

ANNOUNCEMENT FOR THE AWARD OF A RESEARCH FELLOWSHIP

Research Fellowship - 5 vacancies

21/ECUM/CMAT/2025 – CMAT-B

A call for applications is now open for the attribution of 5 (five) grants for students of a master degree within the scope of the R&D project UIDB/00013/2025 – Pluriannual Funding of the Centre of Mathematics (CMAT) of the School of Sciences of the University of Minho, financed by Fundação para a Ciência e Tecnologia (FCT), under the following conditions:

Scientific Area: Mathematics

Recipient category: It is intended for carrying out R&D activities by students enrolled in a master's degree course in a Higher Education Institution.

Requirement for granting the fellowship:

- The applicants may apply without prior registration in the course for which the fellowship is open. The requirement to enroll in a degree course will be verified on the date of contracting the fellowship;
- Only fellowships whose selected applicants present a valid proof of enrolment in a degree course will be contracted, according to the type of the fellowship, issued by a Higher Education Institution, indicating, respectively, the academic year or its duration (star and term).

Applicants' eligibility: Candidates who meet the conditions set out in Article 9 of the Research Grant Regulations, No. 950/2019, of 16-12-2019, of FCT I.P. are eligible.

Nationals or citizens of other European Union member states, third-country nationals, stateless persons, and citizens with political refugee status are eligible to apply for this competition.

Candidate eligibility requirements: Applications will only be accepted from students enrolled in a master's degree course in the areas of Mathematics, Statistics, Computer Science or Data Science.

Preferred criteria: Candidates must have a profile suited to the research activities planned for the research project for which they are applying. The 8 (eight) projects in the competition are listed below, where the target audience for each project is specifically presented.

Workplan and objectives to be achieved: It is intended that the fellowship researcher collaborates in the research activities of CMAT, integrating one of the projects whose description, supervisors and targeted audience are indicated below. The candidate must

indicate the project for which he/she is applying, chosen from among the following 8 (eight) projects:

PROJECT BI2025-A	Semigroups of transformations restricted by an equivalence
SUPERVISOR	Suzana Mendes Gonçalves (smendes@math.uminho.pt)
TARGET AUDIENCE	2 nd year students of the Master in Mathematics and Computation
WORK PLAN	Given a non-empty set X , the set of all partial transformations of X , under the operation of composition, forms a semigroup, usually denoted by $P(X)$. This semigroup, as well as many of its subsemigroups, has been the subject of research by numerous scholars. The aim is for the student to study the structure of subsemigroups of $P(X)$ whose elements are (total or partial) transformations restricted by an equivalence E . Examples include the semigroup of all total transformations $\alpha: X \rightarrow X$ that preserve E , or the semigroup of all partial transformations α of X such that $x E \subseteq x(\ker \alpha)$ for each $x \in \text{dom } \alpha$, and $\text{im } \alpha$ is a partial transversal of E .

PROJECT BI2025-B	Application of Deep Learning Methods for the Automatic Identification of Fishing Hauls Using AIS Data
SUPERVISORS	Raquel Menezes and Daniela Silva (IPMA & CMAT) (daniela.dasilva@ipma.pt)
TARGET AUDIENCE	2 nd year students of the Master in Statistics for Data Science
WORK PLAN	This project aims to apply deep learning techniques to Automatic Identification System (AIS) data to automatically detect fishing events along the Portuguese continental coast. Using time series of vessel geolocation, speed, and heading, temporal convolutional networks and segmentation methods will be employed to identify patterns characteristic of fishing activity. The goal is to map fishing areas and support the development of policies for the sustainability of marine ecosystems.

PROJECT BI2025-C	Mathematical and computational models for digital twins in supply chains
SUPERVISOR	Cecília Castro (cecilia@math.uminho.pt)

TARGET AUDIENCE	2 nd year students of the Master in Mathematics and Computation
WORK PLAN	This project focuses on developing mathematical and computational models to support digital twins applied to supply chains. The work includes the formulation of dynamic models, state estimation and forecasting methods, as well as scenario simulation in a test environment. The goal is to evaluate the ability of these models to anticipate behaviors and support decision-making, ensuring robustness and validation with synthetic or anonymized data.

