Guide/Manual to the Quadratic Spline Interpolation and Simplex Method Application

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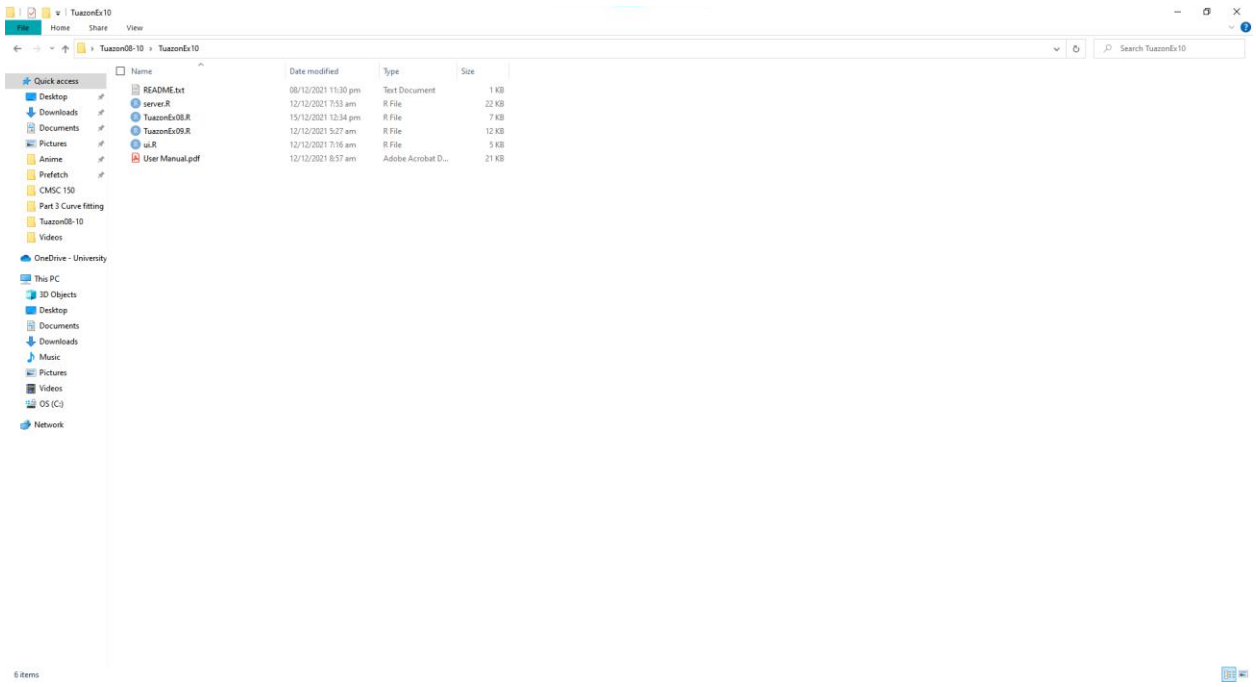
Lab-Section: AB1L

Section I: Requirements

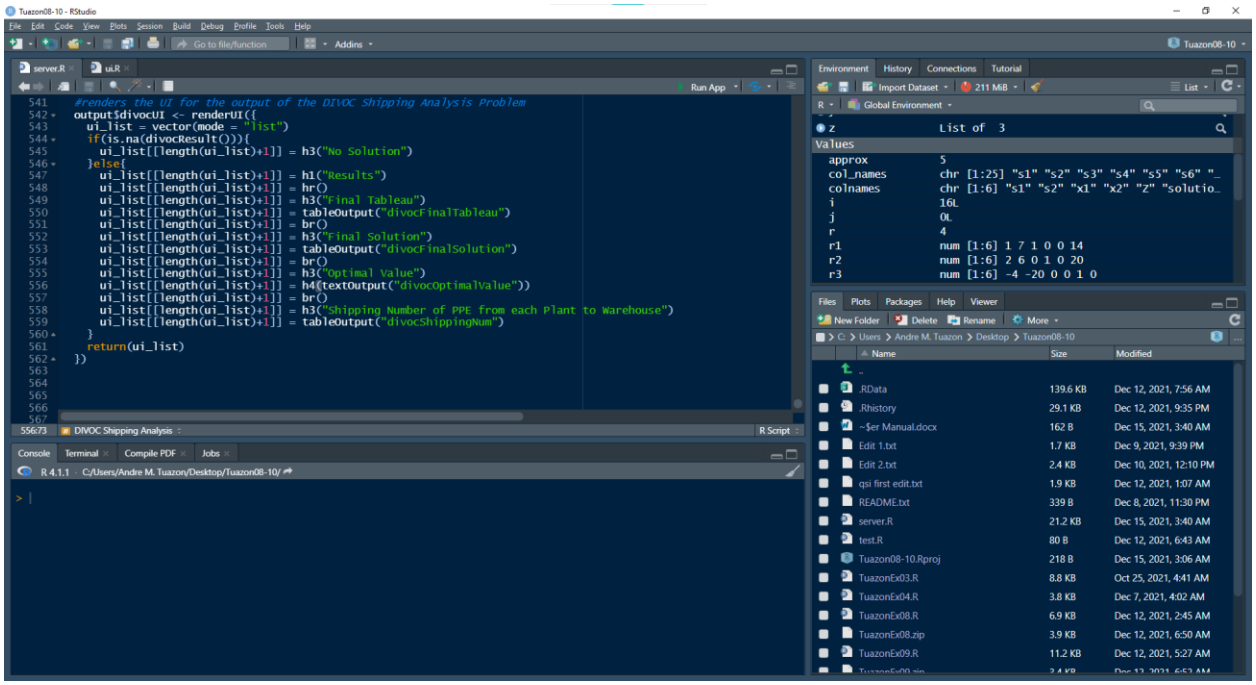
1. Need to install R-studio and the R shiny package

