Name:

SA367 · Mathematical Models for Decision Making Spring 2022 · Uhan

Quiz 6 – 3/10/2022

Problem	Weight	Score
1	2	
2a	0.5	
2b	0.5	
Total		/ 30

Instructions. This take-home quiz is due at the beginning of class on Thursday 3/10.

You may use your own course materials (e.g., notes, homework) as well as any materials linked from the course website. No collaboration allowed.

Type your answers in the Jupyter notebook for this quiz, and submit the notebook (just the `.ipynb` file) using the submission form on the course website.

For Problems 1 and 2, consider the following setting.

The World Health Council is devoted to improving health care in underdeveloped countries. It now has four medical teams available to allocate among three such countries to improve their medical care, health education, and training programs. Therefore, the council needs to determine how many teams to allocate to each of these countries in order to maximize the total effectiveness of the four teams. The teams must be kept intact, so the number allocated to each country must be an integer. In addition, at most two teams can be sent to any country.

The table below gives the estimated additional person-years of life (in multiples of 1,000) for each country and possible allocation of medical teams.

	Country		
Medical teams	1	2	3
0	0	0	0
1	45	20	50
2	70	45	70

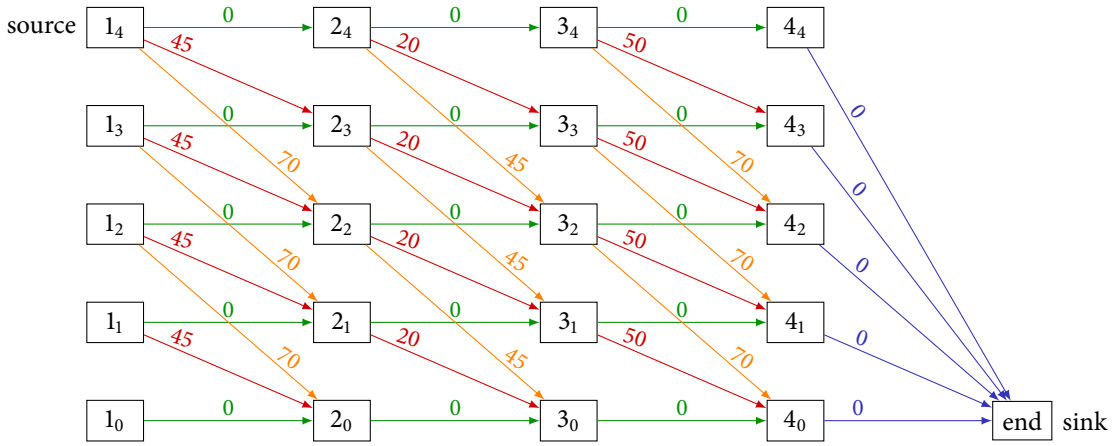
The organization's goal is to maximize the total additional person-years of life resulting from allocating these medical teams.

You have already formulated this problem as a dynamic program:

- Stage t represents deciding how many teams to send to country t ($t = 1, 2, 3$), or the end of the decision-making process ($t = 4$).
- Node t_n represents having n teams remaining at stage t ($n = 0, 1, 2, 3, 4$).

(over)

- We want to find the longest path from source to sink in the following graph:



Problem 1. Solve the dynamic program above using `networkx` and `bellmanford`.

Problem 2.

a. What is the maximum total additional person-years of life possible from allocating the medical teams?
b. How many teams should be added to each country to maximize the total additional person-years of life?