2024 □

DATA SCIENCE, MACHINE LEARNING, AI & GEN AI WITH PYTHON

GenerativeAI | MLOps

Roadmap

Build Your Strong Machine Learning Gen AI MLOpsPortfolio in 5 Months □

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Modules→

1 → Python for Machine Learning

2→ GitHub Make Recruiters reach You, Build your stunningprofile

3 → Data X NumPy, Pandas, Matplotlib, Seaborn

4 → Mathematics in Machine Learning

5 → Machine Learning Algorithms X Data Processing

6 → Natural Language Processing X Deep Learning

7 → Generative AI - GANs, VAEs, LLMs

8 → Computer Vision X Deep Learning

9 → MLOps | Machine Learning Operations

10→ Machine Learning System Design

11→ Major Capstone Projects

12→ Machine Learning, GenAI Interview

13 → Personal Branding & Portfolio

14 → Others

Technology Stack

- Python
- Data Structures
- NumPy
- Pandas
- Matplotlib
- Seaborn
- Scikit-Learn
- Statsmodels
- Natural Language Toolkit (NLTK)
- PyTorch
- Structure Query Language (SQL)
- Cicd pipeline
- Generative Ai & llm model
- Jupyter (Tool - Code Editor)
- VScode (Code Editor)
- TensorFlow
- 5 Major Projects
- Git and GitHub
- LLM Model
- 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
- streamlit

24 | Python Package Manager

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

25 | MYSQL Database

- SQL and NoSQL
- 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

2 | Git and GitHub

- 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

3| 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

4 | Mathematics for Machine Learning

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

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

5 | 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

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

6| 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

7 | 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

8 | 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

9 | 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 - Project Deployment and end-to-end Pipeline

Resources

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

10 | 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.

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

11| Major Capstone Project

Check the following list of 1000 ML Projects
https://github.com/Data-Science-Project-AMXWAM/500-Data-science-projects

12 | Machine Learning, GenAI Interview

Interview Questions

LLMs Interview Questions

Machine Learning Interview Questions

Resume Checklist

13 | Personal Branding & Portfolio

Portfolio

Work on your craft.

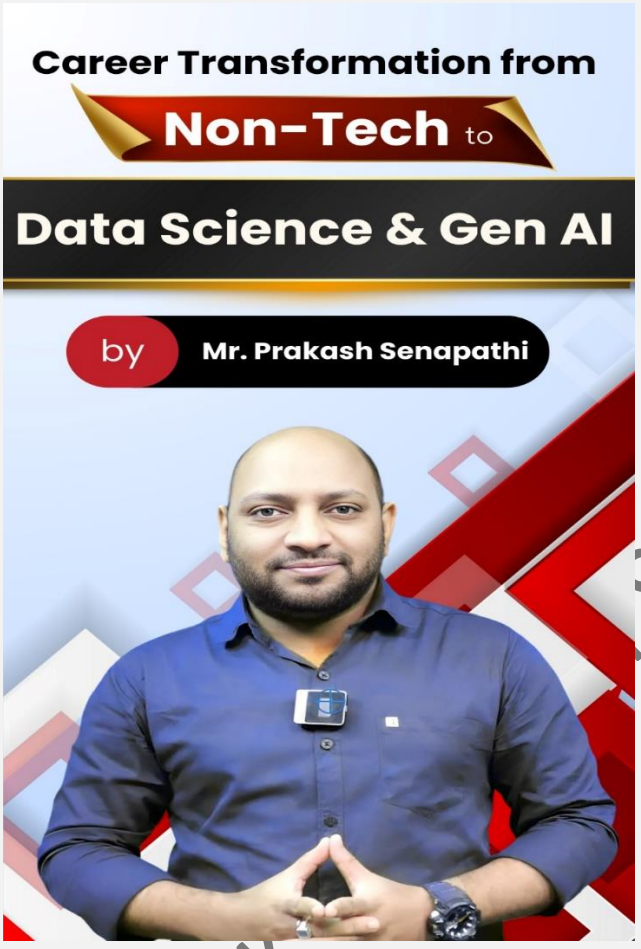
1. Technical blogs (Posts on social media) - Newsletter(LinkedIn, BeeHiive, CovertKit, Medium)
2. Projects - Live (Proof of Work) - read.cv
3. Certification - Google Cloud (ACE)
4. Soft skills - Leadership, Talk, Session, NGO
5. Story - Your Story
6. Research Paper

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

14 | Others

About Your Instructor



Kodi Prakash Senapati

AI Advisor - I help Industry Leaders 10x their AI expertise.

AI Solutions Consulting

17+ Industry experts

10+ Years Teaching experts

Researchers & Lead Data Scientist

THANK YOU