PROJECT BI2025-D	Spatial Analysis of Cancer Mortality in Portugal Using Autoregressive Random Forests
SUPERVISORS	Soraia Pereira and Raquel Menezes (soraia.pereira@math.uminho.pt)
TARGET AUDIENCE	2 nd year students of the Master in Statistics for Data Science
WORK PLAN	It is proposed to study the spatial distribution of cancer mortality (colon and lung) in Portugal at the municipal level, with two aims: (i) to map spatial patterns and (ii) to identify socio-environmental determinants associated with higher risk. Mortality indicators from Statistics Portugal (INE) will be used alongside covariates such as air pollution, diet, socioeconomic status, tobacco use, and physical activity. The analysis will be based on the SPAR-Forest algorithm, which combines random forests with Bayesian spatial smoothing to capture non-linear relationships and spatial dependence, addressing limitations of purely machine-learning approaches (which tend to ignore spatial structure) and traditional hierarchical spatial models (which may impose overly restrictive functional forms).

PROJECT BI2025-E	Comparative Study of Methods for Interval-Censored Data in Survival Analysis
SUPERVISOR	Luís Machado (lmachado@math.uminho.pt)
TARGET AUDIENCE	2 nd year students of the Master in Statistics for Data Science
WORK PLAN	The objective of this project is to study and compare statistical methodologies for the analysis of time-to-event data with interval

	censoring, which is common in epidemiological studies. Imputation-based methods (using interval limits, midpoint, or random values) and methods that explicitly account for censoring, such as the Turnbull estimator and nonparametric extensions of classical survival models, will be evaluated. The analysis will include simulation studies and applications to real or synthetic data, exploring methodological and practical implications for the estimation of survival functions and related parameters.
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PROJECT BI2025-F	Shock Wave Problem in Hyperbolic Systems for Multicomponent Fluids
SUPERVISOR	Ana Jacinta Soares (ajsoares@math.uminho.pt)
TARGET AUDIENCE	2 nd year students of the Master in Mathematics and Computation
WORK PLAN	This work aims to study the propagation of stationary shock waves in gas mixtures described by hyperbolic systems of conservation laws. Starting from a kinetic model based on the integro-differential Boltzmann equation, the corresponding macroscopic system obtained in the hydrodynamic limit is considered. The analysis focuses on the asymptotic one-dimensional smooth plane wave solution connecting two equilibrium states through the Rankine-Hugoniot conditions. The study combines theoretical analysis, physical motivation, and numerical simulations.

PROJECT BI2025-G	The logical framework LF
SUPERVISOR	José Carlos Espírito Santo (jes@math.uminho.pt)
TARGET AUDIENCE	2 nd year students of the Master in Mathematics and Computation
WORK PLAN	The logical framework LF is a type theory developed to be used as a meta-logic in which other object-logics can be codified. The codification methodology goes back to Church's paper on simple types. The LF type theory uses dependent types to allow, not only the codification of formulas and terms, but also of derivations. The goals of the project are: 1) To study the LF type theory; 2) To understand the LF methodology of logic codification; 3) To recognize the power of dependent types.

PROJECT BI2025-H	Theoretical analysis of the efficiency of preconditioned Krylov methods
SUPERVISOR	Carla Ferreira (caferrei@math.uminho.pt)
TARGET AUDIENCE	2 nd year students of the Master in Mathematics and Computation
WORK PLAN	This project proposes a theoretical study of the influence of preconditioners on the efficiency of iterative Krylov subspace methods, such as CG (Conjugate Gradient) and GMRES (Generalized Minimal Residual). The analysis is intended to focus on the spectral conditions that determine the rate of convergence, exploring the role of conditioning and the symmetry and sparsity properties of the matrices. The work includes a literature review and a comparative mathematical evaluation of preconditioning strategies.

Applicable legislation and regulations: Research Fellow Statute (EBI), approved by Law nº. 40/2004 of August 18, in its current wording and FCT Research Fellowship Regulation, approved by Regulation nº 950/2019, published in the Diário da República, 2nd series, of December 16, 2019, in its current wording, and Scientific Research Fellowship Regulation (RBIC) of the University of Minho, approved by order nº 4998/2025, published in the Diário da República, 2nd series, nº 81, of April 28, 2025 Amended and republished through amendment statement no. 634/2025/2, published in the Official Gazette, 2nd series, no. 132, of July 11.

Host/Contracting institution and scientific supervision: The workplan will be carried out in Centre of Mathematics of University of Minho, located in the Campus of Gualtar or Campus of Azurém, under the scientific supervision of the member(s) of CMAT who proposed the research plan for which the candidate was selected.

Fellowship duration: The grant will take place for a period of 3 months, with a provisional starting date in December 2025. The fellowship grant is non-renewable.

