CCSU
DEPARTMENT OF MATHEMATICAL SCIENCES
COLLOQUIUM

Friday, February 23
3:00 – 4:00 PM
Maria Sanford, Room 101

DATA ANALYSIS, SIMPLICIAL COMPLEXES, AND BINARY MATRICES

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Abstract: The beginning of topological data analysis (TDA) is associated with applying persistent homology to discrete data sets, which was pioneered by researchers such as Edelsbrunner, Zomorodian, and Carlsson in the 2000s. However, the idea of using simplicial complexes to model data is older, dating back to at least 1970 with Ronald Atkin's work on applying algebraic topology to social science data. This talk looks back to these earlier ideas and focuses on the generalization of connectivity in graph theory to q-connectivity in simplicial complexes along with the link between connectivity and clustering. This approach relies on incidence matrices, which requires us to think about patterns in binary matrices under the equivalence relationship induced by row and/or column permutations. This, in turn, leads to connections with computer science (for example, the consecutive ones property), combinatorics (such matrices can be counted exactly), and formal concept analysis (a technique that also dates to the 1970s but is now being used in machine learning).

This talk is applied, cross-disciplinary, and assumes knowledge of linear algebra and graph theory – I invite you to join the fun!