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

A diagram of a diagram

AI-generated content may be incorrect.

Model Formulation

*Write the formulation of the model 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.*

MIN: Q

≤ Q

≤ Q

≤ Q

≤ Q

+X31 +X51 -X13 -X14 -X17 ≥ -9806 } Node 1

+X32 +X42 +X52 +X72 -X24 -X26 ≥ 1379 } Node 2

+X13 +X53 +X63 +X73 -X31 -X32 -X34 -X35 -X37 ≥ 1751 } Node 3

+X14 +X24 + X34 +X54 +X64 + X74 -X42 -X72 ≥ 1350 } Node 4

+X35 +X75 -X51 -X52 -X53 -X54 -X57 ≥ 1823 } Node 5

+X26 -X63 -X64 -X67 ≥ 1973 } Node 6

+X17 +X37 + X47 +X57 +X67 -X72 -X73 -X74 -X75 ≥ 1530 } Node 7

X1,…X24≥ 0

X1,…X24= Int

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)*

*A diagram of a diagram

AI-generated content may be incorrect.*

* *A text explanation of what your model is recommending*
* *Update your graph from the EDA section to indicate which arcs are used*

A screenshot of a computer

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The Model recommends that we prioritize the minimization of congestion levels because, that is the solution that keeps the other goals closest to their target values. It keeps them below 37% deviation from the original value.

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.*

*A screenshot of a computer screen

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I chose these weights because I believe they are closer to where modern companies want to be, prioritizing Cost and Travel Distance (time) above all. But also, presenting and eco-forward initiative by weighing eco-friendliness and congestion levels are relatively high.

A screenshot of a spreadsheet

AI-generated content may be incorrect.this image was another of the scenarios I ran I believe this model reflects companies in the 20th century putting all their focus on minimizing the money and not caring about the impact.