



# NUTRIMAX DIET PROBLEM PROGRAM

Optimize your budget,  
create your diet!

## FEATURES

Nutrient Information | Customizable Food Combinations | Budget Optimization | Servings Calculation

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## ABOUT THE PROGRAM

The specific objective of this program is to find the cheapest combination of foods that will satisfy an individual's daily nutritional requirements. It is programmed in RStudio using R Programming Language. The program is designed to be user-friendly, allowing clients to select their preferred food options while also enabling them to view the step-by-step solution process!

## INSTALLING THE PROGRAM

- To use the program, these following library packages must be installed in R.

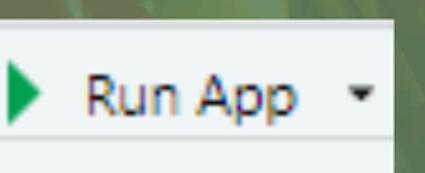
```
library(shiny)  
library(shinyjs)  
library(shinythemes)
```

*for the user interface in R  
for enabling and disabling buttons  
for the design of the program*

- To install, type these lines of code in RStudio

```
# if not yet installed  
install.packages("shiny")  
install.packages("shinyjs")  
install.packages("shinythemes")
```

- Run the program in RStudio by clicking this in the upper right portion of the screen



## HOW TO USE NUTRIMAX?

### KEY FEATURES

- "User Input" Tab: Where users can select their preferred food items.
- "Solving" Tab: Displays the calculations and optimization steps behind the chosen food combinations.
- "Results" Tab: Shows the number of servings of each food item and the total budget for the selected food combination. It also provides an interpretation of the results.

### STEP-BY-STEP GUIDE

#### 1 SELECT YOUR FOODS

- Navigate to the "User Input" tab.
- In the side panel, check the boxes next to the food items you like from the list. You can choose multiple foods to create a combination

User Input      Solving      Results

| Food Selections                     |                     |
|-------------------------------------|---------------------|
| <input type="checkbox"/>            | Frozen Broccoli     |
| <input checked="" type="checkbox"/> | Carrots,Raw         |
| <input checked="" type="checkbox"/> | Celery,Raw          |
| <input type="checkbox"/>            | Frozen Corn         |
| <input type="checkbox"/>            | Iceberg Lettuce,Raw |
| <input type="checkbox"/>            | Peppers, Sweet, Raw |
| <input type="checkbox"/>            | Potatoes, Baked     |
| <input type="checkbox"/>            | Tofu                |
| <input type="checkbox"/>            | Roasted Chicken     |

#### 2 VIEW NUTRIENT VALUES

- After selecting the foods, scroll down and view the nutrient values associated with each food item in the table displayed below the checkboxes

Selected Foods

|               | Carrots,Raw | Celery,Raw |
|---------------|-------------|------------|
| Calories      | 23.70       | 6.40       |
| Cholesterol   | 0.00        | 0.00       |
| Total fat     | 0.10        | 0.10       |
| Sodium        | 19.20       | 34.80      |
| Carbohydrates | 5.60        | 1.50       |
| Dietary Fiber | 1.60        | 0.70       |
| Protein       | 0.60        | 0.30       |
| Vitamin A     | 15471.00    | 53.60      |
| Vitamin C     | 5.10        | 2.80       |
| Calcium       | 14.90       | 16.00      |
| Iron          | 0.30        | 0.20       |

### 3 SOLVE FOR OPTIMAL COMBINATION

- Once you've selected your preferred foods, click the "Solve" button.
- Clicking the button will transfer the user to the "Solving" tab, showing the tableaus and solutions per iteration.