Section II: How to open the Application

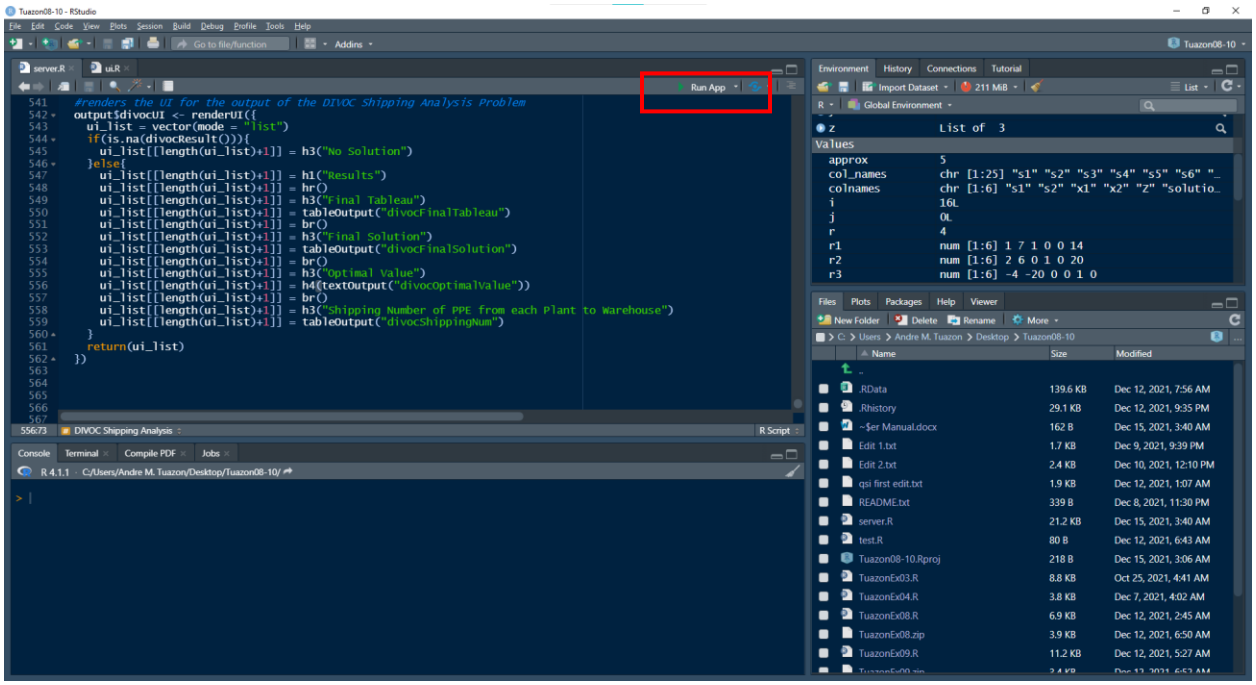
1. Unzip the TuazonEx10.zip



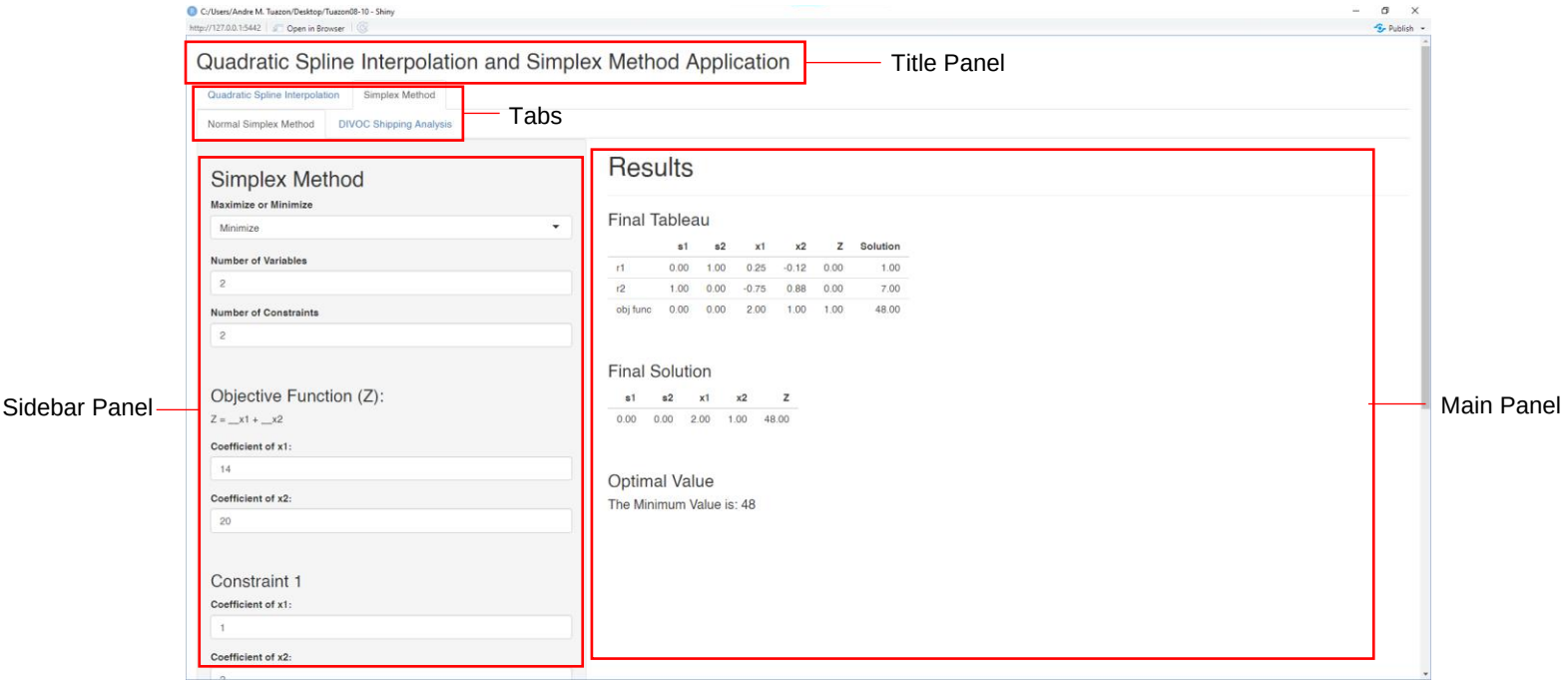
2. Open the ui.R and server.R files



3. Click the “Run App” button at the top of the screen, (it can work whether the server.R or the ui.R is open on the screen)

