Quiz 3 for Lecture 4

17 out of 20 correct

1. What is the purpose of the General Linear Model (GLM)?

- [x] To analyze the relationship between dependent and independent variables
- [ ] To perform feature selection in regression models
- [ ] To apply regularization techniques in machine learning algorithms
- [ ] To optimize the parameters in SVM models

Explanation: The General Linear Model (GLM) is a flexible statistical framework used to analyze the relationship between a dependent variable and one or more independent variables. It encompasses various regression techniques, such as linear regression, logistic regression, and ANOVA.

2. Which of the following regression techniques is suitable for predicting continuous numerical values?

- [x] Linear Regression
- [ ] Logistic Regression
- [ ] Decision Tree Regression
- [ ] Support Vector Regression

Explanation: Linear Regression is a regression technique used to model the relationship between a dependent variable and one or more independent variables. It is suitable for predicting continuous numerical values.

3. Which of the following loss functions is commonly used in linear regression?

- [ ] Mean Absolute Error (MAE)
- [x] Mean Squared Error (MSE)
- [ ] Cross-Entropy Loss
- [ ] Hinge Loss

Explanation: Mean Squared Error (MSE) is commonly used in linear regression. It measures the average squared difference between the predicted and actual values. The goal in linear regression is to minimize the MSE to obtain the best-fitting line.

4. What is the purpose of an optimizer in machine learning?

- [ ] To compute the gradient of the loss function
- [ ] To select the optimal learning rate for the model
- [x] To minimize the loss function and find the optimal model parameters
- [ ] To regularize the model and prevent overfitting

Explanation: An optimizer in machine learning is responsible for minimizing the loss function by adjusting the model's parameters. It searches for the optimal set of parameters that minimize the difference between predicted and actual values.

5. Which optimization algorithm is commonly used in Gradient Descent?

- (●) Stochastic Gradient Descent (SGD)
- ( ) Adam
- ( ) RMSprop
- ( ) Adagrad

6. What is the purpose of regularization in machine learning?

- ( ) To increase the complexity of the model
- (●) To reduce the model's generalization error
- ( ) To decrease the training time
- ( ) To improve the model's accuracy on the training data

Explanation: Regularization techniques aim to prevent overfitting by adding a penalty term to the loss function. It helps the model generalize well to unseen data by discouraging complex patterns that may only fit the training data.

7. Which regularization technique encourages sparsity by adding an L1 penalty to the loss function?

- (●) Lasso regularization
- ( ) Ridge regularization
- ( ) Elastic Net regularization
- ( ) Dropout regularization

Explanation: Lasso regularization adds an L1 penalty to the loss function, promoting sparsity in the model. It tends to shrink the coefficients of less important features towards zero, effectively performing feature selection.

8. In Support Vector Machines (SVM), what is the purpose of the kernel function?

- (●) To map the input data to a higher-dimensional feature space
- ( ) To regularize the model and prevent overfitting
- ( ) To compute the margin between support vectors
- ( ) To minimize the misclassification rate

Explanation: The kernel function in SVM allows the model to implicitly transform the input data into a higher-dimensional feature space, where the data becomes linearly separable. It enables SVM to handle complex non-linear decision boundaries.

9. Which of the following is a disadvantage of Decision Trees?

- (●) Prone to overfitting
- ( ) Cannot handle categorical variables
- ( ) Require extensive computational resources
- ( ) Limited to binary classification problems

Explanation: Decision Trees have a tendency to overfit the training data, capturing intricate patterns that may not generalize well to unseen data. Techniques like pruning and regularization can be used to mitigate overfitting.

10. What is the purpose of ensemble techniques in machine learning?

- (●) To combine multiple weak models to create a stronger model
- ( ) To reduce the model's complexity
- ( ) To improve the model's interpretability
- ( ) To reduce the training time

Explanation: Ensemble techniques combine the predictions of multiple individual models to create a more accurate and robust model. By aggregating the predictions of different models, ensemble techniques can improve prediction accuracy and handle complex patterns in the data.

