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Quantum computing simulations: applications in physics and chemistry

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Abstract: Quantum computing is emerging as a new paradigm for the solution of a wide class of problems that are not accessible by conventional high performance computers based on classical algorithms. In particular, the simulation of the electronic structure of molecular and condensed matter systems is a challenging computational task as the cost of resources increases exponentially with the number of electrons when accurate solutions are required. In this talk, we will first introduce the basics of quantum computing using super-conducting qubits, focusing on those aspects that are crucial for the implementation of quantum chemistry algorithms. In the second part, we will briefly discuss the limitations of currently available classical approaches and highlight the advantages of the new generation of quantum algorithms for the solution of the many-electron Schrödinger equation in the ground and excited states.