

APPLIED AI SPECIALIZATION FOR DEFENSE: FROM SURVEILLANCE TO DECISION SUPPORT.

Duration : 105 hrs

Course Overview:

This Applied AI Specialization equips learners with hands-on experience in building intelligent defence applications—from real-time surveillance using computer vision to language-driven decision support. The course covers computer vision, NLP, prompt engineering, generative AI app development, and agentic AI systems. Learners engage with state-of-the-art models, frameworks like LangChain and CrewAI, and develop end-to-end AI-driven workflows essential for modern defence and surveillance operations.

Audience Profile

- AI engineers working on surveillance and intelligence systems
- Data scientists seeking domain-specific AI expertise
- Researchers in defence technology and national security
- Developers building generative and agentic AI applications
- Technical leads or architects in defence modernization projects
- Graduate students in AI, defence studies, or computer science
- Government or military personnel exploring AI integration strategies

Module - Pre-requisite session on Python (8 hrs)

This module is to get familiar yourself with the python language that is going to be used extensively throughout the sessions.

Variables, operators

Function, loops, conditional flow

Data structure

Modules, try-catch block

File handling

Introduction to Object oriented programming

Module-1– Data Science (16hrs)

This module introduces learners to the core concepts of data science, focusing on supervised and unsupervised learning techniques. Participants will explore regression and classification algorithms, along with clustering methods like K-Means. Through practical labs, they'll gain hands-on experience in data analysis, model building, and pattern discovery—laying the foundation for applying machine learning to real-world problems across various domains. Ideal for beginners looking to enter the data science field.

Introduction to Data science

Supervised and Unsupervised learning

Supervised - Regression and Classification algorithms

Unsupervised Learning algorithms

Lab -1 : Data analysis insights

Lab 2 : Regression

Lab 3 -: Classification

Lab 4 – Unsupervised – K means clustering

Module-2 : Introduction to deep Neural network (16 hrs)

This module provides a foundational understanding of deep learning, covering perceptrons, artificial neural networks (ANN), convolutional neural networks (CNN), and recurrent neural networks (RNN) including LSTM and GRU. Learners explore key concepts like padding, pooling, strides, flattening, and transfer learning. With dedicated labs for each architecture, participants gain hands-on experience in building and predicting with deep learning models for image classification, sequence modeling, and real-world AI applications.

Understanding Perceptron

Lab: Perceptron

Understanding Artificial Neural network / multi-layer perceptron

Lab: ANN

Understanding Convolutional Neural network – CNN

Padding, strides, pooling, Transfer learning etc

Flattening layer and prediction

LAB: CNN prediction

Understanding Recurrent neural network

RNN, LSTM, GRU

Lab: RNN

Module - 3 : Computer Vision (16 hr)

This module builds practical skills in real-time computer vision. Starting with NumPy image arrays, learners progress to OpenCV-based image and video processing, object detection, and multi-object tracking. The focus is on understanding pixel-level manipulation, applying classic filtering techniques, detecting objects using deep learning models, and tracking their movement across frames using OpenCV tracking algorithms—all essential for real-time vision applications.

Labs

1.Numpy Image Basics

2.OpenCV image Processing

3. Video Basics with Python and OpenCV

4.Object detection with Python and OpenCV

Module-4 : Natural Language Processing (8hr)

Natural Language Processing techniques for Entity extraction, text Classification. Understanding Different techniques to convert a sentence into a vector – Bag of words, TF-IDF.

Moving forward with Large Language models, Understanding Transformer and their architecture.

Performing Summarisation, translations, Classification activities with different Hugging face/Local system-based models and API based

LABS

1. **Understanding of Traditional ML models for Natural Language Processing – Sentiment analysis**
2. **Performing same sentiment analysis with Transformers.**
3. **Familiar ourselves with Hugging Face and Ollama based models with various Language based workloads**
4. **Deploying the activity on front end using streamlet**

Module-5 : Prompt Engineering (4 hours)

This module introduces the art and science of prompt engineering—crafting inputs to get optimal responses from generative AI systems. Learners explore prompt types, context injection, role-based prompting, few-shot learning, and code generation tasks. With hands-on labs, participants develop skills to guide large language models (LLMs) like GPT or Open-source models effectively for summarization, classification, reasoning, and creative writing.

Understand Limitations of Prompt engineering with different models

Learning this will develop them to create better AI application -agentic

Labs

1. **Understanding Prompt with different models, Knowing Hallucination**
2. **In context Learning**
3. **Role based prompting**
4. **Chain of Thoughts**

Module – 6: Generative AI application building (16 hour)

This module comprises of understanding generative AI apps with Lang chain.

Building simple Lang chain applications, Chatbots, RAG systems, SQL based QnA systems , Semantic search.

This module refers to the exposure on application building.

Labs

- 1.. Simple Langchain application**
- 2. Context aware chatbot**
- 3. Vector store and similarity search**
- 4. Retrieval augmented generation**
- 5. SQL based Retrieval augmented generation**

Module – 7: Understanding Agentic AI systems – Langgraph and CrewAI (16 hours)

This module refers to the understanding of Uniqueness in agentic systems in genai apps.

Frameworks will be using is Langgraph and Crewai. Understanding of tool calling, memory, parallel, routed workflow, different workflow orchestrations with multi-agents supports

Labs

- 1.Langgraph – creating simple agentic chatbot**
- 2. Langgraph- creating agentic RAG Chatbot**
- 3. Langgraph- Parallelisation , routing etc**
- 4. Crewai – single agents**
- 5.Crewai – Multiple agents in different orchestration**

Capstone Project : (8 hours)

Here we will be focussing on what we have learnt so far and Capstone projects

1. **Deploying a datascience model on fastapi -dockerised and deploying it on AWS**
2. **Deploying a fully functional Hugging face model.**
3. **Capston project on Image segmentation**
4. **Creating a memory based chatbot**
5. **Agentic chatbot memory based**