Question Paper

Exam Date & Time: 29-May-2023 (10:00 AM - 01:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

Manipal School of Information Sciences (MSIS), Manipal
Second Semester Master of Engineering - ME (Big Data Analytics / Cloud Computing) Degree Examination - May 2023

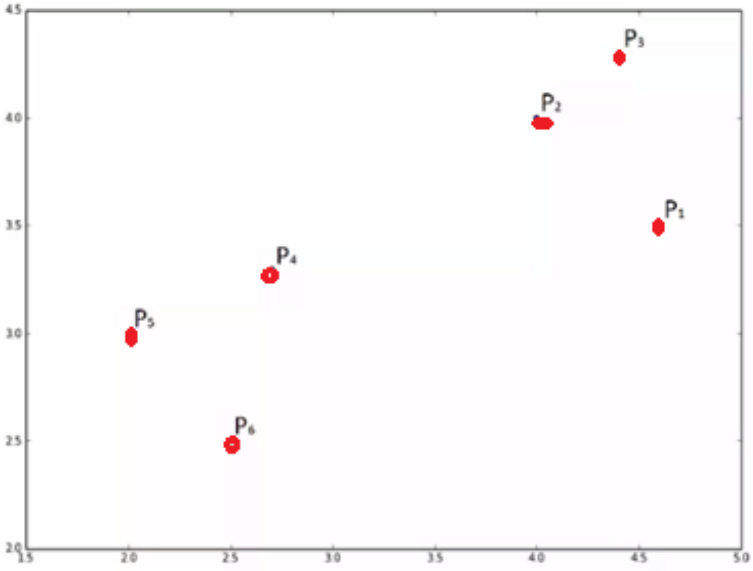
Machine Learning for Big Data [BDA 5201]

Marks: 100 **Duration: 180 mins.**

Monday, May 29, 2023

Answer all the questions.

1)	a.)	Use the McCulloch-Pitts neuron model to generate the output of a logic OR function.	(5)
	b.)	Implement a perceptron model for the OR function with bipolar inputs and targets.	(5)
2)		Discuss the steps used for training the back propagation neural network model.	(10)
3)	a.)	Explain the purpose of the gradient descent approach in artificial neural networks.	(5)
	b.)	If you have an image with a 7x7 spatial dimension, assume a 3x3 filter applied with stride 3. Solve to find the output dimension of the image.	(5)
4)		Implement the within-cluster-sum-of-squares (WCSS) method to select the right number of clusters. What will happen if we choose a bad random initialization? Explain with an example.	(10)
5)		Construct a dendrogram for the following data points to determine the number of clusters. Explain each step in detail.	(10)



6) Implement the optimization technique to obtain a hyperplane such that the minimum distance from any data point to the hyperplane is maximized. Derive the equation for maximum margin without overfitting. (10)

7) We are given the following positively labeled data points in 2D (10)

$$\left\{\begin{pmatrix}3\\1\end{pmatrix},\begin{pmatrix}3\\-1\end{pmatrix},\begin{pmatrix}6\\1\end{pmatrix},\begin{pmatrix}6\\-1\end{pmatrix}\right\}$$

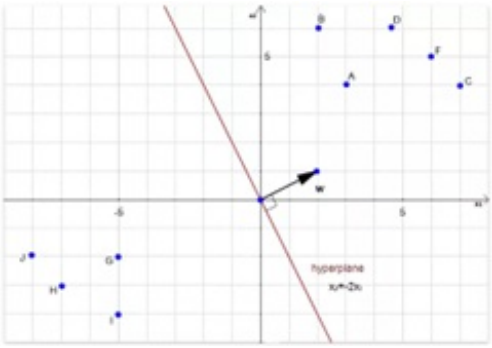
and the following negatively labeled data points in 2D

$$\left\{\begin{pmatrix}1\\0\end{pmatrix},\begin{pmatrix}0\\1\end{pmatrix},\begin{pmatrix}0\\-1\end{pmatrix},\begin{pmatrix}-1\\0\end{pmatrix}\right\}$$

Sketch a separating hyperplane that accurately discriminates between the two classes. [Use vectors augmented with a 1 as a bias input.]

8) Solve to compute the following with reference to the figure given below: (10)

(i) Distance from point A to the hyperplane (8 Marks)
(ii) Margin of the hyperplane (2 Marks)



9) Describe the architecture model of AlexNet with a neat block diagram. (10)

10) Demonstrate the reinforcement learning process with a suitable example. (5)

a.)

b.) Differentiate between exploitation and exploration in reinforcement learning reward maximization with a suitable example. (5)

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