

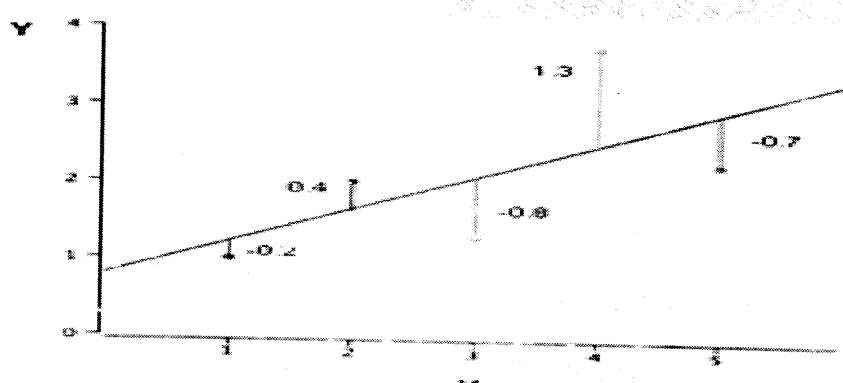
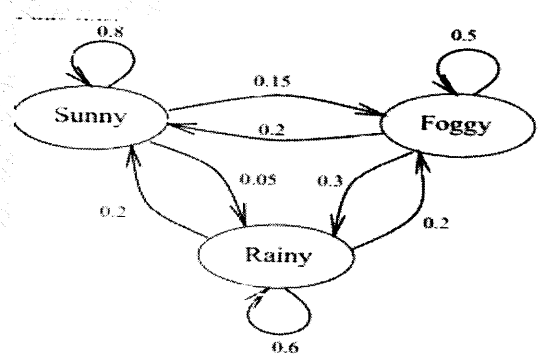
Machine Learning

University of Mumbai
Examinations Summer 2022

Time: 2:30 hour

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1	Which of the following options are true about Machine Learning? 1. Machine learning is automatic learning based on experience 2. Machine learning is programmed so that it learns, and past experience is not required. 3. It can learn and improve from the past experience without being explicitly programmed. 4. Machines can learn from past experience, but it must be explicitly programmed.
Option A:	1 and 2
Option B:	2 and 4
Option C:	1 and 4
Option D:	3 and 4
2	Which of the following is an example of reinforcement learning?
Option A:	Stock price prediction
Option B:	Sentiment analysis
Option C:	Customer segmentation
Option D:	Robot in a maze
3	In Downhill Simplex method, if $f(x)$ at the reflected point is greater than $f(x)$ at worst point (N) then the new point is obtained by
Option A:	Contraction
Option B:	Multiple Reflection
Option C:	Expansion
Option D:	Multiple contraction
4	Given $X = [1 \ 2 \ 3 \ 4]$ $W = [1 \ 1 \ -1 \ -1]$ compute $f(\text{net})$ given $\lambda = 0.5$ using i. Bipolar continuous ii. Unipolar continuous activation function
Option A:	i. 0.7615 ii. 0.880
Option B:	i. 0.880 ii. 0.7615
Option C:	i. -0.7615 ii. 0.1192
Option D:	i. 0.119 ii. -0.7615
5	_____ is a type of learning rule which works with a layer of Neurons.
Option A:	Perceptron
Option B:	Hebbian
Option C:	Windrow Hoff
Option D:	Winner takes all
6	Which of these statements are false with respect to the metrics in linear regression? a. For a strong linear regression R^2 value should be high