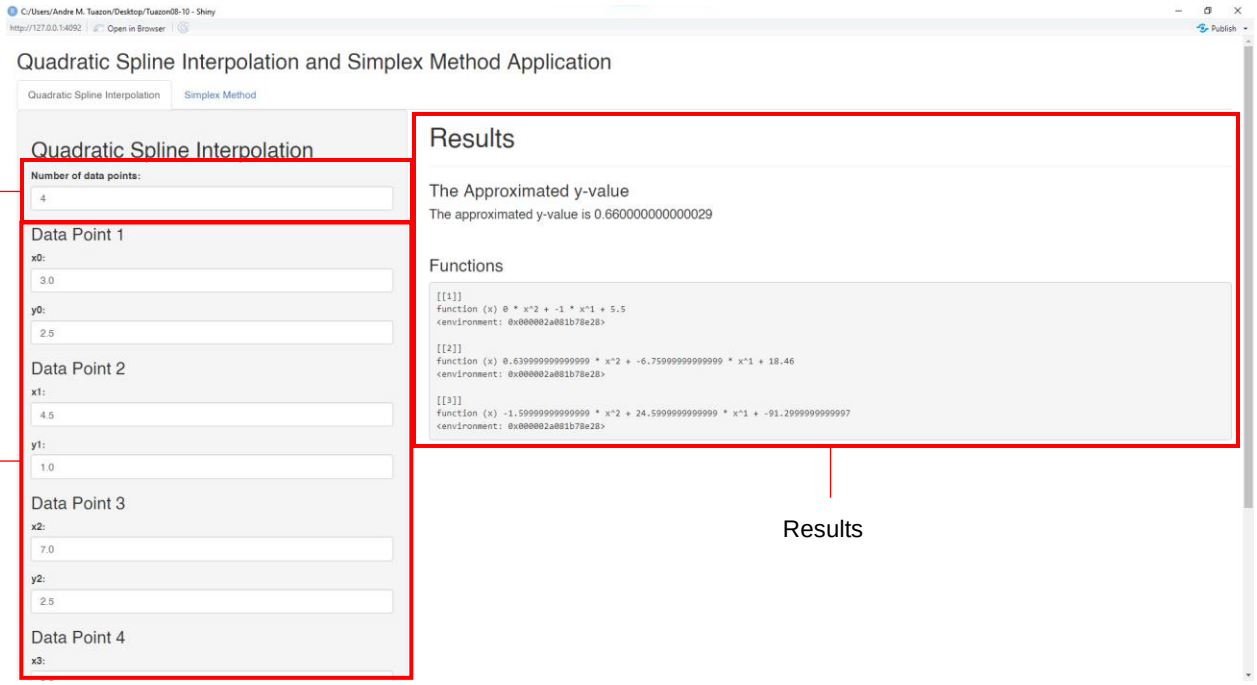


Section III: General Interface



1. **Title Panel** – shows the title of the application
2. **Tabs** – show a variety of tabs for the user to choose which method will be used for the application whether he/she will use the application for Quadratic Spline Interpolation, Simplex Method, or DIVOC Shipping Analysis
3. **Sidebar Panel** – the area where the user will input the data for the selected method
4. **Main Panel** – the area where the result of the selected method will be shown

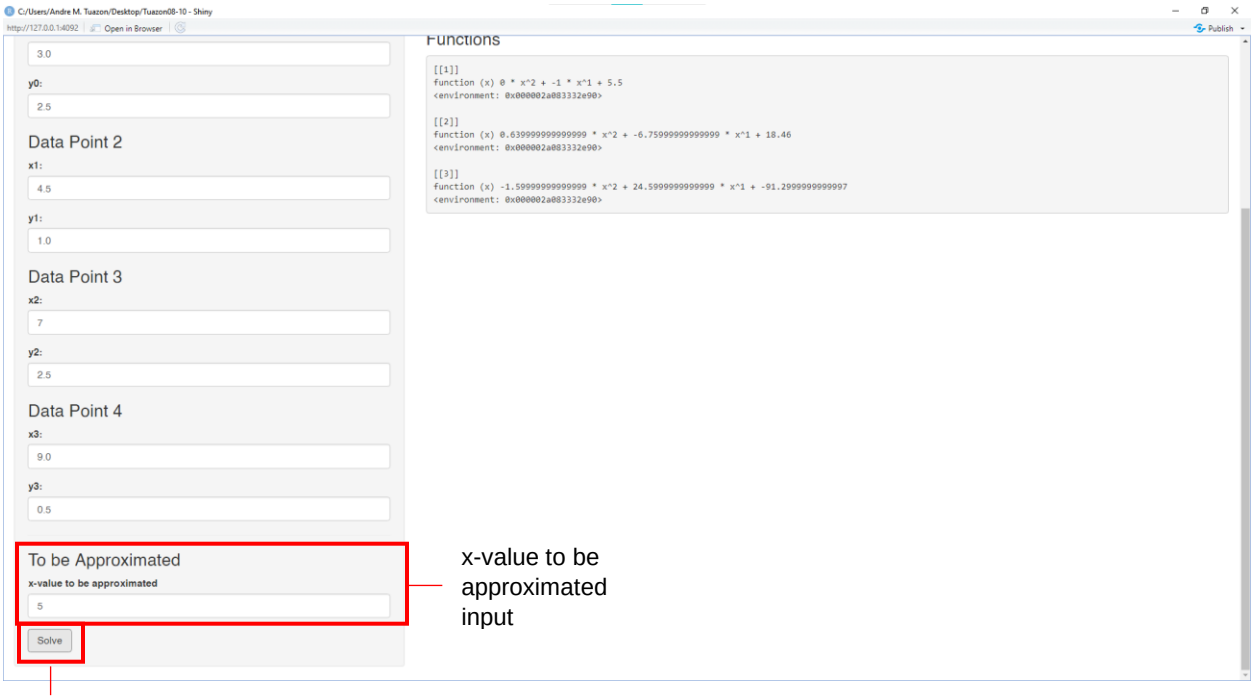
Section IV: Quadratic Spline Interpolation



Number of Data points input

Data point inputs

Results



x-value to be approximated input

Solve button

1. **Number of Data points input** – This is the numeric input to input the number of data points to be used for the Quadratic Spline Interpolation. Take note that the minimum value it can take is 4.

2. **Data point inputs** – These are the numeric inputs to input the x and y values of each data point. The number of these numeric inputs will change depending on the input in the Number of Data points input.

3. **Results** – This is the area where the result will be shown based from the data inputted in the sidebar panel. It will show the approximated y-value and the list of functions from the result of the Quadratic Spline Interpolation. It will show "No Solution" when there is no solution.

4. **x-value to be approximated input** – This is the numeric input to input the x-value to be approximated by the Quadratic Spline Interpolation.

5. **Solve button** – This is the button to be clicked to calculate the approximated y-value from the inputted data using Quadratic Spline Interpolation and show the results of the calculations.

