

CMSC 150 Project Manual

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CMSC 150 B-5L

1. Polynomial Regression

Initial User Interface

The initial user interface of the CMSC 150 Project web application. The interface has a blue header bar with the text "CMSC 150 Project" and a hamburger menu icon. On the left, there is a dark sidebar with three menu items: "Polynomial Regression", "Quadratic Spline Interpolation", and "Simplex". The main content area is light blue and contains the following elements:

- Choose CSV file:** A section with a "Browse..." button and the text "No file selected".
- Enter degree of polynomial:** A text input field containing the value "1" and a small up/down arrow icon.
- Enter value of x:** A text input field containing the value "0" and a small up/down arrow icon.
- Solve for f(x):** A button located below the input fields.
- Data Points:** An empty text area.
- Function:** A text area containing the error message "Error: argument of length 0" in red.
- Estimate:** An empty text area.

Upload a CSV file

You can upload a CSV file by clicking the “Browse” button and choosing a file with CSV format.

The user interface after uploading a CSV file. The interface is similar to the initial state, but with the following updates:

- Choose CSV file:** The "Browse..." button is now disabled, and the text "pr.csv" is displayed. Below it, a blue button labeled "Upload complete" is visible.
- Enter degree of polynomial:** The input field still contains "1".
- Enter value of x:** The input field still contains "0".
- Solve for f(x):** The button remains.
- Data Points:** A table with two columns, "X1" and "X5", containing three rows of data:

X1	X5
3	-4
5	3
7	-2
- Function:** The text area now contains the R code:

```
f <- function(x) { return(2.3063063063063 * x ^ 0 + 0.0067567567568 * x ^ 1)}
```
- Estimate:** The text area remains empty.

Compute for $f(x)$

In order to compute for $f(x)$, you must first enter a value of x on the “Enter value of x : “ field and click the “Solve for $f(x)$ ” button. You can also modify the degree of the polynomial by entering a degree on The field “Enter degree of polynomial”.

The screenshot shows the 'Polynomial Regression' section of the CMSC 150 Project web application. The interface includes a sidebar with navigation links for Polynomial Regression, Quadratic Spline Interpolation, and Simplex. The main content area has a 'Choose CSV file' section with a 'Browse...' button and a file named 'pr.csv' selected, with an 'Upload complete' button. Below this, there are two input fields: 'Enter degree of polynomial:' with a value of 2, and 'Enter value of x:' with a value of 5. A 'Solve for $f(x)$ ' button is positioned below these fields. To the right, the 'Data Points' section displays a table with two columns, X1 and X5, containing the values (3, -4), (5, 3), and (7, -2). Below the data points, the 'Function' section shows a code block with a polynomial function definition. The 'Estimate' section displays the value 7.22.

CMSC 150 Project

Polynomial Regression

Quadratic Spline Interpolation

Simplex

Choose CSV file

Browse... pr.csv

Upload complete

Enter degree of polynomial:

2

Enter value of x:

5

Solve for $f(x)$

Data Points

X1	X5
3	-4
5	3
7	-2

Function

```
data  
f<-function(x){ return(7.96048109965681 * x ^ 0 + -0.153711340206198 * x ^ 1 +  
0.00107560137457053 * x ^ 2)}
```

Estimate

data

7.22

2. Quadratic Spline Interpolation

Initial User Interface

The screenshot shows the 'Quadratic Spline Interpolation' section of the CMSC 150 Project web application. The sidebar is the same as the previous screenshot, but the 'Quadratic Spline Interpolation' link is now selected. The main content area has a 'Choose CSV file' section with a 'Browse...' button and the text 'No file selected'. Below this, there is an 'Enter value of x:' input field with the value 0. A 'Solve for $f(x)$ ' button is positioned below the input field. Below the button, there is a 'Show function for interval' button. To the right, the 'Data Points' section is empty. Below it, the 'Functions per Interval' section displays an error message: 'Error: argument of length 0'. The 'Estimate' section is empty. At the bottom, there is an 'Interval Function' input field.

CMSC 150 Project

Polynomial Regression

Quadratic Spline Interpolation

Simplex

Choose CSV file

Browse... No file selected

Enter value of x:

0

Solve for $f(x)$

Show function for interval

Data Points

Functions per Interval

Error: argument of length 0

Estimate

Interval Function

Upload a CSV file

You can upload a CSV file by clicking the “Browse” button and choosing a file with CSV format.

