



AI & Machine Learning Essentials: From Theory to Real-World Applications

Learning Mode:

Online

Duration:

20 days training + Post Class Coaching
+ 1 Day Exam

This course is specifically designed to provide participants with:

- **Comprehensive software development** expertise from front-end design (HTML, CSS, JavaScript, React.js) to back-end programming with Python and API integration.
- **Hands-on experience** in setting up developer environments, managing version control with Git/GitHub, and deploying real-world web applications using Cloudflare and AWS.
- **Practical Python** skills covering fundamentals, file handling, error management, and using Python to create animations, automate workflows, and integrate AI chatbot systems.
- **Real-world implementation exposure**, including video streaming APIs, cloud-based data collection, and cloud integration using AWS, Google Cloud, and Cloudflare platforms.
- **In-depth understanding of web optimization**, SEO, and performance analytics using industry tools like Lighthouse and GTmetrix.
- **Applied cybersecurity and compliance knowledge**, ensuring that deployed web systems are secure, resilient, and follow best practices in privacy and protection (SSL, WAF, DDoS).
- **A project-driven learning experience that culminates in the design, deployment, and optimization of a fully functional, secure web application.**
- **Advanced ML & optimization techniques**, including Ensemble Learning, Hyperparameter Tuning, Unsupervised Learning (Clustering & Dimensionality Reduction), and their real-world implementation.

Course Overview

SUMMARY

Equips learners with end-to-end web and software development skills – from HTML, CSS, and JavaScript to React, Python, Cloudflare, AWS, and Google Cloud.

Each module includes theoretical insights, and real-world project examples.

Core Technologies

Choosing a hosting provider (Shared, VPS, Cloudflare, AWS, HTML / CSS, SQL, JavaScript, Bootstrap Framework, AngularJS / React, Version Control (Git), REST architecture, Web servers (Apache, nginx), xUnit, Unix command-line, MongoDB and C# Specific other NoSQL databases, UI / UX Design, Cloud-based services, and their development, like (AWS, Google Cloud Platform)

Python Specific Technologies

- Python Programming
- Flask
- MySQL
- Django
- ActiveRecord
- ORM

Course Content

Module 01: Environment Setup & Developer Tools

- Overview of VS Code, GitHub, and Cloudflare
- Installing VS Code, configuring extensions & themes
- Git basics: commit, push, pull, branch
- GitHub repository creation, SSH setup
- Cloudflare Pages and DNS setup for hosting

Module 02: HTML & CSS Significance in Software Development

- HTML as a structure for content and accessibility
- Semantic tags and HTML5 APIs
- CSS for responsive and accessible design
- CSS frameworks (Bootstrap, Tailwind) and SCSS usage

Module 03: JavaScript Essentials

- Syntax, Variable, loops and functions
- DOM manipulation and event handling
- Fetch API and JSON data
- Debugging in browser developer tools

Module 04: React.js Development

- React setup
- Components, props, and state management
- React Hooks (useState, useEffect)
- API integration and dynamic rendering

Module 5: Python Programming Fundamentals

- Syntax, data types, loops and functions
- File handling and error management

MODULE 6 Making Animation using Python

- What is Manim?
- Benefits of Code-Driven Animation
- Manim Ecosystem
- Setting Up Manim Environment

MODULE 7 AI Chatbot Integration (Python)

- Introduction to AI Chatbots
- TestiUnderstanding Large Language Models (LLMs)
- Designing a Chatbot Flow

MODULE 8 Video Streaming Integration using API (Python)

- What is Video Streaming?
- Why Cloudflare Stream?



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Course Content

- **MODULE 9 Data Collection by Cloud Server (Python)**
- Data Collection in Web Applications
- Responsible Data Handling
- Setting Up the Environment

MODULE 10 Software Design and Development

Software Architectures

- robots.txt configuration and purpose
- Meta tags, Open Graph data, and Twitter Cards
- Schema.org structured data with JSON-LD
- Performance optimization using Lighthouse and GTmetrix

Module 11: Cloudflare, AWS & Google Cloud Integration

- Overview of cloud concepts (IaaS, PaaS, SaaS)
- AWS S3, Lambda, and RDS basics
- Google Cloud Storage, Firestore, and Cloud Functions
- Cloudflare for CDN, caching, and DNS management

Module 12: Web Hosting & Web System Performance

- Choosing a hosting provider (Shared, VPS, Cloudflare, AWS, Netlify)
- Tools for speed testing: Lighthouse, GTmetrix, Pingdom, WebPageTest
- Front-end and back-end optimization strategies
- Implementing caching and CDNs
- Web security best practices (SSL, WAF, DDoS protection)

Module 13: Web Security & Protection

- Why security impacts speed.
- Security best practices.
- Why It's Important.

Module 14: DATA FOUNDATIONS & INTRODUCTION TO MACHINE LEARNING

- Course overview and learning outcomes
- Types of data: numerical, categorical, time series, images
- Basic data handling in Python (load, inspect, summarize)
- Data cleaning: missing values, duplicates, simple transformations
- Data visualization: distributions, relationships, correlations
- What is Machine Learning and Deep Learning
- ML workflow: problem, data, model, evaluation, iteration

Module 15: SUPERVISED LEARNING – CLASSIFICATION

- Supervised learning concepts: features, labels, train/test split
- Classification problem types and examples
- Basic classification models:
- Logistic Regression (concept + simple example)
- k-Nearest Neighbors (k-NN)
- Decision Tree
- Tree Ensemble
- Model evaluation for classification:
- Accuracy, confusion matrix
- Precision, recall, F1-score (concept)
- Hands-on end-to-end classification examples

MODULE 16: REGRESSION & UNSUPERVISED LEARNING (CLUSTERING)

- Regression problem definition and use cases
- Basic regression models:
- Linear Regression
- k-Nearest Neighbors (k-NN)
- Tree Ensemble
- Regression evaluation metrics: MAE, MSE, RMSE, R^2
- Introduction to unsupervised learning
- Clustering with k-Means: intuition, how it works
- Clustering example with 2D visualization and interpretation

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MODULE 17: DEEP LEARNING WITH CNN FOR IMAGES

- From traditional ML to Deep Learning: why neural networks
- Neuron, layers, activation functions
- CNN fundamentals:
- Convolution, filters, feature maps
- Pooling, flattening, fully connected layers
- Image data preparation: resizing, normalization, train/validation split
- Building a simple CNN for image classification
- Training and monitoring performance (loss, accuracy curves)
- Overfitting and basic regularization (dropout, simple augmentation – concept)

MODULE 18: TIME SERIES FORECASTING

- What is time series data and where it appears (energy, finance, sensors)
- Key concepts: trend, seasonality, noise, forecast horizon
- Train/validation/test split for time series (no shuffling)
- Feature construction for time series: lags, windows
- Baseline forecasting methods (naive last value, simple moving average)
- Introduction to sequence models for time series:
- RNN concept (idea of memory)
- LSTM and GRU (high-level gates and intuition)
- LSTM/GRU examples for one-step/multi-step forecasting

MODULE 19: RECAP & TIME SERIES FORECASTING PROJECT

- Structured recap of the course:
- data → classification → regression & clustering → CNN → time series
- End-to-end ML/DL pipeline revisited using a time series case
- Time series project work:
- Problem definition and dataset overview
- Short EDA and preprocessing review
- Model selection (baseline vs LSTM/GRU)
- Training, evaluation, and plotting predictions vs actual
- Group or individual mini-presentations / discussion of project results
- Real-world considerations: data quality, domain knowledge, deployment concept
- Next steps for participants and Q&A

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