

# WACQT | Wallenberg Centre for Quantum Technology

## How to program a Quantum Computer



*The growing WACQT superconducting quantum computer.*

### Background

In 2019, Google's quantum computer in a few minutes produced samples from a probability distribution that it would take the world's largest supercomputers years to generate. They called this quantum supremacy. At Chalmers, in the Wallenberg Center for Quantum Technology ([www.WACQT.se](http://www.WACQT.se)) we are building a quantum computer using similar technology. Together with our industrial partners Jeppesen, AstraZeneca, and Volvo Group, we are investigating what real-world problems the future quantum computer would be most well suited to solve.

### Problem description

The goal is to find a real-world computational problem that can be solved by a quantum algorithm. This algorithm should then be numerically simulated and also run on hardware, either at Chalmers or on a cloud service like the IBM Quantum Experience.

### Workflow

The project starts with a short introduction to quantum algorithms, including lectures and some study material. You will then get the opportunity to discuss potential real-world computational problems with our WACQT industrial PhD students. The second part of the project involves simulating the quantum algorithm using Matlab or the Python-based software package QuTiP.

### Team size

3-6 students.

### Student background

F, GU Fysik, Kf, D

### Literature

[www.wacqt.se](http://www.wacqt.se)

### Supervisors

Laura García-Álvarez [lauraga@chalmers.se](mailto:lauraga@chalmers.se)

Göran Johansson:

[goran.l.johansson@chalmers.se](mailto:goran.l.johansson@chalmers.se)