NOTE:

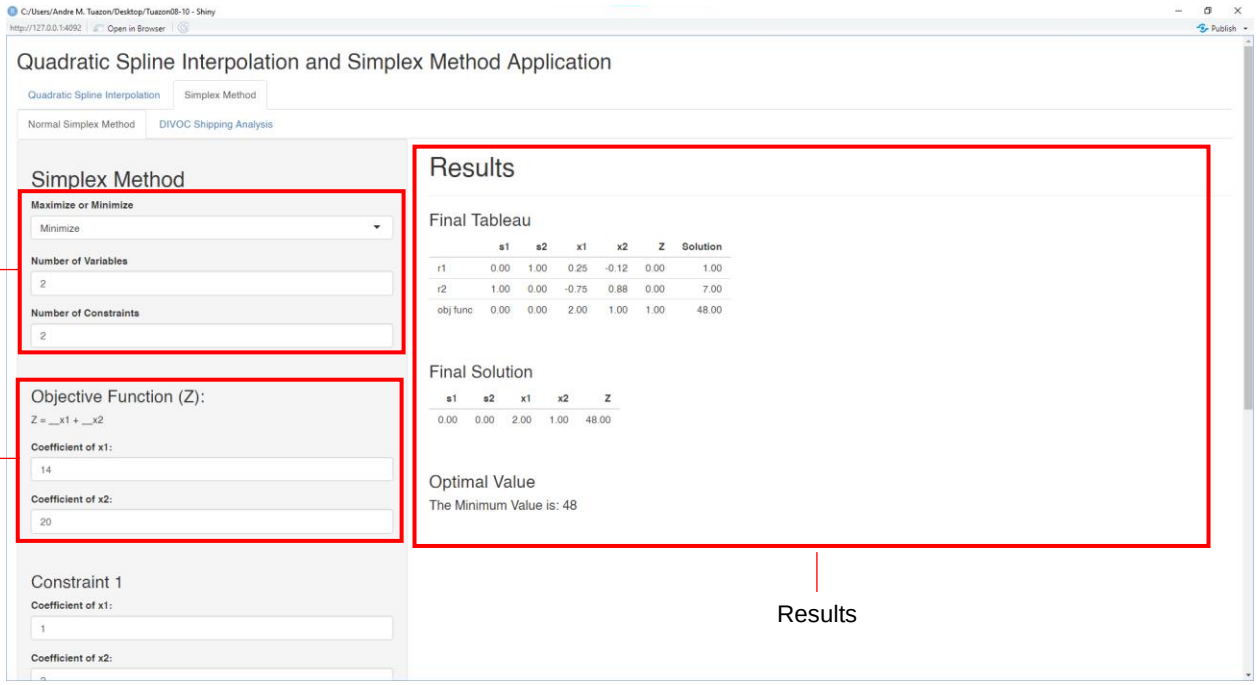
x -> refers to the x-values (where x0 = x_0, x1 = x_1, …, xn = x_n)

y -> refers to the y-values (where y0 = y_0, y1 = y_1, …, yn = y_n)

Steps on Using Quadratic Spline Interpolation Section

1. Select the Quadratic Spline Interpolation Tab
2. Provide the number of data points to be used in the Number of Data points input
3. Input the x and y values of each Data point in the Data point inputs
4. Input the x-value to be approximated in the x-value to be approximated input
5. Click the solve button to calculate the approximated y-value from the inputted data using Quadratic Spline Interpolation and show the results

