



Career positions Announcement

Doctoral fellowships at the Institute of Advanced Materials at Universitat Jaume I, Spain

2023 05 19

Doctoral fellowships in the formation of neural networks with halide perovskites (ERC AdG project)

Area of Research: Our research focusses on building neurons, synapses and operating neural networks with halide perovskites and organic materials. The goal is to build an operational artificial retina for visual recognition of objects fully constructed with these materials. The research involves the investigation of device physics for the functional properties of neurons and synapses, and the fabrication of the material elements with the required properties.

Our approach is to unite basic and applied science in order to pursue this goal. Our team gathers and relies upon experts in chemistry (synthesis, device making, sub microscale fabrication), physics (device properties, impedance spectroscopy, time transient response) and engineering (especially materials synthesis/properties/processing, electrical engineering, chemical engineering).

The specific program we lead is related to the ERC Advanced Grant “Perovskite Spiking Neurons for Intelligent Networks” led by Juan Bisquert. The Project aims to develop compact miniature material elements that will emulate closely the complex dynamic behaviour of neurons and synapses, to form Spiking Neural Networks with substantial reduction in footprint, complexity and energy cost for perception, learning and computation. This method will produce the hardware that we need for a preferred spiking computational model, incorporating time, analog physical elements and dynamical complexity as computational tools. We will show visual object recognition from spiking data provided by a spiking retina by advanced neuristors and dynamic synapses.

Description of Duties: Successful candidates will place their major focus on achieving original first-authored publications in interdisciplinary academic journals. They will work effectively in a team environment and will value the chance to reach across disciplines. They will have the opportunity to develop a PhD degree at the Doctoral School of Universitat Jaume I.

2 × PhD contracts

Applicants must have a master's degree, or be close to receiving it, in an area of science or engineering. Candidates must be interested in pursuing a PhD degree in an area of

materials science that includes chemistry, physics and engineering. Applicants must have a degree in chemistry, physics, materials science or engineering. Candidates with expertise in fundamental methods for preparation of solar cells or memristors will be highly advantageous. Relevant experience in halide perovskite and organic materials optical and electrical characterization will also be highly desired.

PhD 1: The research will focus on the design, fabrication, and investigation of neural networks and neuromorphic systems. The PhD will be highly connected to the fabrication of perovskite materials and buffer layers to obtain the desired electrical response. The candidate will fabricate individual pixel devices, cross-bar arrays and will work on the miniaturization of the memory devices to a size of $1 \times 1 \text{ micron}^2$ using lithography methods. The candidate will work on the formulation, deposition and chemical characterization of 2D, lead-free perovskite materials and organic semiconducting materials.

PhD 2: The research will focus on understanding the device physics of memristors and neural networks by using opto/electrical methods. Advanced electrical techniques like impedance spectroscopy or time transient response will be investigated as well as modeling and simulation of the electrical response. The candidate will gain experience in designing the set-up for opto/electrical measurements and programming measurements and simulations using a range of dedicated software. Previous experience programming in Labview, Python, or Matlab will be highly advantageous.

Salary: ~20,000 €/year

Expected Start Date: September 1, 2023, or as soon as possible thereafter

Appointment: Term – (12 months) with a possible renewal up to four years

How to apply:

Please include in your application package a cover letter; your full academic CV; your two most relevant publications, information on 2 referees that are prepared to be consulted; and a motivation letter of why you want to be part of this project. Please send **as a single combined PDF whose file name includes your first and last names** to Juan Bisquert (bisquert@uji.es) with the subject line **Perovskite application Doctoral** by June 20, 2023. Evaluation of candidates will begin immediately and continue until filled.

Posting Date: May 19, 2023

Closing Date: June 20, 2023