

Press release

Groundbreaking QRC-4-ESP project launched

12 February 2024

Launched recently during a kick-off meeting at Loughborough University, the QRC-4-ESP project (www.qrc-4-esp.eu) is an ambitious venture that aims to revolutionize quantum computing and signal processing. Funded by the European Innovation Council, and coordinated by the Leibniz Institute of Photonic Technology, the project is a collaborative effort involving some of the most prestigious institutions and companies across Europe, including Loughborough University, Linköping University, Université de Montpellier, CNRS, Aalto University and Eötvös Loránd University, Justinmind and Intelligentsia Consultants.



The project's main goal is to develop the first quantum reservoir computing systems utilizing superconducting qubits and silicon carbide defect qubits. This innovative approach is expected to significantly outperform existing classical machine learning systems in terms of speed and energy efficiency, with potential improvements of more than a hundredfold. Dr. Alexandre Zagoskin of Loughborough University, the project's initiator, expressed his excitement and confidence in the collective expertise of the partners involved. He emphasized that the unique strengths and capabilities of each partner form the backbone of this cutting-edge project, setting a new precedent in the field of quantum computing.

The technology developed in the QRC-4-ESP project is set to have a broad range of applications, particularly in enhancing quantum communication and developing new quantum sensors. The use of superconducting qubits is a strategic choice, aligning the

project with the needs of satellite communications, as these qubits operate effectively in the microwave range, which is minimally disturbed by atmospheric conditions like fog and clouds. On the other hand, the defect-based qubits in SiC, operating in several frequency bands including the near-infrared, are ideal for fibre-optical networks, opening new possibilities in long-range communications and medical diagnostics.

Moreover, the QRC-4-ESP project is not just about technological advancements but also about fostering international collaboration in research and development. By bringing together a diverse group of experts from different fields and countries, the project embodies a multidisciplinary approach that is essential for tackling complex modern challenges. This collaborative model serves as a blueprint for future scientific endeavours and strengthens Europe's position as a leader in quantum research and innovation.

In summary, the QRC-4-ESP project is a groundbreaking initiative that promises to push the boundaries of quantum computing and signal processing. With its ambitious goals and a team of world-class experts, it is poised to make significant contributions to the field and pave the way for practical applications that could transform various sectors of society. The combined expertise of the project partners is key to realizing these ambitious objectives and setting new standards in quantum technology.

The QRC-4-ESP project has received funding from the European Innovation Council's Pathfinder Open programme under grant agreement number 101129663 as well as from the UK Research and Innovation's Horizon Europe guarantee scheme.

About the QRC-4-ESP Consortium



Leibniz Institute of Photonic Technology

The Leibniz Institute of Photonic Technology (Leibniz IPHT) researches the scientific basics of photonic processes and systems of the highest sensitivity, efficiency, and resolution. In keeping with its "Photonics for Life" motto, Leibniz IPHT develops custom solutions to problems in the fields of medicine and the life and environmental sciences that are based on this research. Following Leibniz IPHT's principle "From Ideas to Instruments," the institute implements the insights gained from research into processes, instrumental concepts, and into laboratory prototypes in order to sustainably contribute to the benefit of patients and consumers. (<https://www.leibniz-ipht.de>)



Loughborough University

Loughborough University (Lboro) is a research-oriented university, committed to supporting world-leading research, and with Enabling Technologies, including quantum technologies and quantum engineering, being one of its key research challenges. Loughborough University is ranked in the top 10 in each of the most recent national league tables, cementing its status as one of the country's leading higher education institutions. Lboro's School of Sciences contains the Departments of Physics, Chemistry, Computer Science, Mathematical Sciences and the Mathematics Education Centre. The major focus of research in the Physics Department is theoretical and experimental condensed matter physics and nanoscience, centred around quantum engineering and technologies. (<https://www.lboro.ac.uk>)