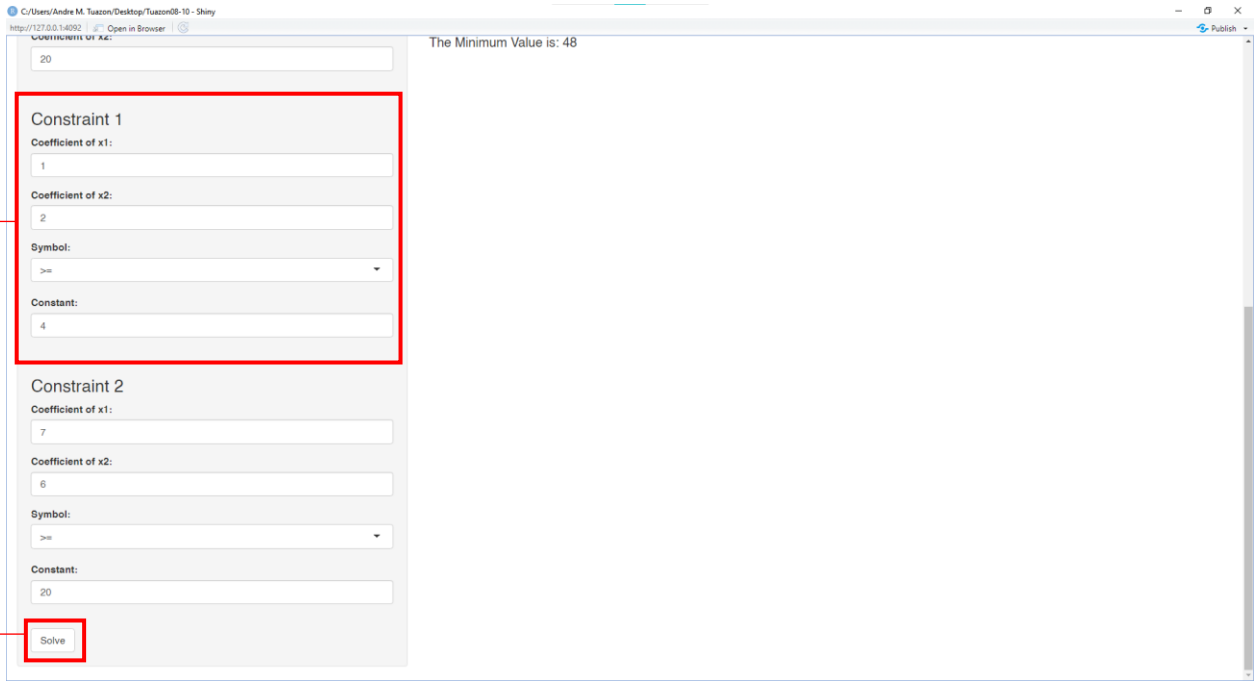
Section V: Normal Simplex Method



General Specification

Objective Function inputs

Results



Constraint Equation inputs

Solve button

1. **General Specification** – This is where the user selects if the simplex method to be used is for maximization or minimization. This is also the area to provide the number of variables and constraints to be used. Take note that the minimum value of the variables and the constraints that can be inputted is 1

2. **Objective Function input** – This is where the user will input the coefficients of the objective function of the simplex method.

3. **Results** – This is the area where the results of the simplex method will be shown. It will show the Final Tableau, Final Solution, and the Optimal Value of the Simplex method. It will show "No Solution" when there is no solution.

