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Computational Geometry and Statistical Depth Functions

Over the past twenty years, statisticians have developed the concept of *data depth* as a method of multivariate data analysis that requires no prior assumptions on the probability distribution of the data and that handles outliers. Proposed *data depth* metrics are inherently geometric, with a numeric value assigned to each data point that represents its *centrality* within the given data set. It is then possible to create *depth contours* that bound the sets of points all having a depth higher than some set of fixed thresholds and use these contours for analysis and visualization of the (presumably large) data set.

Data depth remains a relatively new field. A number of *data depth* measures have been defined and analysed, and new *data depth* measures continue to be proposed. Algorithmic and combinatorial techniques from computational geometry are used to develop more efficient tools for data-depth analysis. This talk will provide an overview of some of the standard *data depth* measures such as *halfspace depth*, *simplicial depth*, *regression depth*, L_1 *depth*, and *proximity graph depth*. It will also discuss a set of desirable properties for *data depth* functions, describe enhancements of some of the standard measures to address some previous weaknesses, and provide a framework for evaluating current and future depth functions.