2024 🚀

Data Science

Machine Learning

GenerativeAI | MLOps

Roadmap for Leaders & Professionals

Curated content for Decision Makers

Build Your Strong Data Science ML Gen AI Portfolio/Personal Brand in 12 weeks 🚀

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https://www.linkedin.com/in/hemansnation/

Subscribe and Get the Roadmap in Your Email Inbox

https://embeds.beehiiv.com/efdd81cb-9fca-427d-b60d-d8c2fabb1325

Modules→

1 → Python for Machine Learning 🚀

2 → Data Structures & Algorithms

3 → Git & GitHub Make Recruiters reach You, Build your stunning profile

4 → Data Science X NumPy, Pandas, Matplotlib, Seaborn

5 → Mathematics in Machine Learning

6 → Machine Learning Algorithms X Data Processing

7 → Natural Language Processing X Deep Learning

8 → Generative AI - GANs, VAEs, LLMs

9 → Computer Vision X Deep Learning

10 → MLOps | Machine Learning Operations

11 → Machine Learning System Design

12 → SQL - Structured Query Language

13 → Major Capstone Projects

14 → Data Science, ML, GenAI Interview

15 → Personal Branding & Portfolio

16 → Others

Technology Stack

- Python
- Data Structures
- NumPy
- Pandas
- Matplotlib
- Seaborn
- Scikit-Learn
- Statsmodels
- Natural Language Toolkit (NLTK)
- PyTorch
- Structure Query Language (SQL)
- Docker
- Jupyter
- VScode
- TensorFlow
- 5 Major Projects
- Git and GitHub
- AWS
- GCP
- Azure

1 | Python Programming and Logic Building

I prefer Python Programming Language. Python is the best for starting your programming journey.

1 | Introduction and Basics

- Installation
- Python Org, Python 3
- Variables
- Print function
- Input from user
- Data Types
- Type Conversion
- First Program

2 | Operators

- Arithmetic Operators
- Relational Operators
- Bitwise Operators
- Logical Operators
- Assignment Operators
- Compound Operators
- Membership Operators
- Identity Operators

3 | Conditional Statements

- If Else
- If
- Else
- El If (else if)
- If Else Ternary Expression

4 | While Loop

- While loop logic building
- Series based Questions
- Break
- Continue
- Nested While Loops
- Pattern-Based Questions
- pass
- Loop else

5 | Lists

- List Basics
- List Operations
- List Comprehensions / Slicing
- List Methods

6 | Strings

- String Basics
- String Literals
- String Operations
- String Comprehensions / Slicing
- String Methods

7 | For Loops

- Range function
- For loop
- Nested For Loops
- Pattern-Based Questions
- Break
- Continue
- Pass
- Loop else

8 | Functions

- Definition
- Call
- Function Arguments
- Default Arguments
- Docstrings
- Scope
- Special functions Lambda, Map, and Filter
- Recursion
- Functional Programming and Reference Functions

9 | Dictionary

- Dictionaries Basics
- Operations
- Comprehensions
- Dictionaries Methods

10 | Tuple

- Tuples Basics
- Tuples Comprehensions / Slicing
- Tuple Functions
- Tuple Methods

11 | Set

- Sets Basics
- Sets Operations
- Union
- Intersection
- Difference and Symmetric Difference

12 | Object-Oriented Programming

- Classes
- Objects
- Method Calls
- Inheritance and Its Types
- Overloading
- Overriding
- Data Hiding
- Operator Overloading

13 | File Handling

- File Basics
- Opening Files
- Reading Files
- Writing Files
- Editing Files
- Working with different extensions of file
- With Statements

14 | Exception Handling

- Common Exceptions
- Exception Handling
- Try
- Except
- Try except else
- Finally
- Raising exceptions
- Assertion

15 | Regular Expression

- Basic RE functions
- Patterns
- Meta Characters
- Character Classes

16 | Modules & Packages

- Different types of modules
- Inbuilt modules
- OS
- Sys
- Statistics
- Math
- String
- Random
- Create your own module
- Building Packages
- Build your own python module and deploy it on pip

17 | Data Structures

- Stack
- Queue
- Linked Lists
- Sorting
- Searching
- Linear Search
- Binary Search

18 | Higher-Order Functions

- Function as a parameter
- Function as a return value
- Closures
- Decorators
- Map, Filter, Reduce Functions

19 | Python Web Scrapping

- Understanding BeautifulSoup
- Extracting Data from websites
- Extracting Tables
- Data in JSON format

