Published Preview Edit

Week 11 Quiz

Plagiarism declaration

By submitting work for this quiz I hereby declare that I understand the University's policy on academic integrity (https://academicintegrity.unimelb.edu.au/) and that the work submitted is original and solely my work, and that I have not been assisted by any other person (collusion) apart from where the submitted work is for a designated collaborative task, in which case the individual contributions are indicated. I also declare that I have not used any sources without proper acknowledgment (plagiarism). Where the submitted work is a computer program or code, I further declare that any copied code is declared in comments identifying the source at the start of the program or in a header file, that comments inline identify the start and end of the copied code, and that any modifications to code sources elsewhere are commented upon as to the nature of the modification.

This is a preview of the draft version of the quiz.

You should attempt the quiz after the lecture and your tutorial.

- The quiz is available for a period of 10 days.
- You may attempt the quiz multiple times (if you happen to get a question wrong, you can do it again)
- Your score on the quiz will be recorded in the grade book. The score is not used when determining your final mark in this subject
- The quiz might not display equations correctly in some browsers. If you experience problems, we recommend that you use Firefox.

Quiz Type	Graded Quiz
Points	7
Assignment Group	Imported Assignments
Shuffle Answers	No
Time Limit	No Time Limit
Multiple Attempts	Yes
Score to Keep	Highest
Attempts	Unlimited
View Responses	Always
Show Correct Answers	Immediately
One Question at a Time	No

Due	For	Available from	Until
-	Everyone	-	-

Preview

Score for this attempt: **7** out of 7
Submitted Sep 25 at 11:43
This attempt took 1 minute.

Question 1

1 / 1 pts

Which one of the following statements about Floyd's algorithm running on a graph with V nodes and E edges is correct?

Correct!

- The iterative (dynamic programming) version finds the shortest path between all pairs of nodes in time $O(V^3)$

- The recursive version finds the transitive closure of a graph in $O(3^V)$ time.

The iterative (dynamic programming) version finds the shortest path between all pairs of nodes in $O(3^E)$ time

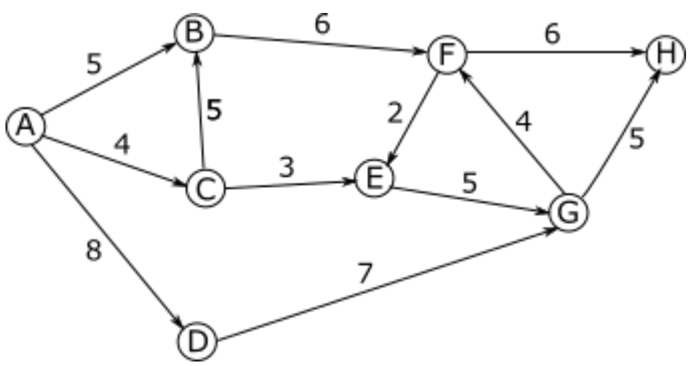
The iterative (dynamic programming) version always finds a minimal spanning tree rooted at every node in $O(V^3)$ time.

Well done! You are on track.

Question 2

1 / 1 pts

Consider the following directed weighted graph:



Run Dijkstra's algorithm on the above graph, with source vertex A. In what order will Dijkstra visit each vertex (i.e. what is the order in which vertices are removed from the priority queue of unvisited vertices)?

- A, B, C, D, E, F, G, H
- A, C, B, D, E, F, G, H

Correct!

