

Advanced AI/ML: Transformers, LangChain & RAG

Learn to build machine learning, deep learning, NLP and generative AI solutions, including transformers, LangChain applications and RAG.

5

MODULES

30

TOPICS

6

HANDS-ON ACTIVITIES

COURSE OVERVIEW

This course covers core data science concepts, including data pre-processing, supervised and unsupervised learning, regression and classification algorithms, and model evaluation. It then moves into deep neural networks such as ANNs, CNNs and RNNs, followed by natural language processing techniques ranging from Bag of Words and TF-IDF to transformer networks. It also addresses generative AI, including transformer architecture and Hugging Face large language models. Finally, it covers application development with LangChain, LlamaIndex and LangGraph, including prompt engineering, fine-tuning, vector stores, retrieval-augmented generation and AI agents.

WHO THIS COURSE IS FOR

Data Scientists

Machine Learning Engineers

NLP Engineers

AI Application Developers

Data Analysts

LEARNING OBJECTIVES

- Explain core data science concepts and pre-processing techniques
- Apply regression and classification algorithms such as decision trees
- Implement unsupervised learning algorithms such as K-Means clustering
- Build deep neural networks including CNNs and RNNs
- Apply NLP techniques such as TF-IDF and Word2Vec
- Describe transformer architecture and generative AI applications
- Develop applications with LangChain, including chatbots and RAG pipelines
- Configure AI agents using LangGraph

5 Modules, 30 Topics

01

Practical Lab

Data Science

TOPICS

- Introduction to Data Science concepts and scope
- Data Analysis & Pre-processing techniques
- Supervised and Unsupervised Learning paradigms
- Regression and Classification Algorithms (Linear, Logistic, Decision Trees, Random Forests)
- Feature Selection & Dimensionality Reduction
- Cross-Validation & ML Strategy
- Hyperparameter Tuning methods
- Unsupervised Learning Algorithms (K-Means, Hierarchical Clustering)
- Model Evaluation and performance metrics

02

Practical Lab

Deep Neural Networks

TOPICS

- Understanding Perceptron and its role
- Artificial Neural Networks (ANN) and Multi-Layer Perceptrons
- **Convolutional Neural Networks (CNNs)**: filters, padding, strides, pooling, transfer learning
- Advanced CNNs & Object Detection approaches
- Recurrent Neural Networks (RNN, LSTM, GRU) for sequential data

03

Practical Lab

Natural Language Processing (NLP)

TOPICS

- Converting language to numerical representation
- **Techniques**: Bag of Words, TF-IDF, Word2Vec
- Feature selection and dimensionality reduction in text data
- Cross-validation and hyperparameter tuning in NLP
- Named Entity Recognition (NER) and sentiment analysis
- Transformer Networks for advanced NLP

04

Hands-on Lab

Hands-on Lab

Generative AI

TOPICS

- Background and backdrop of Generative AI
- Transformer architecture and applications
- Working with Hugging Face Large Language Models (LLMs)

05

Practical Lab

Application Development (LangChain, LlamaIndex, LangGraph)

TOPICS

- Prompt Engineering (zero-shot, one-shot, few-shot techniques)
- Fine-tuning models on custom datasets
- Building simple applications with LangChain
- Creating conversational customized chatbots with LLMs
- Vector stores and retrievers for search
- Retrieval-Augmented Generation (RAG) concepts
- AI Agents with LangGraphs

HANDS-ON ACTIVITIES

Practise What You Learn

#	MODULE	ACTIVITY
01	Data Science	Practical Labs: Data Analysis insights, Regression models, Classification tasks, K-Means clustering
02	Deep Neural Networks	Practical Labs: Perceptron, ANN, CNN predictions, RNN sequence modeling
03	Natural Language Processing (NLP)	Practical Labs: Sentiment Analysis on reviews dataset, NER, Word Cloud
04	Generative AI	Hands-on Labs: Text completion, classification, translation, similarity Hands-on Labs: Text-to-image, Image captioning, Object detection, Speech recognition
05	Application Development (LangChain, LlamaIndex, LangGraph)	Practical Labs: Prompt engineering, fine-tuning, chatbot creation, vector store setup, PDF QnA RAG

WHAT IS INCLUDED

Everything You Need to Succeed

- Koenig course material for every module
- Delivery by certified instructors and subject matter experts
- Hands-on exercises throughout the course
- Course completion certificate from Koenig

ABOUT KOENIG

Who We Are

Established in 1993, Koenig Solutions is a globally recognised training provider with 35+ technology partnerships, 5,000+ training programmes and a network of certified instructors and subject matter experts, supporting individuals and enterprise teams worldwide.

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