

# Machine Learning Algorithms



# 1. Linear Regression



## Overview

Linear regression is a foundational algorithm in machine learning, used for predicting a continuous variable.



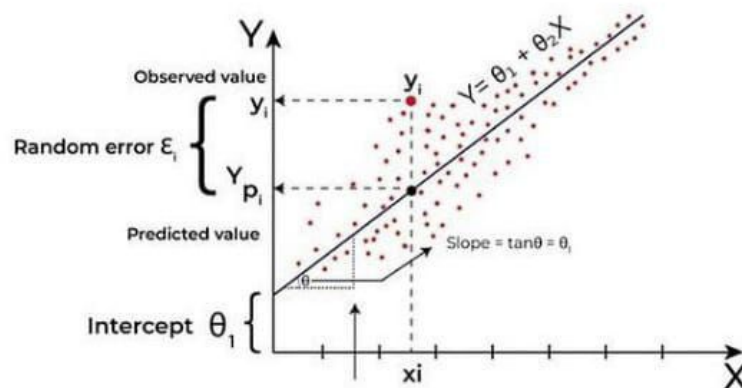
## Learning Objectives

- Understand the theory behind linear regression.
- Learn to implement linear regression in Python.



## Practice Questions

1. Implement linear regression to predict housing prices using a given dataset.
2. How would you evaluate the performance of your linear regression model?



## 2. Logistic Regression



### Overview

Logistic regression is used for binary classification problems, such as spam detection or predicting whether a customer will make a purchase.



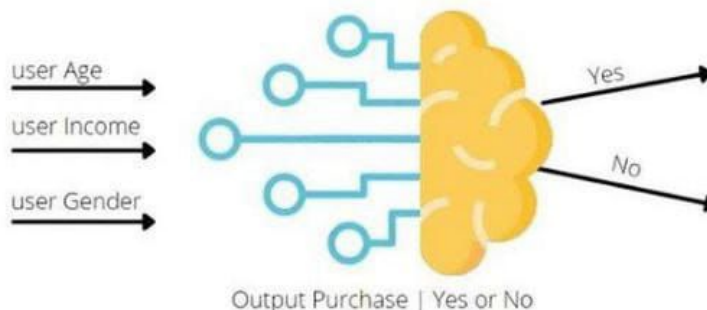
### Learning Objectives

- Grasp the concept of logistic regression and its difference from linear regression.
- Practice implementing logistic regression on a binary classification problem.



### Practice Questions

1. Use logistic regression to classify emails as spam or not spam.
2. Discuss how changing the threshold value affects the model's performance.



# 3. Decision Trees



## Overview

Decision trees are powerful for both classification and regression tasks. They are intuitive and easy to interpret.



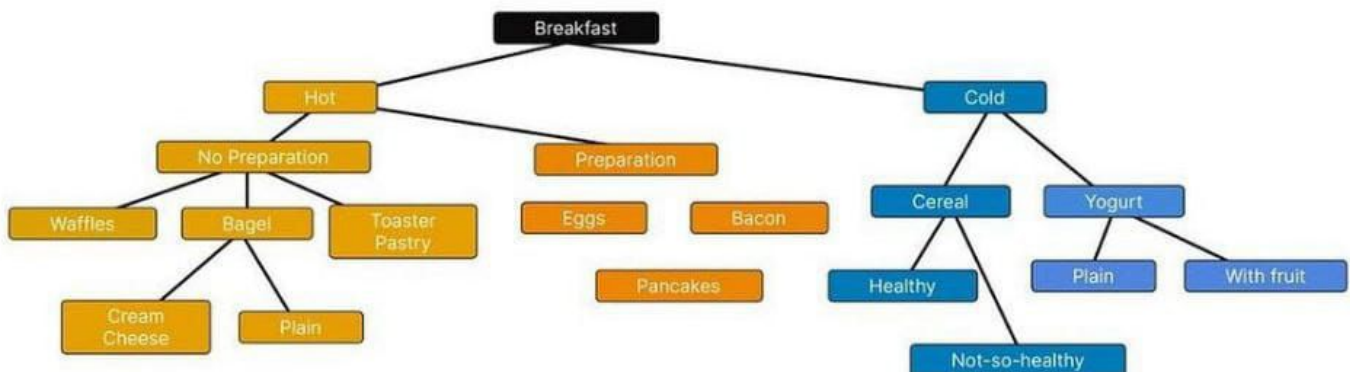
## Learning Objectives

- Learn how decision trees are built, including the concepts of entropy and information gain.
- Implement a decision tree on a classification problem.



## Practice Questions

1. Create a decision tree to predict customer churn.
2. How do decision trees handle overfitting?



# 4. Random Forest



## Overview

Random Forest is an ensemble learning method that operates by constructing multiple decision trees during training time.



