M.Sc Thesis Position: Digital twin of quantum processor
Aalto University

Job Title	M.Sc Thesis Position: Digital twin of quantum processor
Department	T412 Department of Information and Communications Engineering
Institution	Aalto University , , Finland
Date Posted	Oct. 14, 2025
Application Deadline	Open until filled
Position Start Date	Available immediately
Job Categories	Graduate Student
Academic Field(s)	Electrical and/or Electronics
Job Website	https://aalto.wd3.myworkdayjobs.com/aalto/job/Otaniemi-Espoo-Finland/MSc-Thesis-Position--Digital-twin-of-quantum-processor_R44514

Apply By Email

Job Description

Aalto University is where science and art meet technology and business. We shape a sustainable future by making research breakthroughs in and across our disciplines, sparking the game changers of tomorrow and creating novel solutions to major global challenges. Our community is made up of 120 nationalities, 14 000 students, 400 professors and close to 5000 faculty and staff working on our dynamic campus in Espoo, Greater Helsinki, Finland. Diversity is part of who we are, and we actively work to ensure our community's diversity and inclusiveness. This is why we warmly encourage qualified candidates from all backgrounds to join our community.

The Department of Information and Communications Engineering has an open position for M.Sc thesis student. The project involves developing a digital twin that can simulate the impact of quantum control software on the physical quantum circuit. The work is in the context of Business Finland Quantum

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Computation campaign, and will be performed in close collaboration with Quantrolox Oy.

Background
Quantum computation is typically described as quantum circuits, in which a computation is performed as a sequence of quantum gates, measurements, initializations of qubits to known values. Current implementations of quantum computers that are capable of executing quantum circuits typically consist of quantum devices that are housed in a special purpose environment and controlled by special purpose electronics. For example, a quantum computer based on superconducting transmon qubits would typically consist of a Quantum Processing Unit, a cryostat capable of cooling the QPU down to Millikelvin temperatures, room temperature electronics for sending signals to the QPU and capturing data from it, cabling between the QPU and the room temperature electronics, and a software system enabling executing of quantum circuits through the room temperature electronics on the QPU. The software system can be further divided into two parts, control software and application tool chain. The objective of the control software is to realize a maximal similarity between the ideal action of quantum gates and their realization in QPU implementation.

M.Sc Thesis Project
QuantrolOx Oy specializes in qubit control software. In collaboration with QuantrolOx, the goal of this project is to develop a digital twin of the Quantum Processing Unit (QPU), allowing researchers and engineers to evaluate the functionality of application software without requiring access to a physical QPU. This work will require the candidate to thoroughly understand the physical properties of superconducting transmon qubits and to design software models that accurately represent their behavior. Additionally, the project involves modeling the interaction between the control software's microwave pulses and the physical system, enabling comprehensive simulation and analysis of quantum control strategies.

Olav Tirkkonen will supervise the project at Aalto University, and Ülo Parts will act as thesis advisor.

The ideal candidate should possess a solid understanding of microwave technology and quantum computing fundamentals, demonstrate strong skills in mathematical modeling, and have hands-on experience implementing these models in code (for example, using Python).

Join us!
To apply, please share the following application materials (as PDFs) with us through our recruitment site ("Apply now!") * CV * Motivation letter

Please apply as soon as possible, at the latest October 26th, 2025. The start of the work is in November 2025, with a duration of six (6) months, during which the candidate is expected to finalize

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the MSc thesis. The salary is determined according to the salary system of Finnish universities.

Please note: Aalto University's employees should apply for the position via our internal HR system Workday (Internal Jobs) by using their existing Workday user account (not via the external webpage for open positions).

For more information about the role, please contact Professor Olav Tirkkonen, [url=mailto:olav.tirkkonen@aalto.fi]olav.tirkkonen@aalto.fi. Additional information in recruitment process related questions, please contact HR Advisor Monika Mäkinen, [url=mailto:hr-elec@aalto.fi]hr-elec@aalto.fi.

Contact Information

Contact

Finland