THE UNIVERSITY OF **CHICAGO** | **THE COMMITTEE ON COMPUTATIONAL AND APPLIED MATHEMATICS**

STEFAN STEINERBERGER

Department of Math
University of Washington, Seattle

Boundary and Curvature on Graphs

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Jones 303, 5747 S. Ellis Ave. Chicago, IL 60637

I will discuss new notions of boundary and curvature on combinatorial graphs. The boundary will satisfy an isoperimetric principle: graphs with many vertices have a large boundary (or gigantic diameter: the path graph only has 2 boundary vertices independently of length). There are multiple definitions of curvature on graphs (combinatorial, via the behavior of the Laplacian, via Optimal Transport). We propose a new one based on potential theory: this curvature can be computed by solving a linear system and has a large number of desirable properties: it satisfies a Bonnet-Myers theorem (graphs with curvature bounded from below have diameter bounded from above) as well as an inverse Bonnet-Myers and a Lichnerowicz theorem. The von Neumann Minimax Theorem plays a crucial role in the proofs. There will be many pictures and many open problems.