senior members.

OTM-R: Open, transparent recruitment practices- proven by Human resources for scientific researchers (HRS4R) twice validated plan

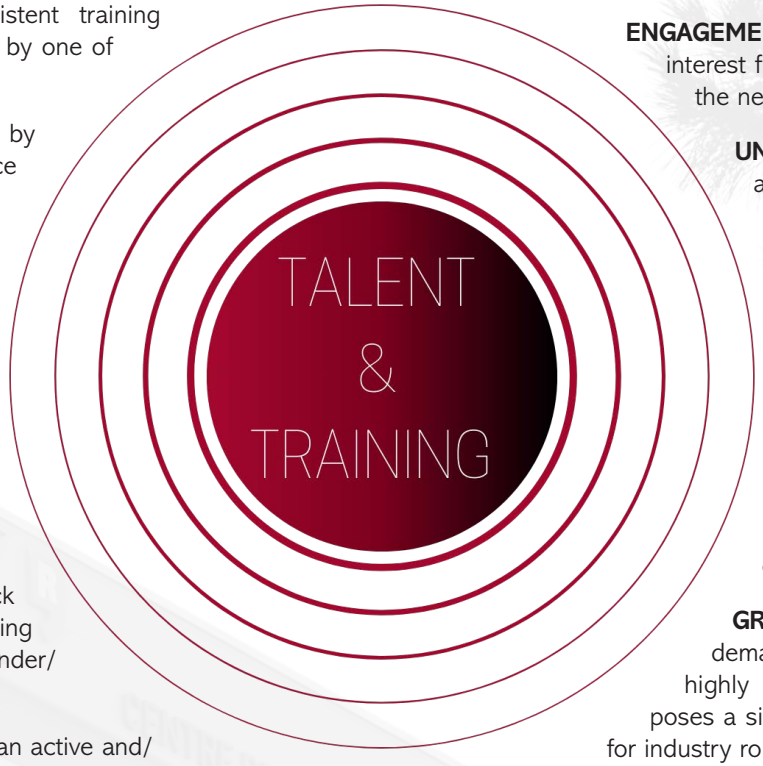
STABLE PARTNERSHIPS FOR APPLIED RESEARCH: Ongoing stable agreements with other organizations for applied research: CRG case

WEAKNESSES

LIMITED INFLUENCE ON UNIVERSITY RECRUITMENT POLICIES: Regarding affiliations as a growth mechanism, CRM can only affiliate researchers that have already been recruited/promoted by universities: The pool of senior, permanent researchers cannot be defined with any feedback from CRM Direction, neither scientifically (such as wishing to promote a particular area/gap) or other questions (gender/ diversity).

LACK OF STRATEGIC PI RECRUITMENT PLAN: Lack of an active and/ or transparent recruitment strategy for Pls/senior researchers' recruitment, with open calls well in advance for specific areas, along with headhunting (identification, guest seminars…etc) for suitable candidates

CHALLENGES DUE TO GEOGRAPHICAL DISTRIBUTION: Predoctoral and postdoctoral researchers are expected to be based at CRM but they experience difficulties if their supervisors/teaching duties are not at the UAB campus. Mathematical research work can be executed without labs, instruments…but working from home, without contact with colleagues, limits discussion and informal contacts in the mid-long term.



OPPORTUNITIES

EXCELLENCE-BASED PROGRAMS TO ATTRACT TALENT: CRM has the opportunity to leverage its María de Maeztu status to attract international talent through programs such as Junior Leader (JLs) and INPHINIT fellowships. These initiatives, coupled with CRM's existing programs like BIMR summer schools and research-in-pairs initiatives, can help recruit high-caliber researchers.

GENERATIONAL SHIFT IN ACADEMIA: The ongoing wave of retirements among senior researchers at universities presents an opportunity to bring in ambitious, early-career faculty who could become affiliated to CRM and drive new research directions.

ENGAGEMENT OF DISTINGUISHED RESEARCHERS: There is a strong interest from world-class scientists to collaborate with CRM without the need for permanent relocation to Barcelona.

UNITED STATES SCIENTIFIC POLICY CHANGES: It creates an opportunity to attract or recover talent, reversing the traditional brain drain (through programmes such as ICREA, ATRAE, Catalonia Talent Bridge).

THREATS

CHALLENGES IN ATTRACTING PHD CANDIDATES: Despite current activities such as BIMR and the Erasmus Mundus Master at UAB, CRM is not fully capitalizing on these programs to attract PhD candidates. According to 2023-2024 data, there is untapped potential to convert engaged master's students into doctoral researchers.

