LaCaixa 2020 PhD Position @BCAM

Project title / Job position title:

Analysis of PDEs

Research Project / Research Group Description.

PhD position in Analysis of PDEs.

- **Objective:** We explore and exploit the connections between Partial Differential Equations, Harmonic Analysis, and Applied Mathematics.

Specific project thesis:

- **Inverse problems.** Advisor: P. Caro. The main goal of inverse problems is to determine the coefficients of a given equation from knowledge of its solutions. The resolution of these theoretical problems is motivated by practical applications.

- **Interplays between probability and dispersive PDEs.** Advisor: R. Lucà. Many problems in partial differential equations can be attacked introducing suitable probability measures (Gibbs measures) on the space of the solutions. We are interested in the implementation of this statistical approach to the study of the large time behavior and the pointwise convergence properties of dispersive PDEs.

- **Non-classical Littlewood-Paley inequalities.** Advisors: I. Parissis and L. Roncal. It is proposed the study of "non-classical" Littlewood-Paley inequalities, in the spirit of Rubio de Francia. The objective is to study such frequency decompositions when the sets of the collection of frequency projections are not Littlewood-Paley, and connect to problems on directional multipliers in higher dimensions.

- **Harmonic Analysis and Quantum Mechanics.** Advisor: C. Pérez. The goal is to study spectral properties of Schrödinger-type operators in connection with Poincaré-Sobolev type inequalities in the context of fractional derivatives using methods from to Harmonic Analysis.

- **Harmonic Analysis and Differential Equations: New Challenges.** Advisor: L. Vega. Recently we have found a connection between a classic analytical object attributed to Riemann (a continuous, nowhere differentiable function) and the evolution of vortex filaments (smoke rings). This connection proposes many questions at the analytical, geometric, and physical level that we are beginning to answer.

- **Mathematical Design of Complex Materials.** Advisor: A. Zarnescu. Spectacular and useful advances in the recent years technology are based on the use of novel materials with complicated microstructure. Despite the technological applications, these materials are poorly understood at a fundamental level. The student will form part of a group aiming to contribute to this understanding, using rigorous mathematics.
Job Position description.

**BCAM** is a world-class research center in the field of Applied Mathematics located in Bilbao (Spain). It obtained the Severo Ochoa Center of Excellence award in 2013 and 2018 given by the Spanish Ministry of Science, Innovation and Universities. BCAM is part of the **ERCOM** European Research Centers on Mathematics [http://www.ercom.org](http://www.ercom.org) networks. BCAM has endorsed the Charter & Code in 2008 and has been awarded the HR Excellence in research Logo in 2016.

The candidate will be part of the **Analysis of PDEs** research area at BCAM.

The candidate must have solid knowledge and experience.

The research environment is international and open to national and international collaborations, the candidate must have willingness to team working and traveling.

**Requirements:**
- Master degree (preferable in Mathematics, Physics, Engineering or Computer Science).
- Applicants must have an excellent academic record.

**Skills:**
- Good communication and interpersonal skills.
- Ability to effectively communicate and present research ideas to researchers with different background (e.g., mathematicians and engineers as well as employs of forest service).
- Ability to clearly present and publish research outcomes in spoken (talks) and written (papers) form.
- Good command of spoken and written English.

Additionally, in terms of transferable & complementary skills, BCAM is carrying out the **Action Plan** within Human Resources Strategy for Researchers (HRS4R) BCAM action plan available here [https://bit.ly/2MH1R9S](https://bit.ly/2MH1R9S); so, the fellow will benefit of this training program composed by: Leadership, Ethic and Research, Effective Communication/Teamwork, Gender Balance, Research Integrity, Citizenship Science, etc. The fellow will receive all the needed support from BCAM to be fully integrated in the group and in the center.
INPhINIT Offer, eligibility requirements, evaluation and selection process

Incoming: https://obrasociallacaixa.org/en/investigacion-y-becas/programa-de-becas-de-posgrado/inphinit/incoming

Retaining: https://obrasociallacaixa.org/en/investigacion-y-becas/programa-de-becas-de-posgrado/inphinit/retaining

How to Apply

1. Click in https://candidate.lacaixafellowships.org/login, Click in “New Users” – Please register your application and fill in all the personal data requested by the page for the creation of a new user.

2. Once you create the profile, you will receive a confirmation email and by clicking on the link you will be redirected to a page that tells you that your user is correctly completed.
3. Once you enter the platform with your user, the following screen will appear with some of your data and to choose the mode: Incoming or retaining:

4. Afterwards, you will be shown a page with all your data previously entered, and you will have to upload your passport, ID card and contact information:
5. After hitting the Save and Continue button, the following screen will appear in which you must enter the following data, choose the position you want and accept the 3 boxes below:
6. Below, on that same page, you choose the first option of the Physical sciences, Mathematics and Engineering Panel:
7. After giving to the button Save and Continue, fill in the Statement of purpose you give to Save and Continue:

8. From there, you will have to fill in the rest of the pages: Reference Letters, CV, Bachelor Studies, Other studies (if you have them), Academic records referring to higher studies relevant to the fellowship, Language required according to the programme terms and conditions, Language certificate, etc.

9. Once you have filled in all the fields you must click on FINISH and your application will be registered.