GenerativeAI

Machine Learning | MLOps

Roadmap 2025🚀

How to become the go-to AI expert—build a strong profile that commands respect.

Himanshu Ramchandani

AI Solutions Consultant

AI **Case Studies** on Google, Uber, Pinterest, OpenAI, Amazon, Walmart and more.

Machine Learning | MLOps | AI System Design | GenAI Architectures | NLP | Personal Brand | Project Portfolio

Subscribe and Get the Roadmap in Your Email Inbox

https://embeds.beehiiv.com/909363d2-9abc-4c70-a4f8-298eaebe9213

Table of Contents

Technology Stack

Programming, Libraries, and Frameworks

- Python, Data Structures
- NumPy, Pandas, Matplotlib, Seaborn
- Scikit-Learn
- Statsmodels
- Natural Language Toolkit (NLTK)
- PyTorch, TensorFlow
- Docker
- LangChain, LlamaIndex

Version Control

- Git
- MLFlow

Cloud

- AWS
- GCP
- Azure

Code Editors

- Jupyter Notebook
- Google Colab
- Kaggle Notebook
- VScode

Projects Portfolio

- 5 Major Projects
- 7+ Case Studies

Prerequisites

1 - Python for Machine Learning

You can cover these topics in 24 hours

Check out this free course with 2 Hour sessions each: https://embeds.beehiiv.com/909363d2-9abc-4c70-a4f8-298eaebe9213

1 | While Loops, Lists, Strings

2 | For Loop, Dictionary, Tuples, Set

3 | Object-Oriented Programming

4 | Functions & Higher-Order Functions

5 | Modules, Packages, and PIP

6 | Virtual Environment, Flask, and Python Web Scrapping

7 | Building API, Python with MongoDB Database

8 | Statistics with NumPy

9 | Data Analysis with Pandas

10 | Data Visualization with Matplotlib

11 | EDA Projects

12 | Resource collection, Interview Questions, What to do Next?

2 | Data Structure & Algorithms

0 | Data Structures & Algorithms Starting Point

- Getting Started
- Variables
- Data Types
- Data Structures
- Algorithms
- Analysis of Algorithm
- Time Complexity
- Space Complexity
- Types of Analysis
- Worst
- Best
- Average
- Asymptotic Notations
- Big-O
- Omega
- Theta