GROWING COMPETITION FROM INDUSTRY: The increasing demand for mathematics graduates in the private sector, with highly competitive salaries and attractive career opportunities, poses a significant challenge. Many promising candidates are opting for industry roles over academic careers.

WORSENING GENDER GAP IN MATHEMATICS: The declining number of female students enrolling in mathematics at undergrad and master's levels in Spain and across Europe is concerning. This trend may further shrink the pool of female PhD candidates as well as new faculty hirings, impacting gender diversity at CRM.

IMPACT OF RETIRING SENIOR FACULTY: CRM's limited influence over university recruitment processes could hinder its ability to maintain leadership in key research areas.

6. VISION – CRM 2030

Starting from the solid foundation of CRM 2024, CRM2030 aims to become a more diverse, integrated, and impactful hub for mathematical research. With talent, early-career training, and societal impact as our guiding pillars, we will navigate a period of generational transition, fostering organic and sustained growth to remain at the forefront of mathematical advancements.

Relevant and Diverse

By 2030, CRM will excel across fundamental and applied mathematics, supported by an engaged, internationally diverse team. We will cultivate leadership and growth opportunities for women, ensure the seamless transfer of expertise across generations, and strengthen engagement with interdisciplinary domains, industry, and society to enhance knowledge transfer.

Global Leadership and Networks

CRM will attract and retain world-class talent, fostering a vibrant network of global partnerships to be connected to how mathematics will be performed in the next decade and emergent topics. Distinguished researchers connected to CRM and world-class scientific events will help in this direction.

Mobilization and Transfer for positive impact

CRM will catalyze societal transformation by leveraging mathematical research to drive change in the economy, environment, and broader society. Through effective impact pathways in collaboration with other scientists, we will prioritize knowledge mobilization to promote sustainable and equitable solutions to current challenges.

7. GLOBAL STRATEGIC OBJECTIVES

Guided by our comprehensive SWOT analysis and contributions from four dedicated working groups, the CRM Board of Directors has outlined Global Strategic Objectives to help us transform Vision 2030 into reality.

GSO1 | Delivering breakthrough relevant science, going beyond the state-of-the-art, according to the proposed scientific programme. Consolidate and increase the very high quality and productivity of the science created by the CRM across all the lines established in the CRM Strategic Plan, both in those already existing in the CRM and in the proposed new research lines to be started up in the period 2025-2030.

GSO2 | Reinforcement of the CRM at the institutional level as a brand of excellence in mathematics, furthering the existing agreements with the local universities and other research-focused organizations, enhancing its visibility across the Catalan scientific community and internally, and cultivating a stronger sense of belonging among its members through initiatives to bring them together.

GSO3 | Taking CRM International leadership to the next level thanks to our scientific activities, coordinated projects and global network of distinguished researchers collaborating with us. We aim to become a reference research centre in Mathematics in Europe that becomes a coveted space to organise scientific events.

GSO4 | Operational Excellence aims to elevate the CRM's efficiency and effectiveness by optimizing funding strategies, management structures, and access to resources and infrastructures, ultimately fostering a more robust research environment. By fostering a culture of continuous improvement and adaptability, the CRM seeks to provide an optimal environment where mathematics research can thrive.

GSO5 | CRM as a magnet for visionaries and leaders. Set up the optimal research and working environment to attract researchers of the highest quality to enhance the leadership of the CRM at the national and international level, both strengthening the research in Mathematics and its applications to other sciences and increasing the synergies with other prestigious scientific institutions.

GSO6 | Diversify talent Beyond equality, CRM is committed to implementing policies and practices to encourage and support the professional growth of women and reducing the attrition rates observed along the academic career, not leaving anyone behind.

GSO7 | Elevate BGSMath to the status of international reference in doctoral and post-doctoral training. The 2030 BGSMath will offer a dynamic environment, by offering an experience which complements the doctoral programs at the three partner Universities. Such experience will combine taught courses, mentoring, student networking, and international connections.

GSO8 | Increase social and economic impact from CRM research, through a constant and fluid dialogue with other stakeholders and citizens, striving to explain the usefulness and beauty of mathematics at once, and being inspired by emergent challenges. Knowledge mobilization will be based on multi-format and multi-platform tactics to converse with society most appropriately.

