

AI Engineering with ML and DL

COURSE OF CONTENT



An educational division of Percoid IT Solutions

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Course Overview

The **Artificial Intelligence with Machine Learning and Deep Learning** program at **Percoid Academy of Technology** is a comprehensive, hands-on training course designed to equip learners with the knowledge and practical skills required to build intelligent software solutions. The course covers the fundamental concepts of Artificial Intelligence, Machine Learning, Deep Learning, and Generative AI using Python and industry-standard libraries.

Participants will gain practical experience in data preprocessing, model development, neural networks, computer vision, natural language processing, and the deployment of AI applications through real-world projects and case studies. Emphasis is placed on problem-solving, model evaluation, and the application of AI techniques to real-world business and engineering challenges.

Upon successful completion of the program, learners will be prepared to develop AI-powered applications, implement machine learning and deep learning models, and pursue careers in Artificial Intelligence, Machine Learning, Data Science, and related fields.

Module 1: Python Foundations for AI

- Python programming fundamentals
- Data types, variables and operators
- Control Structures
- Functions and Modules
- Exception Handling
- File Handling
- Core data structures (Lists, Tuples, Dictionaries, Sets)

Module 2: Machine Learning Fundamentals

- Introduction to Machine Learning
- Machine Learning
 - Supervised
 - Unsupervised learning
 - Reinforcement Learning
- Data Collection and Preprocessing
- Linear, Polynomial and Logistic Regression
- Introduction to Model Evaluation

Module 3: Neural Networks & Deep Learning

- Introduction to Perceptron
- Artificial Neural Networks
- Neural Network Architecture
- Activation & Loss functions
- Forward Propagation & Backpropagation
- Gradient Descent

Module 4: Machine Learning Pipeline & Model Optimization

- End-to-End Machine Learning Pipeline
- Data Preprocessing & Feature Engineering
- Model Selection Strategies
- Cross Validation
- Hyperparameter tuning:
 - Grid Search

- Random Search

Module 5: PyTorch for Deep Learning

- Introduction to PyTorch
- Tensors and operations
- Autograd
- Model Building
- PyTorch Training Workflow
- Training Loop
- Forward Pass
- Loss Computation
- Backward Propagation
- Optimizer Usage

Module 6: Computer Vision using Convolutional Neural Networks (CNNs)

- Introduction to Computer Vision
- Convolution Operations, Filters and Kernels
- Pooling techniques
- Activation Layers
- Deep CNN Architectures
- Transfer Learning Basics

Module 7: Natural Language Processing (NLP) & Transformers

- Introduction to NLP
- Sequence models: RNN & LSTM

- Transformer architecture basics
- Attention Mechanism
- Text Processing and Modelling

Module 8: Generative AI & Retrieval-Augmented Generation (RAG)

- Introduction to Generative AI
- Large Language Models (LLMs)
- RAG fundamentals
- LangChain framework overview
- Building a chat application using LangChain
- Working with LLM APIs
- Building Context-Aware Chat Applications

Module 9: Real World Project (Phase 1)

- Project development (Structured Data)
- Problem definition & dataset selection
- Model building and evaluation

Module 10: Real World Project (Phase 2)

- Project development (Unstructured Data)
- Model improvement & optimization
- Final deployment-ready solution
- Presentation & review