BIOE 198MI Lab 9 Assignment & rubric

You're given 3 different medications, each medicine causes increment of energy cost of one edge (shown in table). We can only use one medicine at a time otherwise there will be drug antagonism. When the total cost of producing chemical product #9 from chemical product #1 is greater or equal to 25 unit, the reaction stops and no harmful product will be released. Which medicine should we use? Describe how does the value function change with each medicine. Draw the diagram with MATLAB, highlight the updated new shortest path and indicate minimum cost of that path.

	Effective edge	Original energy cost	New cost
medicine 1	7—> 9	3	10
medicine 2	1—> 3	2	10
medicine 3	4—> 5	4	10

Extra credit (backward shortest path): We learn the forward shortest path algorithm in lab, which the value function is updated from origin node to the destination node . Alternatively, we can do it from **backward**. For backward shortest path algorithm, the value function Vb(j) is defined as **the minimum cost from node j to the finishing node**. Thus, Vb(9)=0, and the goal is to find Vb(1), which by definition should provide the minimum cost, as well the path that provides Vb(1).

Hint: it always takes a roundtrip to find 1) the cost of shortest path and 2) the actual path. This time, the value function is calculated from node 9 to node 1. The path should calculated from node 1 to node 9.

Rubric:

Introduction (1 point)

Method:

- How do you solve the shortest path problem with traditional approach and dynamic programming approach? Describe the algorithms and how you convert the algorithms into MATLAB code (3 points)
- Explain the difference between while-loop and for-loop (1 point)

Result:

- Describe which medicine you choose to use and explain why, with visualizations (1 point)
- Provide a table/plot for the computation time between traditional approach and dynamic programing approach (1 point)

Clearly labeled figures with proper captions. (1 point)

Discussion:

Describe the advantage and disadvantages of traditional and Dynamic programming approaches. (1 point)

Extra credit:

Design the algorithm of backward shortest path approach, describe how you edit the MATLAB code. (1 point)

Provide the final value function Vb and the highlighted shortest path. (1 point)

Do some background study and generally describe which approach you think is better/faster, forward shortest path or backward shortest path? How about this particular example, the virus network? Hint: is there significantly difference in computational time? (1 point)