4. **Constraint Equation inputs** – This is the area where the user will input the coefficients of each variable in each constraint, the symbol to be used, and the constant. The number of inputs will adjust depending on the number of constraints and variables inputted earlier in the General Specification.

5. **Solve button** – This is the button to be clicked to calculate the optimal value from the inputted data using Simplex Method and to show the results of the calculations.

NOTE**:**

x -> refers to the variables (where x1 = variable 1, x2 = variable 2,…, xn -> variable n)

s -> refers to the slack variables (where s1 = slack variable 1, s2 = slack variable 2,…, sn -> slack variables n)

Z -> refers to the output of the objective function

r -> refers to the rows of the tableau (where r1 = row 1, r2 = row 2,…, rn = row n)

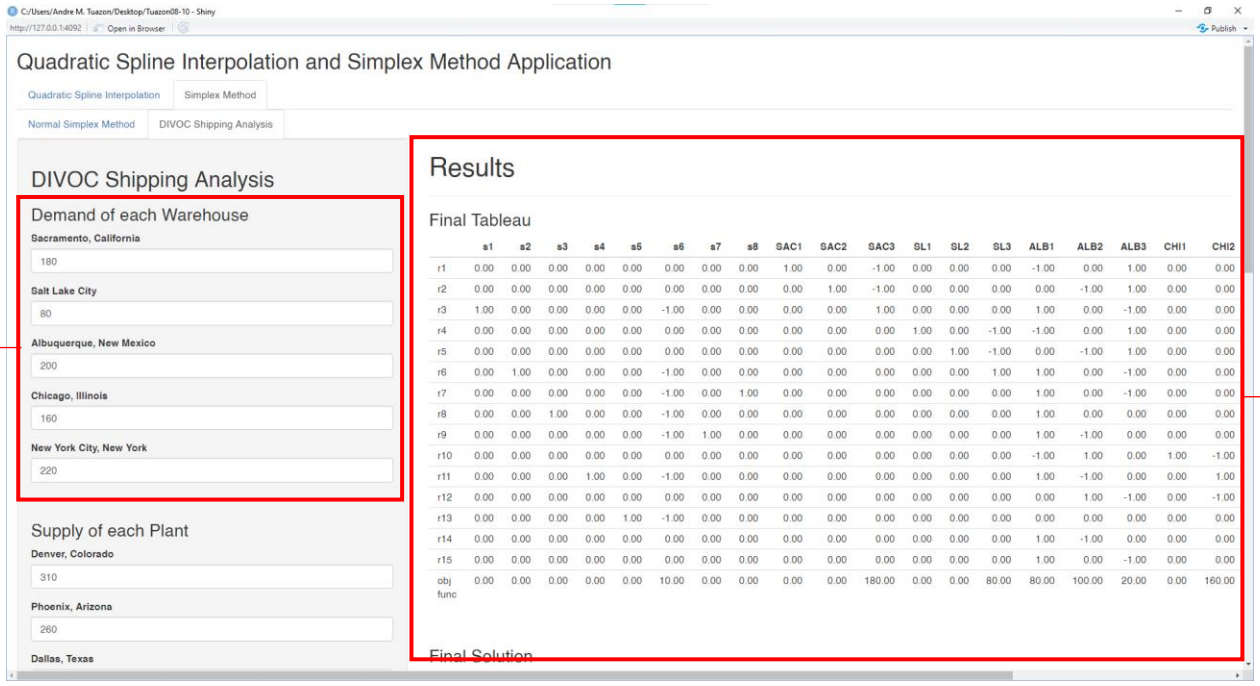
obj func -> refers to the objective function

