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Assignment 11

CS 302

Part B

**Adjacency list and Adjacency matrix data structures**

Adjacency lists and matrices both have their respective advantages and disadvantages. The Adj. list keeps track of all connection via a list; each vertex holds a list of its local connections. This means the list uses memory proportional to the number of edges. The adjacency Matrix however uses a two dimensional array to keep track of any connections by using O(n\*n) memory. The list would be much more efficient when connections are spare but there are a larger number of vertices in the graph, and the opposite would hold true for an adjacency matrix.

**Applications for topological sort shortest and shortest path algorithms**

Topological and shortest path algorithms offer a huge range of possible applications to the computer science world. One popular use is the creation of AI pathing in video games. Treating the world as a graph where walls break connections can let AI use the algorithms learned to find the shortest path to the player. Another such use is finding the shortest path to a destination in terms of traffic on roadways and connections between different streets.

**Big-O for topological sort and Dijkstra’s single source shortest path algorithms**

Topological Sort: O(V + E) where V is the vertex count and E is the extra stack

Dijkstra’s: O(V^2)