DCT ARTIFICIAL INTELLIGENCE ASSOCIATE

Duration: 3 Days

Course Code: DCT - DS - AIA

Overview:

- This associate-level workshop provides a comprehensive foundation in Artificial Intelligence (AI), combining theory, practical lab work, and real-world applications. Participants will learn how AI systems are built, trained, and deployed using both open-source and cloud tools. By the end of the course, learners will be able to design small-scale AI solutions, evaluate models, and understand AI's ethical, business, and operational impacts.

Learning Outcomes

- By the end of the course, participants will be able to:
- Explain the fundamental principles, history, and categories of Artificial Intelligence.
- Prepare and process data for AI and ML applications.
- Implement machine learning and deep learning models for basic use cases.
- Understand how generative AI and large language models (LLMs) function.
- Deploy and manage AI models in both on-premise and cloud environments.
- Identify ethical and responsible AI considerations.
- Integrate AI into IT and business processes.

Target Audience

- IT Professionals, System Administrators, and Developers transitioning into AI
- Database Administrators and Data Engineers expanding into data-driven applications
- Cloud professionals seeking to integrate AI services into workflows

Course Outline

Module 1: Introduction to Artificial Intelligence and Data Foundations

AI Overview and Evolution

- What is AI? Historical context and modern developments
- Key domains: Machine Learning, Deep Learning, Generative AI, Expert Systems
- AI use cases across industries (healthcare, finance, IT operations, etc.)

Understanding AI Ecosystems

- AI frameworks: TensorFlow, PyTorch, Scikit-learn, Hugging Face
- Open-source vs. cloud AI platforms (AWS, Azure, GCP)

AI Project Lifecycle

- Defining the problem and use case selection
- Data collection and cleaning
- Model selection, training, testing, and deployment

Hands-on Labs

- Setting up Python and Jupyter Notebook environment
- Exploring datasets using Pandas and NumPy
- Simple classification using a pre-trained model

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Module 2: Machine Learning and Model Evaluation

Core Machine Learning Concepts

- Supervised, Unsupervised, and Reinforcement Learning
- Algorithms overview: Linear Regression, Decision Trees, KNN, Clustering
- Model training and validation workflow

Feature Engineering and Data Preparation

- Data normalization and encoding
- Handling missing and imbalanced data
- Feature selection techniques

Model Evaluation

- Confusion matrix, ROC curve, Precision/Recall/F1-score
- Avoiding overfitting and underfitting

Model Optimization

- Hyperparameter tuning
- Cross-validation and grid search

Hands-on Labs

- Building a supervised ML model from scratch
- Comparing algorithm performance
- Visualizing results using Matplotlib and Seaborn

Module 3: Deep Learning, Generative AI, and Neural Networks

Deep Learning Fundamentals

- Artificial Neural Networks (ANN) structure
- Convolutional and Recurrent Neural Networks (CNNs and RNNs)
- Transfer learning and pre-trained models

Generative AI

- What is Generative AI?
- Large Language Models (LLMs): GPT, BERT, Claude, Gemini
- Prompt engineering basics
- Use cases: text generation, summarization, image synthesis

Applied AI

- Computer vision, NLP, and speech recognition basics
- AI in automation (AIOps, Chatbots, Intelligent Assistants)

Hands-on Labs

- Training a neural network on image data
- Text classification and summarization using pre-trained NLP models
- Experimenting with generative AI APIs (optional if cloud resources available)

Module 4: AI Deployment, Responsible AI, and Cloud Integration

AI Deployment and MLOps

- Model packaging and versioning
- REST APIs for inference
- Introduction to MLOps and CI/CD pipelines for AI

Edge and Cloud AI

- Edge AI overview (TinyML, IoT inference)
- Cloud deployment using AWS SageMaker, Azure ML, or Vertex AI
- Cost and scaling considerations

Ethics, Governance, and Responsible AI

- Bias, fairness, and transparency
- Explainable AI (XAI)
- AI regulation and governance frameworks

Career and Industry Pathways

- AI job roles (AI Analyst, ML Engineer, Data Scientist Assistant)
- Continuing education and certifications roadmap

Hands-on Labs

- Deploying an ML model as an API endpoint
- Model explainability exercise (SHAP/LIME demo)
- Group mini-project: design an AI-based solution for a business challenge

Module 5 (Capstone Project)

Capstone Project

- End-to-end AI workflow:
  1. Define a use case
  2. Collect and preprocess data
  3. Train and evaluate model
  4. Deploy locally or via a lightweight cloud environment
- Group presentations and feedback session

Assessment and Certification

- Knowledge Check: Short quizzes and discussions at the end of each module
- Practical Evaluation: Hands-on lab submissions or in-class demos
- Capstone Project: Team-based AI solution (optional for shorter version)

Tools & Platforms used

- Languages: Python
- Frameworks: TensorFlow, Scikit-learn, PyTorch, Keras
- Libraries: Pandas, NumPy, Matplotlib, Seaborn
- Cloud Options (optional): Azure AI Studio, AWS SageMaker, or Google Vertex AI
- IDE: JupyterLab / VS Code