NUMERICAL SOLVER v1.0 USER GUIDE

Purpose and Function of the Application

- The primary purpose of this application is to serve as the final project output of the developer, Luis Angelo P. Viloria, for the course CMSC 150 - Numerical and Symbolic Computation. Aside from that, this application aims to make life easier for everyone by alleviating the need to manually perform several algorithms – polynomial regression, quadratic spline interpolation, and minimization. Likewise, this application can be utilized for real-world scenarios, such as the one present in the application which is calculating the minimal cost for a specific list of food whilst maximizing the amount of nutrients.

Contents of the App

- **Generic Solvers**
  - **Polynomial Regression**
    - **i.** The user is able to perform polynomial regression from an uploaded ".csv" file which contains the initial x and y data.
      1. The user must first **upload the ".csv" file** containing the initial data.
      2. The user must **input the desired degree** level of calculation.
      3. The user must then **input the value** which will be estimated through polynomial regression.
      4. The results will be found at the bottom of the window
         - **a.** The "**Function**" table contains the generated function with respect to the desired degree level.
         - **b.** The "**Estimate**" table contains the estimated value with respect to the value that the user inputted.

- ### Quadratic Spline Interpolation
  - i. The user is able to perform quadratic spline interpolation from an uploaded ".csv" file which should contain the initial x and y data.
    1. The user **must first upload the ".csv" file** containing the initial data.
    2. The user must **enter a valid value** to be estimated through quadratic spline interpolation.
    3. The results will be found at the bottom of the window
       - a. The "**Function.Intervals**" table contains the generated functions per x-interval.
       - b. The "**Function**" table contains the correctly selected function from the function intervals with respect to the value that is being estimated.
       - c. The "**Estimate**" table contains the estimated value.

Diet Problem Solver

- The user is able to calculate the minimal cost for a group of selected food items whilst maintaining the optimal amount of nutrients.
  - i. The user must first **upload the** ".**csv**" **file** that contains the price per serving and nutrients of each food item.
  - ii. The user must then **select the food items** that they want to include in their diet and in the minimization calculations.
  - iii. The user must press the "**START CALCULATIONS**" button to start the minimization calculation.
  - iv. The "**Optimal.Cost**" table contains the optimal total cost of the diet that the user selected.
  - v. The "**Serving.Per.Item**" table contains the optimal serving size of that specific food item (if it is 0, that means it is not part of the optimal diet).
  - vi. The "**Cost.Per.Item**" table contains the optimal cost of each food item with respect to the calculated optimal total cost.
  - vii. The "**Basic.Solutions**" table contains the calculated basic solutions of the application with respect to the selected food items.
  - viii. The "**Tableau**" table contains the final tableau after all minimization iterations (the bottom row of the initial tableau is the Basic.Solutions table).
  - ix. If the user wants to calculate a new diet, they must simply select the new food items and click the "**START CALCULATIONS**" button again.

Dependencies Needed

- To use the Numerical Solver v1.0, **the user must have the following installed** in their workstation:
  - **R**
  - **R Studio**
  - **R Shiny**
  - **Shiny Themes**

Prepared by:
Luis Angelo P. Viloria
Developer of the Numerical Solver v1.0
lpviloria@up.edu.ph