Basic Machine Learning Notes

1. What is Machine Learning?

Machine Learning (ML) is a subset of Artificial Intelligence (AI) that enables systems to learn from data and improve their performance without explicit programming.

2. Types of Machine Learning

1. Supervised Learning: Trains on labeled data (e.g., regression, classification).
2. Unsupervised Learning: Works on unlabeled data (e.g., clustering, dimensionality reduction).
3. Reinforcement Learning: Agent learns by interacting with environment and receiving rewards/penalties.

3. Common Algorithms

- Linear Regression
- Logistic Regression
- Decision Trees
- Random Forest
- Support Vector Machines (SVM)
- K-Nearest Neighbors (KNN)
- K-Means Clustering
- Neural Networks

4. Key Concepts

- Training Data: Data used to train model
- Testing Data: Data used to evaluate model
- Overfitting: Model performs well on training data but poorly on unseen data
- Underfitting: Model fails to capture underlying patterns
- Features: Input variables
- Labels: Output variable in supervised learning

5. ML Workflow

1. Data Collection
2. Data Preprocessing (cleaning, normalization)
3. Feature Selection/Engineering
4. Model Selection
5. Training the Model
6. Evaluation (accuracy, precision, recall, F1-score)
7. Deployment
8. Monitoring & Maintenance

6. Applications of ML

- Spam Email Detection
- Fraud Detection

- Recommendation Systems (Netflix, Amazon)
- Speech Recognition
- Computer Vision (face detection, object recognition)
- Self-Driving Cars