



Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Mid Examination, Fall 2024

Course Code: CSE315, Course Title: Introduction to Data Science

Level: 3 Term: 1 Batch: 63& 62

Time: 01:30 Hrs.

Marks: 25

Answer ALL 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.	a)	A telecom company has gathered information on customer age, contract type, monthly charges, and customer complaints in an effort to reduce retention rates. In summary, describe how the company can use these variables to predict which customers are most likely to leave.	2	CO1																		
	b)	A university wants to conduct a survey to understand student satisfaction across all departments. Since surveying every student is not feasible, they decide to use sampling techniques. Explain which sampling method (e.g., random sampling, stratified sampling, or systematic sampling) would be most appropriate for this scenario and why.	3																			
2.	a)	Given the following dictionary of employee data: employee_data = { 'Name': ['Alice', 'Bob', 'Charlie', 'David'], 'Age': [25, 30, 35, 40], 'Department': ['HR', 'Finance', 'IT', 'Marketing'], 'Salary': [50000, 60000, 70000, 80000] } i. Write Python code to convert this dictionary into a Pandas DataFrame. ii. Display the first two rows of the DataFrame. iii. Write code to find the average salary of the employees.	3	CO2																		
	b)	Given the following list of ages for a group of people: 8, 9, 91, 100, 96, 5, 39, 2, 34, 25, 28, 22, 54, 68, 80, 11, 74, 28, 13, 6 Calculate the first quartile (Q1) and third quartile (Q3) of the data. Use the 1.5 IQR (Interquartile Range) method to identify any outliers.	3																			
	C)	A company collects the following data on the number of hours employees spend on training and their corresponding performance scores: <table border="1"><tr><td>Hours of Training</td><td>2</td><td>3</td><td>5</td><td>7</td><td>8</td><td>9</td><td>11</td><td>12</td></tr><tr><td>Performance Score</td><td>50</td><td>55</td><td>65</td><td>70</td><td>80</td><td>90</td><td>95</td><td>105</td></tr></table> i. Explain how you would apply linear regression to model the relationship between the hours of training and performance score. ii. Based on this model, describe how you can predict the performance score for an employee who spends 6 hours on training.	Hours of Training	2	3	5	7	8	9	11	12	Performance Score	50	55	65	70	80	90	95	105	4	
Hours of Training	2	3	5	7	8	9	11	12														
Performance Score	50	55	65	70	80	90	95	105														
3.	a)	What is the difference between the generalized Bayes rule and the naïve Bayes rule? Describe the meaning of the term "naïve" for the Naive Bayes classifier.	2	CO2																		

b)	Explain why Naive Bayes is a good option and how its assumptions and features match the situation. Talk about real-world applications where Naive Bayes is often utilized.	3																																																																																
c)	<p>You are given a randomly selected dataset of ten email messages to build a Naive Bayes classifier to identify whether an email is spam or not based on the occurrence of certain words, including Money, Free, and Win.</p> <table><tr><th>Email</th><th>"Money" (Yes=1, No=0)</th><th>"Free" (Yes=1, No=0)</th><th>"Win" (Yes=1, No=0)</th><th>Label (Spam=1, Not Spam=0)</th></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>2</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>3</td><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>4</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>5</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>6</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>7</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>8</td><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>9</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>10</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>11</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>12</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>13</td><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>14</td><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>15</td><td>1</td><td>1</td><td>0</td><td>1</td></tr></table> <p>A vector of words represents each email. Each email is labeled as either spam (1) or not spam (0).</p> <ul style="list-style-type: none"><input checked="" type="checkbox"/> Determine the prior probability of each label (spam or not spam).<input checked="" type="checkbox"/> Determine the Likelihood of each attribute (Money, Free, and Win).<input checked="" type="checkbox"/> Calculate the probability that a new email containing the words Money, Win, but not free is spam or not spam.	Email	"Money" (Yes=1, No=0)	"Free" (Yes=1, No=0)	"Win" (Yes=1, No=0)	Label (Spam=1, Not Spam=0)	1	1	1	0	1	2	0	1	0	0	3	1	0	0	1	4	0	0	0	0	5	1	1	1	1	6	0	0	1	0	7	0	1	1	1	8	0	1	1	0	9	1	1	1	1	10	0	0	0	0	11	0	0	0	0	12	1	1	1	1	13	1	0	0	0	14	1	0	0	1	15	1	1	0	1	5
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