Mastering

Artificial Intelligence & Machine Learning

- From Foundations to ML, DL, NLP, GenAI, Agentic AI & MLOps.

Author

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DA Dandes Academy

Course Overview:

✓ This course provides a comprehensive, industry-aligned learning path for mastering Artificial Intelligence and Machine Learning. Designed with real-world applications and modern best practices, the program equips learners with the skills required to build, deploy, and optimize AI/ML models.

✓ Whether you are aiming for a career in AI, Data Science, or Machine Learning Engineering, this course offers a structured, hands-on approach to mastering AI concepts — from core fundamentals to advanced techniques.

✓ **This course is taught step-by-step. No prior AI/ML experience is required.**

Who Should Attend:

✓ **Software Engineers & Developers**
- Professionals looking to transition into AI/ML, Data Science, or AI Engineering roles.

✓ **Data Scientists & ML Engineers**
- Practitioners who want to upskill with advanced AI/ML, Generative AI, LLMs, Agentic AI, and MLOps concepts.

✓ **Tech Professionals & AI Enthusiasts**
- Individuals aiming to break into the AI/ML industry with a structured, hands-on learning approach.

✓ **Professionals Preparing for AI/ML Interviews**
- Candidates preparing for AI/ML roles at top product-based companies through strong fundamentals, projects, and interview-focused preparation.

✓ **Job Seekers Targeting High-Growth AI/ML Roles**
- Learners aiming for high-impact and high-growth AI/ML roles in leading technology-driven organizations.

Why Dandes Academy?

✓ Choosing the right AI/ML program is not just about learning algorithms — it's about building real, industry-ready skills that translate into long-term career growth.
✓ At Dandes Academy, we focus on depth, structure, and real-world application, not shortcuts.

1) Industry-Aligned, Future-Ready Curriculum

- Our 16-module AI/ML program is carefully designed to take you from foundations to advanced, production-level AI systems.

- You don't just learn models — you learn how to:
  ✓ Build end-to-end AI/ML solutions
  ✓ Work with Generative AI, LLMs, Agentic AI
  ✓ Deploy and manage models using MLOps best practices

- This ensures you're ready not just for today's roles, but for future AI careers.

2) Step-by-Step Learning (Beginner Friendly)

- This course is taught step-by-step.
  ✓ No prior AI/ML experience is required.

- **We start with:**
  ✓ Python, SQL, Data Modeling
  ✓ Mathematics, Statistics, EDA
  ✓ And gradually move into:
  ✓ Machine Learning → Deep Learning
  ✓ NLP → Generative AI → LLMs
  ✓ Agentic AI → MLOps → Capstone Project

- This structured approach ensures clarity, confidence, and strong fundamentals.

3) Founder-Led Teaching with 20+ Years of Experience

- This program is taught by **Srinivas Dande, Founder & Instructor at Dandes Academy**, with **20+ years of industry and teaching experience**.

- **What this means for you:**
    - ✓ Clear explanations from basics to advanced
    - ✓ Real-world insights, not just theory
    - ✓ Guidance aligned with actual industry expectations

4) Hands-On Learning with Real Projects

- Learning happens by doing, not just watching.

- **You will work on:**
    - ✓ Multiple mini-projects
    - ✓ Real-time industry-oriented projects
    - ✓ A final end-to-end AI/ML capstone project
- This builds a strong project portfolio that recruiters value.

5) Advanced Skills That Most Courses Don't Teach

- **Unlike many programs, we go deep into:**
    - ✓ Generative AI & LLMs
    - ✓ Fine-tuning & RAG pipelines
    - ✓ Agentic AI (Autonomous & Multi-Agent Systems)
    - ✓ Production MLOps & deployment

- These are the skills companies are actively looking for right now.

6) Strong Career & Placement Focus

- We don't just teach — we prepare you for the job market.

- **You get:**
    - ✓ Placement assistance
    - ✓ Resume & interview guidance
    - ✓ Mock interviews
    - ✓ Internship opportunities (based on performance)

- This helps you confidently target roles such as:
    - ✓ ML Engineer,
    - ✓ AI Engineer,
    - ✓ Gen AI Engineer,
    - ✓ Data Scientist,
    - ✓ Lead ML Engineer,
    - ✓ ML Architect.

7) Long-Term Learning & Flexibility

- 12 months structured program
- 5 years LMS access for recordings & materials
- Batch switching option (subject to availability)
- 100% refund within 30 days if you're not satisfied — no questions asked

What You Will Learn:

✓ **Strong AI & ML Foundations**
- Master core concepts in Supervised and Unsupervised Learning, along with Statistics, Mathematics for ML, and Exploratory Data Analysis (EDA) to build a solid foundation.

