

Spring School on Open-Source Tools for Quantum Computing & Simulation

March 29, 2023 to March 31, 2023
ICFO Auditorium

Outline:

The growing attention towards Quantum Computing and Quantum Simulations in academia and industry is leading to an increased attention to educate and train more students in this matter. In this context, learning not only the theory behind but also the tools needed to solve computational problems is extremely important for the students that want to work in this field. This Spring School is meant to cover (not exhaustively) both theory and tools to build that core knowledge needed for moving the first steps of a career in Quantum Computing & Simulations.

The program includes a 2-day hands-on workshop led by researchers from ICFO and IBM Quantum aimed at introducing students and researchers to several open-source tools, and their use in cutting-edge research, followed by a 1-day symposium with researchers from ICFO, IBM Quantum and invited speakers from the wider research community sharing their

latest research results.
The school is offered as a pilot activity within the framework of the **DigiQ - Digitally Enhanced Quantum Technology Master**, a new European initiative financed through the European Commission's Digital Europe Programme.
The school is aimed at Masters students, PhD students and researchers in the field who are interested in familiarizing themselves with the use of these tools in a cutting-edge research environment.

Program:
Day 1, Wednesday 29 March: Open-Source Software for Quantum Information

General quantum computing frameworks (Qiskit)
Hardware implementations (superconducting qubits & open-pulse)

Day 2, Thursday 30 March: Research with Open-Source Quantum Computing Tools

Quantum info packages (Qiskit Quantum-info / Dynamics)
Quantum computing applications (QML, Optimization & Simulations)

Day 3, Friday 31 March: Symposium on Open-Source Tools for Quantum Computing & Simulation

Confirmed speakers include:

Dario Gil, IBM
Elisa Baumer, IBM
Antonio Acin, ICFO
Michele Grossi, CERN
Almudena Carrera Vazquez, IBM
Philipp Hauke, University of Trento
Alba Cervera Lierta, BSC
Annabelle Bohrdt, Harvard University
Zoe Holmes, EPFL
Sarah Hirthe, ICFO
Fabian Grusdt, LMU

The school will also be followed by a hackathon organized by IBM Quantum, the Quantu Barcelona Community, & ICFO in Barcelona the weekend of 1-2 April.

There are **limited places** available for both the workshop and the symposium. Preference will be given to Masters students.

Registration:
The registration is open to attend the workshop (in person at ICFO, on March 29-30) and/or the Symposium (in person or online, on March 31).
The deadline for registration to the school is Friday 10 March 2023.

Travel Fellowships:
We will offer up to **10 travel fellowships** for **Masters Students** interested in attending the school. The fellowships will include reimbursement of travel expenses of up to ?350 and accommodation for 4 nights at a local hotel.
To benefit from a fellowship, you **must be currently enrolled in a master program**. Priority will be given to students enrolled in a master program at one the partner institutions in the DigiQ - Digitally Enhanced Quantum Technology Master.
All required application material must be complete in order to be considered. We reserve the right to revoke the fellowship if any of the requested information is false or incorrect.
The deadline for applications for travel fellowships is Friday 10 March 2023.
Applicants will be notified the results the week of 13 March 2023.

Participating institutions:?

ICFO - the Institute of Photonic Sciences, is a young research institution that aims to advance the very limits of the science and technology of light, tackling important challenges faced by society at large in all areas of life, including health, energy, information, safety, security and caring for the environment. ICFO is a member of BIST, the Barcelona Institute of Science and Technology. More information about ICFO can be found here.
IBM Quantum is an industry leader in quantum computing, working everyday towards achieving quantum advantage. IBM's full-stack approach delivers the best of IBM's quantum computing systems together with the most complete suite of quantum software tools and cloud services. Learn, develop, and run programs with quantum applications and systems through cloud access to the most advanced quantum computers available. Learn more here
DigiQ (Digitally Enhanced Quantum Technology Master), a new European initiative coordinated by the University of Aarhus (DK), aims to drive transformation of the education ecosystem by introducing a number of educational innovations and a multinational programme structure to prepare the workforce and talent for future quantum technologies. It is funded by a ?17.6 million grant over four years through the European Commission's Digital Europe Programme. Twenty universities from ten European countries will participate in DigiQ,

including partners from the Master in Quantum Science and Technology Barcelona, coordinated by the University of Barcelona.

Organization:

Fabio Scafirimuto and Albert Garcia (IBM)
Rob Sewell, Joana Fraxanet Morales, Paolo Stornati, Pedro Cruz, Borja Requena and Gabriel Fernandez Fernandez (ICFO)
Antonio Acin, Leticia Tarruell and Maciej Lewenstein (ICFO)

Sponsorship & Acknowledgements:
This project has received funding from the European Union's Digital Europe Programme under grant agreement no. 101084035
The school is sponsored by IBM Quantum, an industry leader in quantum computing, working everyday towards achieving quantum advantage.