Machine Learning Week 2 Conceptual 1

Topics:

1. Linear Algebra for ML
2. Vectors and Matrices
3. Matrix Operations
4. Overfitting and Underfitting

Linear Algebra for ML

1. Linear algebra is a branch of mathematics that studies **vectors**, **matrices**

Usage in ML :

1. Data Representation
   i. vectors - a row or a data point
   Ii . matrices
2. Helps us to work with n dimensional spaces
3. Matrix operations are used throughout Deep learning.

Vectors

- A **vector** is fundamentally an **ordered list of numbers**. Mathematically, it represents a quantity that has both **magnitude** (length) and **direction**, or simply a point in a coordinate system.

- **Most basic building blocks** for representing **data points**.

Machine Learning models takes numerical features/ values only to predict which is called **Feature vector**

Examples with dataset with multi dimensional

Vector distance can be used to predict (kNN algorithm) , word embedding etc

Type of vectors : Row vector and column vector

Vector operation

1. Addition : v1 + v2

   Ml use : combining feature contribution

2. Subtraction : v1 - v2

   Ml use : Word embedding

3. Dot product

   Ml use : used to find similarities between two vectors , thus useful for Recommendation system

   Cosine similarity

   Deep learning

Euclidean distance (L2) and Manhattan distance (L1)

When to use ?

1. Euclidean is safer with data with less outliers , not too dimension
2. Euclidean is used in KNN
3. Manhattan is safer with data with more possible outliers
4. Manhattan is used in Lasso Regression , works good with higher dimensions

Matrix

A **matrix** is just a **table of numbers** arranged in **rows** and **columns**.

It helps to store data such as text , images

Matrix multiplication is the core concept of Neural network.

Matrix Multiplication

Overfitting and Underfitting