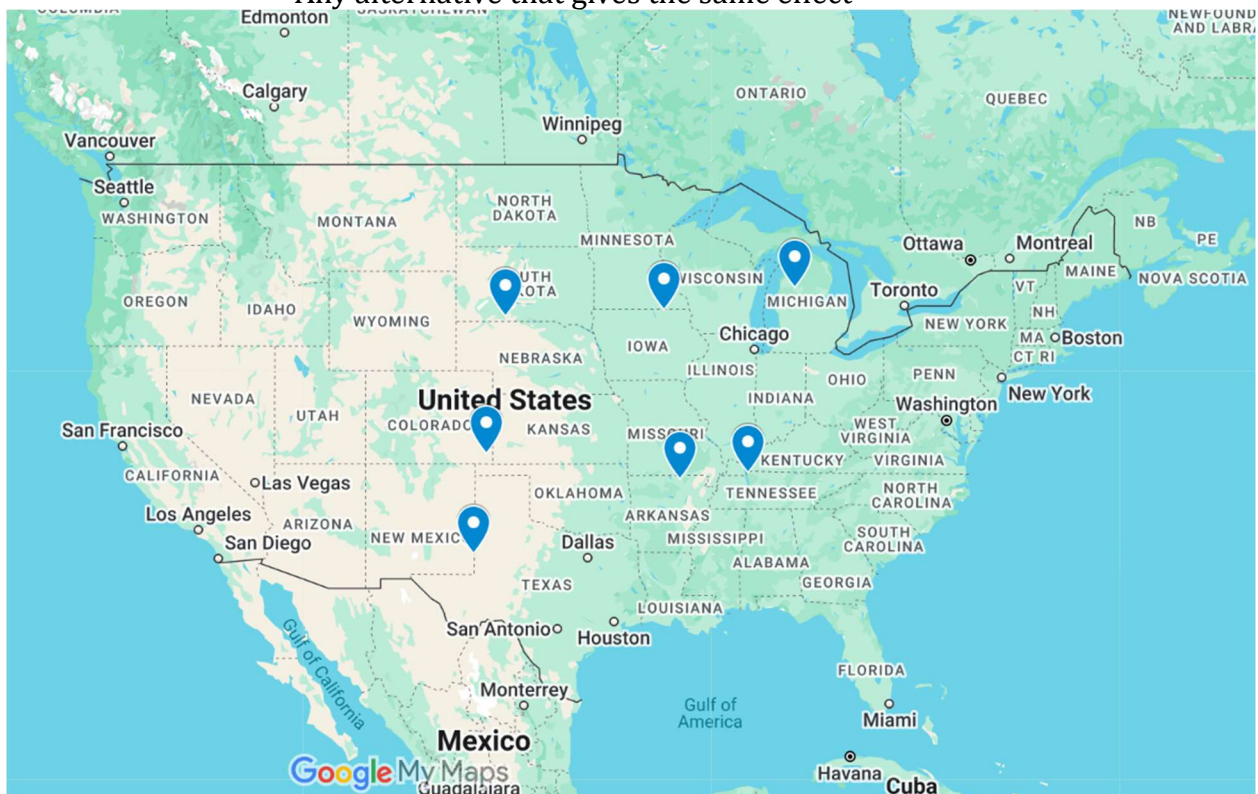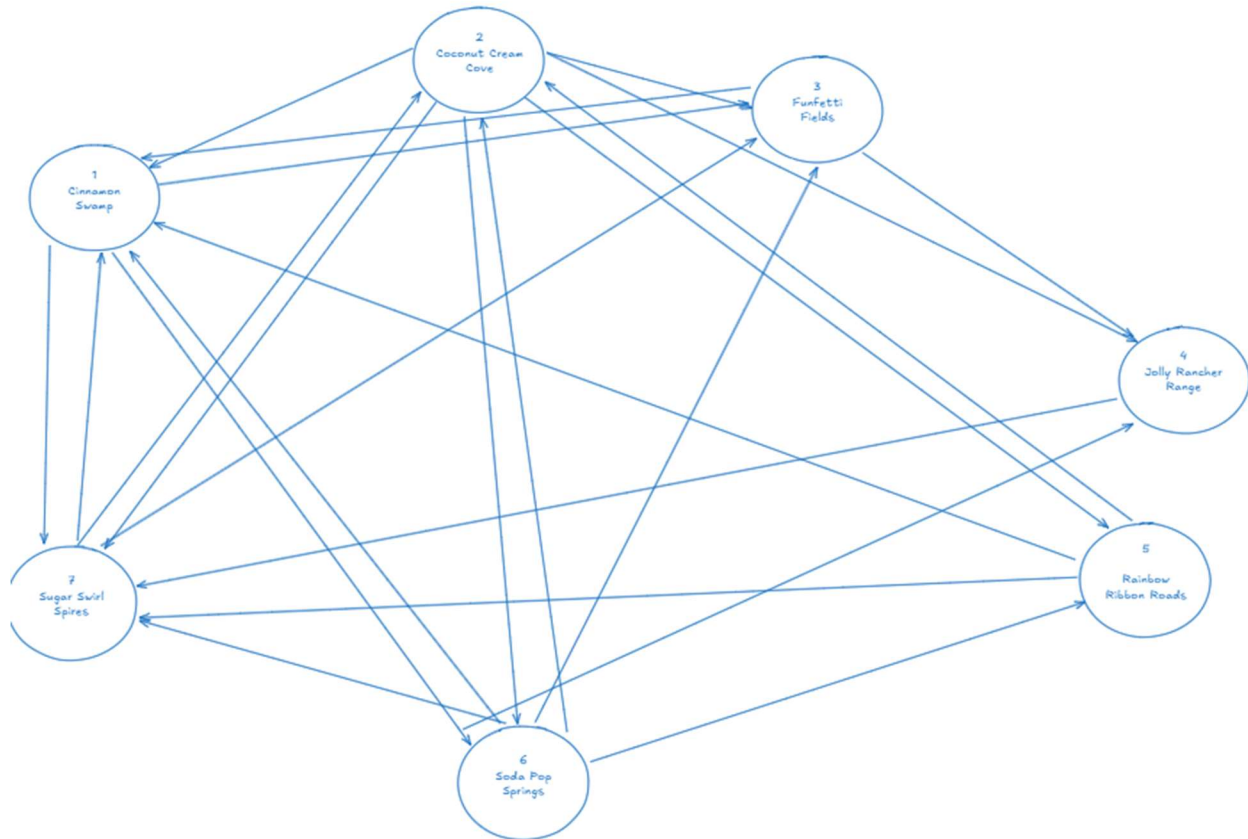# Module 10 – MOLP

