

# Quantum Computing CAMK

## Report for 2024

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CAMK PAN reporting meeting  
Warsaw, 22 January 2025

# Group members

## Researchers

- Piotr Gawron
- Tomasz Rybotycki
- Piotr Kalaczyński

## Past members

- Manish Gupta

## Collaborators

- Ryszard Kukulski (UJ, IT4I)
- Mateusz Ostaszewski (PW)
- Grzegorz Rajchel-Mieldzióć (NASK)
- Krzysztof Leszczyński (CAMK)
- Mateusz Stępniać (UJ)
- Chloé Pennerat (Institut Supérieur de l'Aéronautique et de l'Espace, ENSMA)

# Section 1

## Projects



# GIGANT

Gravitational-wave Insights through Global Analysis with Next-generation Technologies

## Goal

To explore the application of Quantum Machine Learning and quantum algorithms to Gravitational Wave data analysis.

## Partners

- Institut für Geophysik, ETH Zürich, Switzerland
- Institute of Space Science, Romania
- Department of Physics of Complex Systems, Institute of Physics and Astronomy, Eötvös Loránd University, Hungary

Submitted to Swiss National Science Foundation

# QEDAS

Quantum-Enhanced causality Discovery for Algorithmic Security analysis of complex networked systems

## Goal

Apply Quantum Computing to speed-up causal discovery in time-series data.

## Partners

- VSB — Technical university of Ostrava, IT4Innovations, Czechia
- University of Galway, Ireland

Submitted to NATO Science for Peace and Security program<sup>1</sup>.

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<sup>1</sup>1<sup>st</sup> attempted failed, project resubmitted

# EUROQHPC-I

Integration of European quantum computers and simulators into HPC supercomputers

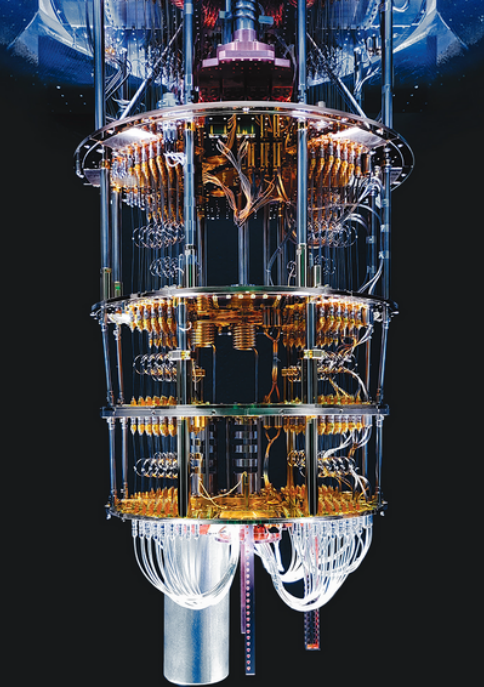
## Goal

Integration of European High Performance Computing and Quantum Computing systems.

## Partners

- 30 organizations from Europe

Submitted to DIGITAL-EUROHPC-JU-2022-HPCQC-04-IBA. Project accepted.



# LUMI-Q

## Large Unified Modern Infrastructure-Quantum

### Goal

To acquire, operate and integrate with HPC systems a 24-qubit quantum computer.

### Partners

- VSB — Technical University of Ostrava, IT4Innovations National Supercomputing Center, CZ,
- CSC — IT Center for Science, FI,
- VTT Technical Research Centre of Finland Ltd, FI,
- Chalmers University of Technology, SE,
- Danish Technical University, DK,
- Akademickie Centrum Komputerowe CYFRONET AGH, PL,
- Sigma2 AS, NO,
- Simula Research Lab, NO,
- SINTEF AS, NO,
- Deutsches Zentrum für Luft- und Raumfahrt, DE,
- University of Hasselt, BE,
- TNO Netherlands Organisation for Applied Scientific Research, NL,
- SURF BV, NL.



## Section 2

# Collaboration with industry and other activities



## Goal

Develop compiler software for an ion-trapped quantum computer located in Warsaw.

## Components

- Experiment life-cycle management
- Experiment-related data storage and management
- Queue management
- Digital model of the ion trap
- Measurement module

# Other activities

## Outreach and trainings

- Julia tutorial for Geoplanet students ( $3 \times 8h$ ).
- Presentation at Geoplanet meeting in Sopot.

## Popular science lectures

- National museum of technology, Warsaw.
- Copernicon — S-F convention.
- Silesian Festival of Science, Katowice.

## Other

- Mentorship for a UW PhD student.

# Papers



Piotr Gawron, Przemysław Sadowski, Przemysław Glomb, Bartłomiej Gardas, Matthijs Van Waveren, Clément Forray, Guillaume Pasero, Mickaël Savinaud, Pierre-Marie Brunet, Orphée Faucoz, et al.

What could be achieved with a million qubits quantum annealer in remote sensing?

In *IGARSS 2024-2024 IEEE International Geoscience and Remote Sensing Symposium*, pages 475–478. IEEE, 2024.



Tomasz Rybotycki and Piotr Gawron.

Aqmlator—an auto quantum machine learning e-platform.  
*arXiv preprint arXiv:2409.18338*, 2024.



# Thank you

## This year goals

- Promote CAMK PAN's expertise in quantum technologies — enhance visibility.
- Establish more collaborations in Poland.
- Acquire new group members.
- Write some good software for this damn quantum computer of ours!