20 | Virtual Environment

- Virtual Environment Setup

21 | Web Application Project

- Flask
- Project Structure
- Routes
- Templates
- Navigations

22 | Git and GitHub

- Git - Version Control System
- GitHub Profile building
- Manage your work on GitHub

23 | Deployment

- Heroku Deployment
- Flask Integration

24 | Python Package Manager

- What is PIP?
- Installation
- PIP Freeze
- Creating Your Own Package
- Upload it on PIP

25 | Python with MongoDB Database

- SQL and NoSQL
- Connecting to MongoDB URI
- Flask application and MongoDB integration
- CRUD Operations
- Find
- Delete
- Drop

26 | Building API

- API (Application Programming Interface)
- Building API
- Structure of an API
- PUT
- POST
- DELETE
- Using Postman

27 | Statistics with NumPy

- Statistics
- NumPy basics
- Working with Matrix
- Linear Algebra operations
- Descriptive Statistics

28 | Data Analysis with Pandas

- Data Analysis basics
- Dataframe operations
- Working with 2-dimensional data
- Data Cleaning
- Data Grouping

29 | Data Visualization with Matplotlib

- Matplotlib Basics
- Working with plots
- Plot
- Pie Chart
- Histogram

30 | What to do Now?

- Discussions on how to process further with this knowledge.

2 | Data Structure & Algorithms

Data Structure is the most important thing to learn not only for data scientists but for all the people working in computer science.

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

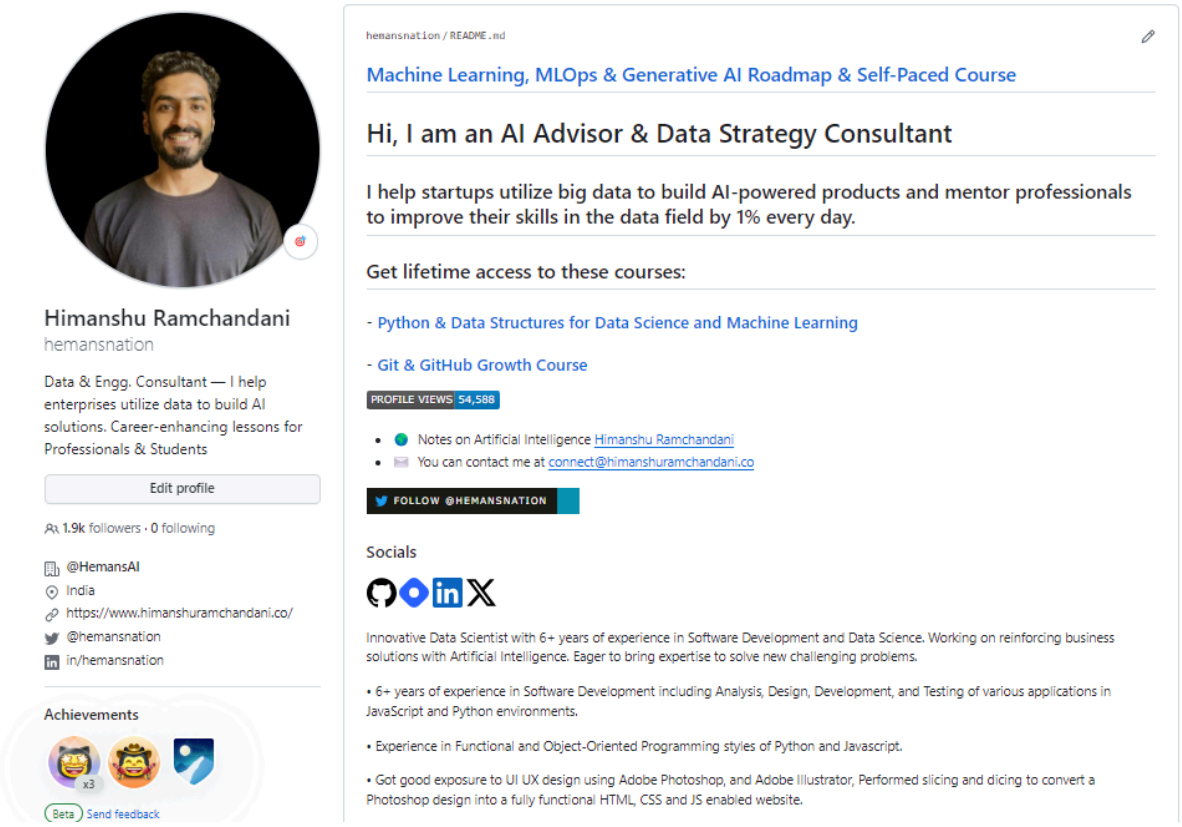
8 | Searching

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 own viral repository?
- Building a personal landing page for your Portfolio for FREE
- How to grow followers on GitHub?
- How to work with a team?

