

AI/ML

GenerativeAI | MLOps Roadmap

Build Your Strong Machine Learning Gen AI MLOps
Portfolio/Personal Brand with a Life-Long Community 🚀



Minal Pandey



Modules→

1→ Python for Machine Learning 🚀 2 → Data Structures & Algorithms

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

4 → Data 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 → Major Capstone Projects

13 → Machine Learning, GenAI Interview

14 → Personal Branding & Portfolio

15 → Others

Technology Stack

- Python Data Structures NumPy
- Pandas Matplotlib Seaborn
- Scikit-Learn Statsmodels
- Natural Language Toolkit (NLTK
-
-
-
-
-)
- PyTorch
- Structure Query Language (SQL)
- Docker
- Jupyter(Tool - Code Editor)
- VScode(Code Editor)
- 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
- PythonOrg,Python3
- Variables
- Printfunction
- Inputfromuser
- DataTypes
- TypeConversion
- FirstProgram

2 | Operators

- ArithmeticOperators
- RelationalOperators
- BitwiseOperators
- LogicalOperators
- AssignmentOperators
- CompoundOperators
- MembershipOperators
- IdentityOperators

3 | Conditional Statements

- IfElse
 - If
- Else
- ElIf(elseif)
- IfElseTernaryExpression

4 | While Loop

- Whilelooplogicbuilding
- SeriesbasedQuestions
- Break
- Continue
- NestedWhileLoops
- Pattern-BasedQuestions
- pass
- Loopelse

5 | Lists

- ListBasics
- ListOperations
- ListComprehensions/Slicing
- ListMethods

6 | Strings

- StringBasics
- StringLiterals
- StringOperations
- StringComprehensions/Slicing
- StringMethods

7 | For Loops

- Rangefunction
- Forloop
- NestedForLoops
- Pattern-BasedQuestions
- Break
- Continue
- Pass
- Loopelse

8 | Functions

- Definition
- Call
- FunctionArguments
- DefaultArguments
- Docstrings
- Scope
- SpecialfunctionsLambda,Map,andFilter
- Recursion
- FunctionalProgrammingandReferenceFunctions

9 | Dictionary

- DictionariesBasics
- Operations
- Comprehensions
- DictionariesMethods

10 | Tuple

- TuplesBasics
- TuplesComprehensions/Slicing
- TupleFunctions
- TupleMethods

11 | Set

- SetsBasics
- SetsOperations
- Union
- Intersection
- DifferenceandSymmetricDifference

12 | Object-Oriented Programming

- Classes
- Objects
- MethodCalls
- InheritanceandItsTypes
- Overloading
- Overriding
- DataHiding
- OperatorOverloading

13 | File Handling

- FileBasics
- OpeningFiles
- ReadingFiles
- WritingFiles
- EditingFiles
- Workingwithdifferentextensionsoffile
- WithStatements

14 | Exception Handling

- CommonExceptions
- ExceptionHandling
 - Try
- Except
- Tryexceptelse
- Finally
- Raisingexceptions
- Assertion

15 | Regular Expression

- BasicREfunctions
- Patterns
- MetaCharacters
- CharacterClasses

16 | Modules & Packages

- Differenttypesofmodules
- Inbuiltmodules
- OS
 - Sys
- Statistics
- Math
- String
- Random
- Createyourownmodule
- BuildingPackages
- Buildyourownpythonmoduleanddeployitonpip

17 | Data Structures

- Stack
- Queue
- LinkedLists
- Sorting
- Searching
- LinearSearch
- BinarySearch

18 | Higher-Order Functions

- Functionasaparameter
- Functionasareturnvalue
- Closures
- Decorators
- Map,Filter,ReduceFunctions

19 | Python Web Scrapping

- UnderstandingBeautifulSoup
- ExtractingDatafromwebsites
- ExtractingTables
- DatainJSONformat

20 | Virtual Environment

- VirtualEnvironmentSetup

21 | Web Application Project

- Flask
- ProjectStructure
- Routes
- Templates
- Navigations

22 | Git and GitHub

- Git-VersionControlSystem
- GitHubProfilebuilding
- ManageyourworkonGitHub

23 | Deployment

- HerokuDeployment
- FlaskIntegration

24 | Python Package Manager

- WhatisPIP?
- Installation
- PIPFreeze
- CreatingYourOwnPackage
- UploaditonPIP

25 | Python with MongoDB Database

- SQLandNoSQL
- ConnectingtoMongoDBURI
- FlaskapplicationandMongoDBintegration
- CRUDOperations
- Find
- Delete
- Drop

26 | Building API

- API(ApplicationProgrammingInterface)
- BuildingAPI
- StructureofanAPI
- PUT
- POST
- DELETE
- UsingPostman

27 | Statistics with NumPy

- Statistics
- NumPybasics
- WorkingwithMatrix
- LinearAlgebraoperations
- DescriptiveStatistics

28 | Data Analysis with Pandas

- DataAnalysisbasics
- Dataframeoperations
- Workingwith2-dimensionaldata
- DataCleaning
- DataGrouping

29 | Data Visualization with Matplotlib

- MatplotlibBasics
- Workingwithplots
- Plot
- PieChart
- Histogram

30 | What to do Now?

- Discussionsonhowtoprocessfurtherwiththisknowledge.

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

- 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 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 AlgorithmsX

Data Processing

Chapter 1 - Categories of Machine Learning

1 | Supervised

2 | Unsupervised

3 | Reinforcement

Algorithms

- LinearRegression
- LogisticRegression
- DecisionTree
- GradientDescent
- RandomForest
- RidgeandLassoRegression
- NaiveBayes
- SupportVectorMachine
- KMeansClustering

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

- Sentimentanalysis
- POSTagging,Parsing,
- Textpreprocessing
- StemmingandLemmatization
- SentimentclassificationusingNaiveBayes
- TF-IDF,N-gram,
- MachineTranslation,BLEUScore
- TextGeneration,Summarization,ROUGEScore
- LanguageModeling,Perplexity
- Buildingatextclassifier

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

- PyTorchTensors
- Understanding Pretrained models like AlexNet, ImageNet, and ResNet.
- NeuralNetworks
- Buildingaperceptron
- Buildingasingle-layerneuralnetwork
- Buildingadeepneuralnetwork
- Recurrentneuralnetworkforsequentialdataanalysis

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 | 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](#)

13 | Machine Learning, GenAI Interview

Interview Questions

LLMs Interview Questions

Machine Learning Interview Questions

Resume Checklist

14 | 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

15 | Others