Module 07 – Maximal Flow

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:*

* *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/Word

A diagram of different types of food

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.*

Max = X70

+X70 -X01 -X02 -X03 = 0

+X01 +X21 -X15 = 0

+X02 -X21 -X25 – X26 = 0

+X03 + X53 +X63 -X34 = 0

+X34 +X54 -X47 = 0

+X15 -X57 -X54 -X53 = 0

+X26 -X67 -X63 = 0

+X47 +X57 +X67 -X70 = 0

Model Optimized for Maximal Flow

*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, especially any identified bottlenecks*
* *Update your graph from the EDA section to bold/color the links being used (and show how much is going through that link)*

*A screenshot of a graph

AI-generated content may be incorrect.*

* *The model suggests the use of all edges except for 2-1, 5-3, and 6-3. The model has some bottlenecks at node 0, 2, 3, 5, 6*
* *A diagram of different types of food

  AI-generated content may be incorrect.*

Model with Stipulation

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

*Let’s demonstrate the “Flow Aggregation” special consideration that was discussed in the textbook and the Follow Along – Model Formulation video. Please follow these steps:*

* *Identify an edge that is not used with your current solution* 
  + *If by chance all your edges are in use, then apply the next step to an under-utilized edge*
* *Add a lower bound (LB) constraint to that edge (i.e. there must be a non-zero flow to the edge)*
  + *The LB should be 10% of the capacity of that edge (i.e. if the unused edge supports 500-unit flow, then we should had a LB of 50 units through that edge)*
* *Discuss the changes to the optimal solution with this change and how it impacts the model formulation*

The edges that are capacity need to be raised to the amount necessary, so all edges are at capacity.

*A table with numbers and text

AI-generated content may be incorrect.*

*A diagram of a variety of locations

AI-generated content may be incorrect.*