1. Which of the following is a supervised learning problem?
   (a) Grouping people in a social network.
   (b) Predicting credit approval based on historical data
   (c) Predicting rainfall based on historical data
   (d) all of the above
   Sol. (b) and (c)
   (a) does not have labels to indicate the groups. (b) and (c) have the correct answers for the examples in the dataset.

2. Which of the following are classification problems? (multiple options may be correct)
   (a) Predicting the temperature (in Celsius) of a room from other environmental features (such as atmospheric pressure, humidity etc).
   (b) Predicting if a cricket player is a batsman or bowler given his playing records.
   (c) Predicting if a particular route between two points has traffic jam or not based on the travel time of vehicles.
   (d) Filtering of spam messages
   Sol. (b),(c), (d)

3. Which of the following is a regression task? (multiple options may be correct)
   (a) Predicting the monthly sales of a cloth store in rupees.
   (b) Predicting if a user would like to listen to a newly released song or not based on historical data.
   (c) Predicting the confirmation probability (in fraction) of your train ticket whose current status is waiting list based on historical data.
   (d) Predicting if a patient has diabetes or not based on historical medical records.
   (e) Predicting the gender of a human based on facial features.
   Sol. (a) and (c)

4. Which of the following is an unsupervised task?
   (a) Learning to play chess.

(b) Predicting if a new edible item is sweet or spicy based on the information of the ingredients, their quantities, and labels (sweet or spicy) for many other similar dishes.

(c) Grouping related documents from an unannotated corpus.
(d) all of the above

Sol. (c)
option (b) has the labels, so it is supervised task

5. Which of the following is a categorical feature?
   (a) Number of legs of an animal
   (b) Number of hours you study in a day
   (c) Your weekly expenditure in rupees.
   (d) Branch of an engineering student
   (e) Ethnicity of a person
   (f) Height of a person in inches
   Sol. (d) and (e)
6. Let X and Y be a uniformly distributed random variable over the interval [0, 4] and [0, 6] respectively. If X and Y are independent events, then compute the probability,
   $P(\max(X, Y) > 2)$
   (a) 1
   6
   (b) 5
   6
   (c) 2
   3
   (d) None of the above
   Sol. (b)

$P(\max(X, Y) > 2) = P(X > 2) + P(Y > 2) - P(X > 2 \& Y > 2)$

$= \frac{1}{2} + \frac{2}{3} - \frac{1}{2} \times \frac{2}{3}$

$= \frac{5}{6}$

7. Let the trace and determinant of a matrix A =

a b
c d
be 4 and 3 respectively. The eigenvalues

of A are
(a) 3+ι
√
7
2
,
3−ι
√
7
2
, where ι =
√
−1

(b) 1, 3
(c) None of the above
(d) Can be computed only if A is a symmetric matrix.
(e) Can not be computed as the entries of the matrix A are not given.
Sol. (b)
Use of the facts that the trace and determinant of a matrix is equal to the sum and product of its eigenvalues respectively. Using this

λ1 + λ2 = 4, λ1λ2 = 3

where λ1 and λ2 denotes the eigenvalues. Solve the above two equations in two variables or check if option (a) satisfies them.
2

8. What happens when your model complexity increases? (multiple options may be correct)
   (a) Model Bias decreases
   (b) Model Bias increases
   (c) Variance of the model decreases
   (d) Variance of the model increases
   Sol. (a) and (d)
9. Based on a survey, it was found that the probability that a student likes to play football was 0.25 and the probability that a student likes to play cricket is 0.43. It was also found that the probability that a student likes to play both football and cricket is 0.12. What is the probability that a student does not like to play either?
   (a) 0.32
   (b) 0.2
   (c) 0.44
   (d) 0.56
   Sol. (c)
   Given P(football) = 0.25, P(cricket) = 0.43, and P(football ∩ cricket) = 0.12.
   We are interested in the probability of students who do not like to play either football or cricket, i.e., P((football ∪ cricket)0
).

From basic set theory, we have P(football ∪ cricket) = P(football) + P(cricket) − P(football ∩ cricket) = 0.25 + 0.43 − 0.12 = 0.56.

Also, the two events, a student likes to play football or cricket (football ∪ cricket) and a student does not like to play either football or cricket ((football ∪ cricket)0

) are mutually exclusive.

Therefore, we have P((football ∪ cricket)0

) = 1 – P(football ∪ cricket) = 1 – 0.56 = 0.44.

10. Which of the following are true about bias and variance of overfitted and underfitted models? (multiple options may be correct)
    (a) Underfitted models have high bias.
    (b) Underfitted models have low bias.
    (c) Overfitted models have low variance.
    (d) Overfitted models have high variance.
    (e) none of these
    Sol. (a), (d)

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