Exploratory Data Analysis

In this section, you should perform some data analysis on the data provided to you. Please format your findings in a visually pleasing way and please be sure to include these cuts:

- *Choose a visualization method (expect 7 nodes and ~24 arcs):*
  - *Make a visual graph of your data on a map (coordinates should be within US borders)*
    - https://mymaps.google.com/
    - Find a map with latitude/longitude and place them approximately
    - Any alternative that gives the same effect

  - *Make a visual graph of your data like what we saw for the sample problem*
    - https://excalidraw.com
    - https://mermaid.live
    - https://dreampuf.github.io/GraphvizOnline
    - Powerpoint

Model Formulation

Write the formulation of the model into here prior to implementing it in your Excel model. Be explicit with the definition of the decision variables, objective function, and constraints. For this problem, I am only asking that you perform the model formulation for the MOLP model.

Objectives:

Min: Q

Constraints:

W1((145.76X13 + 146.34X16 + 139.92X17 + 140.65X21 + 146.42X23 + 140.01X24 + 148.63X25 + 147.03X26 + 140.63X27 + 138.9X31 + 138.13X34 + 128.59X47 + 124.18X51 + 119.84X52 + 122.21X57 + 130.56X61 + 126.14X62 + 136.23X63 + 129.09X64 + 137.31X65 + 129.44X67 + 126.38X71 + 122.01X72 + 131.99X73)- 1,785,593.68)/ 1,785,593.68

W2((1X13+0X16+1X17+0X21+1X23+1X24+1X25+1X26+1X27+1X31+1X34+1X47+1X51+ 1X52+1X57+1X61+1X62+1X63+0X64+1X65+1X67+0X71+1X72+1X73)- 6042/ 6042

W3((81X13+28X16+35X17+74X21+88X23+94X24+94X25+72X26+98X27+102X31+105X34+27X47+84X51+35X52+89X57+94X61+78X62+87X63+87X64+32X65+88X67+40X71+87X72+35X73)-1298/1298

Model Optimized for Equally Weighted Objectives

Implement your formulation into Excel and be sure to make it neat. This section should include:

- *A screenshot of your optimized final model (formatted nicely, of course)*

Objectives	Totals	Target	Deviation	% Deviation	Weight	Weighted Deviation %
Min Trans Cost	169159	$ 140,314.00	$ 28,845.00	21%	1.00	20.56%
Min Distance	2582431.614	$ 1,785,593.68	$ 796,837.93	45%	1.00	44.63%
Max Eco Friendly	13313	6042	$ 7,271.00	120%	1.00	120.34%
Min Congestion	1298	1298	$ -	0%	1.00	0.00%
Objective						
MiniMax	120.34%					

