CE 272
Traffic Network Equilibrium

Programming Task 4
Due Jun 18

General Instructions: This task is the last of four tasks in the course project. The requirements are different depending on your degree program. Share the link to your Colab with the TA (Helen Thomas). Also submit a zipped file of the complete code and a one page write-up summarizing your output. Make sure to add adequate comments to your code.

Task Objectives:
Ph.D. and M.Tech. (Research) students:

1. Add a function `bisection` that provides the optimal step size to take between the current and all-or-nothing solution. Call this from a function `frank wolfe` that computes the overall equilibrium solution.
2. Write functions in your code to print the TSTT and the link flows at equilibrium.
3. Change your delay functions to obtain the SO solutions for the four test networks.
4. Compile the results from your code in the following format. Set the relative gap threshold to 10^{-3}.

Network	UE TSTT	SO TSTT	% Difference	UE Computation Time (in sec)	
				MSA + LS & LC	FW + LS & LC
`SiouxFalls`					
`Eastern-Mass.`					
`Chicago-Sketch`					
`Anaheim`					

*LS: Label Setting, LC: Label Correcting, MSA: Method of Successive Averages, FW: Frank-Wolfe

M.Tech. (Coursework) students:

1. Write functions in your code to print the TSTT and the link flows at equilibrium.
2. Change your delay functions to obtain the SO solutions for the four test networks.
3. Compile the results from your code in the following format. Set the relative gap threshold to 10^{-3}.

Network	UE TSTT	SO TSTT	% Difference	UE Computation Time (in sec)
				MSA + LS & LC
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4. Create a CUBE model for the Fargo, North Dakota sample network using the four steps described in the tutorial. Upload the output network files and report the TSTT for the following scenarios:

```
from random import seed
from random import randint

seed(last five digits of your SR. No.)
for _ in range(5):
        print(randint(1, Number of Links))

for _ in range(5):
        print(randint(1, Number of Zone Pairs))
```

- Base case model
- Base case model with doubled demand (for all modes) between the five randomly chosen OD pairs from the above code.
- Base case model with doubled capacity on 5 randomly chosen links from the above code.
- Base case model with doubled capacity on 5 links with the highest V/C ratio.

U.G. students:

1. Write functions in your code to print the TSTT and the link flows at equilibrium.
2. Change your delay functions to obtain the SO solutions for the four test networks.
3. Compile the results from your code in the following format. Set the relative gap threshold to 10^{-3}.

Network	UE TSTT	SO TSTT	% Difference	UE Computation Time (in sec) MSA + LS & LC
SiouxFalls				
Eastern-Mass.				
Chicago-Sketch				
Anaheim				

*LS: Label Setting, LC: Label Correcting, MSA: Method of Successive Averages