Machine Learning

Mathematics

Roadmap

Linear Algebra, Statistics, Probability, Objective Functions, Regularization, Information Theory, Optimization, Distribution

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Contents

This phase is different from books that are available on the internet. I included all the topics required to understand the whole architecture of Machine Learning algorithms.

Examples of how and where these mathematical equations are used and Interview Questions can be asked of an ML Engineer while hiring.

We will learn different concepts individually, converting mathematical equations into Python programming expressions along with their examples in the real world.

FREE Resources →

Mathematics for Machine Learning

Algebra, Topology, Differential Calculus, and Optimization Theory For Computer Science and Machine Learning

All math topics for Machine Learning by Stanford

Stanford CS229: Machine Learning Course | Summer 2019 (Anand Avati)

Chapter 1 - Linear Algebra

Learn for FREE - Mathematics for ML - Linear Algebra

Mathematics for Machine Learning - Linear Algebra

1 | Vectors

2 | Matrix

3 | Eigenvalues and Eigenvectors

3 | Factorization

4 | Singular Value Decomposition (SVD)

5 | Gradient

6 | Tensors

7 | Jacobian Matrix

8 | Curse of Dimensionality

Chapter 2 - Statistics

The Element of Statistical Learning

Elements of Statistical Learning: data mining, inference, and prediction. 2nd Edition.

Statistics give us 2 tools descriptive and inferential

1 | Descriptive Statistics

1 | Variables

2 | **Mean**

3 | **Median**

4 | **Mode**

5 | **Standard Deviation**

6 | **Variance**

7 | **Range**

8 | **Percentile**

9 | **Skewness**

10 | **Kurtosis**

2 | Inferential Statistics

1 | **Sampling Distributions**

2 | **Central Limit Theorem**

3 | **Hypothesis Testing**

4 | **Confidence Intervals**

5 | **T-Tests**

6 | **Analysis of Variance (ANOVA)**

7 | **Chi-Square Test**

8 | **Regression Analysis**

9 | **Bayesian Inference**

10 | **Maximum Likelihood Estimation (MLE)**

Chapter 3 - Probability

Probability Theory: The Logic of Science

https://bayes.wustl.edu/etj/prob/book.pdf

1 | Probability Distribution

2 | Conditional Probability

3 | **Bayes' Theorem**

4 | **Joint and Marginal Probabilities**

5 | **Independence and Conditional Independence**

Chapter 4 - Objective Functions

Chapter 5 - Regularization

10 | **Total Variation Regularization**

Chapter 6 - Information Theory

Information Theory, Inference and Learning Algorithms

David MacKay: Information Theory, Pattern Recognition and Neural Networks: The Book

1 | Entropy

2 | Conditional Entropy

3 | Joint Entropy

4 | Mutual Information

5 | Relative Entropy (Kullback-Leibler Divergence)

6 | Cross-Entropy

7 | Information Gain

8 | Shannon-Fano Coding

9 | Huffman Coding

10 | Data Entropy

Chapter 7 - Optimization

1 | **Gradient Descent**

2 | **Stochastic Gradient Descent (SGD)**

3 | **Mini-Batch Gradient Descent**

4 | **Momentum**

5 | **Nesterov Accelerated Gradient (NAG)**

6 | **Adagrad (Adaptive Gradient Algorithm)**

7 | **RMSprop (Root Mean Square Propagation)**

8 | **Adam (Adaptive Moment Estimation)**

Chapter 8 - Distribution

1 | Bernoulli Distribution

2 | Binomial Distribution

3 | Multinomial Distribution

4 | Normal (Gaussian) Distribution

5 | Uniform Distribution

6 | Exponential Distribution

7 | Poisson Distribution

Calculus

Calculus 1 | Math | Khan Academy

Machine Learning, MLOps & GenerativeAI Roadmap

https://god-level-python.notion.site/Build-a-Strong-Machine-Learning-Portfolio-Personal-Brand-Get-Tons-of-Job-Offers-in-12-Weeks-Live-b3c98407b4ab45819811db081ae9d102?pvs=4

About me

I am Himanshu Ramchandani a Data & Engineering Consultant. I help enterprises utilize big data to build AI-powered products & Mentor professionals to improve their skills in the data field by 1% every day.

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