A set of strategic lines have been defined to group sub-objectives and actions whose results will contribute to the achievement of the GSOs above:

STRATEGIC LINE 1: Funding and Resources Acquisition and Management

Line Objective 1.1 | Increasing funding acquisition for growth and collaboration

Actions:

1.1.1. Prioritize participation in competitive programmes to recruit permanent senior researchers

1.2.1. Strengthen support for proposal preparation and participation in research consortia, including training and coordination.

1.3.1. Define internal incentives to promote involvement in collaborative, consortia-like projects.

1.4.1. Expand cooperation with universities and research organizations through framework agreements to jointly apply for funding.

1.5.1. Apply to institutional excellence programmes to enhance CRM's profile.

Line Objective 1.2 | Streamlined access to research resources and infrastructures

Actions:

1.2.1. Review internal systems to identify and solve barriers to access institutional platforms, software, and tools.

1.2.2. Establish agreements with partner institutions to ensure shared access to essential research services.

1.2.3. Improve planning and availability of spaces for scientific activities and large events through repurposing and external collaboration.

Line Objective 1.3 | Compliance with regulations to perform excellent research

Actions:

1.3.1. Develop internal guidelines to simplify administrative and resource management procedures.

1.3.2. Explore shared service models with other research centres to optimize operations.

STRATEGIC LINE 2: CRM Institutional Strengthening. Foster Sense of Belonging to CRM.

Line Objective 2.1 | Making more appealing and visible the CRM support package for researchers

Actions:

2.1.1. Redistribute part of overheads to research groups to fund new initiatives.

2.1.2. Support dual-affiliated researchers with reduced teaching loads to focus on research and competitive grants.

2.1.3. Regularly update and promote the benefits of CRM affiliation to new members.

Line Objective 2.2 | Collaborate with Universities to support the generational change

Actions:

2.2.1. Promote internal grants and prioritize early-career researchers in institutional calls.

2.2.2. Support faculty with mentoring and schemes to prepare project proposals or organize international activities.

2.2.3. Collaborate with universities to jointly attract and retain RyC researchers.

Line Objective 2.3 | Align and intensify opportunities for CRM Faculty to interact

Actions:

2.3.1. Improve internal scientific meetings structure and explore new formats such as CRM Faculty Seminars.

2.3.2. Inter-area Intensive Research Programmes (IIRPs) will foster collaboration across disciplines and help transfer knowledge while building international research networks.

2.3.3. Launch new joint initiatives across research groups, leveraging existing seminars and competitive funding.

STRATEGIC LINE 3: Talent Attraction, Retention and Growth

Line Objective 3.1 | Attract visionary senior researchers

Actions:

3.1.1. Identify potential ICREA or ERC candidates and actively promote CRM as a host institution.

3.1.2. Offer incentives and start-up packages for applicants reaching advanced stages of major grants.

3.1.3. Launch collaborative "Joint Ventures" in key areas led by distinguished researchers.

Line Objective 3.2 | Talent attraction and growth. From students to independent researchers.

Actions:

3.2.1. Improve conditions and outreach to attract non-local and international PhD students.

3.2.2. Launch a communication campaign to raise awareness among undergraduate and master students.

3.2.3. Provide clear pathways for postdoctoral researchers to transition into tenure-track roles.

Line Objective 3.3 | Ensuring the adaptation of CRM recruitment and promotion protocols to the reform of research evaluation.

Actions:

3.3.1. Implement a CRM-wide COARA Action Plan outlining recruitment, evaluation, and monitoring principles, and provide awareness and training across all career stages.

STRATEGIC LINE 4: Reducing Gender Gap in CRM Faculty at Diverse Career Levels

Line objective 4.1 | Improve work-life balance and gender equity

Actions:

4.1.1. Provide tailored support packages for women researchers, especially in early post-maternity years.

4.1.2. Build networks of women leaders and mentors across career stages.

4.1.3. Encourage women students to pursue advanced studies through mentorship and role model programmes.

STRATEGIC LINE 5: Advanced Training in Mathematics.

Line objective 5.1 | Continue efforts to position CRM Training Unit (BGSMath) as an international reference in doctoral and postdoctoral training in mathematics.

Actions:

5.1.1. Connect early-stage students to research pathways from undergraduate to PhD level.

5.1.2. Continuously improve the doctoral training programme, complementing university offerings and aligning with international best practices.

5.1.3. Establish a postdoctoral committee to guide leadership development, grant preparation, and research career paths.

STRATEGIC LINE 6: CRM International Scientific Networking. Activities to Improve Collaboration.

