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 a network

AI-generated content may be incorrect.

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.*

Max:

Node 0: --+=0

Node 1: ++=0

Node 2: ---=0

Node 3: +---=0

Node 4: +--+=0

Node 5: +++++=0

Node 6: --+=0

Node 7: -+-+-=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 computer

AI-generated content may be incorrect.

The model finds that the maximum flow from Crispy Rice Reef to Twizzler Tunnels is 904 units, with all nodes maintaining balanced inflow and outflow. Key bottlenecks include the Molten Mocha Marsh to Pixie Stix Plateau (206 units) and Strawberry Swirl Stream to Twizzler Tunnels (450 units), both reaching their capacity limits. Additionally, the Crispy Rice Reef to Molten Mocha Marsh link is unused, suggesting that alternative paths are more optimal. To increase flow beyond 904 units, capacity expansions on these bottlenecked links would be necessary.

A diagram of a network

AI-generated content may be incorrect.

Model with Stipulation

*A diagram of a network

AI-generated content may be incorrect.*

For my model, the edges in green are underutilized, and the edges in red are at max capacity. The edges in black are 0.

To increase the optimal solution beyond 904 units, the network's capacity constraints on key bottlenecks need to be expanded. Specifically, increasing the limits on Molten Mocha Marsh to Pixie Stix Plateau (206 units) and Strawberry Swirl Stream to Twizzler Tunnels (450 units) would allow more flow through the system. Additionally, utilizing the unused Crispy Rice Reef to Molten Mocha Marsh link by redistributing flow could improve efficiency.