Amount of the research grant: The amount of the grant corresponds to 1040,98 €/month, according to the table of values of the Research scholarship of FTC, in Portugal (https://www.fct.pt/wp-content/uploads/2025/02/Tabela_valores_SMM_2025.pdf), and of the University of Minho, updated annually, as decided by the Management Board.

Payment is made on the 23rd of each month, through bank transfer to the Bank Identification Number of the fellow identified in the contractualization process.

Other benefits: personal accident insurance.

Exclusivity regime: The grantee will perform the activities under exclusivity, as foreseen in article 5 of the Research Fellow Statutes and applicable regulations.

Selection panel:

President:

Luís Filipe Ribeiro Pinto, CMAT member, Associate Professor at the Department of Mathematics, School of Sciences, University of Minho;

Effective members:

Susana Margarida Ferreira de Sá Faria, CMAT member, Associate Professor at the Department of Mathematics, School of Sciences, University of Minho;

José Luis dos Santos Cardoso, CMAT member, Associate Professor at the Department of Mathematics, School of Sciences and Technology, University of Trás-os-Montes e Alto Douro.

Substitute members:

Lucile Arlette Guilaine Vandembroucq, CMAT member, Associate Professor at the Department of Mathematics, School of Sciences, University of Minho;

José Pedro Miranda Mourão Patrício, CMAT member, Associate Professor with Habilitation at the Department of Mathematics, School of Sciences, University of Minho.

The first effective member will substitute the President of the selection panel in case of impediment, being nominate the first substitute member in the place of the first effective member.

Criteria and procedures for applications assessment and selection: The applications assessment will focus on the candidate's Merit, following evaluation criteria, valued on a scale of 0 to 5 values:

Applicant Merit - AM:

- A1. Academic path (considering the classifications of academic degrees), with a weighting of 50%;
- A2. Personal curriculum (considering professional and scientific background), with a weighting of 30%
- A3. Motivation letter, with a weighting of 20%.

The final classification of the **Applicant's Merit (AM)** will be achieved through the following formula:

$$AM=(A1*0,5) + (A2*0,3) + (A3*0,2).$$

Applicants with an AM score of less than 3 will not be eligible for a research grant.

Note: Applicants with degrees obtained abroad must present proof of recognition of qualifications in Portugal and conversion of the final classification obtained in them to the Portuguese classification scale or declaration under the terms indicated in the previous point. Candidates who do not comply with one of these provisions, the selection panel will assign “0” in the grade of the graduation and/or master course. These candidates will not be assessed on the remaining parameters as they are unable to achieve a minimum classification of 3 in the AM (required for eligibility for a research grant).

If the jury considers it convenient, candidates with a minimum classification of 3 in the AM will be admitted to the Interview stage, with the Jury proceeding to assess the following sub-criteria:

Interview – INT:

- B1. Interpersonal skills (30%);
- B2. Demonstrated knowledge in the area of the project (30%);
- B3. Motivation (40%).

The **Interview classification (INT)** will be obtained by applying the following formula:

$$\text{INT} = (\text{B1} \times 0,3) + (\text{B2} \times 0,3) + (\text{B3} \times 0,4).$$

If an interview takes place, the Final Classification (FC) of the Applicant Merit (AM) and Interview (INT) will be obtained by applying the following formula:

$$\text{FC} = (\text{AM} \times 0,7) + (\text{INT} \times 0,3).$$

If there is no interview, the final classification (CF) will coincide with the Applicant Merit (AM):

$$\text{FC} = \text{AM}.$$

Application deadline and submission: The call for applications is open for a period of 10 working days from the date of publication on the *Euraxess* portal.

Applications must be submitted by email to bolsas@ecum.uminho.pt, indicating the reference number of the competition (**21/ECUM/CMAT/2025 – CMAT-B**) in the subject line, and indicating in the body of the message the reference and the title of the project to which the candidate is applying. Only applications submitted within the established deadline and accompanied by the following documents will be accepted:

- a) Candidate's updated *curriculum vitae*;

- b) Certificates of the academic degrees obtained or, if applicable, the candidate's declaration of honor that he/she has completed the degrees required in the notice by the application deadline.

For degrees obtained abroad, the record of recognition of the academic degrees and record of the conversion of the respective final classification to the Portuguese classification scale must be presented, or, alternatively, a declaration of honor from the candidate.