Line Objective 6.1 | Increase CRM visibility among universities and research centres.

Actions:

6.1.1. Conduct information sessions at Catalan universities and build partnerships with research centres in related fields.

6.1.2. Provide materials and mentoring for new scientific organizers and streamline activity planning procedures.

Line Objective 6.2 | Revamp intensive Research Programmes (IRPs)

Actions:

6.2.1. Identify strong research topics with the help of the SAB to maximize international impact.

6.2.2. Secure better funding and increase flexibility by collaborating with other international centres.

Line Objective 6.3 | Capacity building to organize scientific activities.

Actions:

6.3.1. Launch a student volunteer programme in coordination with university assemblies.

6.3.2. Participate in ERCOM exchanges to share event organization practices and foster collaboration.

STRATEGIC LINE 7: Fluid Dialogue with Society.

Line objective 7.1 | Formulation and execution of CRM 26-30 Communication Plan.

Actions:

7.1.1. Conduct a diagnosis of current communication practices to guide the new plan.

7.1.2. Roll out a multi-channel communication strategy, including social media, press kits, and audiovisual content.

7.1.3. Ensure content is available in Catalan, English, and Spanish to reach diverse audiences.

Line Objective 7.2 | Partnerships and resources for Outreach Activities

Actions:

7.2.1. Formalize agreements with science museums and communication institutions.

7.2.2. Apply to external funding schemes to expand CRM's outreach capacity.

Line Objective 7.3 | Corporate communication policy. Definition and follow-up/

implementation.

Actions:

7.3.1. Develop branding guidelines for researchers.

7.3.2. Upgrade the suite of practical resources for research staff, including customizable templates.

7.3.3. Streamline internal communication with a unified weekly newsletter.

STRATEGIC LINE 8: Development of the Knowledge Transfer Unit (KTU) as a Singular Instrument to Increase Social and Economic Impact of CRM Research.

Line Objective 8.1 | Improve awareness of CRM researchers and positioning of the KTU

Actions:

8.1.1. Organize internal sessions to showcase KTU services and foster collaboration.

8.1.2. Ensure CRM presence at key innovation events to expand its reach and impact.

8.1.3. Join and actively contribute to knowledge transfer networks.

Line Objective 8.2 | Strengthen resources and processes for knowledge transfer

Actions:

8.2.1. Apply for funding to support valorization and hire experts in intellectual property and commercialization.

8.2.2. Partner with leading centres in knowledge transfer to exchange best practices.

8.2.3. Offer advanced training for researchers on protecting and applying their research.

Line Objective 8.3 | Forge and develop long-term alliances to increase impact

Actions:

8.3.1. Organize regular meetings with industry and research stakeholders to create collaborative opportunities.

8.3.2. Establish formal agreements for joint projects based on shared interests and needs.

8.3.3. Promote industrial doctorates and short postdoctoral placements to bridge academia and application.

8. CORE BLOCKS

The continuation of CRM's high-quality output will rely on:

4 Core Blocks, a reformulation of our MdM Scientific Programme, will pursue key goals

4 Flagship initiatives, that will promote core-core interactions.

In particular, the research areas outlined in SRP22-25, Analysis, PDEs, and Dynamical Systems, are closely interconnected and have been consolidated into a single block to strengthen collaboration. The multidisciplinary lines focused on climate, biology, and neuroscience applications are also grouped under a broader category called Modelling.

CORE BLOCK 1 | Analysis, PDE, and Dynamical Systems

In SP26-29, a new research line will explore links between Machine Learning (ML) and Computer-Assisted Proofs (CAPs) with Analysis, PDEs, and Dynamics (see Weakness W1 and Flagships 1 and 2). Another strategic action is to strengthen research in Elliptic PDEs and Geometric Analysis and its connection to ML. The Analysis and PDE research lines will be also enhanced by the CRM-BCAM SOMMA Alliance (Exploratory workshop, Sept 2025).

Knowledge base: Complex and Harmonic analysis, elliptic/parabolic PDEs, Calculus of Variations, Holomorphic dynamics, Hamiltonian systems, Celestial Mechanics.

Team Senior Members (June 2025)

Analysis: Jorge Antezana, Carme Cascante, Albert Clop, Jordi Marzo, Joan E. Mateu, Artur Nicolau, Joaquim Ortega, Olli Saari, Sergey Tikhonov, Xavier Tolsa.

