

# PhD Scholar Opening

Joint ANR/FAPESP BRAZIL-FRANCE

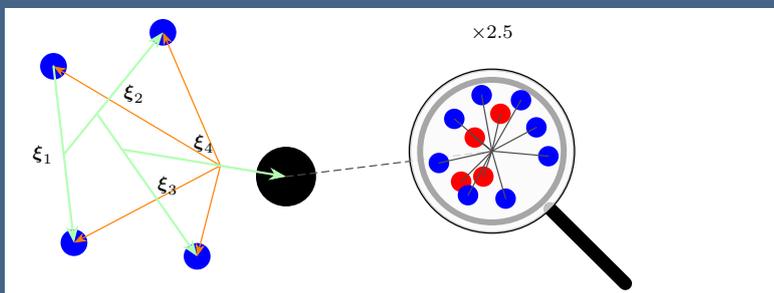
## Application of Artificial Intelligence for the Efficient Solution of Faddeev-Yakubovsky Equations in Nuclear Physics

### The opportunity

This PhD project is a central part of the international ANR-FAPESP project **FBCUBES** (France-Brazil Collaboration on Universal Behavior of Exotic Nuclear Systems). The FBCUBES project aims to develop a unified theoretical framework to understand the structure and dynamics of exotic, neutron-rich nuclei, which are a primary focus of modern nuclear-physics research at international facilities such as GANIL-SPIRAL2 (France), FAIR (Germany), and RIKEN (Japan).

A key challenge in this field is solving the quantum-mechanical equations for systems of multiple interacting particles (few-body systems). The **Faddeev-Yakubovsky (FY) equations** provide a rigorous mathematical framework for this, but their solution is notoriously complex and computationally expensive, which limits their range of applications. This PhD thesis will address this challenge directly by pioneering the integration of **Artificial Intelligence (AI)** and Machine Learning (ML) techniques into FY numerical solvers. This innovative approach is expected to enable a step change in our ability to solve these fundamental equations, making problems that are currently intractable accessible.

We are seeking a highly motivated candidate with a Master's degree in Theoretical Physics, Computational Physics, or a closely related field.



### Scientific Context

The student will be based at INPHYNI in Nice, within a research group with expertise in few-body physics and AI applications, and will work in close day-to-day collaboration with Dr. Rimantas Lazauskas (IPHC, Strasbourg), a world-leading expert on the FY method.

### Competency Levels (desired)

**Quantum mechanics and numerical methods:**



**Programming skills:**



**Prior experience with AI/ML:**



**Team work:**



Promenade des Anglais at sunset, from the Colline du Château from Wikipedia.

### Host Lab:

CNRS-Physique/INPHYNI  
Université Côte d'Azur

### Main collaborator:

Dr. M. Gattobigio   
Dr. R. Lazauskas 

### FCUBES PIs:

Dr. R. Lazauskas  
Prof. T. Frederico 

### Apply at:

Dr. Mario Gattobigio