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**Section:** CMSC 150 - BIL

# CMSC 150 Lab Project Manual

## Imported Files:

- GaussianElimination.R
- QuadraticSpline.R
- PolynomialReg.R
- FoodItem.csv

## R Libraries Used:

- readr
- R Shiny
- R Shiny JS
- R Shiny Matrix
- R Shiny Themes

## User Interface

The opening screen UI can be shown in the figure below when the file “*ui.R*” is run.

### CMSC 150 Project

The screenshot displays the 'CMSC 150 Project' application interface. At the top, there is a blue navigation bar with three tabs: 'QSI Calculator' (active), 'PR Calculator', and 'Simplex Method'. Below the navigation bar is a light gray header for the 'Quadratic Spline Interpolation Calculator'. The main content area is divided into two panels. The left panel, titled 'Parameters', contains a text input field labeled 'Enter Value to be Evaluated' with the value '0', an 'Upload CSV File' section with a 'Browse...' button and 'No file selected' text, and a 'Generate' button. A note below the CSV upload section states: 'Note: CSV file should have at least two columns for x and y values.' The right panel, titled 'Function f(x) Per Interval', contains a 'Generated Functions Per Interval' section and an 'Estimated Value' section with the text 'Estimated Value of Target'.

The UI mainly involves three tab panels, namely, **QSI Calculator**, **PR Calculator**, and **Simplex Method**. These panels, when clicked, show different types of solvers needed for a problem.

This screenshot shows the top navigation bar of the application. It consists of three blue tabs: 'QSI Calculator' (which is highlighted in a darker blue), 'PR Calculator', and 'Simplex Method'.

Each panel consists of a side panel which asks the users for certain parameters, and a main panel which shows the outputs (Function  $f(x)$  Per Interval, Polynomial Function, and Estimated Value).

## Quadratic Spline Interpolation Calculator

To perform the Quadratic Spline Interpolation, you need to upload the **CSV file** which contains the numeric X and Y values that you want to solve and enter the corresponding **value to be evaluated**.

After the parameters are filled, clicking the **Generate** button will perform the calculations and show the outputs: **Function f(x) Per Interval** and **Estimated Value**. A test case is shown in the figure below.

QSI CalculatorPR CalculatorSimpex Method

### Quadratic Spline Interpolation Calculator

#### Parameters

Enter Value to be Evaluated

Upload CSV File

Note: CSV file should have at least two columns for x and y values.

#### Function f(x) Per Interval

Generated Functions Per Interval

```
[[1]]
function (x) 0*x^2 + 0.35*x + 0.850000000000001
<environment: 0x0000017ac41ba610>

[[2]]
function (x) -2.05555555555557*x^2 + 62.0166666666672*x + -461.6500000000004
<environment: 0x0000017ac41ba610>

[[3]]
function (x) 1.68639455782314*x^2 + -61.4676870748303*x + 557.09591836735
<environment: 0x0000017ac41ba610>
```

#### Estimated Value

Estimated Value of Target

If the value to be evaluated is not within the range of the X values, then the Estimated Value will print as **NA**. But the f(x) per interval result will still show.

#### Parameters

Enter Value to be Evaluated

Upload CSV File

Note: CSV file should have at least two columns for x and y values.

#### Function f(x) Per Interval

Generated Functions Per Interval

```
[[1]]
function (x) 0*x^2 + 0.35*x + 0.850000000000001
<environment: 0x0000017acbee6420>

[[2]]
function (x) -2.05555555555557*x^2 + 62.0166666666672*x + -461.6500000000004
<environment: 0x0000017acbee6420>

[[3]]
function (x) 1.68639455782314*x^2 + -61.4676870748303*x + 557.09591836735
<environment: 0x0000017acbee6420>
```

#### Estimated Value

Estimated Value of Target

#### Parameters

Enter Value to be Evaluated

Upload CSV File

Note: CSV file should have at least two columns for x and y values.

#### Function f(x) Per Interval

Generated Functions Per Interval

```
[[1]]
function (x) 0*x^2 + 0.35*x + 0.850000000000001
<environment: 0x0000017acbac2b8>

[[2]]
function (x) -2.05555555555557*x^2 + 62.0166666666672*x + -461.6500000000004
<environment: 0x0000017acbac2b8>

[[3]]
function (x) 1.68639455782314*x^2 + -61.4676870748303*x + 557.09591836735
<environment: 0x0000017acbac2b8>
```

#### Estimated Value

Estimated Value of Target

## Polynomial Regression Calculator

To perform Polynomial Regression, you need to upload the CSV file which contains the numeric X and Y values that you want to solve. Enter the **polynomial degree** and the **value of X** that will be used to substitute the polynomial function and show the estimated value.

