UNSW SYDNEY

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POSITION DESCRIPTION

Quantum Applications Scientist

Position Level	A/B
Faculty/Division	Science
Position Number	00159049
Original document creation	May 2023

Position Summary

The Quantum Applications Scientist will support the identification of use cases and algorithm development for both analogue and digital quantum computers to solve difficult industry applications in the near-term. In this role, the Quantum Applications Scientist will consider analogue quantum systems comprised of large arrays of phosphorus-doped silicon quantum dots as a computational resource. Additionally, this role will develop algorithms for digital quantum computers focusing on solving industry problems with a 100-qubit silicon-based quantum processor, as the broader SQC team works to scale quantum devices from 10-qubit to 100-qubit architectures within the next 5 years. This role will examine optimisation and machine learning use cases for both quantum computing paradigms from the transportation, finance, and communications industries.

The Quantum Applications Scientist will report to Dr Casey Myers, the Algorithms and Applications team lead, alongside A/Prof Charles Hill, the Quantum Architectures team lead, and other staff and students funded by SQC. The role will assist where necessary with the support of PhD and undergraduate students and other members of the Algorithms and Architectures team members. This position provides a unique opportunity to work within a truly multi-disciplinary team of scientists and engineers working at the forefront of global quantum computing internationally.

Background:

- SQC is a well-funded Australian company formed by the Commonwealth Government, Commonwealth Bank of Australia, Telstra, the New South Wales Government and UNSW Sydney.
- SQC is seeking to commercialise silicon quantum computing technology developed in Australia – technology that has the potential to have a global impact.
- SQC's work is building on more than 20 years of world-leading research by the Centre of Excellence which includes the development of dedicated manufacturing and measurement techniques for an atom-based quantum computer in silicon.
- This role and SQC are located at the headquarters of the Centre at UNSW Sydney.

Accountabilities

Specific accountabilities for this role include:

Level A

- Investigate quantum advantage with near-term quantum systems.
- Explore the implementation of analogue quantum systems on near-term arrays of phosphorus-doped silicon quantum dots.
- Explore the implementation of digital quantum algorithms on near-term, atom-based silicon hardware.
- Adapt, tailor, and develop analogue quantum systems and quantum algorithms for industry focussed applications.
- Work on the theory of analogue quantum systems to better understand the near- and medium-term direction of analogue quantum computing to determine when/how a quantum advantage can be achieved.
- Work on the theory of quantum algorithms to better understand the medium- to long-term direction of quantum computing to determine when/how a quantum advantage can be achieved.
- Work with a multidisciplinary team of quantum physicists, engineers, technicians, postdoctoral researchers, and PhD students for early-stage quantum system implementations on silicon-based quantum computer devices.
- Generate high quality research publication output.
- Provide technical assistance and training to the research staff and students working within SQC.
- Align with and actively demonstrate the UNSW Values in Action: Our Behaviours and the UNSW Code of Conduct.
- Cooperate with all health and safety policies and procedures of the university and take all reasonable care to ensure that your actions or omissions do not impact on the health and safety of yourself or others.

Level B

- Make significant contribution to the field of quantum computing.

- Where appropriate, take leadership of research projects.
- Supervise honours or other higher degree research students.

Skills and Experience

Level A

- A PhD Physics, Computer Science, Mathematics, or relevant field, with work experience in a research or commercial environment.
- Demonstrated research capabilities in classical machine learning, quantum machine learning, condensed matter physics, computational physics or related field.
- Experience writing high-performance quantum algorithm implementation, preferably in Python, MATLAB, C/C++, or equivalent. GPU programming experience.
- Experience with Python quantum computing packages such as OpenQASM (Qiskit), Cirq, Project Q, or equivalent.
- Experience in troubleshooting and solving complex unplanned issues.
- Well-organised, attention to detail and ability to meet deadlines.
- Excellent written and verbal communication skills.
- Demonstrated ability to work in a team, collaborate across disciplines and build effective relationships.
- An understanding of and commitment to UNSW's aims, objectives and values in action, together with relevant policies and guidelines.
- Knowledge of health and safety responsibilities and commitment to attending relevant health and safety training.

Level B

- Demonstrated ability to conduct independent research.
- Demonstrated outstanding research capabilities in classical or quantum machine learning, condensed matter physics, computational physics or related field.
- Experience devising solutions to industry use-cases with quantum systems.
- Experience solving problems with machine learnng on quantum systems.
- Experience modelling qubit systems.
- Significant experience with Python quantum computing packages, such as OpenQASM (Qiskit), Cirq, ProjectQ, or equivalent.
- Experience with co-supervision of higher degree research students in quantum computing.

Pre-employment checks required for this position

- Verification of qualifications

About this document

This Position Description outlines the objectives, desired outcomes, key responsibilities, accountabilities, required skills, experience and desired behaviours required to successfully perform the role.

This template is not intended to limit the scope or accountabilities of the position. Characteristics of the position may be altered in accordance with the changing requirements of the role.