Department of Mathematics
University of Notre Dame

ALGEBRAIC GEOMETRY AND COMMUTATIVE ALGEBRA SEMINAR

Speaker: Laurentiu Maxim
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Date: Friday, November 22, 2019
Time: 3:00 PM
Location: 258 Hurley Hall

Lecture Title:

Topological methods in applied algebra and algebraic statistics

Abstract

Determining the closest point to a model (subset of Euclidean space) is an important problem in many applications in science, engineering, and statistics. One way to solve this problem is to determine the critical points of an objective (e.g., distance) function on the model. In algebraic statistics, the models of interest are algebraic sets, i.e., solution sets to a system of polynomial equations. The number of critical points of the squared Euclidean distance function on the (complexification of an) algebraic model is a measure of the algebraic complexity for the nearest point problem, called the Euclidean distance degree. In this talk, I will present some models from linear algebra, computer vision and statistics that may be described as algebraic sets, and I will discuss a new topological method for determining the Euclidean distance degree. As applications, I will discuss the solution to an open problem in computer vision of determining the Euclidean distance degree of the multiview variety, and I will answer positively a conjecture of Aluffi-Harris concerning the Euclidean distance degree of projective varieties. Such projective models appear naturally in low rank matrix approximation, formation shape control and all across algebraic statistics.

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