SNS College of Technology

[An Autonomous Institution]

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai

Accredited by NAAC-UGC with 'A++' Grade (Cycle III) &

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COIMBATORE-641 035, TAMIL NADU

DEPARTMENT OF MANAGEMENT STUDIES

Academic Year : 2023-24 Semester : 02

Course Code : 23BAT615

Course Name : Artificial Intelligence for Managers

Unit : II – Unboxing ML and Its Applications

Questions [13 Marks]

1. Describe the difference between supervised and unsupervised learning. Provide examples of each and discuss their applications in real-world scenarios.
2. Explain three different ensemble techniques in machine learning, such as bagging, boosting, and stacking. Compare and contrast their strengths, weaknesses, and applications.
3. Discuss the challenges faced in building recommendation systems. Describe at least three different types of recommendation algorithms and their approaches to addressing these challenges.
4. Explain the concept of reinforcement learning. Describe the components of a reinforcement learning system, including the agent, environment, actions, rewards, and policies. Provide examples of reinforcement learning applications in various domains.
5. Describe the process of data preprocessing in machine learning. Discuss common techniques used for data cleaning, feature scaling, and feature engineering. Explain why data preprocessing is essential for building accurate machine learning models.
6. Discuss the bias-variance tradeoff in machine learning. Explain how underfitting and overfitting relate to bias and variance, respectively. Describe techniques such as regularization and cross-validation used to manage the bias-variance tradeoff.
7. Explain the concept of clustering in unsupervised learning. Describe at least three different clustering algorithms, such as K-means, hierarchical clustering, and DBSCAN. Discuss their strengths, weaknesses, and applications.
8. Describe dimensionality reduction techniques in machine learning. Discuss the importance of dimensionality reduction, common methods such as Principal Component Analysis (PCA) and t-distributed Stochastic Neighbor Embedding (t-SNE), and their applications in feature selection and visualization.

9. Discuss the challenges and techniques involved in evaluating machine learning models. Explain various evaluation metrics such as accuracy, precision, recall, F1-score, and ROC-AUC. Describe how to interpret these metrics and choose the appropriate ones for different types of tasks.
10. Explain the collaborative filtering approach used in recommendation systems. Describe user-based and item-based collaborative filtering methods, their advantages, disadvantages, and how they handle the cold start problem.
11. Describe deep learning and its applications in various domains such as computer vision, natural language processing, and speech recognition. Discuss the architecture of deep neural networks, common activation functions, and optimization techniques used in training deep learning models.
12. Discuss transfer learning in the context of deep learning. Explain the concept of fine-tuning pre-trained models and domain adaptation. Describe how transfer learning can accelerate model training and improve performance, especially with limited labeled data.
13. Explain the role of hyperparameters in machine learning models. Discuss common hyperparameters such as learning rate, batch size, and number of hidden units. Describe techniques such as grid search and random search used for hyperparameter tuning.
14. Discuss the challenges and opportunities in deploying machine learning models in real-world applications. Describe considerations such as model interpretability, scalability, reliability, and ethical implications.
15. Explain the concept of explainable AI (XAI) and its importance in machine learning. Discuss techniques such as feature importance analysis, model-agnostic methods, and local interpretability approaches used to explain black-box models.
16. Describe the role of natural language processing (NLP) in machine learning applications. Discuss common NLP tasks such as text classification, sentiment analysis, named entity recognition, and machine translation. Explain the challenges and techniques in NLP, including word embeddings and recurrent neural networks (RNNs).
17. Discuss the application of machine learning in healthcare. Describe use cases such as disease diagnosis, personalized treatment recommendation, and medical image analysis. Explain the challenges, including data privacy, interpretability, and bias in healthcare datasets.
18. Explain the concept of anomaly detection in machine learning. Discuss common techniques such as statistical methods, clustering-based approaches, and machine learning algorithms used for anomaly detection. Describe their applications in fraud detection, network security, and predictive maintenance.
19. Discuss the application of machine learning in finance. Describe use cases such as credit scoring, algorithmic trading, and risk management. Explain the challenges, including data quality, market volatility, and regulatory compliance.

20. Describe the role of machine learning in autonomous vehicles. Discuss techniques such as sensor fusion, perception, localization, and decision-making used in autonomous driving systems. Explain the challenges, including safety, reliability, and regulatory approval.
21. Explain the concept of semi-supervised learning in machine learning. Describe techniques such as self-training, co-training, and pseudo-labeling used to leverage both labeled and unlabeled data. Discuss the advantages, disadvantages, and applications of semi-supervised learning.
22. Discuss the application of machine learning in e-commerce. Describe use cases such as personalized recommendations, customer segmentation, and fraud detection. Explain the challenges, including data sparsity, scalability, and dynamic pricing.
23. Explain the concept of time series forecasting in machine learning. Discuss techniques such as autoregressive models, moving averages, and recurrent neural networks (RNNs) used for time series prediction. Describe their applications in finance, sales forecasting, and energy demand prediction.
24. Discuss the role of machine learning in climate science. Describe use cases such as weather prediction, climate modeling, and extreme event detection. Explain the challenges, including data complexity, model uncertainty, and long-term forecasting.
25. Explain the concept of adversarial attacks in machine learning. Discuss techniques such as adversarial examples, poisoning attacks, and evasion attacks used to manipulate machine learning models. Describe defenses such as adversarial training and robust optimization against adversarial attacks.