

HARVARD UNIVERSITY  
17 Oxford Street  
Cambridge, MA 02138



**Tuesday, April 28, 2020, at 10:00 (Boston)  
15:00 (UK/Eire) 16:00 (C.Europe) 22:00 (China)**

**Mathematical Picture Language Seminar**  
**Zoom at: <https://harvard.zoom.us/j/779283357>**

**Graphical proofs for fault-tolerant quantum computation**  
**Daniel Gottesman, Perimeter Institute**

**Abstract:** Experimentalists are getting better and better at building qubits, but no matter how hard they try, their qubits will never be perfect. In order to build a large quantum computer, we will almost certainly need to encode the qubits using quantum error-correcting codes and encode the quantum circuits using fault-tolerant protocols. The central result of the theory of fault tolerance is the threshold theorem, which states that arbitrarily long and reliable quantum computations are possible if the error rate per gate or time step is below some constant threshold value. Fault tolerance can be nicely defined using graphical techniques, allowing for a relatively straightforward proof of the threshold theorem.

