

Shortest Paths and Related Problems in Weighted Directed Graphs

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Abstract

Shortest paths problems are among the most fundamental algorithmic graph problems. Some variants of these problems tend to be more difficult when the graph in question is directed and/or the graph edges have (possibly negative) weights.

In recent years there have been several new results in this area, improving running times of earlier classical algorithms. Most of these new results use fast matrix multiplication as an important ingredient.

In this talk we give an overview of the new results in the area and look at some of them in more detail. In particular, we describe an algorithm that solves the *Single Source Shortest Paths* problem in directed graphs with bounded (possibly negative) integer weights, in matrix multiplication time, and an algorithm that computes the *diameter* of a directed graph with bounded (possibly negative) integer weights faster than any known All Pairs Shortest Paths algorithm for this problem. We will also mention several open problems.