✓ **End-to-End Machine Learning**
- Design, train, evaluate, and optimize Machine Learning models using industry-standard techniques, including feature engineering, model selection, and hyperparameter tuning.

✓ **Deep Learning & Neural Networks**
- Gain hands-on experience with Deep Learning architectures, including ANNs, CNNs, and RNNs, and apply them to real-world problems.

✓ **Natural Language Processing (NLP)**
- Work with text data, covering text preprocessing, embeddings, transformers, and NLP use cases.

✓ **Generative AI & Large Language Models (LLMs)**
- Explore Generative AI, including Transformers, Diffusion Models, LLMs, and fine-tuning techniques, and build practical GenAI applications.

✓ **Agentic AI Systems**
- Learn to design and build Agentic AI workflows, including multi-step reasoning, tool usage, and real-world agent-based applications.

✓ **MLOps & Model Deployment**
- Build end-to-end AI pipelines using MLOps best practices, including model deployment, versioning, monitoring, and automation.

✓ **Hands-On Projects & Real-Time Case Studies**
- Work on multiple mini-projects and real-time industry projects to gain practical exposure and build a strong project portfolio.

✓ **Industry-Ready AI Skills**
- Gain practical skills to design, deploy, and scale AI/ML solutions, preparing you for real-world roles such as ML Engineer, AI Engineer, and ML Architect.

List of Modules

Course 1: Python Fundamentals

Course 2: Python for ML & DS

Course 3: SQL, Advanced SQL and Data Modeling

Course 4: Mathematics for ML & DS

Course 5: Exploratory Data Analysis (EDA)

Course 6: Machine Learning - Foundation

Course 7: Advanced Machine Learning

Course 8: Deep Learning - Foundation

Course 9: Advanced Deep Learning

Course 10: Image Processing & Computer Vision

Course 11: Natural Language Processing (NLP)

Course 12: Generative AI

Course 13: Large Language Models (LLMs) & Fine-Tuning

Course 14: Agentic AI (NEW)

Course 15: MLOps

Course 16: End-to-End AI/ML Project

Course 1: Python Fundamentals

- **Topic Coverage**

  - ✓ Data Types & Variables
  - ✓ Conditional Statements (if-else)
  - ✓ Loops (for, while)
  - ✓ Functions & Lambda Functions
  - ✓ Strings, Lists, Tuples, Sets, Dictionaries
  - ✓ Comprehensions (List, Dict, Set)
  - ✓ Functional Programming
  - ✓ Object-Oriented Programming
  - ✓ Decorators
  - ✓ Generators & Iterators
  - ✓ Exception Handling
  - ✓ File Handling

- **Assessment**

  - ✓ Practice Questions
  - ✓ Assignment (Python Problem Solving)
  - ✓ Test 1 - Python Fundamentals

Course 2: Python for ML & DS

- **Topic Coverage**

  - ✓ NumPy
  - ✓ Pandas
  - ✓ Matplotlib
  - ✓ Seaborn

- **Assessment**

  - ✓ Practice Questions
  - ✓ Assignment #1 - Pandas
  - ✓ Assignment #2 - Plotting
  - ✓ Test 2 - Python for ML & DS

Course 3: SQL, Advanced SQL, and Data Modeling

- **Topic Coverage**

  - ✓ SQL Query Fundamentals
  - ✓ Set Operators
  - ✓ Group By & Aggregations
  - ✓ Joins
  - ✓ Common Table Expressions (CTEs)
  - ✓ Window Functions
  - ✓ RANK, ROW_NUMBER, LEAD, LAG, etc
  - ✓ Nested Queries
  - ✓ Indexes
  - ✓ Query Optimization & Best Practices
  - ✓ Data Modeling (OLTP vs OLAP)
  - ✓ Entity Relationships
  - ✓ Normalization
  - ✓ Star Schema & Snowflake Schema

- **Assessment**

  - ✓ Practice Questions
  - ✓ Assignment #1 - Advanced SQL
  - ✓ Assignment #2 - Data Modeling
  - ✓ Test 3 - SQL, Advanced SQL, and Data Modeling

Course 4: Mathematics for ML & DS

- **Topic Coverage**

  - ✓ Probability Basics & Rules
  - ✓ Probability Distributions
  - ✓ Important Theorems
  - ✓ Descriptive & Inferential Statistics
  - ✓ Hypothesis Testing
  - ✓ Correlation & Covariance
  - ✓ Linear Algebra
  - ✓ Vectors, Matrices
  - ✓ Eigenvalues & Eigenvectors
  - ✓ Matrix Decomposition
  - ✓ Calculus for ML
  - ✓ Derivatives & Gradients
  - ✓ Optimization Intuition
  - ✓ Regression Mathematics (Linear & Polynomial)