Git Resources

Git - Version Control System

Resources and Cheatsheets

Personal Profile

GitHub Resources

Resources and Tools

Interview Questions

Portfolio of Projects

Repo Description

4 | Data Science 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

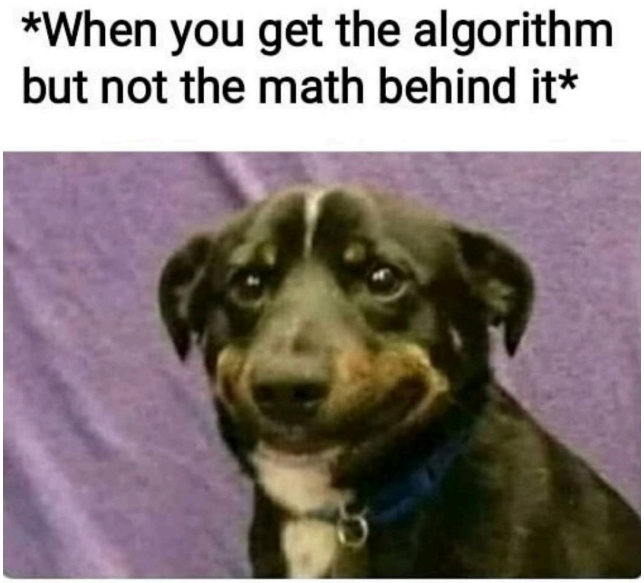
- Graph Basics
- Format Strings in Plots
- Label Parameters, Legend
- Bar Chart, Pie Chart, Histogram, Scatter Plot

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

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

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 | Machine Learning Algorithms X Data Processing

Chapter 1 - Categories of Machine Learning

1 | Supervised

2 | Unsupervised

3 | Reinforcement

Algorithms

- Linear Regression
- Logistic Regression
- Decision Tree
- Gradient Descent
- Random Forest
- Ridge and Lasso Regression
- Naive Bayes
- Support Vector Machine
- KMeans Clustering

Chapter 2 - Types of Machine Learning

1 | Regression

2 | Classification

3 | Clustering

4 | Dimensionality Reduction

5 | Density Estimation

Chapter 3 - Parameter Tuning

1 | Hyperparameter

2 | Cross-validation

3 | Regularization

4 | Overfitting

5 | Underfitting

Chapter 4 - Ensemble Methods

1 | Bagging

2 | Boosting

Chapter 5 - Performance Analysis

1 | Confusion Matrix

2 | Accuracy

3 | Precision, Recall and F1 score

4 | ROC and AUC curve

5 | Mean Squared Error (MSE)

6 | Mean Absolute Error (MAE)

7 | R-squared

8 | Bias-Variance Tradeoff

Chapter 6 - Libraries and Framework

1 | NumPy

2 | Pandas

3 | Scikit-Learn

4 | TensorFlow

5 | PyTorch

6 | Keras

7 | Natural Language Processing X Deep Learning

Understanding Models and Hands-On implementation

1 | NLP Fundamentals

2 | PyTorch x NLP

3 | The model building API - Keras

4 | Word to Vector Representation

5 | Convolutional Neural Network

6 | Named Entity Recognition using Recurrent Neural Network(RNN)

7 | Long Short Term Memory (LSTM)

8 | Generating Text using LSTM

9 | Transformers Basics

Others

- Sentiment analysis
- POS Tagging, Parsing,
- Text preprocessing
- Stemming and Lemmatization
- Sentiment classification using Naive Bayes
- TF-IDF, N-gram,
- Machine Translation, BLEU Score
- Text Generation, Summarization, ROUGE Score
- Language Modeling, Perplexity
- Building a text classifier

8 | Generative AI - GANs, VAEs, LLMs

1 | Foundational Understanding of Large Language Models (LLMs)

2 | TensorFlow Revision

3 | Environment Setup

4 | Understanding Docker, Kubernetes, and Kubeflow

5 | Deep Learning Fundamentals

6 | Understanding Variational Autoencoders (VAEs)

7 | GANs (Generative Adversarial Networks)

8 | LSTM (Long Short-Term Memory networks) Revision

9 | GPTs (Generative Pre-trained Transformers)

10 | Generative AI

11 | Prompt Engineering

9 | Computer Vision X Deep Learning

1 | Image Classification

2 | Transfer Learning

3 | Autoencoders Noise Reduction

4 | Image Captioning

5 | Segmentation & Object Detection

6 | In-Depth DeepFakes

Others

- PyTorch Tensors
- Understanding Pretrained models like AlexNet, ImageNet, and ResNet.
- Neural Networks
- Building a perceptron
- Building a single-layer neural network
- Building a deep neural network
- Recurrent neural network for sequential data analysis

10 | MLOps | Machine Learning Operations

Deploy your models in production and let the world see your portfolio

Not knowing any of the cloud platform for production AWS, GCP or Azure is a concern.

