IEE 574 APPLIED DETERMINISTIC OPERATIONS RESEARCH MODELS

PROJECT 1 REPORT

LP #2 – Candy Business - Blending LP Problem

Decision Variables:

X_{ij} - # of ingredient I required to produce candy j.

where, i € {sugar, nut, chocolate}

j € {slugger candy, easy out candy}

Objective Function:

Maximize $Z = 20(X_{11} + X_{21} + X_{31}) + 25(X_{12} + X_{22} + X_{32})$

Constraints:

$X_{11} + X_{12} <= 100$ → Sugar constraint

$X_{21} + X_{22} <= 20$ → Nut constraint

$X_{31} + X_{32} <= 30$ → Chocolate constraint

$0.2\ X_{12} - 0.8\ X_{22} + 0.2\ X_{32} <= 0$ → Easy out Nuts constraint

$0.1\ X_{11} - 0.9\ X_{21} + 0.1\ X_{31} <= 0$ → Slugger Nuts constraint

$0.1\ X_{11} + 0.1\ X_{21} - 0.9\ X_{31} <= 0$ → Slugger chocolate constraint

$X_{11}, X_{12}, X_{13}, X_{21}, X_{22}, X_{23} >= 0$ → Non- negativity constraint

LP #3 - Productivity during quarantine – Problem Formulation

I have formulated my own linear programming problem to determine the effective usage of my time during this quarantine to make the best use of it. I have considered almost all possible factors to formulate this problem. I want to maximize the number of hours where I do productive work taking into the consideration my health, physical and mental factors which should also be included in this formulation in order to maintain a balanced work life.

Objective Function:

Maximize $Z = 8X_1 + 10X_2 + 9X_3 + 8X_4 + 9X_5 + 6X_6 + 9X_7 + 10X_8 + 1X_9 + 2X_{10} + 3X_{11} + 4X_{12} + 4X_{13} + 2X_{14} + 1X_{15} + 5X_{16} + 10X_{17} + 1X_{18} + 3X_{19} + 3X_{20} + 2X_{21}$

Decision Variables:

X_1 - #hours spent working part time as a Data Analyst at ASU

X_2 - #hours spent for IEE 574 coursework (incl. lectures, review sessions, quizzes and homework)

X_3 - #hours spent practicing leetcode and hackerrank coding problems

X_4 - #hours spent working with INFORMS for data collection and analysis project

X_5 - #hours spent on working with data science projects

X_6 – #hours spent designing a data science website/portfolio

X_7 – #hours spent on studying for Tableau Certification

X_8 – #hours spent working for as ML Fellow – Fellowship.ai

X_9 – #hours spent in sleeping

X_{10} – #hours spent to buy groceries

X_{11} – #hours spent on cooking and washing vessels

X_{12} – #hours spent talking over phone to other (family & friends)

X_{13} – #hours spent walking and doing exercises

X_{14} – #hours spent chilling, chit chatting and playing with friends

X_{15} – #hours spent bathing and performing other personal routine checks

X_{16} – #hours spent using phone and browsing through social media platforms

X_{17} – #hours spent praying god

X_{18} – #hours spent cleaning the house

X_{19} – #hours spent watching useful content in YouTube

X_{20} – #hours spent working out

X_{21} – #hours spent eating food

Constraints:

All of the below details were calculated based on one-week time period.

- ***Total** #hours* spent over a week should at most 168
- Total #hours spent ***working*** should be at most 55
- Total #hours spent **studying** should be at most 38
- Total #hours spent **sleeping** should be at least 40
- Total #hours spent doing **household work** should be at most 5.5
- Total #hours **trying to stay fit and healthy** should be at least 7
- Total #hours spent for **personal needs** should be at most 10
- Total #hours spent **chilling with friends** should be at most 9
- Total #hours spent **eating food** should be at most 8
- Total #hours spent **using phone** should be at most 15
- All the decision variables should be positive

Data:

	CONSTRAINTS										
DECISION VARIABLES	S.NO	TIME	WORK	STUDY	SLEEP	HOUSEHOLD WORK	HEALTH	PERSONAL NEEDS	CHILLING WITH FRIENDS	EATING	PHONE USAGE
	1	1	1	0	0	0	0	0	0	0	0
	2	1	0	1	0	0	0	0	0	0	0
	3	1	0	1	0	0	0	0	0	0	0
	4	1	1	0	0	0	0	0	0	0	0
	5	1	0	1	0	0	0	0	0	0	0
	6	1	0	1	0	0	0	0	0	0	0
	7	1	0	1	0	0	0	0	0	0	0
	8	1	1	0	0	0	0	0	0	0	0
	9	1	0	0	1	0	0	0	0	0	0
	10	1	0	0	0	1	0	0	0	0	0
	11	1	0	0	0	1	0	0	0	0	0
	12	1	0	0	0	0	0	0	1	0	0
	13	1	0	0	0	0	1	0	0	0	0
	14	1	0	0	0	0	0	0	1	0	0
	15	1	0	0	0	0	0	1	0	0	0
	16	1	0	0	0	0	0	0	0	0	1
	17	1	0	0	0	0	0	1	0	0	0
	18	1	0	0	0	1	0	0	0	0	0
	19	1	0	0	0	0	0	0	0	0	1
	20	1	0	0	0	0	1	0	0	0	0
	21	1	0	0	0	0	0	0	0	1	0

Assumptions:

- The decision variables selected for this formulation are considered for the current time being. It might change every week where there might be some new factors which has to be considered in order to improve productivity based on its priority.
- We model this problem for a week time period, therefore having 24*7 = 168 hours in a week as the maximum limit for #hours an individual can spend.
- The variable coefficients in the objective function are based on the priority and how much they contribute to maximize the productivity. They are considered based on a scale of 1 – 10 where 1 represents the least productive factor and 10 represents the most productive factor.

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