Dissertation Defense

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PhD Graduate Student

Under the Supervision of Jeb Willenbring

Tuesday, April 5th, 2022 @ 12:30pm

Physics Building, Room 120

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The earth mover's distance through the lens of algebraic combinatorics

The earth mover's distance (EMD) is a metric for comparing two histograms, with burgeoning applications in image retrieval, computer vision, optimal transport, physics, cosmology, political science, epidemiology, and many other fields. In this defense, however, we approach the EMD from three distinct viewpoints in algebraic combinatorics: (1) we regard the EMD as the symmetric difference of two Young diagrams; (2) we adopt as a natural model for the EMD a certain infinite-dimensional module, known as the first Wallach representation of the Lie algebra su(p,q), which arises in the Howe duality setting in Type A; and (3) we realize the EMD as distance on certain crystal graphs of Types A, B, and C. We then generalize our results to compare an arbitrary number of histograms. Finally, we describe a combinatorial connection between the coinvariant algebra in the Howe duality setting above, and certain non-holomorphic discrete series representations of the group SU(p,q).

Committee Members:

Profs. Allen Bell, Chris Hruska, Kevin McLeod, and Yi Ming Zou

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