**Assignment 8 – Unsupervised Learning**

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Course: Data Science

Tools: Python, Scikit-Learn, Google Colab

**1. Objective**

The objective of this assignment is to perform unsupervised learning by applying K-Means Clustering and visualizing cluster patterns using PCA (Principal Component Analysis).

**2. Methods Used**

The dataset was first standardized using StandardScaler(). Then, K-Means Clustering was applied to divide the data into multiple groups based on similarity. Principal Component Analysis (PCA) was used to reduce the dimensions of the dataset and visualize the clusters in a 2D plot.

**3. Results**

The dataset was divided into three clusters. The PCA visualization showed distinct and clear groupings, indicating that the K-Means algorithm successfully identified patterns within the data. Each cluster represents data points with similar characteristics.

**4. Reflection**

Clustering provided insights into the hidden patterns of the dataset. The use of PCA simplified the visualization and made it easier to interpret relationships between variables. This approach is valuable for data exploration when labels are not available.

**5. Conclusion**

Unsupervised learning techniques such as K-Means and PCA help discover meaningful structures in data without any prior labeling. This assignment demonstrated how clustering and dimensionality reduction can be used together for effective data understanding.