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# SC2001/CE2101/CZ2101

# ALGORITHM DESIGN AND

# ANALYSIS

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## Project 2: The Dijkstra's Algorithm

In the Dijkstra's algorithm, the choice of the input graph representation and the priority queue implementation will affect its time complexity.

*relax here means just checking if  $d[u] + w(u, v) < d[v]$*

- (a) Suppose the input graph  $G = (V, E)$  is stored in an *adjacency matrix* and we use an *array* for the *priority queue*. Implement the Dijkstra's algorithm using this setting and analyze its *time complexity* with respect to  $|V|$  and  $|E|$  both theoretically and empirically.
- (b) Suppose the input graph  $G = (V, E)$  is stored in an *array of adjacency lists* and we use a *minimizing heap* for the *priority queue*. Implement the Dijkstra's algorithm using this setting and analyze its *time complexity* with respect to  $|V|$  and  $|E|$  both theoretically and empirically.
- (c) Compare the two implementations in (a) and (b). Discuss which implementation is better and in what circumstances.