
PYTHON MACHINE LEARNING

1: Introduction to Machine Learning

- 1.1 What is Machine Learning?
- 1.2 Types of Machine Learning (Supervised, Unsupervised, Reinforcement Learning)
- 1.3 Python and Machine Learning Libraries (NumPy, Pandas, Scikit-Learn)
- 1.4 Jupyter Notebooks for Machine Learning

2: Data Preprocessing

- 2.1 Data Cleaning and Handling Missing Data
- 2.2 Feature Scaling and Normalization
- 2.3 Data Encoding (One-Hot Encoding, Label Encoding)
- 2.4 Feature Engineering

3: Supervised Learning

- 3.1 Linear Regression
- 3.2 Logistic Regression
- 3.3 Decision Trees and Random Forests
- 3.4 Support Vector Machines (SVM)
- 3.5 k-Nearest Neighbors (k-NN)
- 3.6 Naive Bayes
- 3.7 Evaluation Metrics (Accuracy, Precision, Recall, F1-Score, ROC, AUC)

4: Unsupervised Learning

- 4.1 Clustering (K-Means, Hierarchical Clustering, DBSCAN)

4.2 Dimensionality Reduction (Principal Component Analysis - PCA)

4.3 Anomaly Detection

4.4 Association Rule Learning (Apriori)

5: Neural Networks and Deep Learning

5.1 Introduction to Artificial Neural Networks (ANNs)

5.2 Feedforward Neural Networks

5.3 Activation Functions (Sigmoid, ReLU, etc.)

5.4 Backpropagation and Gradient Descent

5.5 Convolutional Neural Networks (CNNs)

5.6 Recurrent Neural Networks (RNNs)

5.7 Transfer Learning

5.8 Introduction to TensorFlow and Keras

6: Model Evaluation and Hyperparameter Tuning

6.1 Cross-Validation

6.2 Grid Search and Random Search for Hyperparameter Tuning

6.3 Model Selection and Comparison

6.4 Bias-Variance Tradeoff

6.5 Overfitting and Underfitting

7: Natural Language Processing (NLP)

7.1 Text Preprocessing

7.2 Bag of Words and TF-IDF

7.3 Word Embeddings (Word2Vec, GloVe)

7.4 Sentiment Analysis

7.5 Text Classification

7.6 Named Entity Recognition (NER)

8: Reinforcement Learning

8.1 Introduction to Reinforcement Learning

8.2 Markov Decision Processes (MDPs)

8.3 Q-Learning

8.4 Deep Q-Networks (DQNs)

8.5 Policy Gradient Methods

9: Deployment and Scaling

9.1 Model Deployment (Flask, Django, Docker)

9.2 Cloud-Based Deployment (AWS, Google Cloud, Azure)

9.3 Model Monitoring and Maintenance

10: Case Studies and Projects

10.1 Real-world Machine Learning projects and case studies

10.2 Hands-on implementation and problem-solving

11: Ethical and Responsible AI

11.1 Bias and Fairness in Machine Learning

11.2 Ethical Considerations

11.3 Regulatory Compliance

12: Future Trends and Advanced Topics

12.1 Generative Adversarial Networks (GANs)

12.2 Autoencoders

12.3 Reinforcement Learning in Robotics

12.4 Explainable AI (XAI)

12.5 Quantum Machine Learning



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