Machine Learning with Advanced Python

Course Handbook 2025

Infotech College of Business & IT

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Prepared for Students and Faculty

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INFOTECH
COLLEGE OF BUSINESS AND IT

Contents

1 Welcome to the Course

Welcome to the **Machine Learning with Advanced Python Masterclass** at Infotech College! This comprehensive 10-week program is designed to transform you into a proficient AI practitioner, equipping you with cutting-edge skills in machine learning, deep learning, natural language processing, and generative AI. Whether you are a university student, a professional, or an AI enthusiast, this course offers a structured pathway to mastering advanced Python and AI technologies.

2 Course Overview

2.1 Program Details

- **Duration**: 3 Months (10 Weeks)
- **Format**: 100% Online via Live Zoom Sessions
- **Total Hours**: 60 Lecture Hours
- **Special Offer**: LKR 6,000

2.2 Who Should Enroll?

This course is designed for:

- University undergraduates (Highly recommended)
- Students awaiting university admission
- Professionals in any field
- Anyone passionate about AI and Python programming

2.3 Learning Outcomes

By the end of this course, you will:

- Understand core machine learning paradigms and algorithms
- Build and evaluate deep learning models using TensorFlow/Keras
- Apply NLP techniques for text processing and sentiment analysis
- Leverage generative AI and transformer models for innovative applications
- Complete three real-world portfolio projects to showcase your skills
- Gain insights into AI industry trends and career pathways

3 Course Structure

The course is divided into four modules, delivered over 10 weeks, with 15+ hands-on mini-projects and three portfolio projects.

3.1 Modules

1. **Machine Learning**: Supervised, unsupervised, and reinforcement learning fundamentals
2. **Deep Learning & Neural Networks**: Neural network architectures and computer vision
3. **Natural Language Processing (NLP)**: Text processing and sequence models
4. **Generative AI & Emerging Technologies**: Transformers, LLMs, and modern AI applications

3.2 Weekly Breakdown

3.2.1 Week 1: Introduction to Machine Learning

- Day 1: What is AI and Machine Learning? ML Paradigms: Supervised, Unsupervised, Reinforcement Learning
- Day 2: Supervised Learning Algorithms: Linear Regression, Logistic Regression, Decision Trees
- Day 3: Ensemble Techniques: Random Forests, Gradient Boosting (Intro)

3.2.2 Week 2: Deeper into Machine Learning

- Day 4: Support Vector Machines (SVM) and K-Nearest Neighbors (KNN)
- Day 5: Evaluation Metrics: Precision, Recall, F1-Score, ROC-AUC; Model Validation: K-Fold Cross-Validation
- Day 6: Hands-on Practice: Build and Evaluate Basic ML Models

3.2.3 Week 3: Unsupervised and Reinforcement Learning

- Day 7: Unsupervised Learning: K-Means, DBSCAN, Hierarchical Clustering
- Day 8: Dimensionality Reduction: PCA and t-SNE; Visualizing Clusters
- Day 9: Reinforcement Learning: Agent-Environment Interaction, Q-Learning Overview

3.2.4 Week 4: Introduction to Deep Learning

- Day 10: What is Deep Learning? Neural Networks vs Traditional ML
- Day 11: Neural Networks Components: Neurons, Activation Functions, Loss Functions
- Day 12: Hands-on: Build a Basic Neural Network using TensorFlow/Keras

3.2.5 Week 5: Introduction to Computer Vision

- Day 13: Convolutional Neural Networks (CNNs), Image Processing Techniques
- Day 14: Transfer Learning: Pretrained Models (VGG, ResNet)
- Day 15: Hands-on: Image Classification with Transfer Learning (Custom Dataset)

3.2.6 Week 6: Introduction to Natural Language Processing (NLP)

- Day 16: NLP Fundamentals: Tokenization, Stemming, Lemmatization, Bag of Words, TF-IDF
- Day 17: Word Embeddings: Word2Vec, GloVe, FastText
- Day 18: Hands-on: Text Classification with TF-IDF and Logistic Regression

