



HARVARD UNIVERSITY  
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Cambridge, MA 02138

# Mathematical Picture Language Seminar



**Tuesday, November 14**

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

**Jefferson 453**

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## Higher dimensional digraphs from cube complexes and their spectral theory

**Abstract:** We define  $k$ -dimensional digraphs and initiate a study of their spectral theory. The  $k$ -dimensional digraphs can be viewed as generating graphs for small categories called  $k$ -graphs. Guided by geometric insight, we obtain several new series of  $k$ -graphs using cube complexes covered by Cartesian products of trees, for  $k \geq 2$ . These  $k$ -graphs can not be presented as virtual products, and constitute novel models of such small categories. The constructions yield rank- $k$  Cuntz-Krieger algebras for all  $k \geq 2$ . We introduce Ramanujan  $k$ -graphs satisfying optimal spectral gap property, and show explicitly how to construct the underlying  $k$ -digraphs.



**Zoom QR Code & Link:**

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

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