- **Assessment**

  - ✓ Practice Questions
  - ✓ Assignment (Math → ML Mapping)
  - ✓ Test 4 - Mathematics for ML & DS

Course 5: Exploratory Data Analysis (EDA)

- **Topic Coverage**

  - ✓ Understanding the Data
  - ✓ Data Cleaning & Validation
  - ✓ Handling Missing Data & Outliers
  - ✓ Feature Engineering
  - ✓ * Encoding Techniques
  - ✓ * Scaling & Normalization
  - ✓ * Feature Transformation
  - ✓ * Time-based Features
  - ✓ Dimensionality Reduction (PCA, VIF)
  - ✓ Data Leakage Detection
  - ✓ Model Evaluation Metrics
  - ✓ Train / Validation / Test Split
  - ✓ Stratified Sampling
  - ✓ Data-Centric AI Principles

- **Assessment**

  - ✓ Practice Questions
  - ✓ Assignment (EDA + Feature Engineering Project)
  - ✓ Test 5 - Exploratory Data Analysis (EDA)

Course 6: Machine Learning - Foundation

- **Topic Coverage**

  - ✓ Introduction to Machine Learning

  - ✓ Supervised vs Unsupervised Learning

  - ✓ Supervised Learning

  - ✓ Regression Algorithms

      - Linear Regression
      - Regularization (L1, L2)
  - ✓ Classification Algorithms

      - Logistic Regression
      - Naïve Bayes
      - K-Nearest Neighbors (KNN)
      - Support Vector Machines (SVM)
      - Handling Imbalanced Data
  - ✓ Unsupervised Learning

  - ✓ Clustering Techniques

      - K-Means
      - Hierarchical Clustering
      - Elbow Method
      - Clustering Metrics & Evaluation
  - ✓ Evaluation Metrics

      - Regression Metrics
      - Classification Metrics
- **Assessment**

  - ✓ Practice Questions

  - ✓ Assignment - Supervised Learning

  - ✓ Assignment - Unsupervised Learning

  - ✓ Test 6 - Machine Learning - Foundation

Course 7: Advanced Machine Learning

- **Topic Coverage**

  - ✓ Advanced Supervised Learning
  - ✓ Decision Trees
  - ✓ Bagging Techniques
  - ✓ Random Forest
  - ✓ Boosting Techniques
    - ▪ AdaBoost
    - ▪ Gradient Boosting
    - ▪ XGBoost
  - ✓ Advanced Unsupervised Learning
  - ✓ Advanced Clustering
    - ▪ DBSCAN
    - ▪ Birch
    - ▪ GMM
  - ✓ Expectation Maximization
  - ✓ Anomaly Detection
  - ✓ Dimensionality Reduction
  - ✓ Model Selection & Optimization
  - ✓ Time Series Forecasting

- **Assessment**

  - ✓ Practice Questions
  - ✓ Mini Project #1 - Supervised Learning
  - ✓ Mini Project #2 - Unsupervised Learning
  - ✓ Test 7 - Advanced Machine Learning

Course 8: Deep Learning - Foundation

- **Topic Coverage**
  - ✓ Deep Learning Fundamentals
  - ✓ Basics of Neural Networks
  - ✓ Forward & Backpropagation
  - ✓ Gradient Descent & Optimization
  - ✓ Activation Functions
    - Sigmoid, tanH, ReLU
    - Leaky ReLU, Softmax
  - ✓ Training Deep Neural Networks
  - ✓ Weight Initialization Strategies
  - ✓ Regularization Techniques
    - L1, L2, Dropout
    - Batch Normalization
  - ✓ Learning Rate Schedulers
  - ✓ Optimizers - SGD, Adam, RMSprop-
  - ✓ Tensors & Computation
  - ✓ Deep Learning Frameworks
    - PyTorch and TensorFlow
  - ✓ Core Deep Learning Architectures
    - Convolutional Neural Networks (CNNs)
    - Recurrent Neural Networks (RNNs)
    - Long Short-Term Memory (LSTMs)
  - ✓ Hyperparameter Tuning & Model Optimization

- **Assessment**
  - ✓ Practice Questions
  - ✓ Assignment
  - ✓ Test 8 - Deep Learning - Foundation

