SUPERVISED LEARNING - TEST 1 (20 to 30 mins)

15-Question Test on Linear Regression, Gradient Descent, Bias & Variance

Topics:

 Linear Regression:

 Gradient Descent:

 Bias & Variance:



Section 1: Linear Regression

Q1. What is Linear Regression?   
Answer: Linear Regression is a method used to model the relationship between a dependent variable and one or more independent variables by fitting a straight line that best predicts the target variable

Q2. Write the formula for simple linear regression. Answer: y=β0​+β1​x+ε

3. What is the purpose of the cost function in linear regression? Answer: The purpose of the cost function in linear regression is to measure how well the model's predictions match the actual data. It quantifies the error between predicted values and actual values.

Q4. How do you interpret the coefficients in a multiple linear regression model?

Answer: In a multiple linear regression model, each coefficient represents the estimated effect of one independent variable on the dependent variable, holding all other variables constant.

y=β0​+β1​x1​+β2​x2​+⋯+βn\*​xn​+ε

Q5. What are the assumptions of Linear Regression? Answer: 1)- Linearity, 2)-Independence of Errors,

3)- Normality of Errors, 4)-No Multicollinearity

5)- No Autocorrelation



Section 2: Gradient Descent

Q6. What is Gradient Descent?

Answer: Gradient Descent is an optimization algorithm used to minimize the cost function in machine learning models, including linear regression.

Q7. Write the formula for parameter update in Gradient Descent. Answer:

Q8. What is the role of the learning rate in Gradient Descent? Answer: The learning rate (denoted as α\alphaα) in Gradient Descent controls the size of the steps taken toward minimizing the cost function



Q9. What is the primary purpose of regularization in machine learning models?

A) To increase the complexity of the model to fit the training data better.

B) To minimize the training error without regard to generalization.

C) To prevent overfitting by penalizing large coefficients in the model.

D) To ensure that all features are included in the final model regardless of their importance.

Ans -C

Q10. What happens if the learning rate is too small or too large? Answer:

1)- Too small learning rate: Slow training; takes many steps to converge.

2)- Too large learning rate: Overshoots minimum; may cause divergence or oscillation.



Section 3: Bias & Variance

Q11. Define Bias and Variance in the context of machine learning models. Answer:

**Bias:** Error due to oversimplification; causes underfitting.

**Variance:** Error due to over-sensitivity to training data; causes overfitting.

Q12. What is the Bias-Variance tradeoff?

Answer: The Bias-Variance tradeoff is the balance between bias and variance

Q13. How does increasing the complexity of a model affect bias and variance?

Answer: More complex models → lower bias, higher variance

Q14. What is underfitting and overfitting in machine learning? Answer:

**Underfitting:** Model is too simple, performs poorly on training and test data.

**Overfitting:** Model is too complex, fits training data too closely but performs poorly on new data.

Q15. How can you reduce overfitting in a model? Answer:

1-Using regularization (L1 or L2)

2-Collecting more training data

3-Simplifying the model (reduce complexity)

4-Using cross-validation

5-Applying early stopping during training

6-Using dropout (in neural networks)