MAT168 HW2

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(1)(2)(3)

Please refer to written part.

(4a)

Let x_j denote the quantity of $j-th$ food consumed.

The primal problem is: $min\ c^T x$
$Ax \geq b$

(4b)

Let y_i denote the quantity of $i-th$ nutrient consumed.
The dual problem is: $max\ b^T y$
$A^T y \leq c$

(4c)

A few examples:

A homeless person only has a couple dollars to spare on any food for the day. Maximizing nutrition is very important to prevent serious health issues. That person needs to make sure that they spend wisely to maximize health. Solve the problem so that the person can maximize nutrition within the tight budget.

Anya has poor eating habbits, she eats too much junk food and not enough healthy food, and thus was told by the doctor that she has to maximize nutrition from now on before she gets health related issues. Since Anya is not super rich, she cannot overspend. Solve the problem so that Anya can maximize nutrition without getting ripped off.

Andrew just learned about the roles of the nutrients in his nutrition class, and thus wants to ensure that his nutrition is maximized so that he can stay healthy. As a college student with no financial aid, tuition is too darn high which leaves Andrew with a very tiny budget for healthy foods. Solve the problem so that Andrew can maximize nutrition without breaking the bank.

(4d)

One of the real world factors that isn't taken account for is the diminising returns for nutrients. While it is crucial to consume enough nutrients, too much nutrients doens't realistically benefit your body either. For example, too little body fat can make a person boney which isn't good. On the other hand, too much body fat can make a person obese which also isn't good. This model just assumes the more the better.

Another real world factor that isn't taken account for is that nutrients have to be balanced. Suppose you are currently intak-

ing the recommended daily values of all nutrients. Based on the model, you may get a higher value by replacing carbs with minerals. But, in reality, this actually makes you less healthy since these nutrients have different functions and are not substitutes.

Collaboration

All collaborators are listed (in alphabetical order) below:

- Andrew
- Zhongning
- Sterling
- Fenqgin
- Anne
- Dhruv
- Alisa

Academic Integrity

On my personal integrity as a student and member of the UCD community, I have not given, nor received and unauthorized assistance on this assignment.
Signature: Andrew Jowe