

# Master's Thesis in Quantum Optimization

Peter Grünberg Institute for Quantum Computing Analytics (PGI-12)

**Project Overview:** We are looking for a highly motivated student to work on one of a variety of research ideas revolving around the general topic of quantum optimization. The direct day-to-day supervisor will be Dr. Tim Bode (<https://timbode.github.io/>). Recent papers that have come forth out of Master's projects in our group are [arxiv:2411.19388](https://arxiv.org/abs/2411.19388) and [arxiv:2411.07646](https://arxiv.org/abs/2411.07646). PGI-12 is a lively and supportive institute with access to great infrastructure.

## Possible research directions:

- Algorithm development for quantum continuous optimization.
- Algorithm development for low-autocorrelation binary sequences.
- Algorithmic benchmarking: parallel tempering, simulated-bifurcation method, semi-definite programming etc. against our methods.
- High-performance computing: accelerate our methods via special-purpose hardware (e.g. GPUs).

## Candidate requirements:

- Strong grades in theoretical physics, in particular quantum mechanics.
- Demonstrated programming experience in Julia or similar.
- Some knowledge of quantum field theory is a plus.
- Motivation to push a research topic independently.
- The official first supervisor needs to come from the student's home university.

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Applications should include CV, transcripts and coding examples.