# Computer Science Colloquium

## Algorithms and Analysis of Depth Functions using Computational Geometry

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Olsen 311
Refreshments at 2:30, Talk from 3:00-4:00

The concept of data depth has been developed over the last decade as a method of multivariate data analysis. In today's information age, with the proliferation of large amounts of high dimensional data, it provides an analysis method that is an attractive alternative to classical statistics: while classical statistical analysis requires a preliminary assumption as to the underlying probability distribution of the data, that affects the analysis, depth based statistics requires no prior assumptions and is robust to outliers. Potential applications of this technique include bioinformatics, clinical data mining, statistical process control and financial risk analysis. Various data-depth-based analysis methods have existed for a few years, but most have not been sufficiently efficient to handle large data sets.

Computational Geometry focuses on the complexity analysis of geometric problems and the design of effective algorithmic solutions. We have used computational geometry techniques to develop more efficient tools for data-depth analysis and to suggest alternative approaches. Examples include a theoretical framework to evaluate any depth function; dynamic algorithms for computing depth contours; and the novel proximity graph depth, a new class of depth functions that, unlike most existing depth functions, can distinguish multimodal data sets.

*Bio:* Eynat Rafalin is an NSF-funded Postdoctoral Associate at Tufts University. Her main research interest is development and analysis of geometric algorithms for problems from a variety of application areas. Her recent focus is application of computational geometry techniques to the analysis of the statistical concept of data-depth. Dr. Rafalin received her Ph.D. and M.Sc. in computer-science from Tufts University and a B.Sc. in Physics and Mathematics from the Hebrew University. More details about her work are in http://www.eecs.tufts.edu/~erafalin/