

Algebra/Topology Seminar

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TOPOLOGICAL DATA-DRIVEN METHODS IN ROBOT MOTION PATH PLANNING

Thursday, March 5, 2026
3:00 p.m. in Massry B012

ABSTRACT. Motion path planning is an intrinsically geometric problem which is central to design of robot systems. The motion path is a path in the space of feasible or allowable configurations of a robot which connects the initial and the desired final configurations. Finding such a path is essentially equivalent to prescribing an unobstructed motion of the robot. Many questions that arise, such as existence, optimality, and diversity of motion paths in the configuration space, are of topological nature. The recent advances in topological data analysis and related metric geometry and topology have provided new tools to address these engineering tasks. I will survey some questions, issues, and my recent collaborations using data-driven geometric and topological methods with emphasis on the use of discrete Morse theory. The collaborations are with Chinwe Ekenna (UAlbany), Aakriti Upadhyay (Colorado School of Mines), and Weifu Wang (Baidu Research).