Topics in Quantum Machine Learning

Special Session at the 2017 IEEE International Conference on Systems, Man, and Cybernetics

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Outline and Motivation

The advent of modern machine learning has ushered in rapid advances in the classification and interpretation of large data sets, sparking a revolution in areas such as image and natural language processing. It is known that the underlying principles governing the growth of this revolution emerges from the fundamental insights obtained from condensed matter and/or statistical physics. It still remains an important question as to what more fundamental and applied research can be done at the intersection of machine learning and fields such as statistical physics, condensed matter, and quantum information. This special session aims to bring together experts from a variety of backgrounds who are interested in understanding connections between many body physics, quantum computing and machine learning.

Scope

Papers related to the session theme are solicited, including theories, methodologies, and emerging applications. Contributions to theory and practice, including but not limited to the following technical areas, are invited:

- **Use of techniques from machine learning (ex. Neural networks or statistical learning) to solve problems from quantum many body physics like:**
  - Discriminating phases of matter.
  - Analyzing phase transitions.
  - Addressing the inverse Hamiltonian problem.
- **Algorithms for Machine Learning that take their inspiration from physics, such as:**
  - Extensions of Boltzmann machines (classical statistical mechanical learning).
  - Connections between deep learning, the renormalization group, and tensor networks/MERA and so on.
- **Exploiting the power of quantum computing to power the machine learning algorithms:**
  - Algorithmic advancement in fault tolerant computers.
  - Algorithmic advancement in systems such as quantum annealers.
  - Innovations and advancements in ML approaches (all supervised, unsupervised, and reinforcement learning).

Paper Submission Deadline: **April 7th, 2017** (https://conf.papercept.net/conferences/scripts/submissionwizard.pl)

Submission of Title and Co-authors Deadline: **February 25th, 2017** (Email at apurva.narayan@uwaterloo.ca asap!)

Organizer

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We are expecting original contributions as these papers will be published on IEEE Xplore and will undergo peer review. All papers shall be published on IEEE Xplore and in the conference proceedings. The submissions shall be maximum 6 pages in IEEE double column format.