After the parameters are filled, clicking the **Generate** button will perform the calculations and show the outputs: **Polynomial Function** and **Estimated Value**. A test case is shown in the figure below.

CSV CalculatorPR CalculatorSimple Method

### Polynomial Regression Calculator

#### Parameters

Polynomial Degree

Enter X Value

Upload CSV File

Browse...input\_Regression.csv

Upload complete

Note: CSV file should have at least two columns for x and y values.

Generate

#### Polynomial Function

Generated Polynomial Function

[1] \*function(x) 39.7166999760158 + -0.0519965423005998 \* x ^ 1 + 0.000127798367305103 \* x ^ 2 + -1.68663251807435e-07 \* x ^ 3 + 7.442283e+17

#### Estimated Value

Estimated Value of Target

34.26113

The polynomial degree must be *greater than zero* and not more than the *number of data points - 1*. Otherwise, the polynomial function and/or estimated value will return as NULL values. As for the X value, it can be *any* from *-Inf to +Inf*.

#### Parameters

Polynomial Degree

Enter X Value

Upload CSV File

Browse...input\_Regression.csv

Upload complete

Note: CSV file should have at least two columns for x and y values.

Generate

#### Polynomial Function

Generated Polynomial Function

[1] NA

#### Estimated Value

Estimated Value of Target

NA

#### Parameters

Polynomial Degree

Enter X Value

Upload CSV File

Browse...input\_Regression.csv

Upload complete

Note: CSV file should have at least two columns for x and y values.

Generate

#### Polynomial Function

Generated Polynomial Function

[1] \*function(x) 39.7166999760158 + -0.0519965423005998 \* x ^ 1 + 0.000127798367305103 \* x ^ 2 + -1.68663251807435e-07 \* x ^ 3 + 7.442283e+17

#### Estimated Value

Estimated Value of Target

7.442283e+17

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## Simplex Method for Diet Problem

To perform the Simplex Method (Minimization), the user must select any food item present in the selection. The user has an option to **check all** items, **reset** them, or continue to **solve**.

[QBI Calculator](#) [PR Calculator](#) [Simplex Method](#)

### Simplex For Diet Problem

#### Parameters

Select Food Items

Frozen Broccoli Carrots,Raw Celery,Raw

Check All Reset All Solve Simplex

[Optimal Diet Plan](#)  
[Simplex Iterations](#)

#### Parameters

Select Food Items

Frozen Broccoli Carrots,Raw Celery,Raw Frozen Corn  
Lettuce,Iceberg,Raw Peppers,Sweet,Raw Potatoes,Baked Tofu  
Roasted Chicken Spaghetti W/ Sauce Tomato,Red,Ripe,Raw  
Apple,Raw,W/Skin Banana Grapes Kiwifruit,Raw,Fresh Oranges  
Bagels Wheat Bread White Bread Oatmeal Cookies Apple Pie  
Chocolate Chip Cookies Butter,Regular Cheddar Cheese  
3.3% Fat,Whole Milk 2% Lowfat Milk Skim Milk Poached Eggs  
Scrambled Eggs Bologna,Turkey Frankfurter,Beef  
Ham,Sliced,Ex,tralean Kielbasa,Prk Cap'N Crunch Cheerios  
Corn Flks Kellogg'S Raisin Brn Kellogg'S Rice Krispies Special K  
Oatmeal Malt-O-Meal,Choc Pizza W/Pepperoni Taco  
Hamburger,W/Toppings Hotdog,Plain Couscous White Rice  
Macaroni,Ckd Peanut Butter Pork Sardines in Oil  
White Tuna in Water Popcorn,Air-Popped Potato Chips,Bbqflvr  
Pretzels Tortilla Chip Chicknoodl Soup Split Pea&Hamsoup  
Vegetbeef Soup Neweng Clamchwd Tomato Soup  
New E Clamchwd,W/Mlk Crm Mshrm Soup,W/Mlk  
Beanbch Soup,W/Watr

Check All Reset All Solve Simplex

[Optimal Diet Plan](#)  
[Simplex Iterations](#)

#### Parameters

Select Food Items

Check All Reset All Solve Simplex

[Optimal Diet Plan](#)  
[Simplex Iterations](#)

Unfortunately, this specification is unfinished due to time constraints and personal reasons. This concludes the manual for my CMSC 150 project. Thank you!