## **CONTACT INFORMATION**

















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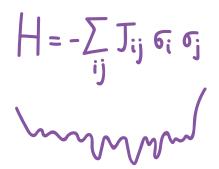






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Spatial Quantum
Optical Annealer
for Spin
Hamiltonians



**HEISINGBERG** aims to develop a novel photonic Ising machine operating at room temperature, leveraging newly established holographic and nonlinear photonics principles for the efficient solution of NP-hard problems. HEISINGBERG proposes an alternative approach to existing photonic simulators exploiting the mature technology of spatial light modulation. The latter introduces a range of advantages that mitigate systemic bottlenecks associated with the scalability and applicability of these devices, with the most pronounced of these being:

- i) cost effective
- ii) easily programmable
- **iii)** environmentally friendly, low power consumption
- iv) scalability
- v) non cryogenic operation

Real-life NP-hard problems solution is challenging since:

- Require improved computational efficiency, that conventional von Neumann architectures struggle to provide as they are reaching their scalability and power efficiency limits
- Existing approaches, such as GQC and analog quantum simulators, suffer from **limited** qubit count, high error rates (need for error mitigation protocols), quantum decoherence hardware complexity, low temperature operation (sophisticated cryogenics required), high Energy consumption and they are **costly**



**HEISINGBERG** envisions to offer the following value propositions:

- Demonstrate fully programmable spin coupling up to 100 000 spins
- Incorporation of an effective magnetic field, enabling the solution of a range of optimization problems
- Deployment of annealing algorithms based on HEISINGBERG mode of operation
- Theoretical model describing the simulator beyond the mean field approximation using squeezed light states
- Proof of principle experimental showcase of the Quantum HEISINGBERG annealer with a 3 x 3 lattice
- Development of a dedicated graphical control software for the HEISINGBERG platform and online server for open access