Module 12 – Location Graph

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 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

A map of the united states with blue pins

AI-generated content may be incorrect.

* Use your available data to determine a good starting coordinate for the DC
  + Should you use the average of the ranges of lat longs of the stores?
  + Should you use the coordinates of the store furthest away from the current DC?
  + Can you think of something better to use?
  + Whatever you use, please record the optimal function with your starting coordinate to compare to your optimized model

Average of the lats and longs 39.25375 -106.6825

Model Formulation

*Try to 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. Hint: Linking constraints aren’t needed since we are using Nonlinear GRG but refer to the associated PowerPoint in your data if you need help.*

Model Optimized for Distance Reduction from DC to Store

*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 screenshot of a data

  AI-generated content may be incorrect.*
* *A text explanation of what your model is recommending* *The model optimizes the placement of a new distribution center to reduce the total distance traveled from DCs to stores. Using the current and proposed DC coordinates, we calculated the Euclidean distance from each store to both DCs and then assigned each store to the closest one. The optimal location for the new DC is latitude 39.4928, longitude -106.683, which results in a minimized total travel distance of 50.70 units. Most stores benefit from switching to the new DC, while a couple (like Marzipan Metropolis and Jolly Rancher Range) remain assigned to the current DC due to proximity. This hybrid assignment ensures maximum efficiency.*
* *Update your graph from the EDA section by adding in your new DC and add indicators of which Stores are serviced by which DC*

A map of the united states

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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.*

*You should notice that while distance is minimized between each store and each DC, there is a discrepancy between how much demand is serviced between each DC (i.e. one DC may service a lot more demand than others). Please:*

1. *Choose one:*
   1. *Implement a change that picks a location for the new DC to distance AND load. You can do this by multiplying distance by demand if a store is serviced by a particular DC. A screenshot of a computer

      AI-generated content may be incorrect.*
   2. *Instead of just summing the distance, also add the difference between demand serviced between each DC (i.e. if the old DC serves stores with 8000 total demand and the new DC does 3000 then the difference would be 5000). Be sure to not remove the sum of distance too, it should be both. You may want to add weights and such but not necessary*
2. *Provide a text explanation on what your model is recommending now with this change.*

*This assignment reduces the overall travel distance while keeping the volumes at each DC nearly balanced*

1. *Explain the changes to your Solver/Model. With these modifications, Solver finds the assignment that best trades off shorter routes with evenly distributed demand across both centers.*