Chapter 1 - Fundamentals

1 | Basics of ML Operations

2 | ML Model, Data and Code

Chapter 2 - Pipeline

3 | Building Machine Learning Pipeline

4 | Deployment

5 | CI/CD Pipeline and APIs

6 | Monitoring

7 | Orchestration

Chapter 3 - AWS

1 | MLOps Fundamentals on AWS

2 | Containers

3 | Analytics using Amazon RedShift Serverless

4 | SageMaker

Chapter 4 - Project Deployment and end-to-end Pipeline

1 | Amazon EKS and KubeFlow

Resources

https://github.com/GokuMohandas/mlops-course

https://github.com/DataTalksClub/mlops-zoomcamp

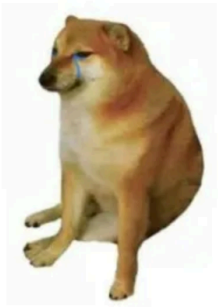
- Deploy ML models using Flask
- Amazon Lex—Natural Language Understanding
- AWS Polly—Voice Analysis
- Amazon Transcribe—Speech to Text
- Amazon Textract—Extract Text
- Amazon Rekognition—Image Applications
- Amazon SageMaker—Building and deploying models
- Working with Deep Learning on AWS

11 | Machine Learning System Design

Create Your ML Design

Understanding the whole Machine Learning architecture from a birds-eye view, so that you will not end up knowing anything.

Your expected ML application workload



Your machine learning project plan

Resources

https://github.com/CathyQian/Machine-Learning-System-Design

https://github.com/ifding/ml-system-design

Chapter 1

1 | Fundamentals

2 | Pinterest → Visual Search ML System

3 | YouTube → Video Search ML System

4 | Video Recommendation System

12 | Structured Query Language (SQL)

1 | Fundamentals to SQL and Installation

2 | Creating Tables - modifiers, altering table, Insert, Update, Delete

3 | Retrieving Data - SELECT

4 | Aggregating Data using Functions

5 | Subqueries - retrieving data with conditions

6 | JOINS

Others

- Fundamental to SQL syntax and Installation
- Creating Tables, Modifiers
- Inserting and Retrieving Data, SELECT INSERT UPDATE DELETE
- Aggregating Data using Functions, Filtering, and RegEX
- Subqueries, retrieve data based on conditions, grouping of Data.
- Practice Questions
- JOINs
- Advanced SQL concepts such as transactions, views, stored procedures, and functions.
- Database Design principles, normalization, and ER diagrams.
- Practice, Practice, Practice: Practice writing SQL queries on real-world datasets, and work on projects to apply your knowledge.

13 | Major Capstone Project

Check the following list of 600 ML Projects

https://github.com/hemansnation/God-Level-Data-Science-ML-Full-Stack/tree/master/projects

Projects

Here is the list of project ideas

14 | Data Science, ML, GenAI Interview

Interview Questions

LLMs Interview Questions

Machine Learning Interview Questions

Resume Checklist

15 | Personal Branding & Portfolio

Portfolio

Work on your craft.

1. Technical blogs (Posts on social media) - Newsletter(LinkedIn, BeeHiive, CovertKit, Medium)
2. Projects - Live (Proof of Work) - read.cv
3. Certification - Google Cloud (ACE)
4. Soft skills - Leadership, Talk, Session, NGO
5. Story - Your Story
6. Research Paper

Personal Branding

1. Profile Page as Landing Page
2. How to Post
3. Who to connect with
4. Tools to use to make it better

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Community of 35k Data Professionals Join them 👉

LinkedIn (25,000+), Telegram (5,500+), Discord (1000+),

Instagram (4,100+), GitHub (1.9k)

About Your Mentor

Himanshu Ramchandani
AI Advisor - I help Industry Leaders 10x their AI expertise.
Building AI & Data Teams
Modern Data Architecture & Engineering Consulting

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https://t.me/+sREuRiFssMo4YWJl

Join the Discord Community:

https://discord.gg/q3svy4VEEs