1145-81-2744 **Archismita Dalal**, **Seyed Shakib Vedaie**, **Radhakrishnan Balu** and **Barry Cyril Sanders*** (sandersb@ucalgary.ca), , Canada. *Machine-learning-assisted search for a quantum-annealing speedup.* Preliminary report.

Quantum annealing could enable quantum-enhanced speedup for certain computational problems. Quantum annealers are designed to find the ground state of an Ising Hamiltonian, which encodes the solution of the NP-Hard problem called weighted MAX-2-SAT. This computational problem can be equivalently expressed as a quadratic unconstrained binary optimization problem over Boolean variables and hence mapped to the hardware graph for qubit connectivity of the quantum annealer (Chimera graph for D-Wave's current architecture). We seek to develop an intelligent search for a quantum-annealing speedup over the weighted MAX-2-SAT language using machine learning. If successful, quantum annealers will then be known to provide a genuine quantum-computational advantage. Our aim is to devise an autonomous approach to search for a quantum-annealing speedup. Through this approach, a set of problem instances, of varying size, are methodically searched, and a set of tests is performed for comparing quantum annealing against various classical algorithms such as simulated annealing and quantum Monte Carlo. We make this search "intelligent" by devising a suitable reward function for problem instances so that the autonomous agent learns from experience and thus rapidly finding promising problems. (Received September 25, 2018)