PDEs: Xavier Cabré, Gyula Csato, Albert Mas, Xavier Ros-Oton, Tomás Sanz.

Dynamical Systems: Inmaculada Baldomá, Andrew Clarke, Jezabel Curbelo, Kostiantyn Drach, Núria Fagella, Marcel Guàrdia, Alejandro Haro, Xavier Jarque, Marc Jorba, José Tomás Lázaro, Pau Martin, Maria Teresa Martínez-Seara, Mercè Olle, Leticia Pardo, Joan Torregrosa.

CORE BLOCK 2 | Algebra, Geometry, and Topology

This block will consolidate research in Symplectic and Poisson Geometry and its connections to dynamics, fluid mechanics, complexity, and topology (link to Core Block 1).

Knowledge base: Non-/Commutative algebra, Algebraic geometry, Symplectic and differential geometry, Topology, Homotopy, Number Theory, Langlands programme.

Team Senior Members (June 2025)

Algebra and Algebraic Geometry: Josep Álvarez, Ramon Antoine, Florent Balacheff, Guillem

Blanco, Carles Broto, Carlos d'Andrea, Martí Lahoz, Ignasi Mundet, Francesc Perera, Martin Sombra.

Geometry and topology: Robert Cardona, Natàlia Castellana, Joana Cirici, Simone Marchesi, Marta Mazzocco, Eva Miranda, Joan Carles Naranjo, Wolfgang Pitsch, Joan Porti, Gil Solanes.

Number Theory: Francesc Bars, Paloma Bengoechea, Luis Dieulefait, Francesc Fité, Xavier Guitart, Marc Masdeu, Víctor Rotger.

CORE BLOCK 3 | Modelling

Three new researchers will open lines in 2025 to expand the Mathematical Modelling core block. E. Latorre, as an Independent Fellow (joint CRM/CRG via MdM funds), will focus on the Mathematics of Biological Ageing. D. Moriña joins CRM to apply data science to public health, particularly for early warning signals. D. Vidaurre (ATRAE 2025) will develop ML methods to integrate biology and behavior into predictive models. These efforts boost CRM's interdisciplinary impact (Opportunities O1 & O2).

Knowledge base: Real-world modelling in Biology, Neuroscience, Social/Health Systems, Industry, and Environment. Techniques include Stochastic PDEs, Statistics, AI, Dynamical Systems, and Numerical Modelling.

Team Senior Members (June 2025)

Mathematical Biology: Tomás Alarcón, Marta Casanellas, Silvia Cuadrado, Gissell Estrada, Eric Latorre, Josep Sardanyés.

Computational and Mathematical Neuroscience: Antoni Guillamon, Gemma Huguet, Alexandre Hyafil, Manuel Molano, Adrián Ponce, Alex Roxin, Klaus Wimmer.

Mathematics for the Environment and Society: Marc Calvo, Álvaro Corral, David Moriña, Timothy G. Myers, Pere Puig.

CORE BLOCK 4 | Combinatorics and Mathematics of Computer Science

This core block will launch a Formalization Initiative (see Flagship 3), verifying proofs via assistants like Lean, creating synergies with the Combinatorics, Number Theory, and Complex Analysis research lines (link to Core Blocks 1 and 2). Strategic goals also include strengthening Geometric and Algebraic Combinatorics through recent affiliations to impulse interactions with Algebra, Geometry and Topology (Core Block 2).

Knowledge base: Logic, Theoretical CS, Structural Graph Theory, Enumerative/Asymptotic Combinatorics, Probabilistic Methods, Additive and Extremal Combinatorics, Algebraic and Geometric Combinatorics.

Team Senior Members (June 2025)

Albert Atserias, Simeon Ball, Kolja Knauer, Richard Lang, Marc Noy, Arnau Padrol, Guillem Perarnau, Vincent Pilaud, Juan José Rué, Oriol Serra, Lluís Vena.

9. FLAGSHIPS

The results from the 4 Core Block domains by 2029 will reflect the shared goal of methodological transformation initiated by the 4 flagship initiatives. The strategic aim of fostering a "sense of belonging through transformation" will be implemented via the flagships, which introduce a new approach to mathematical research. By updating methodologies institutionally while tackling frontier problems, CRM continues its path as a hub for advanced research. Activities such as workshops, forums, visitor programmes, and training will foster a sense of belonging and create spaces for CRM faculty, postdocs, and predocs to connect and collaborate.

