Module 10 - MOLP

Exploratory Data Analysis

* *A visual graph of the data on a map*
* Link to the map: <https://my.atlist.com/map/49d985e6-63ac-4578-a560-985ce41b792f?share=true>

A map of the united states

AI-generated content may be incorrect.

Fig 1: Different locations of the MOLP problem

Fig 2 : Demand/ Supply of different locations

Model Formulation

1. *Decision Variables  
   Decision variables are the variables in an optimization model whose values are to be determined in order to achieve the best outcome according to the objective function. These variables represent the decisions to be made within the constraints of the problem.*

*In this model “Units Shipped and MiniMax” = $B$4:$B$27,$Q$18 are Decision Variables*

1. *Objective Function  
   The objective function is a mathematical expression that defines the goal of the optimization model. It is formulated in terms of the decision variables and is either maximized or minimized, depending on the nature of the problem.*

*Objective Function, MiniMax =$Q$18*

1. *Constraints  
   Constraints are mathematical expressions that represent the limitations or requirements of the optimization problem. They define the feasible region by restricting the values that the decision variables can take.*

*In the model the following Constraints:*

*A math equations with numbers

AI-generated content may be incorrect.*

1. *Units shipped should be integers*
2. *Units shipped should be greater than or equal zero*
3. *Nerflow should be greater than or equal Supply/Demand*
4. *Weighted Deviation % should be less than or equal MiniMax*

Model Optimized for units shipped and MiniMax

* *A screenshot of the optimized final model :*

*A screenshot of a spreadsheet

Description automatically generated*

* *Explanation of the model and recommendation:*

*The model has 24 transportation methods, 7 locations with there longitude and latitude. Cost per units shipped, supply/demand are also given. additionally, the congestion level, and eco-friendly is given*

*The weighted deviation % was connected to the MiniMax variable for the objective function, which was optimized through Excel Solver.*

*The Model is recommending to use location ID 1 and 2 which are Cherry Jubilee Junction and Coconut Cream Cove while majority being shipped from ID 1*. The MiniMax variable was settled at 37.24%.

Model with Stipulation

The weights were changed as the following:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Weight | 0.60 | 0.35 | 0.02 | 0.03 |

*Previously all of the values were given one. The weights of each were alterted several time to based on the Total values. The altered weights changed the MinMax to only 0.50% but the arc for shipping units remained the same, which ID 1 and 2. Best on the results choosing less arc may reduce complications in the supply chain and reduce cost as well. Which why the scenario shown in the model can be used in this case.*

*A screenshot of a spreadsheet

Description automatically generated*