Data Structures - Phase 1

1 | Stack

2 | Queue

3 | Linked List

4 | Tree

5 | Graph

Algorithms - Phase 2

6 | List and Array

7 | Swapping and Sorting

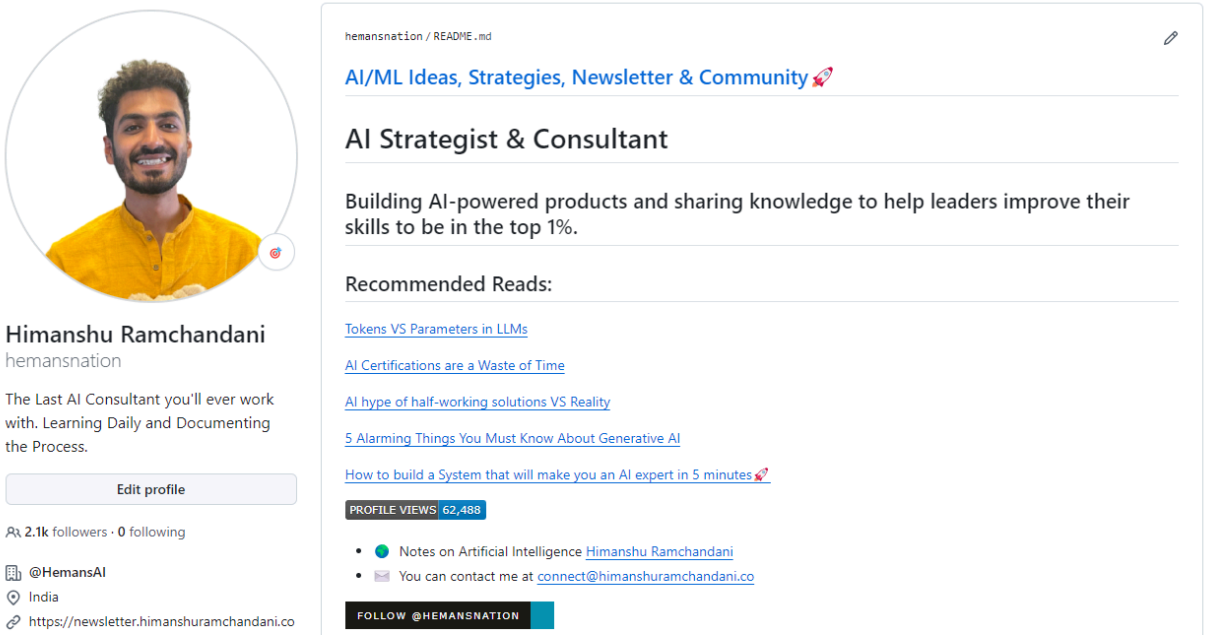
8 | Searching

9 | Recursion

10 | Hashing

11 | Strings

3 | Git and GitHub



Steal My GitHub Profile - https://github.com/hemansnation

- Understanding Git
- Commands and How to Commit Your First Code?
- How to use GitHub?
- How to work with a team?
- How to make your first open-source contribution?
- How to create your stunning GitHub profile?
- How to build your viral repository?
- Building a personal landing page for your Portfolio for FREE
- How to grow followers on GitHub?
- How to work with a team?

4 | Data X Pandas Numpy Matplotlib Seaborn

Numpy

- Vectors, Matrix
- Operations on Matrix
- Mean, Variance, and Standard Deviation
- Reshaping Arrays
- Transpose and Determinant of Matrix
- Diagonal Operations, Trace
- Add, Subtract, Multiply, Dot, and Cross Product.

Pandas

- Series and DataFrames
- Slicing, Rows, and Columns
- Operations on DataFrame
- Different ways to create DataFrame
- Read, Write Operations with CSV files
- Handling Missing values, replacing values, and Regular Expression
- GroupBy and Concatenation

Matplotlib

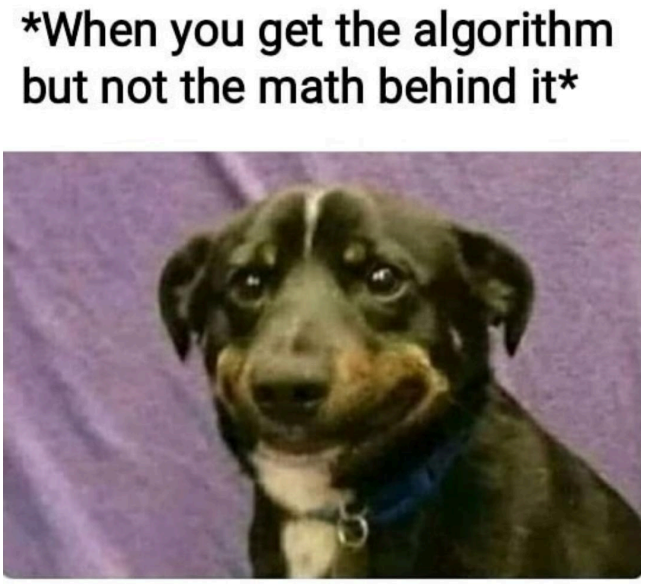
- Graph Basics
- Format Strings in Plots
- Label Parameters, Legend
- Bar Chart, Pie Chart, Histogram, Scatter Plot

5 | 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

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

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

1 | Mean Squared Error (MSE)

2 | Mean Absolute Error (MAE)

3 | Binary Cross-Entropy (Log Loss)

4 | Maximum Likelihood Estimation (MLE)

5 | Gini Impurity

Chapter 5 - Regularization

1 | L1 Regularization (Lasso Regression)

2 | L2 Regularization (Ridge Regression)

3 | Elastic Net Regularization

4 | Dropout Regularization

5 | Max-Norm Regularization

6 | Batch Normalization

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 | Cross-Entropy

5 | Information Gain

6 | Data Entropy

Chapter 7 - Optimization

1 | Gradient Descent

2 | Stochastic Gradient Descent (SGD)

3 | Adagrad (Adaptive Gradient Algorithm)

4 | Adam (Adaptive Moment Estimation)

Chapter 8 - Distribution

1 | Bernoulli Distribution

2 | Binomial Distribution

3 | Multinomial Distribution

4 | Normal (Gaussian) Distribution

Calculus

Calculus 1 | Math | Khan Academy

6 → AI Fundamentals

0.0 → Introduction to AI and its Evolution

0.1 → Machine Learning vs Deep Learning

0.2 → Tokens VS Parameters in Models

0.3 → What can AI realistically achieve today?

0.4 → 25 Papers That Completely Transformed the Computer World

0.5 → Python Crash Course

0.6 → NumPy and Pandas

1 → Machine Learning

1.1 → Introduction to Machine Learning

1.2 → Regression, Classification & Clustering

1.3 → Dimensionality Reduction

1.4 → How much Math to know for Machine Learning?

