



Prerequisites for Advanced AI

- 1. Strong Programming Skills:**
 - Python Proficiency (Core and Libraries like NumPy, Pandas, TensorFlow, and PyTorch)
- 2. Mathematics for AI:**
 - Linear Algebra: Eigenvalues, Singular Value Decomposition
 - Calculus: Optimization, Gradients
 - Probability and Statistics: Bayesian Inference, Distributions
- 3. Basic AI and ML Knowledge:**
 - Familiarity with Neural Networks, ML Algorithms, and Generative AI

Advanced AI Syllabus

Module 1: Deep Learning Advanced Architectures

- 1. Convolutional Neural Networks (CNNs)**
 - Advanced Architectures: ResNet, DenseNet, Inception
 - Applications: Image Classification, Object Detection
- 2. Recurrent Neural Networks (RNNs)**
 - LSTMs, GRUs, and Attention Mechanisms
 - Applications: Time Series, Sequence Modeling
- 3. Transformers**
 - Detailed Study of Self-Attention and Multi-Head Attention
 - Vision Transformers (ViTs)

Module 2: Advanced Generative AI

- 1. Generative Adversarial Networks (GANs)**
 - Advanced Variants: CycleGAN, StyleGAN
 - Applications: Image-to-Image Translation, Style Transfer
- 2. Diffusion Models**
 - Concepts and Implementation for Generative Tasks
 - Text-to-Image Models (e.g., Stable Diffusion)
- 3. Large Language Models (LLMs)**
 - Deep Dive into Transformers (BERT, GPT, T5)
 - Fine-Tuning and Prompt Engineering
- 4. Foundation Models**
 - Overview of Multimodal AI (e.g., OpenAI's CLIP, DALL·E)

Module 3: Reinforcement Learning (RL)

- 1. Advanced RL Concepts**

- Policy Gradients, Q-Learning Variants (DQN, DDQN)
 - Proximal Policy Optimization (PPO)
2. **Deep Reinforcement Learning**
 - Applications in Robotics, Game Playing, and Decision Systems
 3. **Multi-Agent RL**
 - Cooperative and Competitive Environments

Module 4: Advanced Natural Language Processing (NLP)

1. **Semantic Understanding**
 - Advanced Text Embeddings (Word2Vec, FastText, BERT)
 - Sentence Transformers and Contextual Representations
2. **Advanced Applications**
 - Machine Translation with Transformers
 - Text Summarization and Question-Answering Systems
3. **Dialogue Systems**
 - Building Chatbots with LLMs
 - OpenAI's GPT Models and Conversational AI

Module 5: Advanced Computer Vision

1. **Object Detection and Segmentation**
 - Advanced Models: YOLOv5, Faster R-CNN, Mask R-CNN
 - Semantic and Instance Segmentation
2. **3D Vision**
 - 3D Object Recognition and Reconstruction
 - Applications in AR/VR
3. **Generative Vision Models**
 - Image Synthesis and Super-Resolution

Module 6: AI for Specialized Domains

1. **Healthcare AI**
 - Applications in Medical Imaging and Diagnostics
 - Drug Discovery with AI
2. **AI in Finance**
 - Fraud Detection, Risk Assessment
 - Predictive Models for Stock Market Analysis
3. **AI in Robotics**
 - Vision and Perception for Robots
 - AI-Based Control Systems

Module 7: Explainable AI (XAI)

1. **Introduction to Explainability**
 - Importance and Techniques for AI Interpretability
2. **XAI Tools**
 - LIME, SHAP, Integrated Gradients

- Model Debugging with XAI

Module 8: Ethical AI and Governance

1. **AI Ethics**
 - Bias Detection and Mitigation
 - Fairness, Accountability, and Transparency
2. **AI and Privacy**
 - Federated Learning
 - Differential Privacy
3. **Regulatory Compliance**
 - GDPR, CCPA, and AI Governance Standards

Module 9: Advanced AI Applications

1. **AI for Edge Devices**
 - Optimizing Models for Edge AI (Quantization, Pruning)
 - Deployment on IoT Devices
2. **Autonomous Systems**
 - AI for Self-Driving Cars
 - Navigation and Path Planning
3. **Real-Time AI**
 - Stream Processing with Apache Kafka and Spark
 - Real-Time Predictions

Hands-On Projects

1. **Advanced Vision:** Object Detection with YOLOv5 and Instance Segmentation
2. **Generative AI:**
 - Style Transfer with GANs
 - Text-to-Image with Diffusion Models
3. **NLP:** Fine-Tuning GPT for Custom Chatbot Development
4. **Reinforcement Learning:** Building an AI Agent to Play Chess
5. **Healthcare AI:** Tumor Detection in Medical Imaging
6. **Deployment:** End-to-End Pipeline with MLOps on Cloud

Tools and Frameworks

- **Core AI Tools:** TensorFlow, PyTorch, Hugging Face
- **Visualization:** Matplotlib, Seaborn, Plotly
- **MLOps:** MLflow, DVC, Kubeflow
- **Generative AI:** DALL·E, Stable Diffusion, OpenAI API
- **Deployment:** Docker, Kubernetes, FastAPI

More Courses:



ORACLE

PostgreSQL

MySQL



Power BI

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