

12-Month Course Outline: AI and Data Science with Python

Course Duration: 12 Months

Classes per week: 2

Class Duration: 2 hours

Instructors: Sir Nasir Hussain / Sir Faisal Amin

Month 1-2: Python Programming & APIs

- Introduction to Python
 - Data Types, Loops, Conditional Statements
 - Functions & Modules
 - Object-Oriented Programming (OOP)
 - Working with Files, JSON, and APIs
 - Introduction to FastAPI
 - Building RESTful APIs with FastAPI
 - API Deployment with Docker & Cloud
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Month 3: Data Handling with NumPy & Pandas

- NumPy Arrays & Matrix Operations
 - Indexing, Broadcasting & Vectorized Computations
 - Pandas DataFrames & Series
 - Data Cleaning, Filtering, and Aggregation
 - Data Visualization with Matplotlib & Seaborn
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Month 4-5: Machine Learning (ML) Fundamentals

- Introduction to Machine Learning
- Supervised Learning:
 - Linear Regression, Logistic Regression

- Decision Trees & Random Forests
 - SVM & KNN
 - Unsupervised Learning:
 - Clustering (K-Means, DBSCAN)
 - Dimensionality Reduction (PCA, t-SNE)
 - Model Evaluation & Hyperparameter Tuning
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Month 6-7: Deep Learning (DL) with TensorFlow & PyTorch

- Introduction to Neural Networks
 - Backpropagation & Optimization
 - Convolutional Neural Networks (CNNs) for Image Processing
 - Recurrent Neural Networks (RNNs)
 - LSTMs & GRUs for NLP
 - Introduction to Attention Mechanisms
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Month 8: Transformers & Large Language Models (LLMs)

- Introduction to Transformer Architecture
 - Understanding Self-Attention & Multi-Head Attention
 - BERT, GPT, and T5 Models
 - Fine-Tuning Pre-trained Models with Hugging Face
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Month 9: Generative AI (GenAI) & AI Art

- Introduction to Generative AI
 - Generative Adversarial Networks (GANs)
 - Style Transfer & Image Generation
 - Text-to-Image Models (DALL·E, Stable Diffusion)
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Month 10: LLMs & Prompt Engineering

- Large Language Models (LLMs)
 - Understanding Prompt Engineering
 - Fine-Tuning LLMs for Custom Use Cases
 - LangChain for LLM-based Applications
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Month 11: Agentic AI & Autonomous Systems

- Understanding Agentic AI
 - Autonomous Decision-Making Models
 - Reinforcement Learning for AI Agents
 - Multi-Agent Systems
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Month 12: AI Model Deployment & Scaling

- Model Deployment with FastAPI & Cloud Services
- Fine-Tuning & Scaling AI Models
- Real-World AI Model Optimization