HOSTING OFFER

Applied Artificial Intelligence in High-Performance and Energy-Aware Computing

Supervisor (Researcher Profile):

Name: Javier Corral García

Department/Unit/Centre: Foundation for Advanced Computing and Technologies of Extremadura (COMPUTAEX). Extremadura Supercomputing Centre.

Javier Corral García holds a PhD in Computer Technologies and a degree in Computer Science, both from the University of Extremadura (UEx), with 18 years of work experience related to his academic and research career. Since July 2020, he has been an Associate Lecturer (Profesor Asociado) in the Department of Computer Systems Engineering and Telematics at the UEx. Since 2020, he has been the Head of R&D Projects at the public foundation COMPUTAEX (Computation and Advanced Technologies of Extremadura) and the Extremadura Supercomputer Centre, a member node of the Spanish Supercomputing Network (RES) recognized as a Unique Scientific-Technical Infrastructure by the Ministry of Science. He also has 16 years of work experience in the Foundation and the Centre, having started his career as a Software Analyst and Researcher in Software Engineering. He is the co-author of 14 popular science books, published between 2010 and 2024, describing the research and technological innovation projects developed and supported at the Extremadura Supercomputing Centre. These books develop the objectives, methodologies, and research results of each R&D project, as well as the scientific publications made. Since March 2020, he has also been a Member of the CTN 139 "Information and Communication Technologies for Health" committee of the Spanish Association for Standardization (UNE) Standardization and Interest Groups Program, and since November 2022, he is also Vice President of the Illustrious Professional College of Computer Engineers of Extremadura.

Research interests and expertise

As part of his work at COMPUTAEX, he leads and participates as a researcher in R&D projects involving advanced computing technologies, mainly High-Performance Computing (HPC) and Artificial Intelligence (AI). His main research line focuses on developing efficient software code to increase performance in HPC centres through AI. He has participated as a researcher in 12 competitive projects: 5 regional, 2 national, and 5 European (POCTEP, SUDOE, and H2020). He has also been involved in 19 non-competitive contracts and projects, including his participation as researcher in the complementary plan for Biotechnology applied to health and in the Quantum Spain project.

He was the Principal Investigator of the competitive project "EfiHPC: Software environment for the development of efficient programming codes in supercomputing centres". This Software Engineering and Artificial Intelligence project focuses on writing efficient programming codes, enabling users to increase the performance of their programs, reducing execution times, and consequently reducing energy consumption. The project developed a framework and a set of strategies allowing programmers to achieve significant improvements in their codes. In this way, performance is improved, and execution times in computing centres are reduced as much as possible. Additionally, the work developed helps programmers understand the significant impact that certain techniques can have on the final performance of their applications, especially those in continuous execution or consuming a considerably high number of CPU hours.

He has published in scientific journals (several of them as the first author in Q1 and Q2 quartiles of the JCR), a book chapter, and at 22 national and international conferences (being the first author and speaker in 11 of them). Currently, he is a reviewer of articles for several JCR journals (Q1 and Q2). He has also been reviewer of a book for the University of Seville, reviewer at national conferences, and for demonstrator project proposals within a Horizon Europe project. Since 2024, he has been directing a Doctoral Thesis on the analysis and improvement of performance in the development of energy-efficient software through the application of Artificial Intelligence and the use of programming strategies.

What we offer (Research support):

Research facilities

The candidate will be hosted at the Extremadura Supercomputing Centre, located in Caceres (a World Heritage City), which operates an infrastructure consisting of several supercomputers recognized as a unique asset in the Spanish research system. COMPUTAEX operates a modern Data Processing Center equipped with advanced supercomputing infrastructure, including over 3,600 cores and 40,000 CUDA cores, recently expanded with two racks from the MareNostrum 4 supercomputer, which will multiply its current CPU computing capacity by five. Additionally, the upcoming LUSITANIA 4 supercomputer is expected to increase the center's operational speed tenfold. In parallel, a Quantum Emulation Service will be deployed to run advanced algorithms in artificial intelligence and quantum cryptography, positioning Extremadura as a reference in emerging technologies. COMPUTAEX offers these resources to researchers, companies, and institutions, providing capabilities for quantum simulation, cloud computing, machine learning, and data science, with secure access through national and international academic networks such as RedIris and GÉANT. The centre provides services to the research systems of both the region and the country as part of the Spanish Supercomputing Network. COMPUTAEX is a foundation fully committed to research and knowledge development. It employs a team of researchers who work in various fields of technology, such as HPC, parallelization and optimization, quantum computing, artificial intelligence, cybersecurity, and HPC code efficiency, as well as in various application areas, such as cosmology, pharmacogenomics and personalized medicine, energy efficiency, and precision agriculture. Candidates are welcome to join any of the research projects developed, as well as to propose and develop their own ideas.

Networking possibilities & external relations:

COMPUTAEX is part of the Spanish Supercomputing Network (RES), which is a Singular Scientific and Technical Infrastructure (ICTS) distributed throughout Spain, consisting of the interconnection of 14 nodes with the aim of offering supercomputing, data management, and artificial intelligence resources and services to the scientific community. The institution has multiple collaborations with researchers from international centres in different fields of science and technology. The Foundation also has a Research Group included in the SECTI (Extremadura Science, Technology, and Innovation System) formed by the set of public and private entities focused on R&D&I activities. In this context, COMPUTAEX has led and participated in coordinated projects in collaboration with a broad network of public and private organizations, fostering strong external relations and strategic partnerships at both national and international levels.

Project idea/position (scientific requirements, topic, discipline):

We are looking for postdoctoral researchers interested in joining a multidisciplinary research initiative focused on code optimization and energy efficiency in High-Performance Computing (HPC) environments. The core of the research lies in the application of Artificial Intelligence (AI) techniques to analyse, improve, and automate the development of efficient software, aiming to reduce execution times and energy consumption. Candidates should have a background in areas such as computer engineering, software optimization, or parallel computing, along with strong programming skills. Experience in HPC environments will be highly valued. This research offers the opportunity to collaborate with a broad network of public and private institutions at both national and international levels, and to contribute to diverse research projects at COMPUTAEX where Artificial Intelligence is increasingly being applied as a key enabling technology across disciplines.

What we expect from you (requirements, preferences):

Our preference would be to participate in a **European Fellowship** application.

Furthermore, you should:

- Have a PhD degree at the time of the deadline for applications.
- At the call deadline, you must not have more than 8 years full-time equivalent experience in research, measured from the date of award of the doctoral degree
- Have not been in Spain for more than 12 months in the 3 years before the call deadline.
- Your profile should comply with the requirements identified in the call. Please, visit the call text and read requirements carefully.

Documents to be submitted and deadline

Applicants should submit his/her CV and a letter of motivation latest until …,   to amelia.aguilar@fundecyt-pctex.es with subject line **MSCA-PF-2025 and indicating the Hosting Offer title.**