Dissertation
Defense

Efficient and Adaptive Skyline Computation

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Abstract: Skyline, also known as Maxima in computational geometry or Pareto in business management field, is important for many applications involving multi-criteria decision making. The skyline of a set of multi-dimensional data points consists of the points for which no other point exists that is better in at least one dimension and at least as good in every other dimension. Although skyline computation and queries have been extensively studied in both computational geometry and database communities, there are still many challenges need to be fixed, especially in this big data ear. In this dissertation, I present several efficient and adaptive skyline computation algorithms. First, I show a faster output-sensitive skyline computation algorithm which is the state-of-the-art algorithm from the theoretical aspect. Second, traditional skyline computation is inadequate to answer queries that need to analyze not only individual points but also groups of points. To address this gap, I adapt the original skyline definition to the novel group-based skyline (G-Skyline), which represents Pareto optimal groups that are not dominated by other groups. Third, to facilitate skyline queries, I propose a novel concept Skyline Diagram, which given a set of points, partitions the plane into a set of regions, referred to as skyline polyominos. Similar to kth-order Voronoi diagram commonly used to facilitate k nearest neighbor (kNN) queries, any query points in the same skyline polyomino have the same skyline query results.

Wednesday, May 10, 2017, 1:00 pm
Mathematics and Science Center: E406

Advisor: Li Xiong

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