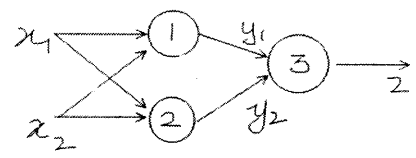
	<p>b. Multiple R value of 1 represents perfect positive relationship</p> <p>c. Karl Pearson value of -1 indicates total negative linear correlation</p> <p>d. High value of Sum of Squared Errors (SSE) indicates perfect fit</p>
Option A:	Both A and B are false
Option B:	Both A and C are false
Option C:	Both B and C are false
Option D:	Only D is false
7	<p>The graph below represents a regression line predicting Y from X. The values on the graph shows the residuals for each predicted value. Use this information to compute the Sum of squared errors (SSE)</p> 
Option A:	4.02
Option B:	3.02
Option C:	1.01
Option D:	0
8	<p>The difference between naïve Bayesian classifier and Bayesian belief networks is</p>
Option A:	The joint conditional probability distributions are considered in Bayesian Belief networks
Option B:	The joint conditional probability distribution is not considered in Bayesian Belief networks
Option C:	Class conditional independence is always considered in Bayesian Belief networks
Option D:	Class conditional independence is sometimes considered in Bayesian Belief Networks
9	<p>Today's weather Tomorrow's weather</p> <p>Initial Probability values</p> <p>Sunny 0.25</p> <p>Rainy 0.75</p> <p>Foggy 0.30</p>  <p>Given that today is sunny what is the probability that tomorrow is sunny and the day after is rainy</p>
Option A:	0.01

Option B:	0.004
Option C:	0.04
Option D:	0.32
10	Compute the Eigen values for matrix $A = \begin{bmatrix} 7 & 3 \\ 3 & -1 \end{bmatrix}$
Option A:	$\lambda_1 = 8; \lambda_2 = -2$
Option B:	$\lambda_1 = -8; \lambda_2 = 2$
Option C:	$\lambda_1 = 4; \lambda_2 = -4$
Option D:	$\lambda_1 = -4; \lambda_2 = 4$

Q2	Solve any Two	10 marks each
A	Why the Support Vector Machine (SVM) is called the maximum margin classifier? Explain mathematically the formulation of margin.	
B	What is a saddle point? Minimize $f(x) = x_1^2 + x_2^2 + 2x_1x_2$, with starting initial point $[0.5, -0.1]$ (Perform 2 iteration only) using the steepest descent method	
C	What are the steps in designing a Machine Learning Application	

Q3	Solve any Two	10 marks each																																																																																										
A	For the following data, to construct the decision tree calculate Gini indexes and determine which attribute is the root attribute.																																																																																											
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B	List down the steps of PCA Using PCA compute the transformed matrix of A Where A is																																																																																											
	<table><tr><td>1</td><td>2</td></tr><tr><td>0.5</td><td>1.5</td></tr><tr><td>0</td><td>0.5</td></tr><tr><td>-0.5</td><td>0.25</td></tr></table>		1	2	0.5	1.5	0	0.5	-0.5	0.25																																																																																		
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C	Define logit function. Explain the importance of logit function in logistic regression with appropriate example
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Q4	Solve any Two	10 marks each																						
A	<p>Given</p>  <p>$X = [3, 5]$ $W = \begin{bmatrix} 1 & 2 \\ 4 & -2 \end{bmatrix}$ $Y = [1, -5]$ $C = 1$</p> <p>Compute output Z using binary bipolar activation function. Also compute the new weights $y_1, y_2, w_{11}, w_{12}, w_{21}, w_{22}$</p>	Comp																						
B	<p>Define covariance? For the given dataset, compute the covariance matrix</p> <table><tr><th>X_1</th><th>X_2</th></tr><tr><td>2.5</td><td>2.4</td></tr><tr><td>0.5</td><td>0.7</td></tr><tr><td>2.2</td><td>2.9</td></tr><tr><td>1.9</td><td>2.2</td></tr><tr><td>3.1</td><td>3.0</td></tr><tr><td>2.3</td><td>2.7</td></tr><tr><td>2.0</td><td>1.6</td></tr><tr><td>1.0</td><td>1.1</td></tr><tr><td>1.5</td><td>1.6</td></tr><tr><td>1.2</td><td>0.9</td></tr></table>	X_1	X_2	2.5	2.4	0.5	0.7	2.2	2.9	1.9	2.2	3.1	3.0	2.3	2.7	2.0	1.6	1.0	1.1	1.5	1.6	1.2	0.9	
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C	<p>What is the role of radial basis function in separating nonlinear patterns? Explain with XOR Example.</p>																							