Course 9: Advanced Deep Learning

- **Topic Coverage**

  - ✓ Advanced Deep Learning Architectures
    - Advanced CNN Architectures
    - RNN, LSTM, GRU
    - Transfer Learning
  - ✓ Advanced Training & Optimization
    - Deep Learning Model Optimization
    - Training Stability Issues
    - Cross-Validation in Deep Learning
    - Hyperparameter Search
  - ✓ Model Explainability & Responsible AI
    - Model Interpretability - SHAP and LIME
    - AI Fairness & Bias Reduction
  - ✓ Transformers
    - Introduction to Transformers
    - High-Level Overview of Transformer Architectures

- **Assessment**

  - ✓ Practice Questions
  - ✓ Mini Project #3 : Deep Learning Applications
  - ✓ Test 9: Advanced Deep Learning

Course 10: Computer Vision

- **Topic Coverage**

  - ✓ Image Processing Fundamentals

  - ✓ Convolutional Neural Networks for Vision

  - ✓ Fundamentals of CNNs

  - ✓ Modern CNN Architectures

    - ▪ SqueezeNet
    - ▪ ResNet
    - ▪ EfficientNet

  - ✓ Image Classification

    - ▪ Image Classification Concepts
    - ▪ Pre-trained CNN Models
    - ▪ Custom CNN Models

  - ✓ Object Detection

    - ▪ Object Detection Fundamentals
    - ▪ YOLO, SSD, Faster R-CNN

  - ✓ Image Augmentation & Preprocessing

    - ▪ Image Augmentation Techniques
    - ▪ Data Preprocessing for Vision

- **Assessment**

  - ✓ Practice Questions

  - ✓ Mini Project #4 : Image Classification

  - ✓ Mini Project #5: Real-Time Object Detection

  - ✓ Test 10: Computer Vision

Course 11: Natural Language Processing (NLP)

- **Topic Coverage**

  - ✓ NLP Fundamentals
    - ▪ Introduction to NLP
    - ▪ Text Preprocessing & Tokenization
  - ✓ Text Representation
    - ▪ Word Embeddings
    - ▪ Word2Vec, GloVe, FastText
  - ✓ Deep Learning for NLP
    - ▪ * Neural Networks for NLP
    - ▪ * Seq2Seq Models
    - ▪ * Transformers for NLP
  - ✓ Pretrained Language Models
    - ▪ BERT
    - ▪ T5
    - ▪ Other Pretrained Models
  - ✓ NLP Applications
    - ▪ Named Entity Recognition (NER)
    - ▪ Sentiment Analysis
    - ▪ Sentiment Analysis on Product Reviews

- **Assessment**

  - ✓ Practice Questions
  - ✓ Mini Project #6 : AI Chatbot for Customer Support
  - ✓ Test 11: Natural Language Processing (NLP)

Course 12: Generative AI

- **Topic Coverage**

    - ✓ Introduction to Generative AI

    - ✓ Applications in Text, Image, and Video Generation

    - ✓ Autoencoders

        - Introduction to Autoencoders
        - Variational Autoencoders (VAEs)
        - Denoising Autoencoders
        - Sparse Autoencoders

    - ✓ Generative Adversarial Networks (GANs)

        - GAN Fundamentals
        - GAN Variants

    - ✓ Diffusion Models

        - Diffusion Models Overview
        - Stable Diffusion
        - DALL·E
        - MidJourney

    - ✓ Generative AI Applications

        - AI-Generated Art using GANs
        - Image-to-Image Translation with CycleGAN
        - Text-to-Image Generation with Stable Diffusion

- **Assessment**

    - ✓ Practice Questions

    - ✓ Mini Project #7 : AI-Generated Art & Image-to-Image Translation

    - ✓ Test 12: Generative AI

Course 13: LLMs & Fine-Tuning

- **Topic Coverage**

  - ✓ Introduction to Large Language Models

  - ✓ Evolution of LLMs- GPT, BERT, T5, LLaMA, Claude, Gemini

  - ✓ LLM Foundations

    - Tokenization Strategies
    - WordPiece, SentencePiece, Byte Pair Encoding (BPE)
    - Pretraining vs Fine-Tuning vs Prompt Engineering

  - ✓ LLM Frameworks & Tooling

    - LangChain and LlamaIndex

  - ✓ Fine-Tuning Large Language Models

    - Fine-Tuning Open-Source LLMs - LLaMA, Falcon
    - Parameter-Efficient Fine-Tuning (PEFT) and LoRA

  - ✓ Alignment & Optimization

    - Reinforcement Learning with Human Feedback (RLHF)
    - Reward Models and Multi-Armed Bandits
    - Proximal Policy Optimization (PPO) for LLMs

  - ✓ Retrieval-Augmented Generation (RAG)

