Mid-term Practice Question Bank

6 Marks Questions (20 Questions)

1. Define feature extraction in pattern recognition. Why is it important?
2. Differentiate between false positives and false negatives in anomaly detection with examples.
3. Explain k-NN classification and its role in pattern recognition.
4. How does Principal Component Analysis (PCA) help in dimensionality reduction?
5. What are hyperparameters in machine learning? Give examples.
6. Discuss the difference between batch learning and online learning.
7. How does overfitting affect model performance? Suggest solutions to mitigate it.
8. Explain how data preprocessing impacts anomaly detection.
9. What is One-Class SVM, and how is it used for anomaly detection?
10. Compare parametric and non-parametric classifiers in pattern recognition.
11. Describe the role of Bayesian classifiers in pattern recognition.
12. What is precision-recall trade-off in classification problems?
13. Explain the importance of cross-validation in machine learning models.
14. Discuss how clustering techniques can be used in anomaly detection.
15. What is bootstrapping in statistical modeling? Give an example.
16. Describe the working principle of DBSCAN and its application in anomaly detection.
17. How does the curse of dimensionality impact machine learning models?
18. Differentiate between local and global anomalies in pattern recognition.
19. Explain ROC curves and their significance in evaluating classification models.
20. What is adversarial learning, and how does it impact anomaly detection?

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15 Marks Questions (10 Questions)

1. Explain the Hidden Markov Model (HMM) and its applications in sequence-based anomaly detection.

2. Describe the working of a decision tree classifier and how entropy is used in tree construction.
3. How does the Expectation-Maximization (EM) algorithm work in clustering and anomaly detection?
4. Discuss the role of ensemble learning in improving classification accuracy. Provide examples.
5. What is the significance of transfer learning in pattern recognition? Provide an example.
6. Explain how reinforcement learning can be used for anomaly detection in cybersecurity.
7. Compare and contrast L1 and L2 regularization in the context of preventing overfitting.
8. Discuss the impact of imbalanced datasets in machine learning. How can this issue be addressed?
9. Explain the t-SNE algorithm and its role in visualizing high-dimensional data.
10. Describe the autoencoder neural network and its application in anomaly detection.

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25 Marks Questions (5 Questions)

1. **Application of Anomaly Detection in Healthcare:** A hospital uses machine learning to detect anomalies in patient vitals.
    - Explain the importance of anomaly detection in healthcare.
    - Describe the challenges associated with real-time anomaly detection in medical data.
    - Propose a deep learning-based solution to detect anomalies in patient vitals.
2. **Fraud Detection in Financial Transactions:**
    - Define fraud detection and explain its significance in banking.
    - Compare rule-based and machine-learning-based fraud detection systems.
    - Develop a framework for fraud detection using supervised and unsupervised learning techniques.
3. **Deep Learning for Pattern Recognition:**
    - Explain Convolutional Neural Networks (CNNs) and their application in image recognition.
    - Describe the key layers in CNN and their function.

- Discuss challenges in training CNNs for large-scale datasets and possible solutions.

4. **Cybersecurity Threat Detection:**
    - Discuss the application of anomaly detection in cybersecurity.
    - Explain how time-series analysis can help detect cyber-attacks.
    - Compare traditional statistical methods and deep learning-based methods for detecting cybersecurity threats.
5. **Anomaly Detection in Smart Cities:**
    - How can anomaly detection be applied in smart city applications?
    - Discuss the challenges associated with anomaly detection in IoT data.
    - Propose a scalable anomaly detection approach for real-time traffic monitoring in a smart city.