# 2018

## COMPUTER SCIENCE AND ENGINEERING

**Paper : CSEL-919**

**(Elective II : Machine Learning)**

**Full Marks : 70**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

Answer ***questions*** **1, 2** and ***any four*** questions from the rest.

**1.** Answer ***any five*** questions from the following : 2×5

(a) "Modern definition of machine learning." Correlate this definition with an example.

(b) What is supervised learning? Difference between regression and classification.

(c) What is Word2Vec?

(d) What is the logistic function?

(e) Formulate the Cost function of Linear Regression.

(f) Mathematically formulate the Singular Value Decomposition technique.

(g) What is the problem of Perceptron as mentioned by Minsky and Papert and why is it a problem?

**2.** Answer ***any five*** questions from the following : 4×5

(a) Using McCulloch and Pitts Network technique derive XOR function.

(b) Mention the limitation of Back-propagation and current invention to overcome it.

(c) Briefly discuss the K-Fold Cross validation algorithm.

(d) Justify the F1-Score with respect to Classification of Skewed classes.

(e) Plot the learning curves for high bias and high variance problem. How to debug these curves to improve its performance?

(f) Compare the performance of gradient descent and normal equation for linear regression.

(g) What is the non-invertibility problem of Normal equation? How ridge regression solves it?

**3.** Derive Back-propagation algorithm mathematically using Gradient Descent Optimization Technique. Stepwise mention the Back-propagation procedure. 6+4

**4.** Explain the basic architecture of Perceptron. What is the Cost function of the Perceptron? Geometrically and intuitively derive it. Mention the convergence criteria of Perceptron Learning. 2+5+3

**Please Turn Over**

5. What is PCA? Mathematically derive 1st and 2nd Principal Component. 2+4+4

6. Mathematically derive the parameters/weights of Ridge Regression in terms of Input variables and Target variable. Using Maximum Likelihood derive the parameters/weights of Linear Regression. 5+5

7. Intuitively explain the cost function of Logistic Regression. Derive Newton's method from Taylor's series. Formulate Logistic Regression using Newton's method. 4+3+3

8. Explain Discriminative and Generative Learning using Bayes Theorem. Mathematically interpret Linear Discriminant Analysis and infer Quadratic Discriminant Analysis from LDA. 4+6

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