Day 11 Training Report

7 July 2025

Introduction to Unsupervised Learning vs Supervised Learning

On **Day 11**, the focus shifted to **unsupervised learning**, which differs fundamentally from supervised learning. While supervised learning uses **labeled data** to predict outcomes, unsupervised learning works with **unlabeled data**, aiming to **find hidden patterns or structures** in the data.

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1. What is Unsupervised Learning?

Unsupervised learning is a type of machine learning where the **algorithm explores the data without predefined labels**. It is widely used in **clustering, dimensionality reduction, and anomaly detection**.

- **Goal:** Identify patterns, group similar data points, and summarize data.
- **Input:** Features only (no target labels).
- **Output:** Patterns, clusters, or associations.

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2. Key Differences from Supervised Learning

Feature	Supervised Learning	Unsupervised Learning
Data	Labeled	Unlabeled
Goal	Predict outcomes	Find patterns or groupings
Algorithms	Linear Regression, Logistic Regression, k-NN	k-Means, Hierarchical Clustering, PCA
Use Case	Email spam detection, price prediction	Customer segmentation, market basket analysis

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3. Use Cases of Unsupervised Learning

- **Market Segmentation:** Grouping customers with similar behaviors.
- **Anomaly Detection:** Detecting fraud in financial transactions.
- **Recommender Systems:** Grouping similar users or products.
- **Data Compression & Visualization:** Dimensionality reduction using PCA.