RESET OPTIONS    SELECT ALL

Note: Choose at least 1 food

START SOLVING

User Input   Solving   Results

Initial Tableau

| S_1      | S_2     | S_3   | S_4    | S_5   | S_6   | S_7   | S_8     | S_9   | S_10   | S_11   | S_12   | S_13   | S_14   |
|----------|---------|-------|--------|-------|-------|-------|---------|-------|--------|--------|--------|--------|--------|
| 23.70    | -23.70  | 0.00  | -0.00  | 0.10  | -0.10 | 19.20 | -19.20  | 5.60  | -5.60  | 1.60   | -1.60  | 0.60   | -0.60  |
| 6.40     | -6.40   | 0.00  | -0.00  | 0.10  | -0.10 | 34.80 | -34.80  | 1.50  | -1.50  | 0.70   | -0.70  | 0.30   | -0.30  |
| -1900.00 | 2250.00 | -0.00 | 300.00 | -0.00 | 65.00 | -0.00 | 2400.00 | -0.00 | 300.00 | -25.00 | 100.00 | -50.00 | 100.00 |

Initial Basic Solution and Cost Value

| S_1      | S_2     | S_3   | S_4    | S_5   | S_6   | S_7   | S_8     | S_9   | S_10   | S_11   | S_12   | S_13   | S_14   |
|----------|---------|-------|--------|-------|-------|-------|---------|-------|--------|--------|--------|--------|--------|
| -1900.00 | 2250.00 | -0.00 | 300.00 | -0.00 | 65.00 | -0.00 | 2400.00 | -0.00 | 300.00 | -25.00 | 100.00 | -50.00 | 100.00 |

### 4 VIEW THE RESULTS

- Switch to the "Results" tab or click the "See Results" button to see the following:
  - The number of servings of each food item
  - The total budget for the selected food combination.

The Optimized Menu  
The cost of the **optimal** diet is 4.01\$ per day.

The Solution and Cost Breakdown by Food

| Food               | Servings | Cost |
|--------------------|----------|------|
| Frozen Broccoli    | 1.85     | 0.30 |
| Potatoes, Baked    | 0.68     | 0.04 |
| Tofu               | 2.43     | 0.75 |
| Roasted Chicken    | 0.93     | 0.78 |
| Spaghetti W/ Sauce | 1.71     | 1.34 |
| Banana             | 5.34     | 0.80 |

iterations: 10

- The program also shows when the food combination is infeasible -- does not meet the minimum required nutritional constraints.

#### The problem is infeasible.

It is not possible to meet the nutritional constraints with the foods you have selected.  
*The possible reason is that the test ratios for finding the pivot row are all invalid.*

### ADVANCED FEATURES

- The constraints for each nutrient category and food servings can also be viewed

Constraints

$$\begin{aligned} 73.8x_{\_1} + 23.7x_{\_2} - &\geq 1900 \\ 0x_{\_1} + 0x_{\_2} - &\geq 0 \\ 0.8x_{\_1} + 0.1x_{\_2} - &\geq 0 \\ 68.2x_{\_1} + 19.2x_{\_2} - &\geq 0 \\ 13.6x_{\_1} + 5.6x_{\_2} - &\geq 0 \\ 8.5x_{\_1} + 1.6x_{\_2} - &\geq 25 \\ 8x_{\_1} + 0.6x_{\_2} - &\geq 50 \\ 5867.4x_{\_1} + 15471x_{\_2} - &\geq 5000 \\ 160.2x_{\_1} + 5.1x_{\_2} - &\geq 50 \\ 159x_{\_1} + 14.9x_{\_2} - &\geq 800 \\ 2.3x_{\_1} + 0.3x_{\_2} - &\geq 10 \\ -73.8x_{\_1} - 23.7x_{\_2} - &\geq -2250 \end{aligned}$$

- Clients are able to see the objective function used for minimizing their food combinations

### Objective Function

```
[1] "Minimize C = 0.16x_{\_1} + 0.07x_{\_2} + 0.04x_{\_3} + 0.18x_{\_4} + 0.02x_{\_5} + 0.53x_{\_6}"
```

## OPTIMIZE YOUR BUDGET, CREATE YOUR DIET WITH NUTRIMAX!



### ABOUT THE DEVELOPER

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