

Davide Venturelli (NASA Ames Quantum Computing Program)

Title: Hardware Efficient Quantum Optimization

Abstract:

I will introduce modern quantum optimization algorithms and their computational principle, including the Quantum Alternating Operator Ansatz (QAOA) and the Mixer-Phaser ansatz, a variation on QAOA developed specifically for dense spin glasses and for constrained optimization. I will go more in details on compilation aspects on superconducting quantum processors, introducing the challenges and the approaches with reference to runs performed in Rigetti's quantum processors. I will also discuss performance evaluation practices of parameterized stochastic optimization methods that employ special hardware (paradigmatic benchmarks vs real-world tests) - with reference to the newly developed metrics of quantum volume and the strategies for detection of quantum advantage.

Short Bio:

Davide Venturelli is Associate Director for Quantum Computing of the Research Institute of Advanced Computer Science at the Universities Space Research Association (USRA). He works since 2021 in the NASA Quantum AI Laboratory (QuAIL) under the NASA Academic Mission Service, invested in research projects dealing with quantum optimization applications and their implementation, in a hardware-software co-design approach. He teaches Quantum Optimization as an adjunct professor at Carnegie Mellon University. He is Principal Investigator / task lead in projects sponsored by DARPA (Optimization in NISQ Devices), NSF (Expeditions in Computing), and DOE (SQMS Ecosystem).