Solution -> refers to the Solution column in the tableau

Steps on Using Normal Simplex Method Section

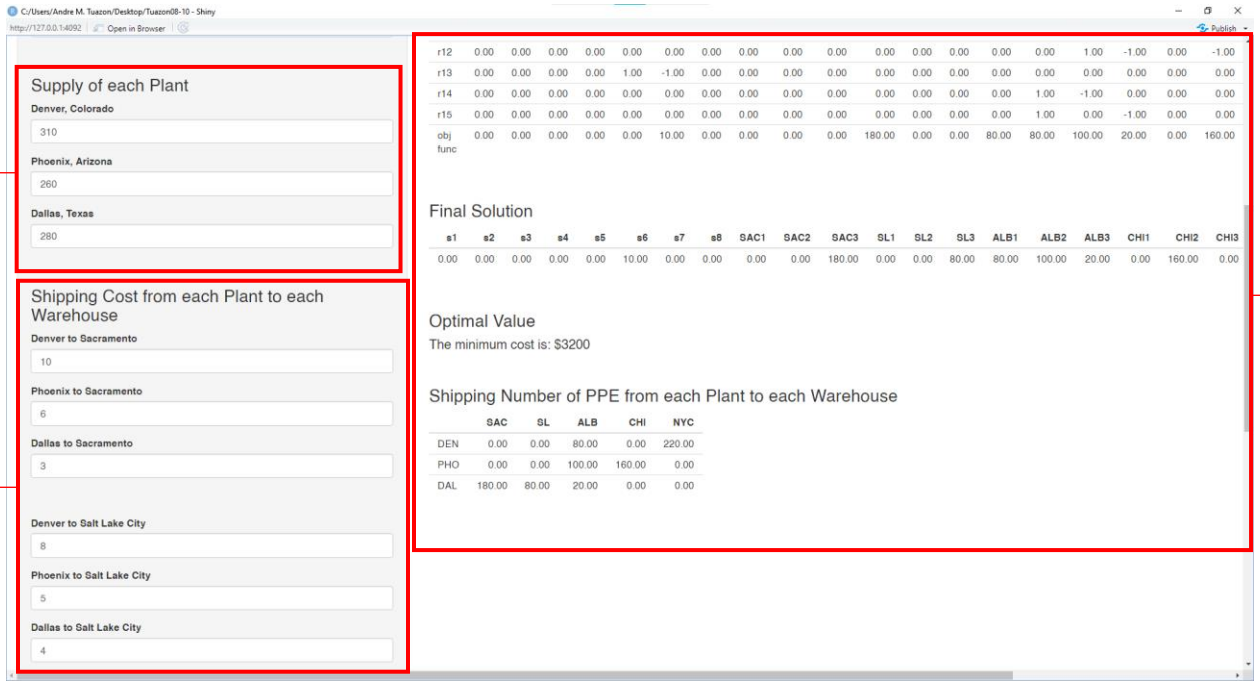
1. Select the Simplex Method tab then the Normal Simplex Method Tab
2. Select whether the simplex method to be used is for Maximization or Minimization in the General Specification
3. Provide the number of variables and constraints to be used in the General Specification
4. Provide the coefficients of the Objective function in the Objective Function input
5. Provide the coefficients, the symbol, and the constant of the constraints in the Constraint Equation inputs
6. Click the Solve button to calculate the optimal value from the inputted data using Simplex Method and show the results

