

ML Math: Linear Algebra, Calculus & Statistics

Learn the algebra, calculus and statistics foundations behind machine learning, from vectors and derivatives to hypothesis testing.

3 Days

24 HOURS

8

MODULES

50

TOPICS

1

HANDS-ON ACTIVITIES

COURSE OVERVIEW

This course covers the mathematical and statistical foundations needed for machine learning, starting with the role of maths and statistics in ML. It builds through basic algebra, calculus including differentiation, partial derivatives and gradient descent, and linear algebra topics such as vectors, matrices and eigenvalues. It then addresses probability foundations, descriptive statistics with data visualisation using charts and plots, and concludes with inferential statistics, distributions and hypothesis testing.

WHO THIS COURSE IS FOR

Data Analyst

Business Analysts

Data Scientist

LEARNING OBJECTIVES

- Gain a solid understanding of math's role in machine learning
- Apply statistical concepts for data analysis in machine learning
- Utilize algebra & calculus for model optimization
- Apply probability & descriptive statistics in machine learning
- Make decisions using inferential statistics in machine learning

8 Modules, 50 Topics

01

Need for Maths & Statistics

TOPICS

- **Mathematics:** Fundamental for ML algorithms and models
- **Statistics:** Data analysis, Model evaluation, Data Handling, Model Selection, Model Interpretation

02

Basic Algebra

TOPICS

Algebraic Equations · Quadratic Equations · Functions

03

Calculus

TOPICS

- Basics of Calculus
- Differentiation and Derivatives
- Derivative Rules and Operations
- Double Derivatives and finding Maxima
- Double Derivatives example
- Partial Derivatives and Gradient Descent
- Integration and Area Under the Curve

04

Linear Algebra

TOPICS

- Vector Basics - What is a Vector and vector operations
- Matrix Foundation
- Identity, Inverse, Determinant and Transpose Matrix
- Matrix Transformation
- Change of Basis and Axis using Matrix Transformation
- Eigenvalues and Eigenvectors

05

Probability Foundation

TOPICS

Understanding probability in simple terms · Conditional Probability · Random Processes and Random Variables

06

Descriptive Statistics

TOPICS

- Understanding the Data and its elements
- Measure Central Tendency using Mean, Median, mode
- Measure of Dispersion using Standard Deviation and variance
- Measure of Dispersion using Percentile, Range and IQR

HANDS ON

- Get Statistical Summary

07

Data Visualization

TOPICS

- Importance of Data Visualization and different Charts
- Understanding Boxplot for Numerical Data
- Matplotlib - Plotting Basics
- Create your first Bar Chart
- Create Histogram of Data
- Plotting Boxplot
- Data Visualization for Categorical Data
- Pie Charts
- Scatter Plots
- Matplotlib Figures for creating multiple plots
- Subplots for plotting multiple plots in one figure
- Customization of Plot elements

Inferential Statistics, Distributions & Hypothesis

TOPICS

- Understand Population Vs Samples
- Concept of Sample Bias
- Concept of Correlation and Causality
- Concept of Covariance and Covariance Matrix
- Probability Density Function and Distributions
- Normal Distributions
- Standard Normal Distributions
- Sampling Distributions
- Central Limit Theorem
- Confidence Intervals
- Concept of Hypothesis & Null Vs Alternate Hypothesis
- Concept of Statistical Significance
- Hypothesis Testing Examples

WHAT IS INCLUDED

Everything You Need to Succeed

- Koenig course material for every module
- Delivery by certified instructors and subject matter experts
- Hands-on exercises throughout the course
- Course completion certificate from Koenig

ABOUT KOENIG

Who We Are

Established in 1993, Koenig Solutions is a globally recognised training provider with 35+ technology partnerships, 5,000+ training programmes and a network of certified instructors and subject matter experts, supporting individuals and enterprise teams worldwide.

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