Machine Learning and Deep Learning Bootcamp

Duration: 15 days (120 hours)

Labs: Open-Source platform

Pre-requisite: Fundamental knowledge of Python/similar programming is a must.

Module 01: Python for Machine Learning

A. Python for Data Analytics (4 days)

- Introduction to Python and Basics
- Data types and Control Flows
- Lists, Tuples, Sets, and Dictionaries
- Lab: Understanding Data Types and Control Flows
- File Handling and Strings
- Lab: File Handling and String Manipulation in Python
- Iterators & Generators
- Regular Expressions
- Lab: Regular Expressions for Text Processing
- OOPS Concept
- Lab: Exploring Object-Oriented Programming Concepts in Python
- Introduction to NumPy, Pandas, SciPy, Seaborn & Matplotlib
- Lab: Getting Started with Data Science: Introduction to NumPy, Pandas, and matplotlib
- Introduction to Data Preprocessing
- Lab: Introduction to Data Preprocessing
- Exploratory Data Analysis (EDA)
- Lab: Data Unveiled- Exploring Insights through EDA
- Hands-on: Project Work- Exploring Data Science Techniques

B. Computer Vision with OpenCV (3 days)

- Introduction to OpenCV - Introduction to OpenCV, Image basics with Numpy, Open an Image with Matplotlib, Get familiar with RGB channels, Differences between Matplotlib and OpenCV
- Lab: Reading, writing and displaying images
- Lab: Color Spaces
- Lab: OpenCV HSV, RGB and Channels
- Image Processing - Introduction to Image Processing, Transform, Resize & Flip an Image, Draw Shapes on an Image, Event Choices for the Mouse, Transformations, Affine and Non-Affine, Image Translations and Rotations, Scaling, Resizing and Cropping
- Lab: Translations, Scaling, re-sizing and interpolations, Cropping, Different Operations and Sharpening
- Image Segmentation - Segmentation and Contours, Sorting and Matching

Contour Shapes, Line Detection Game, Circle Detection, Blob Detection
- Lab: Sorting Contours, Matching Contours Shape
- Object Detection - Object Detection Overview, Feature Description Theory, Finding Corners, SIFT, SURF, FAST, BRIEF & ORB
- Lab: Finding Corners, Face & Eye Detection
- Object Tracking - Filtering by Color, Background Subtraction and Foreground Subtraction, Using Mean Shift
- Lab: Background Subtraction

C. Data Mining for Machine Learning (1 day)

- Understanding Data Sources and Acquisition
- Web Scraping Techniques - Overview of Web Scraping, Legal and Ethical Considerations, Tools and Libraries for Web Scraping
- Lab: Web Scraping for Data Collection

D. Database Operations for Machine Learning (1 day)

- Introduction to Python Database Operations - Overview of Database Management Systems (DBMS), Introduction to SQL and Python Database APIs
- Basic Python Database Operations - Connecting to Databases, Executing SQL Queries, Fetching Data from Databases
- Lab: Implement CRUD operations

Module 02: Document OCR using Deep Learning (1 day)

- Introduction to Document OCR with Deep Learning
- Data Acquisition and Pre-processing
- Building Deep Learning Models for OCR
- Training and Evaluation
- Lab: Implementing Document OCR with Deep Learning

Module 03: Predictive Modelling (1 day)

- Introduction to Predictive Modelling
- Data Preparation for Predictive Modelling
- Building Predictive Models
- Evaluating and Tuning Predictive Models
- Lab: Predictive Modelling Experiment - Regression
- Lab: Predictive Modelling Experiment - Classification
- Lab: Predictive Modelling Experiment – Clustering

Module 04: Natural Language Processing (2 days)

- Introduction to NLP and its applications
- Overview of NLTK, SpaCy, and other NLP libraries
- Setting up NLTK environment and configuring for text processing
- Understanding corpora in NLP and their role in training models
- Techniques for importing and reading text files into Python
- Text mining for extracting valuable insights from textual data
- Text pre-processing techniques like tokenization and stemming

- POS-tagging to categorize words by their grammatical properties
- Named Entity Recognition (NER) using SpaCy or NLTK libraries
- One Hot Encoding in NLP and its challenges
- Importance of Vectorization Techniques
- Lab: Analyzing Text Data with NLP Techniques

Module 05: Generative AI for Image Captioning (2 days)

- Transformer Models and BERT Model
- Lab: T5 transformer for text related tasks
- Introduction to Generative AI
- Introduction to Large Language Models (LLMs)
- Encoder Decoder Architecture
- Attention Mechanism
- Lab: Text generation using LLM model
- Introduction to Image Generation
- Lab: Creating an Image Captioning Model