Section VI: DIVOC Shipping Analysis



Demand inputs

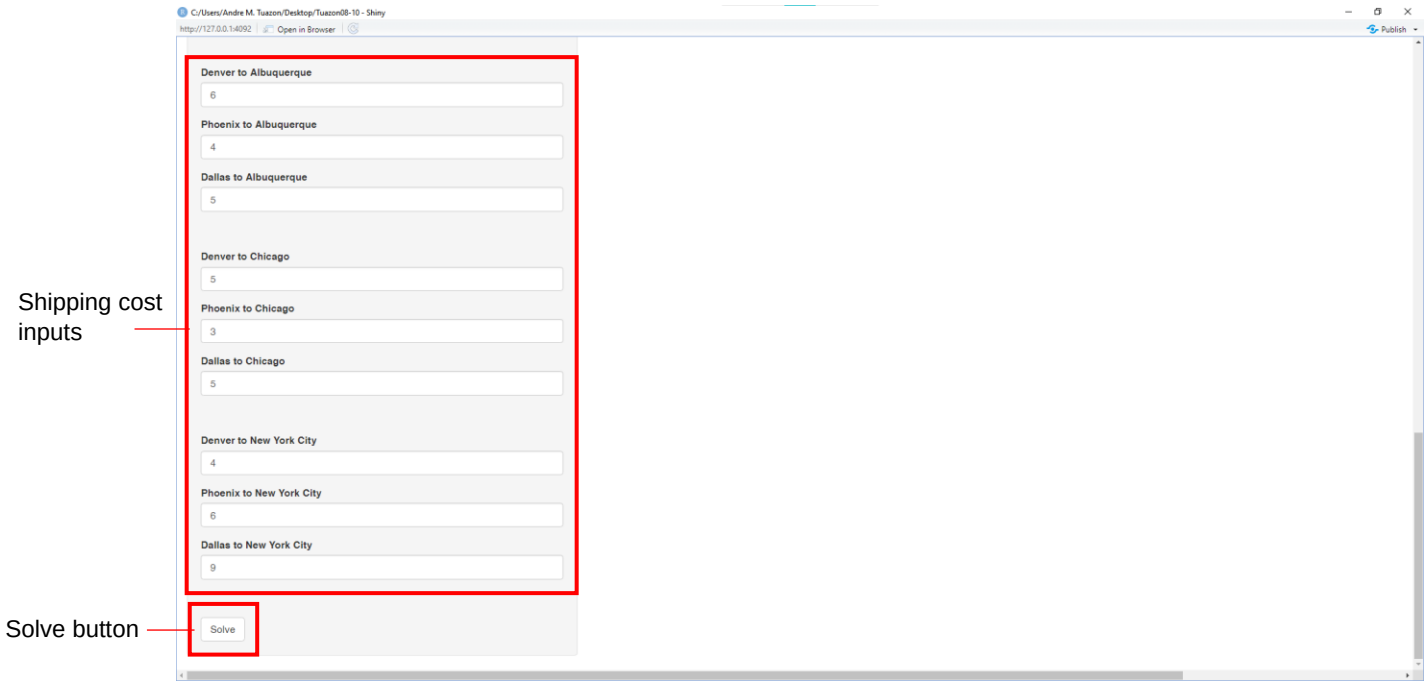
Results



Supply inputs

Shipping cost inputs

Results



1. **Demand inputs** – These are the numeric inputs to input the demand of each warehouse on the number of PPEs
2. **Supply inputs** – These are the numeric inputs to input the supply of each plant on the number of PPEs
3. **Shipping cost inputs** – These are the numeric inputs to input the shipping cost from each plant to each warehouse
4. **Results** – This is the area where the results of the simplex method of the DIVOC Shipping analysis will be shown. It will show the Final Tableau, Final Solution, Minimum Cost, and the Shipping Number of PPE from each Plant to each Warehouse based on the problem in the exercise. It will show “No Solution” when there is no solution.
5. **Solve button** – This is the button to be clicked to calculate the minimum cost using the Simplex Method and to show the results of the calculations.

NOTE:

s -> refers to the slack variables (where s1 = slack variable 1, s2 = slack variable 2,…, sn -> slack variables n)

Z -> refers to the output of the objective function

r -> refers to the rows of the tableau (where r1 = row 1, r2 = row 2,…, rn = row n)

obj func -> refers to the objective function

Solution -> refers to the Solution column in the tableau

SAC1 -> refers to the shipping number of PPE from Denver to Sacramento

SAC2 -> refers to the shipping number of PPE from Phoenix to Sacramento

SAC3 -> refers to the shipping number of PPE from Dallas to Sacramento

SL1 -> refers to the shipping number of PPE from Denver to Salt Lake City

SL2 -> refers to the shipping number of PPE from Phoenix to Salt Lake City

SL3 -> refers to the shipping number of PPE from Dallas to Salt Lake City

ALB1 -> refers to the shipping number of PPE from Denver to Albuquerque

ALB2 -> refers to the shipping number of PPE from Phoenix to Albuquerque

ALB3 -> refers to the shipping number of PPE from Dallas to Albuquerque

CHI1 -> refers to the shipping number of PPE from Denver to Chicago

CHI2 -> refers to the shipping number of PPE from Phoenix to Chicago

CHI3 -> refers to the shipping number of PPE from Dallas to Chicago

NYC1 -> refers to the shipping number of PPE from Denver to New York City

NYC2 -> refers to the shipping number of PPE from Phoenix to New York City

NYC3 -> refers to the shipping number of PPE from Dallas to New York City

DEN -> refers to the plant in Denver, Colorado

PHO -> refers to the plant in Phoenix, Arizona

DAL -> refers to the plant in Dallas, Texas

SAC -> refers to the warehouse in Sacramento, California

SL -> refers to the warehouse in Salt Lake City, Utah

ALB -> refers to the warehouse in Albuquerque, New Mexico

CHI -> refers to the warehouse in Chicago, Illinois

NYC -> refers to the warehouse in New York City, New York

Steps on Using DIVOC Shipping Analysis Section

1. Select the Simplex Method tab, then the DIVOC Shipping Analysis Tab
2. Provide the demand of each warehouse, supply of each plant, and the shipping cost of each plant to each warehouse in the Demand inputs, Supply inputs, and Shipping cost inputs.
3. Click the Solve button to calculate the minimum cost using Simplex method and show the results of the calculations.