**Project:** Implementing a diagrammatic editor for quantum computing

**Keywords:** Quantum Computing, ZX-calculus, Circuit Optimisation, Software Engineering

**Description:** Quantum computers are getting closer to reality, and with this a need to better understand and reason about quantum computations. The ZX-calculus is a graphical language which can represent any quantum computation, and where using graphical local rewrites we can prove (in principle) any property of a computation we wish. The open-source Python library PyZX allows for large-scale rewriting of ZX-diagrams in order to perform quantum circuit optimisation or classical simulation and verification. It is however less suitable for small-scale hand-rewriting. For this purpose we have started working on a new project, zxlive, that acts as a gui and diagrammatic prover for the ZX-calculus.

In this project you will learn about quantum computing and how to use ZX-diagrammatic reasoning to prove things about quantum computing. You will use this knowledge to help develop this new open-source project and find the best way to construct a gui that helps guide people to the correct rewrites.

Students with strong Python skills and an interest in quantum computing are encouraged to apply for this project.

Literature:

This paper gives a detailed overview of the ZX-calculus: https://arxiv.org/abs/2012.13966

PyZX can be found here: https://github.com/quantomatic/pyzx

ZXlive can be found here: https://github.com/Quantomatic/zxlive