Dijkstra's Algorithm

CS 131
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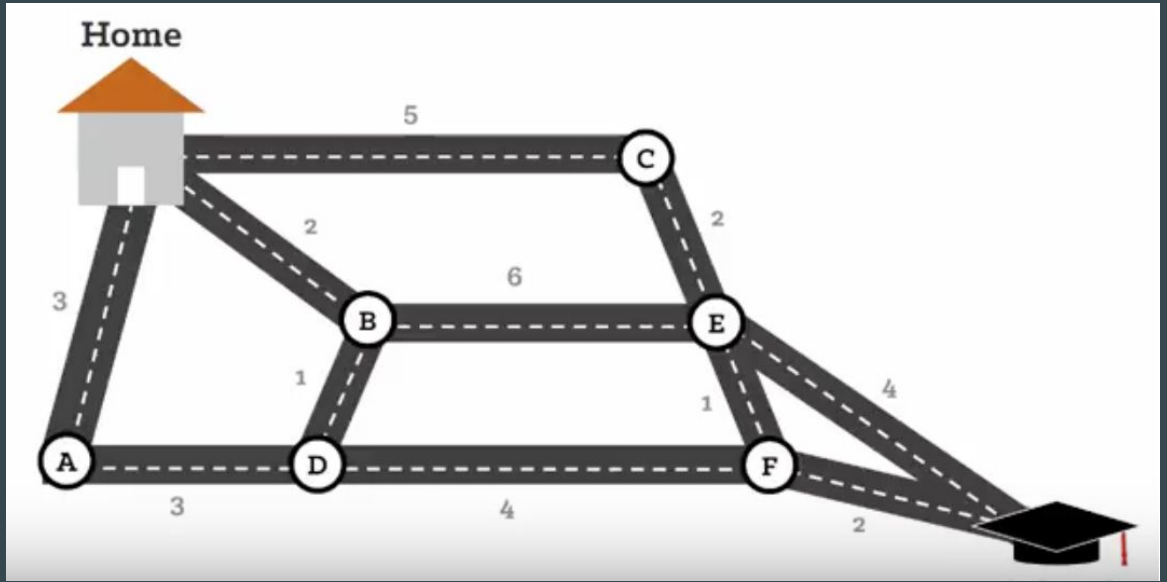
Introduction

- What is the best path from point A to point B?
- What information do we need to calculate this path?

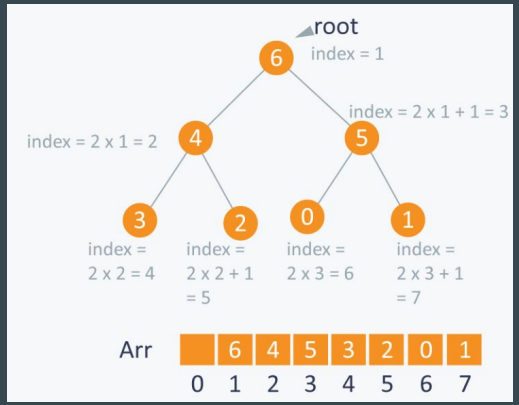
What is Dijkstra's Algorithm

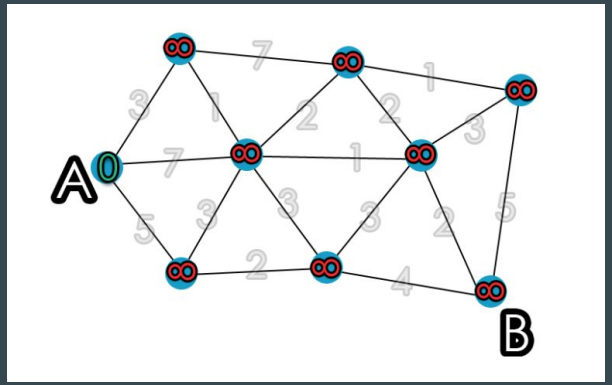
- Dijkstra's Algorithm calculates the shortest path in a weighted graph
- Created by Edsger Dijkstra who studied theoretical physics then switched to his passion of computer science

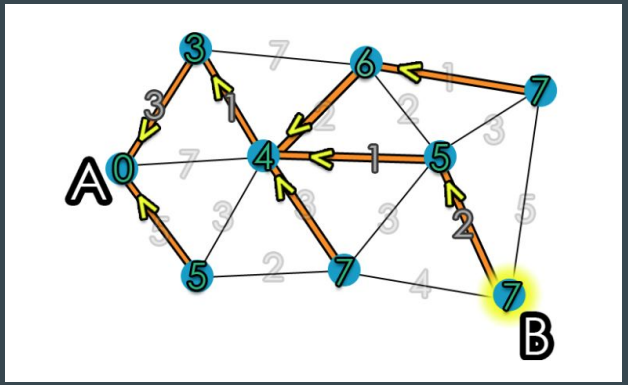


How Does it Work?

- Prioritizing Shortest Paths (use a priority queue)
- Greedy algorithm always looking for the smallest weight
- Keep track of how we got the smallest weight and which vertex connects to that current vertex







Time Complexity

- Time complexity of O(V)^2 where V is the amount of vertices
- Can be reduced to O((V+E)logV) where V is the amount of vertices and E is the amount of edges by using a list representation for the graph

Applications

- Navigation systems to find the best route
- Connecting flights that will take the least amount of travel time and least expensive cost
- Used in networking to send packets over