GATE

CRASH COURSE GATE 2025

Machine Learning

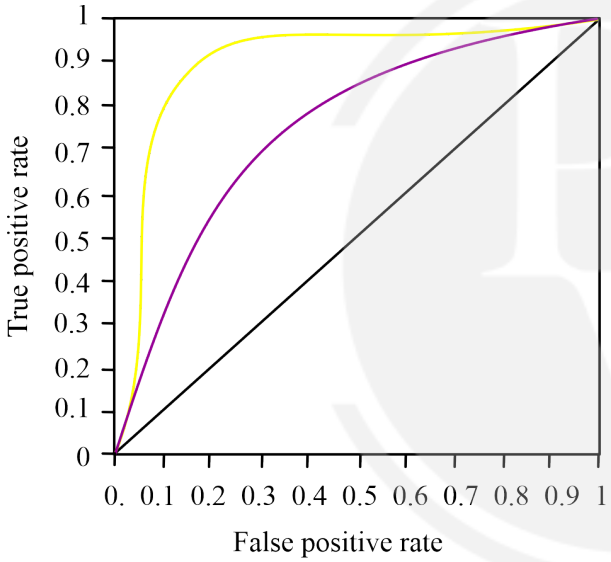
Classification

Q1 In a logistic regression(Linear Classifier) problem, what is a possible output for a new instance?

(A) 85 (B) -0.19

(C) 1.20 (D) 89%

Q2 The below figure shows AUC-ROC curves for three logistic regression models. Different colors show curves for different hyper parameters values. Which of the following AUC-ROC will give the best result?



(A) Yellow (B) Pink

(C) Black (D) All are same

Q3 In the regression model (y = a + bx) where x = 2.50, y = 5.50 and a = 1.50 ($\bar{x}$ and $\bar{y}$ denote mean of variables x and y and a is a constant), which one of the following values of parameter 'b' of the model is correct?

(A) 1.75 (B) 1.60

(C) 2.00 (D) 2.50

Q4 Which of the following is an advantage of linear classification algorithms?

(A) They are highly interpretable

(B) They can capture complex non-linear relationships in the data

(C) They are less sensitive to outliers compared to other algorithms

(D) They require less computational resources for training and prediction

Q5 The learner is trying to predict housing prices based on the size of each house. What type of regression is this?

(A) Multivariate Logistic Regression

(B) Logistic Regression

(C) Linear Regression

(D) Multivariate Linear Regression

Q6 The hypothesis is given by h(x) = t0 + t1x. What is the goal of t_0 and 0_1?

(A) Give negative h(x)

(B) Give h(x) as close to 0 as possible, without themselves being 0

(C) Give h(x) as close to y, in training data, as possible

(D) Give h(x) closer to x than y

Q7 In continuation with question 7, let x = 1 if the server is wearing black shirt and x = 0 for servers wearing other colored shirts. We know that there are 2 points 70 observations with x 1 and 340 observations with x = 0. The response variable is also an indicator variable given by y = 1 if the customer left a tip and y=0 if the customer did not leave a tip. Use this data to fit a logistic regression model to compute the log-odds of leaving a tip depending on the color of the server's shirt.

(A) -0.4797 +0.1249x

(B) 0.2877 +0.1249x

(C) 0.1249+0.4317x

(D) -0.4797 +0.7674x

Q8 In Simple Logistic regression the predictor . . . ?
(A) is interval/ratio data
(B) must undergo a logarithmic transformation before undergoing logistic regression
(C) be in the range of 0 to 1
(D) represent ranked scores
(E) be a binary variable

Q9 In logistic regression the logit is . . . : (one correct choice)
(A) the natural logarithm of the odds ratio.
(B) an instruction to record the data.
(C) a logarithm of a digit.
(D) the cube root of the sample size.

Q10 Given an example from a dataset (x1, x2) = (4, 1), observed value y = 2 and the initial weights w1, w2, bias b as -0.015, -0.038 and 0. What will be the prediction y'.
(A) 0.01 (B) 0.03
(C) 0.05 (D) 0.1

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Answer Key

Q1	(A)	Q6	(C)
Q2	(A)	Q7	(D)
Q3	(B)	Q8	(E)
Q4	(A)	Q9	(A)
Q5	(C)	Q10	(D)

Hints & Solutions

Q1 Text Solution:

The output can only be between 0 and 1.

Q3 Text Solution:

(y = a + bx)

where,

- $\bar{x}$ = 2.50
- $\bar{y}$ = 5.50
- a = 1.50
- ($\bar{x}$ and $\bar{y}$ denote mean of variables x and y and a is a constant)

Putting values in the formula:

5.50 = 1.50 + b × 2.50

b × 2.50 = 4

b = 4/2.5 = 1.60

Q8 Text Solution:

Logistic regression is commonly used when the outcome or dependent variable is binary (e.g., yes/no, 0/1), and it models the probability of the outcome occurring as a function of the predictor variable.

Q10 Text Solution:

Given

x^1 = 4, x^2 = 1, w1 = –0.015, w^2 = -0.038, y = 2 and b = 0.

Then prediction y' = w^1 x1 + w^2 x^2 + b

= (-0.015 * 4) + (-0.038 * 1) + 0

= -0.06 + -0.038 + 0

= -0.098

= -0.1