2025

4Geeks Academy: data science cohort 12

DAY 25: UNSUPERVISED LEARNING

TODO

UNSUPERVISED LEARNING	Types & applications: clustering, dimensionality reduction
K-NEAREST NEIGHBORS PROJECT	Submit K-nearest neighbors Project Tutorial (K-nearest neighbors module), if you haven't done so already
CLUSTERING PROJECT	Work on K-means Project Tutorial (Unsupervised Learning Module), plan to finish before class Friday.

TOPICS

01 CLUSTERING: K-MEANS

02 DIMENSIONALITY REDUCTION: PCA

CLUSTERING: K-MEANS

WHAT Unsupervised learning technique to cluster (group) data by similarity

WHY No need for labels - data is grouped based on structure of feature space
Useful for identifying subpopulations in data

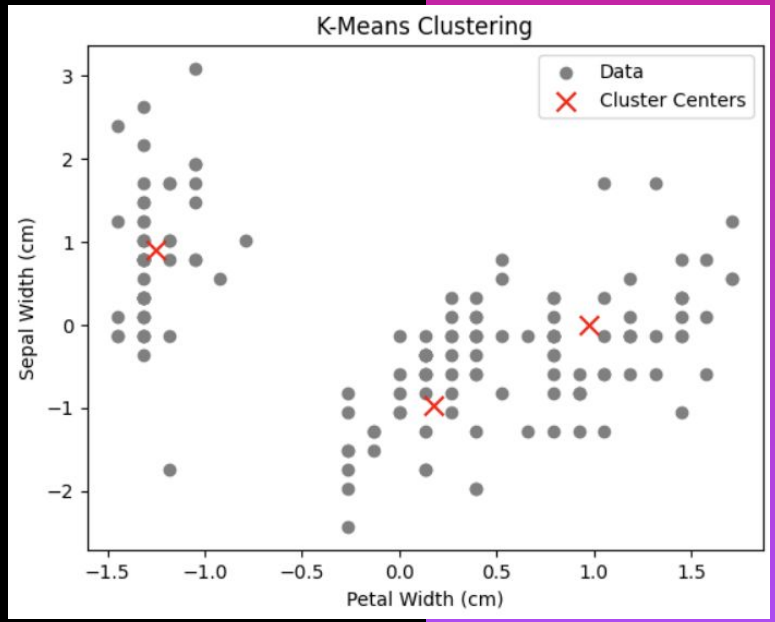
HOW

1. Initialize k cluster center points in feature space
2. Assign each observation to nearest cluster
3. Update cluster center point location
4. Repeat until cluster centers stop moving

Scikit-learn implementation: `KMeans()`

Hyperparmeters:

1. `n_clusters`: number of clusters to find
2. `init`: how to initialize cluster centers
3. `n_init`: how many different initializations to test,
4. `max_iter`: maximum cycles to run
5. `tol`: amount of center movement considered ‘stable’



DIMENSIONALITY REDUCTION: PCA

WHAT Unsupervised feature engineering technique to reduce the size of feature space

WHY Reduce computational complexity
Reduce noise and mitigate overfitting
Can allow visualization/interpretation of high dimensional data sets

HOW

1. Data is transformed into a new set of features (components)
2. First component aligns with the direction of greatest variation in feature space
3. Second component aligns with the direction of greatest variation remaining, etc
4. Select how many components you want for analysis/models

Scikit-learn implementation: `PCA()`

Hyperparmeters:

1. `n_components`: number of components to keep