Each flagship connects to two or more core blocks and to external partners for cross-disciplinary research. Their content and orientation stem from pilot meetings and discussion forums held during 2023-2025 as part of the MDM SRP22-25, and from the SWOT analysis. The results for their contents and implementation are:

Flagship 1 | Computer-Assisted Proofs Excellence Hub

This initiative aims to position the CRM as a global leader in computer-assisted proofs, a rapidly growing area at the intersection of mathematics and advanced computational methods. The hub will foster rigorous collaborations linking PDEs, dynamical systems, AI, and formal verification. It will also catalyze ongoing work at CRM in areas such as dispersive equations, complex analysis, and autoformalization.

Flagship 2 | Mathematics for Deep Learning Excellence Hub

This flagship focuses on developing the mathematical foundations of generative AI, particularly through the lens of transport theory, PDEs, and high-dimensional dynamical systems. The initiative will bring together CRM's expertise in mathematical analysis with leading AI research. By bridging theoretical math and machine learning, this hub will address critical gaps in understanding, training, and error control in modern neural networks.

Flagship 3 | Formalization Initiative

The Formalization Initiative supports the growing movement to write mathematical proofs in fully formalized, computer-verifiable language using systems like Lean, Coq, and Isabelle. With major mathematicians already contributing to this shift, CRM sees formalization as a transformative tool for both mathematical rigor and knowledge transmission. The initiative aligns closely with Flagship 1 and embraces the cultural and pedagogical changes formal proof systems are bringing to mathematics worldwide.

Flagship 4 | Multiscale Modelling for Complex Biological and Societal Problems

This initiative strengthens CRM's role in tackling real-world problems in biology, climate, and society through multiscale modeling. These systems defy reductionist approaches, demanding hybrid methods that merge mathematical theory with data-driven and machine learning techniques. The initiative supports cross-disciplinary PhD programs and collaborative platforms to train the next generation of researchers able to navigate between mathematics and experimental or social sciences, fostering a new kind of applied mathematician equipped to model complex, emergent phenomena.

10. Indicators

Indicator	Means of verification
Percentage of peer-reviewed articles in outstanding/excellent journals.	Web of Science
	CRM Institutional Repository
Number of papers co-authored by researchers from two different research areas.	Web of Science
	CRM Institutional Repository
Annual number of defended PhD theses (by gender).	Annual Report
Number of mentored postdoctoral fellows (by gender).	CRM Staff Database
Number of participants per IIRPs (by gender).	CRM Activities Records. Raw data about participants is available in our website/Annual Report.
FP10 projects submissions and funded projects by members of the CRM.	CRM Projects Database
	Annual Report
Number of industry/non-academic contracts (funded by industrial partners) and amount of funding.	CRM Projects Database
Number of views, likes, and shares per video/press releases (by CRM and non-CRM members).	CRM Communication Records. Each social media site (Instagram, Youtube, X, LinkedIn)
	CRM website.
Number of participants at standalone activities, joint activities	CRM Activities Records

11. Monitoring and Evaluation of the Plan

The monitoring process of the Plan includes both self-assessment and external evaluation, which are essential to ensure transparency and accountability to the member institutions of the Centre de Recerca Matemàtica (CRM), its governing bodies, its staff, and society at large.

Each year, the CRM management team presents a detailed report to the Governing Board outlining the activities carried out during the previous year, as well as proposals and strategic lines of action for the upcoming year. In addition, financial and regulatory compliance audits are published annually as part of the institution's commitment to legality and to the achievement of its strategic objectives.

Monitoring indicators for management activity:

Activity Monitoring	Frequency	Type of Indicator	Responsible Body
Accountability to the European System SEC95 (financial control)	Monthly	Economic/Accounting	CRM Management
Accountability for programme contract	Annual	Strategic/Operational	CRM Management
Accountability to the Governing Board	Annual	Institutional	CRM Management
Accountability under the Budget Law of the Generalitat de Catalunya	Annual	Legal/Budgetary	CRM Management
Financial and regulatory compliance audit	Annual	Accounting/Legal	External Audit
External evaluation by Cerca institution	Every three years	Institutional/Qualitative	Cerca Institution
HRs4R evaluation	Every two years	Qualitative/Compliance with European Standards	European Commission
Evaluation of research staff	Every three or six years	Scientific/Qualitative	Evaluation Committee/SAB
External evaluation of consolidated research groups (AGAUR)	Every three years	Scientific/Qualitative	AGAUR