

High Performance Computing and Quantum Computing 2021 – Fourth Edition

CINECA Workshop – 15-16 December 2021 – Online

Organizers: Daniele Ottaviani (CINECA), Riccardo Mengoni (CINECA),
Enrico Prati (CNR-IFN)

Registration link:

<https://eventi.cineca.it/en/events/workshop-quantum-computing-and-high-performance-computing-4th-edition>

DAY 1 – 15 December 2021

09:30 – 10:00 – **Welcome** (Daniele Ottaviani, Enrico Prati, Sanzio Bassini, Prof. Bruno Apolloni, Prof. Diego De Falco)

Prof. Bruno Apolloni and Prof. Diego De Falco will open the Workshop with Historical remarks on quantum annealing

Quantum Hardware and Software Providers I (Chairman: Riccardo Mengoni)

- 10:00 – 10:30 Andy Mason, D-Wave Systems Inc.
D-Wave Advantage Performance Update
- 10:30 – 11:00 Sebastian Grijalva, Pasqal
Programming a Neutral Atom Quantum Processor: Applications and Emulation
- 11:00 – 11:15 Coffee Break
- 11:15 – 11:45 Federico Mattei, IBM
IBM Quantum: growing quantum performance and quantum network
- 11:45 – 12:15 Fabio Baruffa, AWS
Amazon Braket: an integrated software development environment for quantum computing in the cloud

12:15 – 13:15 Lunch

Relationship between QC and HPC in Europe: European Supercomputing Centers (Chairman: Daniele Ottaviani)

- 13:15 – 13:45 Ariana Torres-Knoop, SURF (Netherlands)
SURF's experience diving in the quantum computing world

- 13:45 – 14:15 Luigi Lapichino, LRZ (Germany)
Quantum Computing as innovation tool for HPC: the Quantum Integration Centre at LRZ
- 14:15 – 14:45 Artur Garcia, BSC (Spain)
An HPC Library for Out-of-Core Quantum Computing Simulation
- 14:45 – 15:15 Jean-Philippe Nominé, CEA (France)
Quantum Computing and HPC perspective at CEA
- 15:15 – 15:30 Coffee Break
- 15:30 – 16:00 Venkatesh Kannan, ICHEC (Ireland)
A full-stack approach towards strongly-coupled HPC-QC systems and applications
- 16:00 – 16:30 Mikael Johansson, CSC (Finland)
Pooling HPC and quantum resources across borders: a Nordic example
- 16:30 – 17:00 Andrés Gomez, CESGA (Spain)
The hybrid classical-quantum computing: The case of the Hybrid Quantum algorithm to classify Hermitian matrix definiteness
- 17:00 – 17:30 Kristel Michielsen, JSC (Germany)
JUNIQ: HPC-QCS infrastructure for practical quantum computing

DAY 2 – 16 December 2021

Quantum Computing Research in Italy (Chairman: Enrico Prati)

- 10:00 – 10:20 Elisa Ercolessi, University of Bologna
Bayesian Adaptive Techniques for Quantum Optimization on NISQ Devices
- 10:20 – 10:40 Chiara Vercellino, LINKS Foundation
Near-Optimal Graph Coloring on Neutral Atoms Quantum Computer
- 10:40 – 11:00 Lorenzo Moro, Polytechnic University of Milan and CNR-IFN
Quantum Control And Quantum Compiling By Deep Learning
- 11:00 – 11:20 Filippo Caruso, University of Florence/CNR
Quantum Machine Learning for HPC Quantum
- 11:20 – 11:35 Coffee Break
- 11:35 – 11:50 Riccardo Molteni*, University of Milano Bicocca and CNR-IFN
Quantum Echo-State Network for time series prediction
**Short Student Talk*
- 11:50 – 12:10 Michele Campisi, CNR
Energetics Of Quantum Computation
- 12:10 – 12:30 Sebastiano Pilati, University of Camerino
Accelerating Spin-Glass Simulations Using Quantum Annealers Through Deep Learning

- 12:30 – 12:50 Giuliana Siddi Moreau, CRS4
Gravity Data Inversion With Adiabatic Quantum Computer

12:50 – 14:00 Lunch

Quantum Hardware and Software Providers I (Chairman: Lorenzo Moro)

- 14:00 – 14:30 Artur Stabrawa, ORCA Computing
Quantum Machine Learning with ORCA PT-series: near- and long-term prospects
- 14:30 – 15:00 Albert Solana, Qilimanjaro Quantum Tech
Bringing quantum capabilities to the HPC centers
- 15:00 – 15:30 Bruno Taketani, IQM
Co-Designing Quantum Accelerators
- 15:30 – 15:45 Coffe Break
- 15:45 – 16:15 Mattia Fiorentini, Cambridge Quantum Computing
Applications and scientific challenges of universal hybrid quantum computation
- 16:15 – 16:45 Amara Katarwa, Zapata Computing
Reducing runtime and error in VQE using deeper and noisier quantum circuits
- 16:45 – 17:00 Coffe Break
- 17:00 – 17:15 Ben Bloom**, Atom Computing
Building a Scalable, Universal Quantum Computer Using Neutral Atoms
**Recent results highlight
- 17:15 – 17:45 Alex McCaskey, NVIDIA
Accelerating Quantum Algorithms Research with cuQuantum

17:45-17:50 **Concluding remarks** (Sanzio Bassini, Daniele Ottaviani, Enrico Prati)