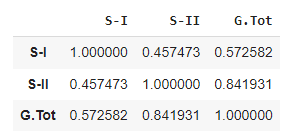
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **National University of Computer and Emerging Sciences, Lahore Campus** | | | | |
| C:\Users\saif\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Word\final design.jpg | **Course:** | **Artificial Intelligence** | **Course Code:** | **AI-2002** |
| **Program:** | **BS(Computer Science)** | **Semester:** | **Spring 2024** |
| **Duration:** | **30 Minutes** | **Total Marks:** | **10** |
| **Paper Date:** | **22-April-23** | **Weight** | **3.33%** |
| **Section:** | **D/F/F** | **Page(s):** | **2** |
| **Exam:** | **Quiz 3A** | **Roll No.** |  |
| **Instruction/Notes:**   * Provide your solution on this sheet. You may use an extra page for rough work. | | | | |

# Problem#1 (CLO-2) 5 Points

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | S-I | S-II | G.Tot | (S-I)2 | (S-II)2 | (G.Tot)2 | S-I\*G.Tot | S-II\*G.Tot |
| ∑ | 688 | 923 | 6932 | 5433 | 9765 | 517503 | 51481 | 69890 |



We possess a dataset containing the sessional marks, grand total marks, and grades of 95 students of AI course in SP23. Leveraging this data, we aim to train a linear regression model. This model will enable us to predict the total marks achieved by students of SP24 based on their sessional performance.

i) Given Correlation matrix shows the value of correlation coefficient for each pair of the numeric attributes. Interpret the correlation between each pair and suggest the independent variable to be chosen for the above problem.

S-I and S-II are weakly correlated and they are both independent variables

S-I and G.Tot are moderately correlated

S-II and G.Tot are highly correlated

Based on the correlation score of S-II and G.Tot , S-II must be selected as independent variable for the regression model

ii) Suppose we selected S-I as independent variable. For each unit increase in S-I marks, by how many units can we expect the grand total marks (G.Tot) to increase on average?

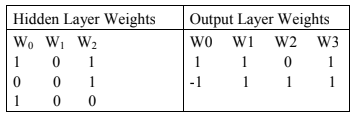
SSxx = ∑x2 – (∑x)2/95 = 5487 – 483025/95 = 404.52

SSxy = ∑xy– (∑x\*∑y)/95 = 51967 – 4817740/95 = 1254

b = SSxx/SSxy = **3.1**

**Problem#2**(CLO-2) **5 Points**

Consider a multi-layer perceptron with 2 inputs, a single hidden layer of 3 neurons and an output layer consisting of 2 neurons. The network uses linear activation function in the hidden layer and sigmoid activation at the output layer. Weights of the hidden layer and output layer neurons are given in the following table with the first weight being that of the bias term. After forward pass the output of the neural network given the input (1 1) is 0.982 and 0.952 respectively while the expected outputs were 0.05 and 0.95. Calculate absolute error at each output neuron and then sum it to have total error. Based on the total error compute the delta and update the weights connecting first hidden neuron to first output neuron assuming learning rate is 0.5.



h1 = 2, h2 = 1, h3 = 1

o1 = 4, g(o1) = 0.982

o1 – 3, g(o2) = 0.952

E1 = |0.05-0.982| = 0.932

E2 = |0.95-0.952| = 0.002

Etotal = 0.934

Delta o1 = Etotal \* g’(o1) = 0.0165

Wh1-o1 = Wold + α \* h1 \* delta o1 = 1 + 0.5 \* 2 \* 0.0165 = 1.165