

## PhD position (FPI fellowship) on COMPLEX QUANTUM SYSTEMS for MACHINE LEARNING

We look for outstanding and motivated candidates with a Master related to Physics and a background in Quantum Physics to pursue a PhD at IFISC (UIB-CSIC), Spain. [IFISC](#) (Institute for Cross-Disciplinary Physics and Complex Systems) is a joint research institute of the University of the Balearic Islands ([UIB](#)) and the Spanish National Research Council ([CSIC](#)) recognized as a "Unit of Excellence" [María de Maeztu Award](#) and a member of the [SOMMa alliance](#), which brings together the cutting-edge research centers and units in Spain.

The 4-years FPI fellowship is associated with the project Complex Quantum Systems funded by Agencia Estatal de Investigación and led by Prof. Roberta Zambrini, Dr. Gian-Luca Giorgi and Dr. Gonzalo Manzano. The program aims at different topics in quantum complex systems and machine learning, including:

- **Quantum reservoir computing:** study of basic concepts of quantum machine learning and in particular reservoir computing techniques and their quantum implementation. Study of numerical methods to simulate spin and boson networks and implementations for relevant models for the implementation of quantum tasks in quantum reservoir computing and other neuromorphic computing approaches.
- **Thermodynamics of reservoir computing:** Fundamental properties of (quantum) stochastic thermodynamics and methods to simulate quantum trajectories. Application to assess the energetic costs of quantum reservoir computing architectures.
- **Variational quantum methods:** The acquired knowledge on monitored quantum systems will be applied to other settings, including different neuromorphic computing approaches and variational quantum methods.

The successful candidate will enroll in the Ph.D. Program in Physics of the University of the Balearic Island, which has been awarded the Excellence Mention of ANECA. The Program offers academic and professional training at the highest scientific level and puts the focus on the capacity to face and solve problems and make original contributions to knowledge in various fields of physics. A research stay (at least 3 months) with another group, e.g., associated with external collaborators involved in the CoCuSy project, in Finland, France, or Germany, is planned.

The host institute (IFISC) provides a stimulating environment for the training of young scientists, with a program of weekly seminars, group meetings, journal clubs, conference participation, visits to leading researchers, and outreach activities.

IFISC is committed to equal opportunity and diversity. We welcome applications from all qualified candidates. Women and members of underrepresented minority groups are particularly encouraged to apply.

Interested candidates should send **by 10/9/2023**

-motivation letter

-CV together with a transcript of academic records

-contact of one or two researchers willing to provide a recommendation letter to

Roberta Zambrini (IFISC): [roberta@ifisc.uib-csic.es](mailto:roberta@ifisc.uib-csic.es)