Machine Learning Foundations – 3 Week Technical Report

Week 1: Python Libraries & ML Foundations

Python libraries such as NumPy, Pandas, Matplotlib, and Scikit-learn are used for numerical computation, data handling, visualization, and model building.

Machine Learning learns a function f(X)=y using data. The ML pipeline includes preprocessing, training, evaluation, and deployment.

Week 2: Supervised Learning – Regression & Classification

Linear Regression model: y = wX + b

Loss function: Mean Squared Error

Optimization: Gradient Descent

Classification includes Logistic Regression, KNN, Decision Trees.

Sigmoid function: 1/(1+e^-z)

Evaluation metrics include accuracy, precision, recall, and F1-score.

Week 3: Neural Networks & Unsupervised Learning

Neural Networks use layers of neurons with activation functions like ReLU and Sigmoid.

Training uses forward propagation and backpropagation.

Unsupervised learning includes:

K-Means Clustering – grouping data by minimizing intra-cluster variance

PCA – dimensionality reduction using eigenvectors

This report integrates theory, algorithms, and Python-based implementation for Machine Learning.