

# Mathematics for Machine Learning

## Instructors:

### Bharath J P V :

Enthusiast Data Scientist with a strong background in Mathematics and Statistics. Completed My Master in Statistics. Have experience teaching Mathematics and Statistics for more than a year. I taught for more than 1000 students and helped them make their careers in their respective fields. I believe in "we rise by lifting others". Following this principle, I hope to make your life easier.

## Curriculum:

### Introduction

- Course introduction Preview
- Who is this course for?
- Course overview
- Course outcome

### Linear Algebra

- Introduction to Linear Algebra Preview
- Vectors, Matrices & Tensors Preview

### Vector Operations

- Transposition and Norm of a Vector
- Dot Product
- Dot Product with Itself

- Orthogonal Vectors
- Projection of Vectors
- Line, Plane and Hyperplane

## **Matrix**

- Transposition of Matrix
- Arithmetic Operation
- Hadamard Operations and Reduction of Matrix
- Hands-on Code demo with Python
- Solving system of Linear Equations
- Types of Solutions
- Plotting Equation
- Hands-on Plotting equations
- Matrix Norms and Properties
- Linear Transformation
- Matrix Multiplication
- Matrix Inversion
- Identity Matrix
- Diagonal Matrix
- Symmetric Matrix
- Determinant of a Matrix

## **Eigen Vectors and Eigen Values**

- Eigen Vectors and Eigen Values
- Properties of Eigen Values

- Eigen Decomposition

## **Matrix Operations in Machine Learning**

- Affine Transformations
- Singular Vector Decomposition
- Image Compression Preview
- Moore-Penrose Pseudoinverse
- Application of Pseudoinverse
- Principle Component Analysis

## **Limits**

- Introduction, tangent and Slope
- Infinitesimals and Area under Curve
- Limits

## **Differential Calculus**

- Rate of change and Slope as a Variable
- Differential Calculus
- Differentiation using Delta Method
- Standard Differentiation rules
- Sum, Product and Quotient rule
- Chain rule
- Higher order Derivatives
- Application of Derivatives
- AutoDiff using PyTorch and Tensorflow

- Partial Derivatives
- Partial Derivatives using Pytorch and TensorFlow
- Application of Partial Derivatives
- Chain rule for Partial derivatives Preview
- Regression Project Theory
- Hands-on Regression Project
- Gradient of Point Regression
- Gradient of Group Regression

## **Integral Calculus**

- Introduction to Integral Calculus Preview
- Standard Integrals and Integration Rules
- Indefinite and Definite Integrals
- Area under Curve(AUC) Using scikit-learn
- Receiver Operating Characteristic(ROC) curve
- Hands-on ROC AUC