INTERNSHIP PROPOSAL

(One page maximum)

Laboratory name: Eviden Quantum Lab
CNRS identification code: N/A
Internship director'surname: Thomas Ayral
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Web page: https://eviden.com/solutions/advanced-computing/quantum-computing/
Internship location: Les Clayes-sous-Bois

Thesis possibility after internship: YES
Funding: YES If YES, which type of funding: Eviden

High-precision numerical assessment of quantum error correction performance

Quantum error correction (QEC) is the holy grail of quantum computing because it allows to counter the deleterious influence of decoherence. Yet, it comes at a price: hardware noise must be under a given threshold for QEC to deliver improved performance. The most widespread way of estimating the QEC threshold involves making several assumptions as to the hardware noise and the decoding process. These assumptions allow for an efficient numerical simulation of the QEC process, but yield only approximate thresholds.
The goal of this internship is to compute more realistic QEC thresholds by removing the simplifying assumptions. This leads to much more complex numerical simulations, yet also much more useful predictions that could be used to tailor QEC codes to a given hardware. The internship will greatly benefit from the HPC Qaptiva emulators.

Reference: http://arxiv.org/abs/1711.04736

The Eviden quantum laboratory is based in les Clayes-sous-Bois in the Paris area. It is a research and development team whose focus is quantum computing. Our goal is to make quantum computing useful by providing quantum programming languages and libraries (including compilation tools for most existing quantum hardware), by delivering powerful realistic classical simulators (digital twins) of quantum processors to predict and improve the outcome of experimental quantum computations, and by developing new algorithms for a wide spectrum of applications ranging from quantum many-body physics (condensed matter, quantum chemistry) to combinatorial optimization over differential equations. These developments are made concrete, in particular, in Eviden's Qaptiva platform, our quantum programming platform.
The internships we propose typically involve Python programming. Basic knowledge in quantum mechanics, a solid understanding of linear algebra, fluent Python and English, and a will to learn are skills you will definitely put to use here. Experience with tensor networks, condensed matter physics, git, linux or C++ are also appreciated.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: NO Soft Matter and Biological Physics: NO
Quantum Physics: YES Theoretical Physics: YES