Assignment 6

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2019-03-13, 23:59 IST.

Problem 1: Multi-Linear Regression

Consider the following model expressed as a linear function of two variables.

\[ y = aT + bU \]

Using linear regression, find the values of \( a \) and \( b \) that best fit the following data:

<table>
<thead>
<tr>
<th>T</th>
<th>300</th>
<th>325</th>
<th>350</th>
<th>375</th>
<th>400</th>
<th>425</th>
<th>450</th>
<th>475</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td>5.7</td>
<td>5.78</td>
<td>5.86</td>
<td>5.93</td>
<td>6</td>
<td>6.05</td>
<td>6.11</td>
<td>6.16</td>
</tr>
<tr>
<td>Y</td>
<td>73.1</td>
<td>79.5</td>
<td>81.7</td>
<td>80.6</td>
<td>88</td>
<td>88.6</td>
<td>90.8</td>
<td>94.4</td>
</tr>
</tbody>
</table>

1) Please report the value of parameter \( a \)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.088, 0.090

2) Please report the value of parameter \( b \)

No, the answer is incorrect.
Score: 0

Accepted Answers:
ketchup flows more smoothly after shaking the bottle. One of the models used for such shear-thinning fluids is called “pseudo-plastic” model, which is given by:

\[ \tau = mx^n \]

\( \tau \) is called shear stress and \( x \) is the strain rate. The following table gives the values of \( \tau \) and \( x \). Use \( \text{lsqnonlin} \) to compute the coefficients \( m \) and \( n \) that best fit the data. Use initial guess of \( m=5 \) and \( n=0.5 \) for this problem.

<table>
<thead>
<tr>
<th>( x )</th>
<th>0.5</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \tau )</td>
<td>2.53</td>
<td>3.11</td>
<td>3.65</td>
<td>4.2</td>
<td>4.79</td>
<td>5.07</td>
<td>5.33</td>
</tr>
</tbody>
</table>

3) Please report the value of parameter \( m \) (accurate to three digits after the decimal) computed using \( \text{lsqnonlin} \).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 3.053, 3.059

4) Please report the value of parameter \( n \) (accurate to three digits after the decimal) computed using \( \text{lsqnonlin} \).

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 0.241, 0.245

Problem 3: Linear Regression for Pseudo-Plastic model

We now focus on linear regression to obtain parameters for the pseudo-plastic model of Problem-2. This can be done by taking logarithm of the equation to express the model as

\[ \ln(\tau) = \ln(m) + n \ln(x) \]

5) Please report the value of parameter \( m \) (accurate to three digits after the decimal) computed using linear regression.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 3.046, 3.052

6) Please report the value of parameter \( n \) (accurate to three digits after the decimal) computed using linear regression.

No, the answer is incorrect.
Score: 0
Problem 4: Interpolation

The following data was collected for boiling water over a period of 16 minutes.

<table>
<thead>
<tr>
<th>t (min)</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>T (°C)</td>
<td>25</td>
<td>42</td>
<td>66</td>
<td>89</td>
<td>100</td>
<td>100</td>
<td>92</td>
<td>81</td>
<td>73</td>
</tr>
</tbody>
</table>

Note that during the boiling process, the temperature of water does not rise above 100 degrees C.

We wish to use interpolation to find the values at 3 minutes and 9 minutes. Please report the following results, accurate to one digit after the decimal.

7) Spline Interpolation: Use spline interpolation to find the temperature at t = 3.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 53,54

8) Spline Interpolation: Use spline interpolation to find the temperature at t = 9.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 101,101.4

9) PCHIP Interpolation: Use pchip interpolation to find the temperature at t = 3.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 53,54

10) PCHIP Interpolation: Use pchip interpolation to find the temperature at t = 9.

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 99.9,100.1