11. Which ensemble technique combines multiple models through weighted voting?

- (●) Bagging
- ( ) Boosting
- ( ) Random Forest
- ( ) AdaBoost

Explanation: AdaBoost (Adaptive Boosting) is an ensemble technique that combines multiple weak models through weighted voting. It assigns higher weights to misclassified samples, allowing subsequent models to focus on correctly classifying those samples.

12. Which ensemble technique builds multiple models sequentially, where each model corrects the mistakes of the previous model?

- ( ) Bagging
- (●) Boosting
- ( ) Random Forest
- ( ) Gradient Boosting

Explanation: Boosting is an ensemble technique that builds multiple models sequentially. Each subsequent model focuses on correcting the mistakes of the previous model by assigning higher weights to misclassified samples. Examples include AdaBoost and Gradient Boosting.

13. Which ensemble technique creates multiple models using bootstrapped samples and combines their predictions through averaging or voting?

- (●) Bagging
- ( ) Boosting
- ( ) Random Forest
- ( ) Stacking

Explanation: Bagging (Bootstrap Aggregating) is an ensemble technique that creates multiple models using bootstrapped samples of the training data. The predictions of these models are combined through averaging or voting to make final predictions.

14. What is the purpose of feature importance in ensemble models?

- ( ) To measure the accuracy of the model

- [x] To assess the performance of individual features in making predictions
- [ ] To determine the optimal number of features to use
- [ ] To reduce the computational complexity of the model

Explanation: Feature importance in ensemble models measures the contribution of individual features towards making accurate predictions. It helps identify the most influential features and assess their relevance in the model's performance.

15. Which ensemble technique combines the predictions of multiple models through a weighted linear combination?

- [ ] Bagging
- [ ] Boosting
- [ ] Random Forest
- [x] Stacking

Explanation: Stacking is an ensemble technique that combines the predictions of multiple models through a weighted linear combination. It trains a meta-model on the predictions of the base models to make final predictions

16. Which regularization technique can be used in both linear regression and logistic regression?

- [ ] L1 regularization
- [x] L2 regularization
- [ ] Ridge regularization
- [ ] Elastic Net regularization

Explanation: Elastic Net regularization combines both L1 and L2 regularization penalties. It can be used in both linear regression and logistic regression to shrink the coefficients towards zero and prevent overfitting.

17. Which optimization algorithm is commonly used in training deep neural networks?

- [ ] Stochastic Gradient Descent (SGD)
- [x] Adam
- [ ] RMSprop
- [ ] Adagrad

Explanation: Adam (Adaptive Moment Estimation) is a popular optimization algorithm used in training deep neural networks. It combines the advantages of AdaGrad and RMSprop, providing adaptive learning rates and momentum.

18. Which of the following loss functions is commonly used in logistic regression?

- [ ] Mean Absolute Error (MAE)
- [ ] Mean Squared Error (MSE)
- [x] Cross-Entropy Loss
- [ ] Hinge Loss

Explanation: Cross-Entropy Loss, also known as Log Loss, is commonly used in logistic regression. It measures the difference between the predicted probabilities and the true class labels

19. Which algorithm can be used for both classification and regression tasks?

- (●) Support Vector Machines (SVM)
- ( ) Decision Trees
- ( ) Random Forests
- ( ) Gradient Boosting

Explanation: Random Forests can be used for both classification and regression tasks. It is an ensemble technique that combines multiple decision trees to make predictions.

20. Which of the following is a non-parametric classification algorithm?

- ( ) Logistic Regression
- ( ) Linear Discriminant Analysis (LDA)
- (●) K-Nearest Neighbors (KNN)
- ( ) Naive Bayes

Explanation: K-Nearest Neighbors (KNN) is a non-parametric classification algorithm that makes predictions based on the majority vote of the k nearest neighbors in the training data.

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