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)*
* A map of the united states

  AI-generated content may be incorrect.
  + *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.*

MIN transportation distance: 10.8X1+14.1X2+8.0X3+14.4X4+10.8X5+12.5X6+4.2X7+10.8X8+19.2X9+4.3X10+7.9X11+14.1X12+23.3X13+19.2X14+3.0X15+12.5X16+7.9X17+11.3X18+12.2X19+8.0X20+9.0X21+21.0X22+8.0X23+12.2X24

Minimize Total Cost

8x1+8x2+14x3+23x4+11x5+10x6+22x7+16x8+5x9+19x10+11x11+7x12+14x13+8x14+15x15+22x16+12x17+14x18+6x19+17x20+24x21+18x22+13x23+16x24

Non Eco: total eco- (X4+X5+X9+X14+X25)

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 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 spreadsheet

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* A screenshot of a computer

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* This model suggests the way and route to distribute the 9123 out of Candy Cane Canyon.
* Minimize cost: cost was significantly higher than target
* Minimize congestion: objective hit the target, showing that the model prioritized avoiding congestion very well.
* Max eco-friendly: the solution uses fewer eco-friendly routes than desired. Tradeoff with cost of distance
* Minimize distance: matched the target exactly, making it a high priority.
* MiniMax: the worst performing weighted deviation from any target was 81%. The model tried to balance the objectives, minimizing the worst deviation across them.

*A diagram of a company

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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.*

* The cost currently has the highest deviation of 581% by increasing the weight we are increasing the importance to reduce that
* The consequences: it increases congestion or eco-unfriendliness