- *A text explanation of what your model is recommending*
    - If all of my objectives are weighed the same, my model is recommending that it focus on we try to minimize as much of the objectives as possible while maximizing the Eco friendliness of the transportation methods. The largest deviation is eco friendliness which means that my model is recommending that we use more eco friendliness than the other objectives. This means that we are way above the target on eco friendliness, so our methods are more eco friendly than what we had targeted for.
- *Update your graph from the EDA section to indicate which arcs are used*
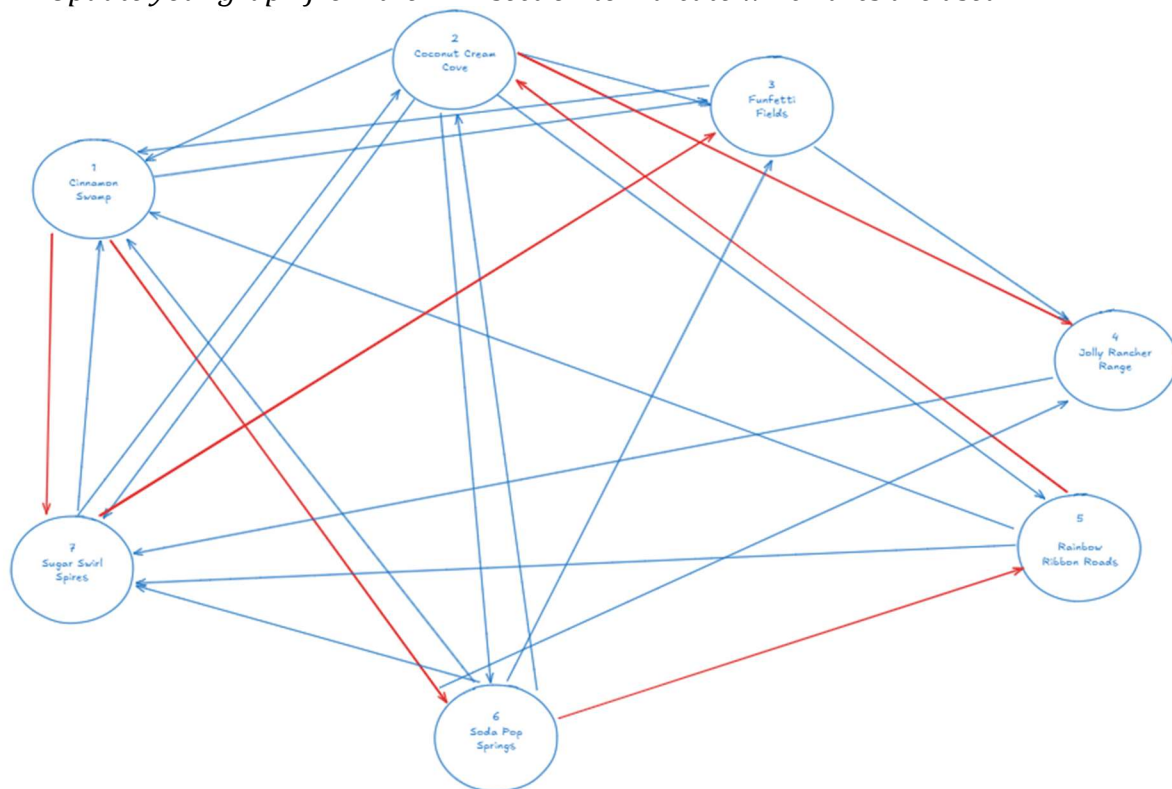
Model with Stipulation

Please copy the tab of your original model before continuing with the next part to avoid messing up your original solution.

Alter the weights of each objective to add weight to match what matters most to you. Perhaps run a few different scenarios to see how the routes change depending on the weights. When you find a weight mix and solution that satisfies you, please write a justification on why you chose the final model/weights and about how a configured model like yours can be used for scenario planning.

Objectives	Totals	Target	Deviation	% Deviation	Weight	Weighted Deviation %
Min Trans Cost	169159	$ 140,314.00	$ 28,845.00	21%	4.00	82.23%
Min Distance	2582431.614	$ 1,785,593.68	$ 796,837.93	45%	1.00	44.63%
Max Eco Friendly	13313	6042	$ 7,271.00	120%	3.00	361.02%
Min Congestion	1298	1298	$ -	0%	2.00	0.00%
Objective						
MiniMax	361.02%					

I chose this weighting system out of 10. I assigned weights based on what I would like to see if this was my business. I gave the lowest cost because minimizing cost is essential. I like eco-friendly transportation so that I could be more aware of the environment that's why it is my second highest. And congestion is my third so that delivers could be on time. I am not as concerned about distance. Again, the highest deviation was eco-friendly transportation. This is because it is the objective that is furthest away from the target value.