    - RAG Architecture & Workflow
    - Building RAG Pipelines for LLMs

  - ✓ LLM Applications

    - Building AI Chatbots & Assistants
    - Code Generation using LLMs- CodeLlama, StarCoder
    - Text Summarization and AI-Powered Content Creation

- **Assessment**

  - ✓ Practice Questions

  - ✓ Mini Project #8 : Fine-Tuning an LLM for a Domain-Specific Chatbot

  - ✓ Test 13: LLMs & Fine-Tuning

Course 14: Agentic AI (Autonomous & Multi-Agent Systems)

- **Topic Coverage**

  - Introduction to Agentic AI

    - What is Agentic AI
    - LLMs as Reasoning Agents
    - Agentic AI vs Traditional AI Pipelines
    - Single-Agent vs Multi-Agent Systems

  - Core Agent Concepts

    - Agent Architecture
    - Perception, Planning, Reasoning, Action Loop
    - Tool Calling & Function Calling
    - Prompting Strategies for Agents

  - Memory in Agents

    - Short-Term Memory
    - Long-Term Memory
    - Conversation Memory
    - Vector Memory using Embeddings

  - Planning & Reasoning

    - Task Decomposition
    - Planning Strategies (ReAct, Plan-and-Execute)
    - Chain-of-Thought & Reasoning Patterns
    - Handling Failures & Retries

  - Agent Frameworks & Tooling

    - LangChain Agents
    - LlamaIndex Agents
    - Tool Integration (APIs, Databases, Web Tools)

  - Multi-Agent Systems

    - Multi-Agent Architectures
    - Agent Collaboration & Coordination
    - Role-Based Agents
    - Task Delegation among Agents

- ✓ Autonomous AI Agents

    - Autonomous Decision Making
    - Long-Running Agents
    - Event-Driven Agents
    - Human-in-the-Loop Systems

- ✓ Agent Evaluation, Safety & Control

    - Agent Evaluation Metrics
    - Guardrails & Safety Mechanisms
    - Preventing Hallucinations
    - Cost & Latency Optimization
    - Ethical Considerations in Agentic AI

- ✓ Agentic AI Applications

    - AI Personal Assistants
    - Autonomous Research Agents
    - Customer Support AI Agents
    - Data Analysis & Reporting Agents

- **Assessment**

    - ✓ Practice Questions
    - ✓ Mini Project #9: Build an Autonomous AI Agent
    - ✓ Test 14: Agentic AI

Course 15: MLOps

- **Topic Coverage**

  - ✓ ML Lifecycle & Foundations
    - End-to-End ML Model Lifecycle
    - MLOps Best Practices
    - Experiment Tracking & Reproducibility
  - ✓ Model & Feature Management
    - Model Versioning
    - Feature Store Management
    - Data Versioning
  - ✓ MLOps Tooling & Platforms
    - MLflow, Kubeflow
    - TensorFlow Extended (TFX)
    - Kubernetes for Machine Learning
  - ✓ CI/CD for Machine Learning
    - CI/CD Pipelines for ML
    - GitOps for ML
    - Kubeflow Pipelines
    - Automated Training & Deployment
  - ✓ Model Deployment
    - Model Serving & Inference
    - Online vs Batch Inference
  - ✓ Monitoring, Evaluation & Optimization
    - Model Monitoring
    - Data Drift vs Concept Drift
    - Model Performance Tracking

- **Assessment**
  - ✓ Practice Questions
  - ✓ Assignment
  - ✓ Test 15: MLOps

Course 16: Final End-to-End AI/ML Project

- **Topic Coverage**
  - ✓ **Capstone Project**
    - AI-Powered Personal Assistant (Multi-Modal AI Agent)
  - ✓ **Project Scoping & Design**
    - Problem Definition
    - Requirements Gathering
    - System Architecture Design
  - ✓ **Data Collection & Preprocessing**
    - Data Collection, Cleaning & Transformation
    - Dataset Versioning
  - ✓ **Feature Engineering & Selection**
    - Feature Engineering
    - Feature Selection Techniques
  - ✓ **Model Training & Optimization**
    - Model Selection
    - Training Pipelines
    - Hyperparameter Optimization
  - ✓ **Model Evaluation & Validation**
    - Evaluation Metrics
    - Validation Strategies and Error Analysis
  - ✓ **Model Deployment**
    - API Deployment
    - Web Application Deployment
  - ✓ **Model Monitoring & Maintenance**
    - Model Monitoring
    - Performance Tracking and Drift Detection
  - ✓ **Scaling & Continuous Improvement**
    - Scalability Strategies and Cost Optimization
    - Continuous Model Improvement