3.2.7 Week 7: NLP with Deep Learning

- Day 19: Sequence Models in NLP: RNNs, LSTMs, GRUs
- Day 20: Introduction to Attention Mechanisms, Self-Attention, and Context Vectors
- Day 21: Hands-on: Build a Simple LSTM Model for Sentiment Analysis

3.2.8 Week 8: Introduction to LLMs and Transformers

- Day 22: Transformers: Encoder-Decoder Architectures, Scaled Dot-Product Attention
- Day 23: Overview of Popular LLMs: GPT, BERT, T5; Hugging Face Transformers Library Usage
- Day 24: Hands-on: Fine-tuning a Small Pretrained Transformer (DistilBERT/T5- small)

3.2.9 Week 9: Generative AI and Modern AI Applications

- Day 25: Generative AI Concepts: GANs, VAEs
- Day 26: Applications of Generative AI: Text, Image, and Code Generation
- Day 27: Hands-on: Prompt Engineering with GPT-like Models (Text Generation)

3.2.10 Week 10: AI in Industry, Research Trends, Career Pathways

- Day 28: AI Project Lifecycle in Industry: Data → Model → Deployment → Monitoring
- Day 29: Research Trends in AI: Multimodal AI, Self-supervised Learning, Explainable AI
- Day 30: Career Pathways in AI Industry: Roles, Skills Roadmap, Research Portfolio Building

4 Portfolio Projects

Students will complete three real-world projects to build a professional portfolio, demonstrating their ability to apply AI techniques to practical problems.

4.1 Project 1: Handwritten Digit Classifier using CNN

Domain: Computer Vision

Overview: Build a Convolutional Neural Network (CNN) to classify handwritten digits using the MNIST dataset.

Key Skills Practiced:

- Image Preprocessing
- CNN Architecture with Keras/TensorFlow/PyTorch
- Model Evaluation (Accuracy, Confusion Matrix)

Tasks:

- Load and preprocess MNIST images
- Design a 2-3 layer CNN
- Train, validate, and test the model
- Visualize predictions using Matplotlib

Deliverables:

- Jupyter Notebook or Python scripts
- Training and validation graphs
- GitHub Repository with README

4.2 Project 2: Sentiment Analysis of Customer Reviews

Domain: Natural Language Processing (NLP)

Overview: Develop a machine learning pipeline to analyze sentiment (positive, negative, neutral) from customer reviews.

Key Skills Practiced:

- Text Preprocessing (Tokenization, Stopword Removal, Lemmatization)
- TF-IDF Feature Engineering
- Train Classification Models (Logistic Regression, Random Forest)
- Evaluation using Precision, Recall, F1 Score

Tasks:

- Preprocess customer review texts
- Create a TF-IDF feature matrix
- Train and tune classification models
- Evaluate and report results

Deliverables:

- Python scripts or Notebook
- Evaluation Metrics Report
- GitHub Repository with full project files

4.3 Project 3: Text Generation with GPT-like Models

Domain: Generative AI

Overview: Use prompt engineering to generate coherent text using a GPT-like model, exploring creative AI applications.

Key Skills Practiced:

- Prompt Engineering
- Working with Pretrained Transformer Models
- Text Generation and Evaluation

Tasks:

- Design effective prompts for text generation
- Fine-tune a small pretrained transformer model
- Generate and evaluate text outputs

Deliverables:

- Jupyter Notebook or Python scripts
- Sample generated texts
- GitHub Repository with README

5 Enrollment and Contact

5.1 How to Enroll

- Join our WhatsApp Group: Click to Join
- WhatsApp your Name and Email to: 0702 422 999

5.2 Contact Information

- **Phone**: 0702 422 999
- **Website**: www.infotechcollege.com
- **Email**: admin@infotechcollege.com

6 Closing Note

At InfoTech College, we believe in empowering the next generation of AI innovators. This course is your opportunity to gain hands-on experience, build a professional portfolio, and prepare for a rewarding career in AI. We look forward to supporting you on this transformative journey!