KNN & PCA

Assignment Questions

PW SKILLS

Theoretical

1. What is K-Nearest Neighbors (KNN) and how does it work?
2. What is the difference between KNN Classification and KNN Regression?
3. What is the role of the distance metric in KNN?
4. What is the Curse of Dimensionality in KNN?
5. How can we choose the best value of K in KNN?
6. What are KD Tree and Ball Tree in KNN?
7. When should you use KD Tree vs. Ball Tree?
8. What are the disadvantages of KNN?
9. How does feature scaling affect KNN?
10. What is PCA (Principal Component Analysis)?
11. How does PCA work?
12. What is the geometric intuition behind PCA?
13. What is the difference between Feature Selection and Feature Extraction?
14. What are Eigenvalues and Eigenvectors in PCA?
15. How do you decide the number of components to keep in PCA?
16. Can PCA be used for classification?
17. What are the limitations of PCA?
18. How do KNN and PCA complement each other?
19. How does KNN handle missing values in a dataset?
20. What are the key differences between PCA and Linear Discriminant Analysis (LDA)?

Practical

21. Train a KNN Classifier on the Iris dataset and print model accuracy.
22. Train a KNN Regressor on a synthetic dataset and evaluate using Mean Squared Error (MSE).
23. Train a KNN Classifier using different distance metrics (Euclidean and Manhattan) and compare accuracy.
24. Train a KNN Classifier with different values of K and visualize decision boundaries
25. Apply Feature Scaling before training a KNN model and compare results with unscaled data.
26. Train a PCA model on synthetic data and print the explained variance ratio for each component.
27. Apply PCA before training a KNN Classifier and compare accuracy with and without PCA.
28. Perform Hyperparameter Tuning on a KNN Classifier using GridSearchCV.
29. Train a KNN Classifier and check the number of misclassified samples.
30. Train a PCA model and visualize the cumulative explained variance.

31. Train a KNN Classifier using different values of the weights parameter (uniform vs. distance) and compare accuracy.
32. Train a KNN Regressor and analyze the effect of different K values on performance.
33. Implement KNN Imputation for handling missing values in a dataset.
34. Train a PCA model and visualize the data projection onto the first two principal components.
35. Train a KNN Classifier using the KD Tree and Ball Tree algorithms and compare performance.
36. Train a PCA model on a high-dimensional dataset and visualize the Scree plot.
37. Train a KNN Classifier and evaluate performance using Precision, Recall, and F1-Score.
38. Train a PCA model and analyze the effect of different numbers of components on accuracy.
39. Train a KNN Classifier with different leaf_size values and compare accuracy.
40. Train a PCA model and visualize how data points are transformed before and after PCA.
41. Train a KNN Classifier on a real-world dataset (Wine dataset) and print classification report.
42. Train a KNN Regressor and analyze the effect of different distance metrics on prediction error.
43. Train a KNN Classifier and evaluate using ROC-AUC score.
44. Train a PCA model and visualize the variance captured by each principal component.
45. Train a KNN Classifier and perform feature selection before training.
46. Train a PCA model and visualize the data reconstruction error after reducing dimensions.
47. Train a KNN Classifier and visualize the decision boundary.
48. Train a PCA model and analyze the effect of different numbers of components on data variance.