



Doctoral Student Project

Position A

One of the main goals of the Quantum Technology Initiative is to assess the potential impact of quantum technologies on CERN and the broader high-energy physics community. One such technological advancement is quantum computing and its novel computational strategies. Quantum computing has the potential to allow for highly efficient implementations of algorithms that are prohibitively expensive on classical hardware, as well as the simulation of physical systems not amenable to classical methods.

This project will focus on one of a few possible directions:

- The development of high-performance computing algorithms for quantum simulation on classical hardware, with a particular focus on the implementation of lattice gauge theories on future quantum hardware.
- The development of hybrid classic-quantum mathematical models based on variational quantum architectures, focusing on designing a framework for quantum machine learning applications, including regression, classification and generative models. This direction would be of phenomenological interest to the high-energy physics community, particularly in its applications to jet tagging, cluster algorithms and quantum generative models for Monte Carlo event generation.
- The development of an optimizer based on quantum annealing and adiabatic evolution, which could be utilized for accelerating many of the above-mentioned quantum machine learning applications.
- The development of a quantum circuit compiler for the optimization of algorithms on specific quantum devices, in order to aid the future implementation of high-energy physics algorithms onto the many currently available quantum hardware devices.

For more information about the CERN Doctoral Student Programme and to apply:

<https://jobs.smartrecruiters.com/CERN/743999727905858-doctoral-student-programme>

When applying, please express your interest for the “CERN QTI position A”.

Deadline for applications: **Wednesday 24 March 2021 at 12pm (CET)**