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Innovating quantum technologies

Quantum machine learning for near-term applications

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We present several primitives for and examples of quantum machine learning in a noisy intermediate-scale quantum (NISQ) setting. While beyond-classical computation has generally been recognized with existing quantum devices, many relevant applications of quantum computers remain distant. In this talk, we explore different approaches and experimental results that are directly applicable to real-world problems despite current hardware limitations. We present recent work in collaboration with the Google Quantum AI Lab, showing that quantum generative adversarial networks may be used to improve the fidelity of quantum machine learning for classical datasets. Implementing end-to-end solutions to high energy physics analyses, we propose quantum annealing approaches and show similar performance to state-of-the-art classical algorithms within certain regimes. While the NISQ era continues to pose many challenges for important algorithms in quantum computing, this work suggests that quantum machine learning may move towards real-world applications in the near term.

Alexander Zlokapa is a physics major at the California Institute of Technology, whose research focuses on combining techniques from theoretical physics and machine learning. He currently collaborates closely with researchers at Harvard, MIT, USC, and Google Quantum AI on various projects in the domains of quantum computing and AdS/CFT. He works on developing new quantum machine learning algorithms and on AI-based methods for simulating physical systems using current quantum technologies. Alexander's undergraduate research has been recognized by a Goldwater Scholarship, as well as the Green Prize and the Fisher Prize from Caltech.

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