Exercises for Lecture 5

March 19, 2024

Exercise 1. Given an adjacency-list representation of a directed graph, how long does it take to compute the out-degree (ie the number of neighbours) of every vertex? How long does it take to compute the in-degrees (ie the number of edges incoming to each vertex)?

Exercise 2. The square of a directed graph $G = (V, E)$ is the graph $G^2 = (V, E^2)$ such that $(u, v) \in E^2$ if and only if G contains a path with at most two edges between u and v. Describe efficient algorithms for computing G^2 from G for both the adjacency-list and adjacency-matrix representations of G. Analyze the running times of your algorithms.

Exercise 3. What is the running time of BFS if we represent its input graph by an adjacency matrix and modify the algorithm to handle this form of input?