Semester Recap

ML2: AI Concepts and Algorithms (SS2025)
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Classification

KNN classification
Logistic regression
Naive Bayes
Support vector machines
Classification trees
Ensembles & boosting
Random Forest
Neural networks

Regression

KNN regression
Regression trees
Linear regression
Multiple regression
Ridge and Lasso regression
Neural networks

Supervised learning

Data handling

EDA
Data cleaning
Feature selection
Class balancing
etc

Clustering

k-means
Hierachical clustering
DB-scan

Non-supervised learning

AI

Dimensionality reduction

PCA / SVD
tSNE
MDS

Reinforcement learning

Covered in a separate lecture.

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Questions

Multiple Linear Regression

1. What is the main assumption behind multiple linear regression?

2. How is the loss function in multiple linear regression defined?

3. When should multiple linear regression be avoided?

4. How do you interpret the coefficients of a linear regression model?

Polynomial and Spline Regression

5. Why would you use polynomial regression over linear regression?

6. What is the danger of using high-degree polynomials?

7. How do splines improve over high-degree polynomials?

Questions

Ridge and Lasso Regression

8. What is the purpose of regularization?

9. How does Ridge differ from Lasso regression?

10. Which regularization technique can be used for feature selection?

11. What does the alpha hyperparameter control in Ridge and Lasso?

Logistic Regression

12. What type of problem does logistic regression solve?

13. What is the output of a logistic regression model?

14. How does F1-score help when dealing with imbalanced datasets?

15. Explain a scenario in which recall is more important than precision and why.

Questions

CNNs

17. What kind of data are CNNs best suited for?

18. Name two common layers used in CNNs.

19. Name parameters used for defining a CNN.

20. What is the role of filters in CNNs?

RNNs

21. What makes RNNs different from feedforward networks?

22. What is a limitation of typical RNNs?

23. What data types are RNNs commonly used for?

24. Name 3 examples of sequential problems?

Questions

Ensemble Models

25. What is the core idea behind ensemble methods?

26. What are the main types of ensemble methods?

27. What is stacking in ensemble learning?

28. What are the advantages of using ensemble models?

Random Forest

29. How does a random forest differ from a decision tree?

30. What is the role of max_features in Random Forest?

31. What is an out of bag sample?

32. What does increasing n_estimators typically do?

Questions

Boosting

33. How does boosting work conceptually?

34. What is the impact of learners on the final prediction in AdaBoost?

35. What is the role of learning_rate in boosting?

36. Why is boosting more prone to overfitting than bagging?

Questions

DBSCAN

37.What kind of clustering does DBSCAN perform?

38.What does the eps parameter control in DBSCAN?

39.How does DBSCAN handle outliers?

40.What type of datasets is DBSCAN ideal for?

UMAP

41.What is the primary purpose of UMAP?

42.What does n_neighbors control in UMAP?

43.What is a common application of UMAP?

44.Is UMAP deterministic?

Questions

MDS

45. What is the main idea of MDS?

46. What is the difference between metric and non-metric MDS?

47. Give an example of when is recommended to use metric MDS.

48. How is the computational speed of MDS when compared to UMAP or t-SNE?

SVM

49. What does the SVM algorithm aim to maximize?

50. What is a support vector?

51. What does the kernel trick allow in SVMs?

52. What does the hyperparameter C control?