The screenshot shows the 'CMSC 150 Project' web application. On the left is a dark sidebar with three menu items: 'Polynomial Regression', 'Quadratic Spline Interpolation' (which is highlighted), and 'Simplex'. The main content area has a header 'Choose CSV file' with a 'Browse...' button and a 'qsl.csv' file name. Below this is a blue 'Upload complete' button. The 'Enter value of x:' field contains the number '0'. There are two buttons below it: 'Solve for f(x)' and 'Show function for interval'. To the right, the 'Data Points' section contains a table with two columns, 'X1' and 'X5', and three rows of data. Below the table are three empty input fields labeled 'Estimate' and 'Interval Function'.

X1	X5
3	-4
5	3
7	-2

Show f(x) for the interval and Compute for f(x)

Enter a value of x on the “Enter value of x: ” field. Click the “Solve for f(x)” to compute for f(x) and click the “Show function for interval” button to show f(x) for the given interval.

This screenshot shows the same web application after the user has entered '3.5' in the 'Enter value of x:' field and clicked the 'Solve for f(x)' and 'Show function for interval' buttons. The 'Data Points' table remains the same. The 'Estimate' field now displays the value '-2.25'. The 'Interval Function' field now contains a code snippet:

```
f <- function(x) { return(3.5 * x + -14.5)}
```

X1	X5
3	-4
5	3
7	-2

3. Simplex Method (Minimization)

Initial User Interface

CMSC 150 Project

Polynomial Regression

Quadratic Spline Interpolation

Simplex

Shipping costs from plant to warehouse

Solve

	Supply	California	Utah	New.Mexico	Illinois	New.York
Denver	310.00	10.00	8.00	6.00	5.00	4.00
Phoenix	260.00	6.00	5.00	4.00	3.00	6.00
Dallas	280.00	3.00	4.00	5.00	5.00	9.00
Shippin	0.00	0.00	0.00	0.00	0.00	0.00
Demand		180.00	80.00	200.00	160.00	220.00

Number to ship from plant to warehouse

Phase One

Enter iteration:

1

<

>

Phase Two

Perform Simplex Method

In order to perform simplex method on the given input on the table, click the “Solve” button and then the resulting values will appear on the table on the right.

CMSC 150 Project

Polynomial Regression

Quadratic Spline Interpolation

Simplex

Shipping costs from plant to warehouse

Solve

	Supply	California	Utah	New.Mexico	Illinois	New.York
Denver	310.00	10.00	8.00	6.00	5.00	4.00
Phoenix	260.00	6.00	5.00	4.00	3.00	6.00
Dallas	280.00	3.00	4.00	5.00	5.00	9.00
Shippin	0.00	0.00	0.00	0.00	0.00	0.00
Demand		180.00	80.00	200.00	160.00	220.00

Number to ship from plant to warehouse

	Total	California	Utah	New Mexico	Illinois	New York
Denver	300.00	0.00	0.00	0.00	80.00	220.00
Phoenix	260.00	0.00	0.00	180.00	80.00	0.00
Dallas	280.00	180.00	80.00	20.00	0.00	0.00
Totals	840.00	180.00	80.00	200.00	160.00	220.00

Show Tableau for a Specific Iteration

The simplex method for minimization has two phases. You can view specific iteration per phase by entering a value on the “Enter Iteration” field.

Phase One

Enter iteration:

1

x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	x11	x12	x13	x14	x15	s1	s2	s3	s4	s5	s6	s7	s8	Z	
1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	-1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	
0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	2
-1.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	-1
0.00	-1.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	-
0.00	0.00	-1.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	-2
0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	-1
-0.00	-0.00	-0.00	-0.00	1.00	-0.00	-0.00	-0.00	-0.00	1.00	-0.00	-0.00	-0.00	-0.00	1.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-1.00	-0.00	2
10.00	8.00	6.00	5.00	0.00	6.00	5.00	4.00	3.00	2.00	3.00	4.00	5.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	1.00	-8
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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Phase Two

Enter iteration:

1

x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	x11	x12	x13	x14	x15	s1	s2	s3	s4	s5	s6	s7	s8	Z	RHS
0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	80.00
1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	0.00	180.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	10.00
1.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	-1.00	-1.00	0.00	0.00	-1.00	-1.00	-1.00	-1.00	0.00	0.00	0.00	180.00
-1.00	-1.00	-1.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	80.00
-1.00	-1.00	0.00	0.00	0.00	-1.00	-1.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	20.00
1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	-1.00	0.00	0.00	0.00	0.00	-1.00	0.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	0.00	0.00	80.00
0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.00	0.00	220.00
6.00	3.00	0.00	0.00	0.00	4.00	2.00	0.00	0.00	4.00	0.00	0.00	0.00	1.00	6.00	0.00	2.00	1.00	4.00	5.00	6.00	5.00	4.00	1.00	-3200.00