- A, C, B, E, D, F, G, H

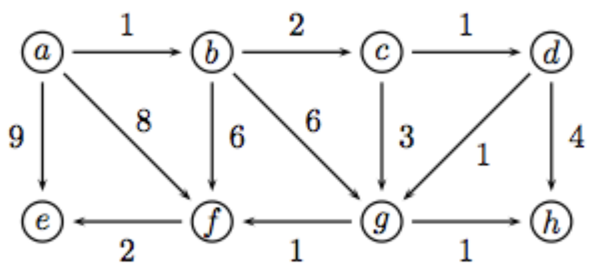
- A, D, C, B, F, E, H, G

When we run Dijkstra's algorithm on the given graph, we start with a vertex-cost table that assigns a cost of 0 to vertex A, and a cost of infinity to all other vertices. We first visit the source vertex, A. It's neighbours are B, C, and D. To get to B, C, and D via A incurs a cost of 5, 4, and 8, respectively. We replace the infinity cost assigned to vertices B, C, and D with 5, 4, and 8. Vertex A is marked as visited. The unvisited vertex with the least cost is currently vertex C. Dijkstra will now visit vertex C. C's unvisited neighbours are B and E, with costs (via C) of 9 and 7. We do not update B's cost as its current cost of 5 is less than 9. We update E's cost to 7. Vertex C is now marked as visited. The next vertex visited by Dijkstra is B. Vertex B, with its cost of 5, is the vertex with the smallest cost. We continue in this fashion, visiting E, D, F, G, and H, in that order.

Question 3

1 / 1 pts

Suppose we run Dijkstra's single-source shortest-path algorithm on the weighted directed graph below, starting from node a. When the algorithm terminates, the seven edges (prev[u],u), with u in the set {b,c,d,e,f,g,h}, make up the shortest-path tree. What is the tree's weight, that is, what is the sum of its edges' weights?



Correct!

9

rrect Answers

9 (with margin: 0)

Excellent! Well done.

Question 4

1 / 1 pts

In what circumstances might we want to use Dijkstra's algorithm to compute all-pairs shortest paths *over* the Floyd-Warshall algorithm?

- We have a dense graph with positive edge weights.
- Our graph has one or more negative edge weights.
- The number of edges in our graph is far greater than the number of vertices (i.e. |E| >> |V|).

Correct!

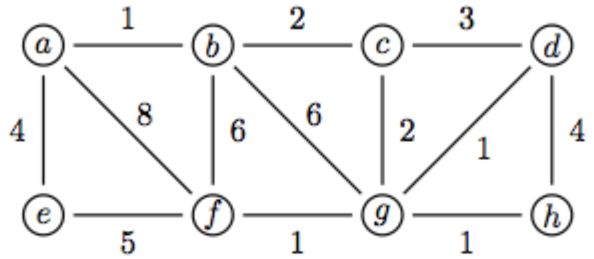
- We have a sparse graph with positive edge weights.

Dijkstra's algorithm cannot be applied to graphs with negative edge weights. The worst case complexity of applying Dijkstra's algorithm to each vertex in a graph is O(|V||E| + $|V|^2$ log |V|). The worst case complexity of applying the Floyd-Warshall algorithm to compute all-pairs shortest paths is O($|V|^3$). For dense graphs, where the number of edges is much greater than the number of vertices, Floyd-Warshall is likely to be faster in practice. For sparse graphs, however, using Dijkstra's algorithm on each vertex is likely to be preferable. It may be helpful to think about how the relative complexities compare when |E| < O(|V|) and |E| > O($|V|^2$).

Question 5

1 / 1 pts

Consider the graph below. What is the cost of its minimum spanning tree, that is, the sum of its edges' weights?



Correct!

12

rrect Answers

12 (with margin: 0)

You got that right!

Question 6

1 / 1 pts

A connected weighted undirected graph G has 57 nodes and 194 edges. How many edges does a minimum spanning tree for G have?

Correct!

56

rrect Answers

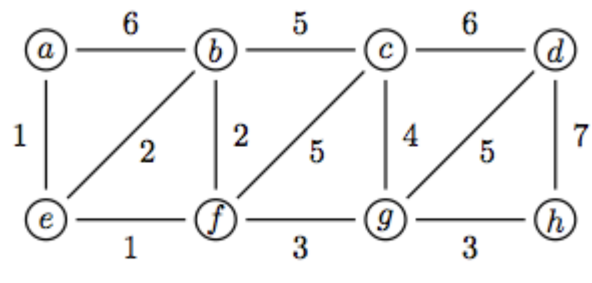
56 (with margin: 0)

Yes, too easy. For a connected undirected graph <V,E>, any spanning tree has |V|-1 edges.

Question 7

1 / 1 pts

Consider the graph below. How many different minimum spanning trees does it have?



Correct!

2

rrect Answers

2 (with margin: 0)

Yes, correct.

Quiz Score: **7** out of 7