



THE UNIVERSITY OF
CHICAGO

Department of Statistics

MASTER'S THESIS PRESENTATION

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Topological Data Analysis Using Hodge Laplacians

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Jones 304, 5747 S. Ellis Avenue

ABSTRACT

The object of this work is twofold: on the computational side, to combine the idea of persistence and Hodge theory to develop a topological data analysis method; on the theoretical side, to find the analogues of Cheeger constant and Fiedler vector for the Hodge 1-Laplacian and characterize Hodge isospectral graphs. The “persistent Hodge 1-Laplacian” method was discussed. The first nonharmonic eigenform was deciphered by considering divergence and curl under perturbations. A construction of isospectral graphs for the Hodge 1-Laplacian was also proposed. All three works used the strength that the Hodge 1-Laplacian can encode subtle relationships between triangles and edges, while the Laplacian-Beltrami can only reflect this kind of relationships between edges and vertices.