



HARVARD UNIVERSITY  
17 Oxford Street  
Cambridge, MA 02138

# Mathematical Picture Language Seminar

**Tuesday, April 26**

**9:30 a.m. Boston time**



## Training landscapes for parameterized quantum circuits

**Patrick Coles**

Los Alamos National Laboratory

**Abstract:** Parameterized quantum circuits (PQCs) are the leading proposal for near-term quantum computing, with applications including electronic structure, dynamical simulation, and solving linear systems. However, recent progress in understanding the training landscapes for PQCs paint a concerning picture. Exponentially vanishing gradients—barren plateaus—occur for various situations, including circuits that are deep or noisy or generate much entanglement. This can lead to exponential resource scaling for algorithms based on PQCs. On the flip side, some architectures for PQCs are immune to barren plateaus. Moreover, the dynamical Lie algebra for a PQC has been connected to presence or absence of barren plateaus, leading to an algebraic theory for the trainability of PQCs. This theory could allow us to engineer favorable training landscapes for PQCs. In this talk, I will overview our theoretical understanding of PQCs training landscapes and how we might engineer them to achieve scalability for near-term quantum computing.



**Zoom QR Code & Link:**

<https://harvard.zoom.us/j/779283357?pwd=MitXVm1pYUIJVzZqT3lwV2pCT1ZUQTog>

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