hw11

2023-04-04

The code for this assignment is submitted in another file. This document is reviewing over the optimization results, and my opinion on the output.

**Solution for Question 15.1:**

1. **Formulate an optimization model (a linear program) to find the cheapest diet that satisfies the maximum and minimum daily nutrition constraints, and solve it using PuLP. Turn in your code and the solution. (The optimal solution should be a diet of air-popped popcorn, poached eggs, oranges, raw iceberg lettuce, raw celery, and frozen broccoli. UGH!)**

Foods\_Celery\_Raw = 52.64371

Foods\_Frozen\_Broccoli = 0.25960653

Foods\_LettuceIcebergRaw = 63.988506

Foods\_Oranges = 2.2929389

Foods\_Poached\_Eggs = 0.14184397

Foods\_PopcornAir\_Popped = 13.869322

Total Cost of Foods per person = **$4.34**

The total cost of food per person is $4.34 a day, which is good considering that an average meal in 2023 costs ~$10 in typical fast food restaurants. However looking at the optimal foods, this doesn’t seem appealing to eat for more than a single day. This may comply with the nutrition constraints, but there needs to be some “taste” in the food. In the next optimization, the problem attempts to add 3 more constraints to tackle the poor choice selection of the optimization model.

1. **Please add to your model the following constraints (which might require adding more variables) and solve the new model:**
2. **If a food is selected, then a minimum of 1*/*10 serving must be chosen. (Hint: now you will need two variables for each food *i*: whether it is chosen, and how much is part of the diet. You’ll also need to write a constraint to link them.)**
3. **Many people dislike celery and frozen broccoli. So at most one, but not both, can be selected.**
4. **To get day-to-day variety in protein, at least 3 kinds of meat/poultry/fish/eggs must be selected. [If something is ambiguous (e.g., should bean-and-bacon soup be considered meat?), just call it whatever you think is appropriate – I want you to learn how to write this type of constraint, but I don’t really care whether we agree on how to classify foods!]**

Foods\_Celery\_Raw has 50.853754 units

Foods\_Frankfurter\_Beef has 0.1 units

Foods\_LettuceIcebergRaw has 68.56226 units

Foods\_Oranges has 2.3990379 units

Foods\_Poached\_Eggs has 0.1 units

Foods\_PopcornAir\_Popped has 13.853127 units

Foods\_Scrambled\_Eggs has 0.1 units

Total Cost of Foods per person = **$4.40**

The total cost of food per person is $4.40, which is only 6 cents more per person compared to the previous optimization. This has slightly better food selection, however personally I wouldn’t want to be constrained to this diet. I believe we should also change the constraint for having 3 different meats to having 3 different proteins. Optimization should also include more variety of foods with different styles and cuisines, and also having options for people with dietary constraints. Lastly, having 50 units of celery is too much celery; this could be reduced to a max of 5 units.