Call reference number	(2025-29)
Call name	Predoctoral researcher position: Artificial intelligence techniques for material surrogate models in multiphysics simulations
Application Deadline	2025/10/03

Introduction and main description

BCMaterials, Basque Center for Materials, Applications and Nanostructures, is an autonomous research centre located in Leioa (Spain) and established in June 2012 by Ikerbasque, the Basque Foundation for Science and the University of the Basque Country (UPV/EHU. The centre is included in the BERC's (Basque Excellence Research Centers) network, and its mission is to generate knowledge on the new generation of advanced materials, turning this knowledge into (multi)functional solutions and devices for the benefit of society.

Smart multiphysics materials are driving revolutionary progress in sectors from renewable energy and electric transport to biomedical devices and smart infrastructure. However, capturing their behaviour, spanning nano to macro scales and involving tightly coupled mechanical, electrical, thermal, and magnetic phenomena, poses a significant computational burden. Multiphysics multiscale materials modelling can resolve these complexities but often require impractical amounts of time and resources, while simplified models sacrifice accuracy and omit critical interactions. The SUMMIT project addresses this length scales link by creating an innovative AI-based framework that captures the microscale interplay and insert them into large scaled multiphysics simulations, capturing realistic responses and leveraging its efficiency for topological optimization of devices.

By generating massive artificial data and introducing into neural networks, the machine learning techniques are able to deliver not only efficient but also physically consistent predictions, which can be extrapolated to a large scale simulations. This novel methodology holds promise for transforming materials research, allowing scientists and engineers to explore broader design spaces with confidence, accelerate prototyping cycles, and tailoring material properties to cutting-edge application requirements such as soft robotics, electronics, biomedical devices or advanced energy storage systems needed for clean-energy transition.

In this role, the candidate will pioneer the application of these AI-based frameworks to high-impact domains, such as, polymer composites enhanced with magnetic or piezoelectric inclusions. This research will involve validating the AI models against microscale finite-element simulations, demonstrating neural networks' capability to capture complex, multiphysics phenomena across scales. Working alongside experts in computational physics, materials science and high-performance computing, you will help establish this technology as the new standard in predictive materials modelling.

This predoctoral position is funded by the State Plan for Scientific and Technical Research and Innovation 2024-2027, which is a strategic programme promoted by the Ministry of Science, Innovation and Universities of the Spanish Government to promote generation of scientific-technical knowledge and experimental development. The project funding will end on 31/08/2028.

The project will be carried out in the Computational Materials Science group at the BCMaterials centre located in Leioa (Spain) under the supervision of Dr. Sergio Lucarini, in collaboration with Dr. Adrià Quintanas-Corominas from Barcelona Supercomputing Center.

Skills and Requirements
The candidate must have Master's degree (or close to completion) or equivalent in Engineering, Materials Science, Chemistry, Physics, Mathematics or related areas. Capacity for teamwork in an interdisciplinary and international environment. Self-motivation and willingness to perform research. Creativity in problem solving. Ability and eagerness to learn new skills outside own discipline. Programming, machine learning and physics simulation knowledge is appreciated although not mandatory.

Work Program / Duties / Responsibilities
The main task of the project is the development of AI-based models able to predict microscale multiphysics behaviour. This includes artificial data generation, computational programming, materials physics theoretical development and generating workflows. Specifically, deep learning neural networks will be developed and multiphysics equations in materials problems will be resolved using finite elements (FEM) and high performance computing (HPC) clusters.

Application Procedure
Apply by submitting a motivation letter and a CV (in English) using the "Contact" button at the corresponding offer, at the "Join Us" area on BCMaterials' portal (https://www.bcmaterials.net/join-us). Your name and email address will be required for furher contact too.

Other Relevant Information
The interviews will take place shortly after the deadline. The flexible start date is 13/10/2025. Please do not hesitate to contact sergio.lucarini@bcmateirals.net with any questions. We provide a highly stimulating and interdisciplinary environment, with state-of-the-art infrastructures and unique professional career development opportunities. We offer and promote a diverse and inclusive environment and welcome applicants regardless of age, disability, gender, nationality, ethnicity, religion, sexual orientation or gender identity.