This declaration must attest to facts that occurred prior to the application. In the event of a discrepancy between the information contained in the declaration and the documentation submitted for the purposes of contracting the scholarship, only the information contained in the latter will be considered. If it is found that the documents proving the academic degree and diploma, or their recognition under the terms of Decree-Law n.º 66/2018, of August 16, do not correspond to the classifications awarded in the assessment of the academic career and may consequently alter the candidate's ranking, the scholarship will not be contracted;

- c) Motivation letter;
- d) Declaration proving enrollment in a master's degree course in the areas of Mathematics, Statistics, Computer Science or Data Science and the grades obtained in the curricular units already completed in the course.

Form of publication/notification of results: The results of the evaluation are published in a single list (in alphabetical order or by final score obtained), posted in a visible and public place in the host unit, as well as by email to all candidates, attaching, for this purpose, the minutes of the jury's deliberations, within a maximum period of 90 working days from the deadline for submission of applications.

Candidates are informed, at a preliminary hearing, in accordance with Articles 121 and 122 of the Administrative Procedure Code, of the likely outcome of the final decision, and may comment within 10 working days of this notification.

An appeal may be lodged against the final decision within 15 working days, or an appeal may be lodged with the highest executive body of the funding entity within 30 days, both after the respective notification (Article 12(nº6) of the FCT Research Grant Regulations).

Within 10 working days of notification of the grant award, the applicant must declare their acceptance in writing. In case of non-acceptance, the next highest ranked applicant will be notified immediately.

Constitution of a selection reserve list: The applicants ranked in the next positions on the ordered list will be included in a selection reserve list, which can be used until 31/03/2026.

Fellowship contractualization: The scholarship is awarded through the signing of a contract between the University of Minho and the scholarship recipient, in accordance with point 2.4 of the Rules for the Award and Management of Scholarships https://www.fct.pt/wpcontent/uploads/2022/03/Normas_de_Atribuicao_de_Bolsas_2021.pdf and the draft contract in Annex II of the University of Minho's Scientific Research Scholarship Regulations.

The contract can only be signed after receipt of all the documentation required for the type of scholarship, which must occur within a maximum period of 6 months, including proof of academic degrees or diplomas, as well as enrollment in non-degree study cycles or courses, as applicable.

Once all the documentation has been received, the contracting entity has 60 working days to sign the scholarship contract. Once received by the scholarship holder, the contract must be returned, duly signed, within 15 working days.

Term and cancellation of fellowship contracts: Without prejudice to the other grounds laid down in the University of Minho's Scientific Research Scholarship Regulation and in the Research Fellow Statute, the scholarship will cease on completion of the contracted work plan, as well as on expiry of the period for which it was granted or renewed.

The **final report** must be submitted to the scientific advisor, in accordance with the defined objectives and evaluation criteria, no later than 60 working days after the end of the scholarship and must be drawn up in accordance with Annex I of the Regulations of the University of Minho.

Non-discrimination and equal access policy: Universidade do Minho actively promotes a policy of non-discrimination and equal access, so that no candidate may be privileged, benefited, harmed or deprived of any right or exempt from any duty due, namely, to ancestry, age, sex, sexual orientation, marital status, family status, economic situation, education, social origin or condition, genetic heritage, reduced working capacity, disability, chronic illness, nationality, ethnic origin or race, territory of origin, language, religion, political or ideological convictions and trade union membership.

Declaration of Honor

Academic qualifications

I, (full name), candidate for the vacancy for the award of a (type of scholarship), within the scope of the project (name or reference of the project), published on the Euraxess portal, with the reference (ref. notice), declare on my honor that I have completed the academic degree of (academic degree), qualifying for the type of scholarship in the competition, namely the course (designation), by the (University conferring the degree), on the date XX/XX/XXXX, with a final average of XXXXX values on the YY scale.

As it is not possible for me to present proof of qualifications until the end of the competition, I declare that I undertake to present the aforementioned certificate at the conclusion of the scholarship contract, in the event that I am selected for the vacancy in the competition.

As this is true, I hereby date and sign this declaration.

(Place), (date).

(full name)

NOTE: The declaration may only attest to facts that occurred prior to the application.

In the event of a discrepancy between the information contained in the declaration and the documentation submitted for the purpose of contracting the scholarship, only the information contained in the latter will be taken into account.



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Declaration of Honor

I, (full name), bearer of identification document number (XXXX), candidate for a research grant (type of grant), within the scope of the project (name or reference of the project), published on the Euraxess portal, with the reference (ref. call for proposals), declare on my honor that (I have not received any research grants to date / I have received the following research grants) under the Research Grant Holder Statute.

University	Financing Entity	Project	Type of Grant	Duration	Start	Term

As this is true, I hereby date and sign this declaration.

(Place), (date).

(full name)