



HARVARD UNIVERSITY  
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# Mathematical Picture Language Seminar

**Tuesday, December 3**

**4:30 p.m. Boston time**

**Jefferson 356 and Zoom**



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MIT

## Quantum error-correcting codes, systolic geometry, and quantitative embeddings

**Abstract:** There have been several recent breakthroughs constructing good quantum codes which have  $N$  qubits with distance and dimension  $\Omega(N)$ . However, these codes cannot be implemented in 3 dimensions - there is no way to place the qubits on a lattice so that every check only involves the qubits in some small ball. Bravyi and Terhal have shown that such 3d codes with  $N$  qubits can have distance at most  $O(N^{2/3})$  and dimension at most  $O(N^{1/3})$ , given that distance. In this talk I'll discuss how to construct 3d codes with parameters that match these bounds. This relies on the known good codes, a connection between codes and systolic geometry made by Freedman-Hastings, and a quantitative embedding theorem.



Zoom QR Code & Link:

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

Passcode: 657361

<https://mathpicture.fas.harvard.edu/seminar>