
Applied Mathematics Seminar



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Algebraic Geometry in Robotics

Algebraic Geometry is fundamentally the study of solution spaces for polynomial equations. Algebraic-geometry methods have recently found a range of applications in Robotics and Machine Learning. In Robotics, algebraic methods are used in solving direct and inverse kinematics problems for mechanisms made of robot arms with different types of joints or connectors, and which can end in "hands" or can jointly support moving platforms. The Forward Kinematic Problem consists in finding the location of the hand or platform, when given the parameters (length, angle of rotation) of the various joints. The Inverse Kinematic Problem consists in finding the corresponding joint configurations for a given hand position. Mathematically, the problems translate into the study of a function from the joint space into the configuration space based on the interplay between parametric and implicit polynomial equations. In Machine Learning, artificial neural networks can be explored with Algebraic-Geometry methods. In this talk we will provide a short introduction to Algebraic Geometry methods used in the problems mentioned above. This talk is partly based on work with PhD graduate Xiuyun He.

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