Course Name: Applied Machine Learning Foundations for Emerging Practitioners Using Python

Contact Hours: 48 hours

Pre-requisite: Mathematical Foundations, Programming Skills, Computing Graduates, Pre-University Computing Students and Persons at Early-Stage Computing

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Abstract

This course is designed as a project-driven bridge programme aimed at transitioning learners from foundational readiness to the ability to independently design, build and deploy machine learning projects.

This is a practical, skill developing course designed to progress efficiently from core concepts into practical machine learning workflows and modern AI tools. Given the rapid evolution of Artificial Intelligence and Machine Learning, learners entering this field require early exposure to applied, hands-on development rather than prolonged theoretical study.

The emphasis throughout is on learning by building. All laboratories are fully guided and delivered using industry-relevant platforms such as Google Colab, Kaggle and Visual Studio, enabling students to develop real, demonstrable projects.

Overall, the programme is designed not merely to prepare students to study AI, but to actively create real-world solutions, rapidly strengthening their technical competence and significantly enhancing their professional portfolios.

Target Audience

This course is geared towards:

- Past Computing Graduates
- Pre-University Students
- Persons at Early-Stage Computing

Learning Outcomes

On completion of this course, learners will be able to:

- Understand the fundamental concepts and terminology used in Machine Learning and Artificial Intelligence.
- Apply Python programming techniques for data analysis, manipulation, and visualization.
- Interpret basic statistical and linear algebra concepts relevant to machine learning models.
- Prepare and preprocess datasets for machine learning applications.
- Build, train, and evaluate supervised learning models for regression and classification problems.
- Apply unsupervised learning techniques to identify patterns and structure within unlabeled data.
- Develop end-to-end machine learning projects using industry-standard platforms such as Google Colab, Kaggle, and Visual Studio.
- Implement feature engineering techniques to improve model performance.
- Use Git and GitHub for version control and collaborative project management.
- Develop introductory AI applications using no-code and low-code tools.
- Implement Retrieval-Augmented Generation (RAG) workflows using Python.
- Demonstrate foundational understanding of agentic AI systems and modern AI development practices.
- Apply basic CI/CD concepts to support reproducible and scalable machine learning workflows.
- Design and present practical machine learning solutions addressing real-world problems.
- Compile a professional project portfolio suitable for further study, internships, or entry-level AI and ML roles.

Course Content

Programming & Mathematical Foundations

- Python programming fundamentals
- Data handling and visualization
- Basic statistics (mean, variance, standard deviation)
- Linear algebra essentials (vectors and matrices)
- Outcome: Students gain sufficient foundational knowledge to engage meaningfully with ML concepts.

Supervised Learning

- Regression and classification
- Model training, evaluation, and validation
- Feature engineering
- End-to-end supervised ML projects
- Outcome: Students can build, evaluate, and interpret supervised ML models.

Unsupervised Learning

- Clustering techniques
- Dimensionality reduction
- Pattern discovery and exploratory ML
- Applied unsupervised learning projects
- Outcome: Students understand how ML can extract structure and insight from unlabeled data.

Applied AI Tools & Modern ML Workflows

- No-code and low-code chatbot development
- Git and GitHub for version control
- CI/CD fundamentals for ML workflows
- Retrieval-Augmented Generation (RAG), taught with coding
- Introduction to Agentic AI systems
- Outcome: Students gain exposure to production-oriented AI development and modern industry practices.