1.5 → Hyperparameter & Cross-validation

1.6 → Regularization, Overfitting & Underfitting

1.7 → Bagging & Boosting

1.8 → Confusion Matrix, Precision, Recall and F1 score

1.9 → ROC and AUC curve

1.10 → Mean Squared Error (MSE) & Mean Absolute Error (MAE)

1.11 → R-squared & Bias-Variance Tradeoff

1.12 → When to use Which ML Algorithm?

2 → MLOps

2.1 → Basics of ML Operations

2.2 → ML Model, Data and Code

2.3 → Building Machine Learning Pipeline

2.4 → Monitoring

2.5 → Orchestration

2.6 → MLOps Fundamentals on AWS

2.7 → Containers

2.8 → Analytics using Amazon RedShift Serverless

2.9 → Build and Deploy with AWS SageMaker

2.10 → Amazon EKS and KubeFlow

3 → Natural Language Processing

3.1 → NLP Introduction

3.2 → NLP Text Pre-processing Pipeline

3.3 → POS Tagging & Named Entity Recognition

3.4 → NLP Statistical Methods - Bag Of Words and TF-IDF

3.5 → Text Normalization and Tokenization

3.6 → Embedding and Word2Vec

3.7 → [Use Cases] - Conversational AI

4 → Deep Learning

4.0 → Activation Functions

4.1 → Neuron & Perceptron

4.2 → Multi-Layer Perceptron

4.3 → Artificial Neural Network (ANN)

4.4 → Convolutional Neural Networks (CNNs)

4.5 → Recurrent Neural Networks (RNNs)

4.6 → Long Short-Term Memory (LSTM) & (GRU)

4.7 → Encoder-Decoder Architectures and Attention Models

4.8 → Transfer Learning

5 → GenerativeAI

5.1 → Variational Auto-Encoders (VAEs)

5.2 → Generative Adversarial Networks (GANs)

5.3 → [Case Study] Uber ML

5.4 → Transformers & Language Models

5.5 → Hugging Face Models [Hands-On]

5.6 → Large Language Models (LLMs)

5.7 → How Does ChatGPT works?

5.8 → Large Language Models

5.9 → State-of-the-art LLMs

5.10 → How difficult it is to build LLMs?

6 → RAG, LangChain & LlamaIndex

6.1 → What is Retrieval-Augmented Generation?

6.2 → How does RAG differ from traditional generative models?

6.3 → Steps and Tools to build RAG System

6.4 → What is LangChain?

6.5 → Architecture of LangChain

6.6 → How to develop applications using LangChain?

6.7 → [Use Cases] - One

6.8 → [Use Cases] - Two

6.9 → [Use Cases] - Three

6.10 → [Use Cases] - Four

6.11 → What to know on Cloud for LLMs?

6.12 → AWS for LLMs

6.13 → GCP for LLMs

6.14 → Azure for LLMs

6.15 → Operationalizing ML models and challenges

6.16 → Building vs Buying AI

6.17 → How to Build Your Private Language Model?

6.18 → AI Project Management

6.19 → [Case Study] - AI Implementation

7 → ML & GenerativeAI System Design

7.1 → The 7-Step ML System Design Framework

7.2 → Pinterest - Visual Search ML System

7.3 → YouTube - Video Search ML System

7.4 → Video Recommendation System

7.5 → Resources

8 → AI Interview

8.1 → AI/ML Interview Questions

8.2 → LLMs Interview Questions

8.3 → Machine Learning Interview Questions

8.4 → Resume Checklist

9 → Personal Branding & Portfolio

9.1 → Personal Branding & Portfolio [4 Hours]

9.2 → Resume Building

9.3 → Career Transition to AI

9.4 → How to get a Job in AI or How to get promoted?

9.5 → How to start your freelance work?

9.6 → Data Engineer VS AI Product Manager, Which profile to choose?

Resources & Previous Version [200+ Hours]

About Me

I'm Himanshu Ramchandani, I am from India.

I am an AI Consultant with close to a decade of experience.

I worked on over 100 Data & AI projects in [Energy, Healthcare & Law Enforcement].

I am the Founder of a Data & AI Solutions company [Team of 7].

I focus on action-oriented learning in ML, DL, MLOps, Generative AI & System Design with implementation drills.

In the last decade, I have never stopped sharing my knowledge and have helped over 10000 leaders, professionals, and students.

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