LAHORE UNIVERSITY OF MANAGEMENT SCIENCES
Department of Electrical Engineering

EE514/CS535 Machine Learning
Quiz 03 Solutions

Name: ______________________

Campus ID: ______________________

Total Marks: 10
Time Duration: 12 minutes

Question 1 (4 marks)

True or False: (Circle your answer)

(a) The accuracy of classification always increases with an increase in the number of inputs/features. T/F

Solution: F: Not necessarily.

(b) The "Intrinsic" dimensionality of the data may be smaller than the actual size of the data. T/F

Solution: T: Self-explanatory.

(c) In feature selection, we select the features in the subset that either improves classification accuracy or maintain the same accuracy. T/F

Solution: T: Self-explanatory.

(d) Dimensionality reduction using principal component analysis maximizes discriminatory information (i.e., maximizes the separation between classes to enable better classification). T/F

Solution: F: It does not account for discriminatory Information.

Question 2 (1 mark)

You are provided with the following correlation graphs between features $[x^{(1)}, x^{(2)}, x^{(3)}]$ and true labels as [left, middle, right] plots respectively. Choose the top 2 features and explain your choice.

Solution: x1 and x3 (strong correlation)

Question 3 (3 marks)

You are provided with the following feature value table. Calculate the covariance between x and y.

x	y
-1	-3
3	5
1	1

Solution: Mean of $x = 1$
Mean of $y = 1$
Covariance : $1/n \sum_{i=1}^{n}(x_i - 1) * (y_i - 1) = \frac{16}{3}$

Question 4 (2 marks)

Define the difference between feature selection and feature extraction (either in words or mathematically).

Solution: Dimensionality reduction refers to the reduction in the number of features such that the learning ability of the classifier is enhanced. Feature selection refers to selecting a subset of the existing features, where we transform existing features to obtain a set of new features using some mapping function in feature extraction. Mathematically, given d features $\mathbf{x} = [x_1, x_2, \ldots, x_d]$, we want to select k out of d features in as a) feature selection: $\mathbf{z} = [x_{i_1}, x_{i_2}, \ldots, x_{i_k}]$, and (b) feature extraction: $\mathbf{z} = [z_1, z_2, \ldots, z_k] = f(\mathbf{x})$.