

Quantum Excellence Centre for Quantum-Enhanced Applications (QEC4QEA)

[European Quantum Excellence Centers \(QECs\) in applications for science and industry \(HORIZON-EUROHPC-JU-2023-QEC-05\)](#)

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Quantum computing has the potential to revolutionize science and technology, offering breakthroughs in optimization, cryptography, machine learning, materials science, and drug discovery. However, challenges including the lack of standardized tools, specialized training, infrastructure access, and limited industrial collaboration hinder its impactful progress or adoption. The QEC4QEA project seeks to overcome these obstacles by building a unified platform to accelerate the development and integration of quantum-enhanced applications across various scientific and industrial fields.

QEC4QEA will provide a suite of resources, including a hardware-agnostic application library, benchmarking tools, compilers, APIs, and curated access to high-performance computing and quantum computing infrastructures. The project will refine its capabilities through agile development while promoting cross-disciplinary collaboration. A training program and help desk will support scientists and developers, enabling them to build and integrate quantum-enhanced solutions. By focusing on applications such as complex multi-objective optimization, advanced cryptography, quantum-enhanced machine learning, accelerated materials discovery, financial crash prediction, image analysis, graph classification and routing, QEC4QEA aims to demonstrate quantum computing's practical potential.

Leveraging the collective expertise of its consortium and engaging industries like finance, pharmaceuticals, and supply chain management, QEC4QEA will deliver impactful solutions for real-world needs. This outreach strategy will foster collaboration between academia and industry, translating scientific breakthroughs into commercial applications. QEC4QEA will eliminate the barriers to adoption and catalyze a rapid shift from theoretical potential to practical deployment. These deployments might then enable new pathways for quantum computing applications with accelerated societal and economic benefits.

The consortium consist of five European clusters. Our local cluster includes PSNC, AMU, CPT PAS, and VU. Poznan Supercomputing and Networking Center (PSNC), affiliated to the Polish Academy of Sciences, is a R&D center in the field of information and communication technologies. The Adam Mickiewicz University (AMU) has a rich history of theoretical and experimental research in quantum information, quantum optics, open quantum systems, condensed matter, quantum chemistry, and cavity QED. It is the first academic member of IBM's quantum hub in Poznan. The research of the Center for Theoretical Physics of the Polish Academy of Sciences (CPT PAS) focuses, among other topics, on quantum information and quantum technologies. Vilnius University (VU) is the largest university in Lithuania and is involved in multidisciplinary academic activity. VU is home to Lithuania's largest supercomputer and is a founding member of Quantum Lithuania, an organization dedicated to advancing quantum technologies in the country.