NEASQC project

NExt ApplicationS of Quantum Computing

`<NE|AS|QC>`

Boosting practical applications of quantum computing in the NISQ era

About us

- A multidisciplinary consortium of 12 companies and research labs
- A 4-year project started 1st September 2020
- Funded by the European Commission's Horizon 2020 programme as part of the Quantum Technology Flagship
- An interdisciplinary project based on deep collaboration between knowledge-generating agents and industrial agents

Our 4 objectives

1. Develop **industrial Use Cases** for NISQ machines
2. Develop **open-source application libraries** for the myQLM free programming platform
3. Build a strong **community** dedicated to industrial NISQ applications
4. Develop SW stacks and benchmarks for the **QT Flagship HW platforms**

Our 9 NISQ-compatible use cases

Each use case is endorsed by an industrial partner and investigated by an integrated team of industrial and academic partners
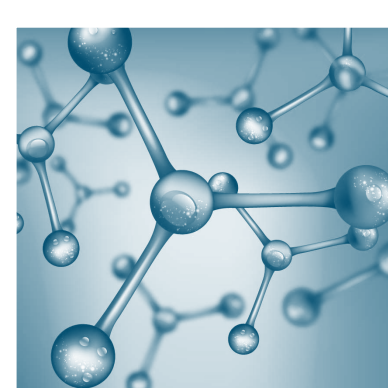
Chemistry

Bridging the gap between the recent proof-of-concept quantum chemical computations on NISQ processors and actual, industrial-scale quantum chemistry problems:

1. **CO_2 capture** by Metal Organic Frameworks (MOFs) and other relevant chemical surfaces;

2. **Drug discovery,** calculation of energy of large number of molecular conformations in proteins.

Machine Learning & Optimisation

Quantum-enhanced machine learning and optimization methods for

3. Quantum reinforcement learning for **optimal inventory management;**

4. QAOA-type algorithms for **mesh segmentation problems;**

5. QAOA-type algorithms for **smart-charging optimisation;**

6. Applications of QML optimisation and quantum Monte-Carlo methods in **finance,** such as Option pricing or Value-at-Risk estimation.
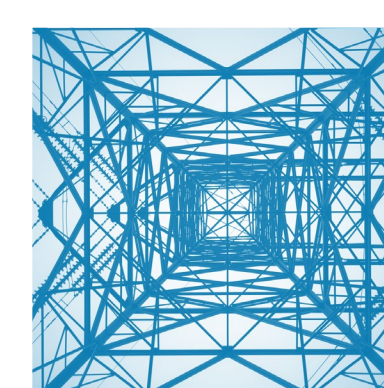
Symbolic AI and graph algorithmics

Developing methodologies and implementations in the areas of Artificial Intelligence and graph algorithms for:

7. Quantum **natural language processing** (QNLP) for sentence similarity computations and topic detection;

8. Quantum **probabilistic safety assessment** (QPSA) for large infrastructure installations;

9. Quantum rule-based systems (QRBS) for **diagnosis and treatment** of Breast Invasive Ductal Carcinoma.

Atos | AstraZeneca | CESGA Centro de Supercomputación de Galicia | EDF | HQS QUANTUM SIMULATIONS | HSBC | ICHEC Irish Centre for High-end Computing | TILDE | TotalEnergies | UNIVERSITÉ DE LORRAINE | UNIVERSIDADE DA CORUÑA | Universiteit Leiden

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