Felicidades a la nueva graduada de doctorado del ICFO

La Dra. Aikaterini Gratsea se ha graduado con una tesis titulada ?Introducing tools to quantify the performance of quantum computing algorithms and their applications'

July 18, 2024

Felicitamos a la Dra. Aikaterini Gratsea que hoy ha defendido su tesis en el Auditorio de ICFO. La Dra. Gratsea obtuvo su Master en Fisica Avanzada por la Universidad de Creta. Se unio como estudiante de doctorado en el grupo de investigacion de Quantum Optics Theory dirigido por el profesor ICREA Dr. Maciej Lewenstein.
La tesis de la Dra Gratsea ?Introducing tools to quantify the performance of quantum computing algorithms and their applications' fue supervisada por el profesor ICREA Dr. Maciej Lewenstein y el Dr. Patrick Hümbeli

RESUMEN:
In this thesis, I focused on introducing tools to quantify the performance of quantum computing algorithms and their applications. The main focus is on two of the most popular

application areas of quantum computing, quantum machine learning and quantum chemistry. To this end, I analyze the properties of quantum machine learning models by following statistical method techniques, which can help us build our understanding of the capabilities of such quantum models. Moreover, I introduce the teacher-student scheme as a computational tool to benchmark the performance of different quantum models and their training capabilities. Until large-scale benchmarking is available, these tools can help us understand the potential of quantum machine learning and guide the research in the right direction. Next, in recent years substantial effort have been devoted to the development of quantum algorithms for quantum chemistry applications. I introduce tools to assess the utility of various combinations of quantum chemistry algorithms. I perform extensive numerical simulations on computationally affordable systems of intermediate size to explore how quantum methods can accelerate tasks of quantum chemistry. These works set a foundation from which to further explore the requirements to achieve quantum advantage in quantum chemistry. Finally, I discuss how research in quantum computing has tended to fall into one of two camps: near-term intermediate scale quantum (NISQ) and fault-tolerant quantum computing (FTQC). Through a quantum chemistry application, I explore how to use quantum computers in transition between these two eras, namely the early fault-tolerant quantum computing (EFTQC) regime.

Comite de Tesis:
Dr. Erik Torrontegui Munoz, Universidad Carlos III de Madrid
Prof. Dr. Antonio Acin, ICFO
Dr. Michal Tomza, University of Warsaw

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