URJC Escuela Internacional de Doctorado

EULiST

PhD Thesis Project Offer

(valid during the calendar year 2025)

Provisional Title of the Doctoral Thesis

Development of AI Models to Address Inconsistencies between Quantum Mechanics and General Relativity

Subject area* / Research line

Engineering and Architecture Artificial Intelligence Applied to Quantum Mechanics and General Relativity

Summary of the Doctoral Thesis (maximum 300 words)

This doctoral thesis focuses on the use of advanced artificial intelligence (AI) techniques to address the fundamental discrepancies between quantum mechanics and general relativity—two of the most important pillars of modern physics. Despite significant progress in both fields, a conceptual and mathematical gap remains, hindering the development of a unified theory of the universe. This project proposes the development of innovative AI methods, such as deep neural networks, machine learning, and optimization algorithms, with the aim of modeling and identifying patterns that may offer a resolution to these conflicts. The approach of the thesis will be divided into several phases: first, the main challenges and points of disagreement between the two theories will be analyzed; next, AI models will be designed to simulate and predict quantum and relativistic behaviors in complex contexts, such as quantum gravity. Finally, the capacity of these algorithms to generate new, experimentally testable hypotheses will be evaluated, potentially advancing toward a more integrated theory. This work will also explore the philosophical and practical implications of unifying these two domains of physics and their potential impact on emerging technologies such as quantum computing.

Is the development of this thesis associated with the execution of any research project? If so, provide details of the project (title, funding entity, and execution period)

Academic Profile of the Student (maximum 200 words)

The candidate should possess a strong background in theoretical physics, particularly in the fields of quantum mechanics and general relativity, as well as knowledge of programming and artificial intelligence algorithms. Experience with programming languages such as Python, R, or MATLAB is desirable, along with familiarity with machine learning tools and neural networks. In addition, the ideal candidate must be capable of working independently while also demonstrating strong teamwork skills, given the complex and multifaceted nature of the project. The ability to read and critically analyze advanced scientific literature, and to communicate findings clearly and effectively—both in writing and oral presentations—is

essential. A strong research mindset, intellectual curiosity, and a genuine interest in addressing some of the most fundamental problems in physics will be especially valued.

Contact: institutional email of the Supervisor

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*See the Subject Areas at https://www.urjc.es/informacion-practica#oferta-proyectos-de-tesis.
Each project will be included in a single subject area.