On Point-Location in Arrangements of Hyperplanes in High Dimensions

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In this talk I will review arrangements of hyperplanes in n-dimensions, and discuss point-location mechanisms. The latter is based on a geometric divide and conquer approach, and on stratifying a set of hyperplanes into cells of small combinatorial complexity. For the latter, we present two major decomposition strategies: bottom-vertex triangulation and vertical decomposition; we describe their combinatorial and geometric properties. As a major application, we present a new bound on the complexity of a linear decision tree for the so-called k-SUM problem, and also show that our strategy yields an improved mechanism for point-location. Joint work with Micha Sharir.