

## COLLOQUIUM

### *Novel Geometric Algorithms for Machine Learning Problems*

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**Abstract:** Machine learning is a discipline that concerns the construction and study of algorithms for learning from data, and plays a critical role in many other fields, such as computer vision, speech recognition, social network, bioinformatics, etc. As the data scale increases dramatically in the big-data era, a number of new challenges arise, which require new ideas from other areas. In this talk, I will show that such challenges in a number of fundamental machine learning problems can be resolved by exploiting their geometric properties. Particularly, I will present three geometric-algorithm-based results for various machine learning problems: (1) a unified framework for a class of constrained clustering problems in high dimensional space; (2) a combinatorial algorithm for support vector machine (SVM) with outliers; and (3) algorithms for extracting chromosome association patterns from a population of cells. The first two results are for fundamental problems in machine learning, and the last one is for studying the organization and dynamics of the cell nucleus, an important problem in cell biology. Some geometric-algorithm-based future work in machine learning will also be discussed.

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