Quantum Boltzmann Machine using a Quantum Annealer

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Machine learning is a rapidly growing field in computer science with applications in computer vision, voice recognition, medical diagnosis, spam filtering, search engines, etc. In this presentation, I will introduce a new machine learning approach based on quantum Boltzmann distribution of a transverse-field Ising Model. Due to the non-commutative nature of quantum mechanics, the training process of the Quantum Boltzmann Machine (QBM) can become nontrivial. I will show how to circumvent this problem by introducing bounds on the quantum probabilities. This allows training the QBM efficiently by sampling. I will then show examples of QBM training with and without the bound, using exact diagonalization, and compare the results with classical Boltzmann training. Finally, after a brief introduction to the D-Wave quantum annealing processor, I will discuss the possibility of using such processors for QBM training and application.