# LINEAR PROGRAMMING

Due date: Apr 19, 2018, 9am

This time around we will come up with a dietary recommendation for people who want to lose weight, or to improve their bloodwork, or to prepare for a strenuous exercise, or to *[insert your goal here]*. For a given set of groceries we know the nutrient content, and the amount of food ingested is *linearly* related to the amount of nutrients delivered to the body. A successful diet will minimize or maximize the targeted dietary aspect, and it will do so under reasonable intake constraints. For example, we need to make sure that we provide the people following our diets with recommended daily intake of nutrients, minerals, vitamins, etc, and limit the intake of sugars, fats and harmful compounds, all the while making sure that the overall energy intake is suitable for a given person based on gender, weight, age, and so on. This is a computational problem that lends itself readily to linear programming.

1. From the course webpage download the file `nutrition.ods` or `.xls`. The file contains a "pocket" table of a number of foods along with their basic properties. Extract a list of 30 chosen food products that you frequently eat, along with their energy content, fats, carbs, proteins, Ca content, and Fe content. Minimize the amount of calories if the recommended daily intake is 70 g for fats, 310 g for carbs, 50 g for proteins, 1000 mg for calcium, and 18 mg for iron. In addition, make sure that the total food intake per day does not exceed 2 kg.

2. How does the result change if you restrict the diet to *at least* 2000 kcal, and minimize the intake of fats instead of energy?

3. As you are optimizing the diet with only 5 parameters, the results will not be completely realistic. Can you impose a set of sensible constraints on a diet so that the food intake is as varied as possible?

4. Google for the prices of the extracted products and try to minimize the price instead of calories. How does minimizing the cost reflect on the health of your meals?

5. *Extra credit:* go crazy with the entire table of nutritional elements, or the USDA table, also available from the course webpage. Generate a healthy diet for yourself and explain what constraints you imposed.