MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2025

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

Center for Mathematics and Applications of NOVA University of Lisbon (NOVA Math)

RESEARCH GROUP AND URL

Operations Research (https://novamath.fct.unl.pt/research-groups/operations-research/)

SUPERVISOR (NAME AND E-MAIL)

Ana Luísa Custódio (alcustodio@fct.unl.pt)

SHORT CV OF THE SUPERVISOR

Ana Luísa Custódio is an Associate Professor (with tenure) in the Department of Mathematics at NOVA School of Science and Technology, and a researcher at the Centre for Mathematics and Applications (NOVA Math), where she currently serves as Director. She is also part of the Operations Research Group within the center.

She holds a PhD in Mathematics from NOVA School of Science and Technology. Her main research interests lie in Nonlinear Optimization, with particular emphasis on Derivative-free Optimization and Multiobjective Optimization. Her work combines theoretical innovation with practical impact, contributing to the development of efficient algorithms and methods for complex, real-world problems.

Ana Luísa has participated in five funded research projects, including one as Principal Investigator. Her contributions include not only peer-reviewed publications but also the development of cutting-edge computational tools, which are openly shared with the community — strengthening the link between academic research and societal needs.

As an active member of the international optimization community, she serves as Associate Editor for both the *Journal of Optimization Theory and Applications* and *Optimization Methods and Software*.

Ana Luísa is committed to mentoring early-career researchers and fostering interdisciplinary collaboration. She welcomes postdoctoral candidates interested in applying for a Marie Skłodowska-Curie Postdoctoral Fellowship, particularly in the fields of optimization theory, algorithms, and applications, within the vibrant and supportive environment of NOVA Math. NOVA Math is a research unit classified as Excellent, having received the highest evaluation score awarded to Mathematics research centers in Portugal**.**

5 SELECTED PUBLICATIONS

- A. L. Custódio and L. N. Vicente, Using Sampling and Simplex Derivatives in Pattern Search Methods, SIAM Journal on Optimization, 18 (2007) 537 - 555
- A. L. Custódio, J. F. A. Madeira, A. I. F. Vaz, and L. N. Vicente, Direct Multisearch for Multiobjective Optimization, SIAM Journal on Optimization, 21 (2011), 1109 – 1140
- A. L. Custódio, Y. Diouane, R. Garmanjani, and E. Riccietti, Worst-case complexity bounds of directional direct-search methods for multiobjective derivative-free optimization, Journal of Optimization Theory and Applications, 188 (2021) 73 – 93
- A. Mohammadi and A. L. Custódio, A trust region approach for computing Pareto fronts in Multiobjective Optimization, Computational Optimization and Applications, 87 (2024) 149-179

- E. J. Silva and A. L. Custódio, An inexact restoration direct multisearch filter approach to multiobjective constrained derivative-free optimization (2024; accepted for publication in Optimization Methods and Software)

PROJECT TITLE AND SHORT DESCRIPTION

Project Title: FILL-MODFO: Filling Gaps in Multiobjective and Derivative-Free Optimization

Project Overview (Public Description for Prospective Candidates):

Modern scientific and engineering applications increasingly rely on complex models whose optimization poses serious challenges — especially when derivatives are unavailable, objective function evaluations are costly, and functions are nonsmooth or noisy. This is the domain of Derivative-Free Optimization (DFO), a field of growing importance in both theory and practice.
In real-world decision-making, however, problems rarely involve a single criterion. Instead, multiple conflicting objectives often need to be optimized simultaneously — bringing Multiobjective Optimization (MOO) into the picture. When these two settings overlap, the result is a highly challenging and underexplored field: Derivative-Free Multiobjective Optimization.
This project addresses key methodological and computational gaps in this area, aiming to contribute to the development of robust, efficient, scalable, and theoretically sound algorithms that can tackle complex multiobjective problems under derivative-free settings. Topics of particular interest include:

- Large-scale optimization
- Handling discrete or categorical variables
- Dealing with uncertainty and limited function evaluations

We welcome expressions of interest from motivated postdoctoral researchers with a background in mathematical optimization, numerical analysis, computational mathematics, or applied machine learning, and an interest in developing innovative algorithms that bridge theory and practice.
Further project details and specific directions will be discussed in one-to-one meetings with prospective candidates.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST*

Mathematics (MAT)