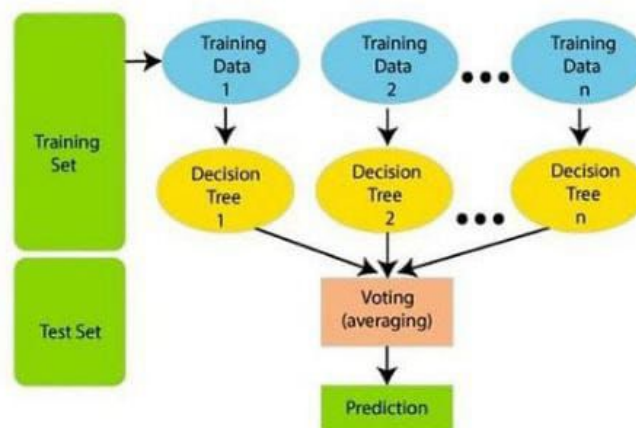
## Learning Objectives

- Understand the concept of ensemble learning and how random forests improve upon single decision trees.
- Implement a random forest model to solve a problem.



## Practice Questions

1. Use a random forest to improve the model created on Day 3 for predicting customer churn.
2. Compare the performance of the decision tree and random forest models.





# 5. Support Vector Machines



## Overview

SVMs are powerful for high-dimensional spaces and are used for classification and regression tasks.



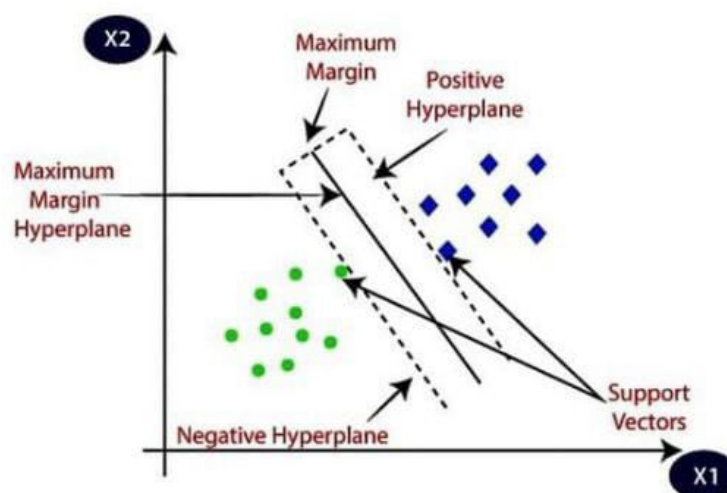
## Learning Objectives

- Learn the theory behind SVMs, including the kernel trick.
- Practice implementing SVMs on a dataset.



## Practice Questions

1. Implement an SVM to classify images of handwritten digits.
2. Experiment with different kernels and compare their effects on the model's performance.



# 6. K-Nearest Neighbors



## Overview

KNN is a simple, instance-based learning algorithm where the class of a sample is determined by the majority class among its  $k$  nearest neighbors.



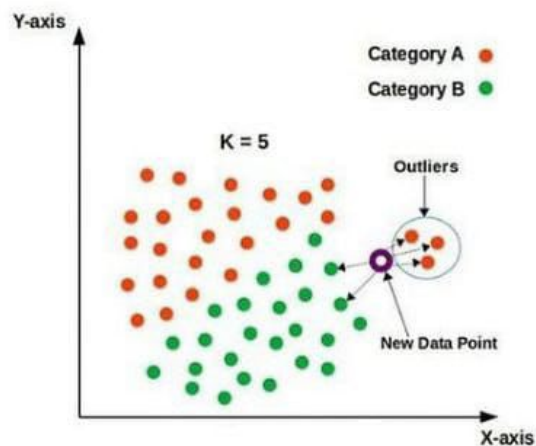
## Learning Objectives

- Understand the KNN algorithm and its application.
- Implement KNN for a classification problem.



## Practice Questions

1. Use KNN to classify patients as either having a disease or not based on their medical records.
2. How does the choice of ' $k$ ' affect the performance and how would you select it?



# 7. Naive Bayes



## Overview

Naive Bayes classifiers are a family of simple probabilistic classifiers based on applying Bayes' theorem with strong independence assumptions between the features.



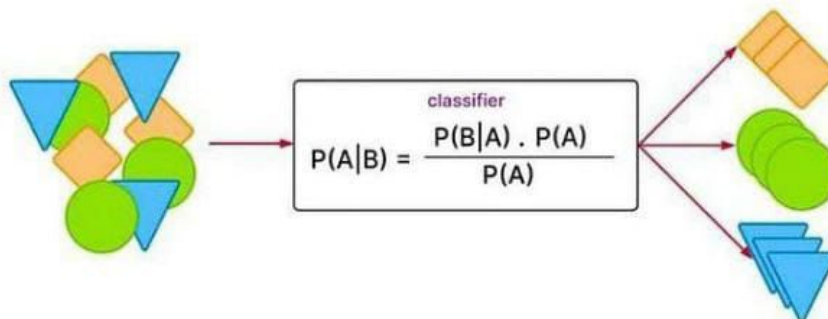
## Learning Objectives

- Learn about the theory and assumptions behind Naive Bayes.
- Apply Naive Bayes to a text classification problem.



## Practice Questions

1. Classify news articles into categories using Naive Bayes.
2. Discuss the assumption of feature independence in Naive Bayes. Is it always valid?





# 8. K-Means Clustering



## Overview

K-Means is a type of unsupervised learning algorithm used for clustering.



## Learning Objectives

- Understand the concept and algorithm behind K-Means clustering.
- Implement K-Means to segment a dataset into clusters.



## Practice Questions

1. Use K-Means to cluster customers based on their shopping habits.
2. How do you determine the optimal number of clusters?