Linköping University

Linköping University (LiU) is renowned for its scientific excellence and innovative research environment. Established in 1969, it is one of Sweden's larger academic institutions, distinguished by a strong focus on interdisciplinary studies and collaboration with industry and society. The university excels in areas like materials science, IT, and environmental studies. It is particularly noted for research in the fields of electronics, aerospace, and computer science, often leading to practical applications. LiU fosters a vibrant academic community, attracting international researchers and students. Its commitment to high-quality research and education has placed it among the top-tier universities globally in various rankings. (<https://liu.se>)



Laboratoire Charles Coulomb

The Laboratoire Charles Coulomb, located in Montpellier, France, was established on January 1st, 2011. It is named in honour of Charles-Augustin Coulomb, a pioneer in electrostatics and electromagnetism who resided in Montpellier around 1755-1760. The laboratory stands out for its unique composition, encompassing a broad spectrum of expertise ranging from highly mathematical theoretical physics to physical chemistry and biophysics, with a strong emphasis on fundamental research in condensed matter and nanoscience. Functioning as a Joint Research Unit between the Centre National de la Recherche Scientifique (CNRS) and the University of Montpellier, the Charles Coulomb Laboratory represents a collaborative effort between these institutions. Founded in 1220, the University of Montpellier is particularly acclaimed for its innovative work in ecology and evolutionary biology. (<https://coulomb.umontpellier.fr>; <https://www.umontpellier.fr>; <https://www.cnrs.fr>)



Aalto University

Aalto University in Finland, established in 2010 through the merger of three prestigious institutions, stands at the forefront of innovation and academic prowess. It integrates the fields of science and technology, design and art, business and economics, creating a unique interdisciplinary educational environment. Aalto is celebrated for fostering an entrepreneurial spirit and collaboration with industry, resulting in groundbreaking research and creative solutions. The university boasts state-of-the-art facilities and a global outlook, attracting students and researchers from around the world. Its commitment to sustainability, digitalization, and design thinking makes Aalto a hub for future-oriented education and research, preparing graduates to address complex modern challenges. (<https://www.aalto.fi>)



Eötvös Loránd University

Eötvös Loránd Tudományegyetem (ELTE) is the largest and oldest science university in Hungary. ELTE was in the category level 501–600 in the 2023 Academic Ranking of World Universities and it is regarded as the best higher education institution in Hungary. ELTE's nine faculties cover a wide spectrum of science and education with over 28,000 students attending ELTE's eight campuses across Budapest. The university won over 15 Horizon 2020 projects and five of its researchers have been recipients of prestigious ERC grants. (<https://www.elte.hu>)



JUSTINMIND SL

Justinmind company specializes in developing no-code prototyping tools for web/mobile applications, with experience in Data analytics/visualization, AI/ML/DL from 2013 applied to user behaviour to help end-users in its +3Million customer base get the best of the platform. Their flagship product, the Justinmind Prototyper, allows designers and developers to create high-fidelity, interactive prototypes without coding. Justinmind has gained recognition for its user-friendly interface and comprehensive feature set, which includes drag-and-drop functionality, pre-built UI kits, and integration with other tools like Photoshop and Sketch. The software supports collaboration, enabling teams to work together seamlessly on projects. Justinmind's solutions cater to a wide range of users, from freelancers to large enterprises, aiding in the efficient design and testing of user interfaces and experiences. (<https://www.justinmind.com>)



Intelligentsia Consultants

Intelligentsia Consultants, based in Luxembourg, is a dynamic consultancy firm specializing in scientific and technological innovation. Established in 2008, the company primarily focuses on assisting clients in securing European funding for research and innovation projects. Their expertise spans various sectors, including ICT, health, energy, and environment. Intelligentsia Consultants offers a range of services, from identifying suitable

funding opportunities and writing grant proposals to project management and dissemination of research findings. Their team, composed of experienced consultants and project managers, collaborates closely with universities, research institutes, and high-tech companies across Europe, contributing to the advancement of cutting-edge scientific and technological developments. (www.intelligentsia-consultants.com)