Quantum Computing: What, Why, How?

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Quantum computing technologies are rapidly emerging, thus opening a new era for computational science, where complex and intractable problems can be solved using quantum mechanical effects, like superposition and entanglement. What are those unusual quantum effects which can help to speed-up the classical computation? The basic building blocks for quantum hardware are qubits and gates. Physical implementations and different solutions are under investigation, like superconducting circuits, spins in quantum dots, ion traps, to name a few. However, the main questions remain: Why the research community and the industry are interested is such challenging journey? Let's imagine a scalable quantum computer will be available soon, do we have enough comprehension of new algorithms to be able to program such unusual machine for solving computational problems? Good news is that we do not need to wait for a fully functional hardware to become available, to understand how to create and produce new kind of computational algorithms. In this framework, simulation environments such as the Intel® Quantum Simulator can be highly helpful to design, implement and test quantum algorithms and finally run it on already available High-Performance computing systems.

Speaker Bio

Fabio Baruffa is a senior software technical consulting engineer at Intel. He provides customer support in the high-performance computing (HPC) area and artificial intelligence software solutions at large scale. He is also engaged with several research institutes in Europe to drive the awareness on quantum computing technologies. Prior at Intel, he has been working as HPC application specialist and developer in the largest supercomputing centers in Europe, mainly the Leibniz Supercomputing Center and the Max-Plank Computing and Data Facility in Munich, as well as Cineca in Italy. He has been involved in software development, analysis of scientific code and optimization for HPC systems. He holds a PhD in Physics from University of Regensburg for his research in spintronics devices and quantum computing.