Daffodil International University
Department of Software Engineering
Faculty of Science & Information Technology
Midterm Examination, Spring 2024
Course Code: SE544; Course Title: Introduction to Machine Learning
Sections & Teachers: A (MHS)

Time: 1:30 Hours   Marks: 25

Answer <u>ALL</u> Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	Consider a scenario where a company is implementing a machine learning model for predicting stock prices. Compare the advantages and disadvantages of using batch learning and online learning in this context. Discuss how each approach aligns with the nature of stock price prediction and the specific challenges or benefits they present in terms of computational requirements, adaptability to changing data, and overall model performance. Provide a recommendation for the most suitable learning approach based on the characteristics of the stock price prediction task.	**[Marks–5]**	**CO–1** *Level–2*
2.	 	X	Y
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2	7
5	16
4	13
11	23
1	3
3	7 | Generate a linear regression hypothesis function to predict Y using X and **Apply** 2 epochs of gradient descent to find the optimal values of the parameters. You are given the following information: a. $\partial L/\partial_X = -2 \times X \times (Y - \hat{Y})$	**[Marks-10]**	**CO–2** *Level–3*
3.	Consider a scenario where a team of data scientists has developed a machine learning model to predict customer preferences for an e-commerce platform. The model is designed to enhance personalized product recommendations. During the analysis phase, you are tasked with critically analyzing the model's design, analysis, results, conclusions, and interpretations.	**[Marks–5]**	**CO–3** *Level–4*

	1. Investigate the design aspects of the machine learning model, for example, required features, data preprocessing, possible models, etc., and how they align with the task. 2. Examine the model's performance evaluation process, for example, the whole evaluation process, and the appropriateness of each evaluation metrics employed. 3. Examine for any potential case where the model could overfit or over generalize. 4. Analyze the whole process to ensure whether the model is transparent and reproducible. 5. Recommend any further improvement.		
4.	Imagine a scenario where a machine learning model has been developed to assist healthcare professionals in predicting patient outcomes based on historical medical data. The dataset used for training the model contains information from diverse demographic groups. During the evaluation phase, you discover potential biases in the model's predictions related to different demographic factors. Evaluate the model for potential bias, fairness issues, and societal, cultural, or ethical concerns: 1. Analyze the dataset used for training, considering the representation of various demographic groups. 2. Identify instances of biased outcomes in the model's predictions based on different demographic factors. 3. Assess the potential societal and ethical implications of relying on this model in a healthcare setting. 4. Propose specific strategies to mitigate the identified biases and enhance the fairness of the model. 5. Reflect on the broader ethical considerations of deploying machine learning models in sensitive domains like healthcare, discussing the importance of transparency and accountability.	**[Marks-5]**	**CO-4** *Level-5*