



Global Nexus Institute
— Innovation & Excellence —

Professional Certificate in Machine Learning & AI





Duration: 4 Months (16 Weeks)

Delivery Mode: Online

Target Audience: Aspiring data scientists, professionals transitioning to AI, researchers, students, industry professionals, and AI enthusiasts seeking practical AI knowledge.

Why Machine Learning & AI?

Learning Machine Learning and AI opens doors to high-demand, high-paying careers across industries. It equips you to solve real-world problems, stay relevant in a technology-driven world, and boost your resume. Whether you're a job seeker or career changer, AI skills offer flexibility, innovation, and opportunities for global impact.

The Demand for ML & AI is Driven by Four Megatrends:

The demand for Machine Learning and AI is fueled by four megatrends: explosive data growth, advances in computing power, breakthroughs in algorithms, and the increasing need for automation across industries to drive innovation, efficiency, and smarter decision-making

Who Is This Course For?

This course is perfect for newcomers eager to enter Machine Learning and AI, professionals seeking to upskill and futureproof their careers, recent graduates or career changers looking to explore data-driven fields, and tech enthusiasts passionate about leveraging AI and ML for innovation. Prerequisites: Basic proficiency in Python programming and a foundational understanding of statistics or mathematics to fully grasp the concepts.





Week 1–2: Intro to Machine Learning (ML)



Objective

Learn how to build and evaluate models using labeled and unlabeled datasets.



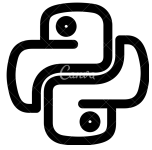
1. Supervised Learning

- Understand the difference between regression and classification problems.
- Implement models such as Linear Regression and Decision Trees to solve real-world problems.
- Learn how to evaluate models using metrics like accuracy, precision, and recall.

2. Unsupervised Learning

- Explore clustering techniques like K-Means for grouping similar data.
- Learn dimensionality reduction methods like PCA to simplify datasets.
- Discover how anomaly detection algorithms identify unusual data points.





Week 3–5: Deep Learning with TensorFlow



Objective

Understand the structure of neural networks and build deep learning models using TensorFlow/Keras.

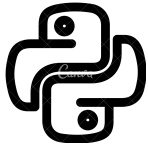


1. Neural Networks Basics

- Learn the structure of neurons and how activation functions like ReLU help models learn.
- Study the loss functions and how they guide the optimization of models.
- Understand the concepts of forward propagation and backpropagation in training neural networks.

2. Using TensorFlow

- Set up and use TensorFlow/Keras to build deep learning models.
- Learn the steps to compile, train, and evaluate models in TensorFlow.
- Gain hands-on experience saving and reloading trained models for future use.



Week 6–8: Transfer Learning and Pre-trained Models



Objective

Apply transfer learning techniques and leverage pre-trained models to solve new problems efficiently.

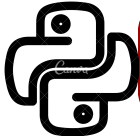


1. Transfer Learning

- Understand the concept of transfer learning and its benefits in machine learning.
- Learn the difference between feature extraction and fine-tuning in transfer learning.
- Explore how pre-trained CNNs like ResNet can be adapted to new tasks.

2. Pre-trained Models in NLP

- Work with powerful NLP models such as BERT for various text-based tasks.
- Learn how tokenization and embeddings transform text into machine-readable formats.
- Apply these models to tasks like sentiment analysis and text classification.



Week 8–10: Intro to AI & Natural Language Processing



Objective

Understand fundamental techniques for processing and analyzing human language data.

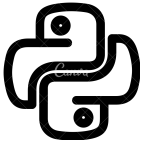


1. Natural Language Processing (NLP)

- Learn the essential preprocessing techniques such as tokenization and stemming.
- Understand how to transform text into vectors using methods like TF-IDF and Word Embeddings.
- Apply NLP techniques to solve problems like Named Entity Recognition (NER) and topic modeling.

2. Text Analysis

- Implement sentiment analysis to understand the emotions expressed in text data.
- Learn techniques for summarizing long texts to extract key information.
- Build end-to-end text classification pipelines for tasks like spam detection.



Week 10–12: Large Language Models & Hugging Face



Objective

Utilize state-of-the-art transformer models and Hugging Face tools for advanced NLP tasks.



1. Working with LLMs

- Understand the transformer architecture that powers large language models like GPT.
- Explore how fine-tuning and zero-shot learning make LLMs versatile for different tasks.
- Learn the importance of prompt engineering to guide model behavior and outputs.

2. Hugging Face Ecosystem

- Get hands-on experience with the Hugging Face Transformers library for NLP tasks.
- Learn how to use the Pipeline API to simplify model execution.
- Import and work with custom datasets to train models tailored to specific tasks.



Week 13–15: Real-world Applications & Tools



Objective

Explore real-world applications of AI and understand how to deploy models responsibly and effectively



1. AI in Practice

- Learn how AI is applied in industries like healthcare, finance, and agriculture.
- Study the ethical challenges and fairness issues surrounding AI implementation.
- Understand the principles behind Explainable AI (XAI) to make model decisions transparent.

2. ETC: Other Useful Tools & Concepts

- Explore model deployment using tools like Streamlit for building interactive web apps.
- Learn the fundamentals of ML Ops for managing models in production environments.
- Understand how to monitor model performance and handle drift over time.



Week 16: Capstone Project



Objective

Integrate all skills and knowledge into a full real-world machine learning or AI project



- Defining a Real-world ML/AI Problem
- Data Preprocessing and Exploration
- Building, Training, and Evaluating Models
- Visualization and Presentation

References

- Géron, Aurélien. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow (O'Reilly Media, 2022)
- Goodfellow, Ian, et al. Deep Learning (MIT Press, 2016)
- Jurafsky, Daniel, and James H. Martin. Speech and Language Processing (Pearson, 2023)
- Chollet, François. Deep Learning with Python (Manning Publications, 2021)
- Data Preprocessing and Exploration
- Building, Training, and Evaluating Models



Global Nexus Institute
— Innovation & Excellence —