

# SEMINAR: Weighted quantum wires for sparse graph optimisation problems

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12:00 to 13:00

Elements Room

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Neutral-atom arrays have recently attracted attention as a versatile platform to implement coherent quantum annealing as an approach to hard problems, including combinatorial optimisation. Here we present an efficient scheme based on chains of Rydberg-blockaded atoms, which we call quantum wires, to embed maximum weighted independent set (MWIS) and quadratic unconstrained binary optimisation (QUBO) problems into a layout compatible with the neutral atom architecture. For graphs with quasi-unit-disk connectivity, in which only a few non-native long-range interactions are present, our approach requires a significantly lower overhead in the number of ancilla qubits than previous proposals, facilitating the implementation in currently available hardware. We perform simulations of realistic annealing ramps to find the solution of combinatorial optimisation problems within our scheme, demonstrating high success probability for problems of moderate size. Furthermore, we provide numerical evidence of a favourable scaling of the minimum gap along the annealing path with increasing wire length and of the robustness of the encoding to experimental imperfections. Our work expands the existing toolkit to explore the potential use of neutral atom arrays to solve large scale optimisation problems.

**Hosted by:** Prof. Dr. Antonio Acin