Course Module and Sessions: Introduction to AI and Machine Learning

Course Overview

- **Course Name**: Introduction to AI and Machine Learning
- **Duration**: 8 weeks
- **Format**: Hybrid (in-person lectures, online videos, and hands-on activities)
- **Target Audience**: Beginners and intermediate learners with basic programming knowledge (preferably Python)
- **Instructor**: Joel Odufu Ekowicho, contributor to the AI-Powered Real Estate Platform

Module 1: Foundations of AI and Machine Learning

- **Duration**: 1 week
- **Objective**: Understand the basics of AI and ML, key terminology, and setup tools for hands-on learning.
- **Total Time**: ~3–4 hours

Session 1: What is Artificial Intelligence?

- **Duration**: 45 minutes
- **Format**: Lecture (in-person or video)
- **Content**:
  - Definition of AI: Systems mimicking human intelligence
  - Brief history: Turing Test, Deep Blue, modern deep learning
  - Types of AI: Narrow, General, Superintelligent
- **Activity**: Group discussion: “Where do you see AI in daily life?” (15 min)
- **Resources**: Slides, article: “A Brief History of AI”

Session 2: Introduction to Machine Learning

- **Duration**: 1 hour
- **Format**: Lecture + Demo
- **Content**:
  - Definition: Learning from data without explicit programming
  - Types: Supervised, Unsupervised, Reinforcement Learning
  - Key terms: Data, features, models, training
  - Demo: Simple dataset exploration with Pandas
- **Resources**: Jupyter Notebook, sample CSV dataset

Session 3: Tools and Setup

- **Duration**: 1 hour
- **Format**: Hands-on Workshop
- **Content**:
  - Overview: Python, Scikit-learn, TensorFlow, Jupyter Notebook
  - Setup: Install software and test a simple script
  - Best practices: Organizing code and data
- **Activity**: Run a Python script to print “Hello, AI World!” (30 min)
- **Resources**: Setup guide, video tutorial

Module 2: Supervised Learning Basics

- **Duration**: 2 weeks
- **Objective**: Learn supervised learning concepts, build and evaluate simple models.
- **Total Time**: ~6–8 hours

Session 1: Understanding Supervised Learning

- **Duration**: 1 hour
- **Format**: Lecture
- **Content**:
  - Definition: Learning from labeled data
  - Tasks: Classification (e.g., spam detection), Regression (e.g., price prediction)
  - Examples: Real estate price prediction

- **Activity**: Quiz: Identify classification vs. regression tasks (15 min)
- **Resources**: Slides, case study: “AI in Real Estate”

Session 2: Building a Linear Regression Model

- **Duration**: 1.5 hours
- **Format**: Lecture + Hands-on
- **Content**:
  - Concept: Predicting numerical values
  - Steps: Load data, train model, make predictions
  - Code: Build a model with Scikit-learn
  - Sample: Predict house prices based on size
- **Activity**: Code a linear regression model (45 min)
- **Resources**: Jupyter Notebook, dataset (house prices)

Session 3: Model Evaluation and Improvement

- **Duration**: 1 hour
- **Format**: Hands-on Workshop
- **Content**:
  - Metrics: Mean Squared Error, Accuracy
  - Overfitting vs. underfitting
  - Improving models: Data cleaning, feature selection
- **Activity**: Evaluate your model, tweak inputs (30 min)
- **Resources**: Code template, evaluation guide

Module 3: Unsupervised Learning and Patterns

- **Duration**: 2 weeks
- **Objective**: Explore unsupervised learning, clustering, and real-world applications.
- **Total Time**: ~6–8 hours

Session 1: Introduction to Unsupervised Learning

- **Duration**: 1 hour
- **Format**: Lecture

- **Content**:
  - Definition: Finding patterns in unlabeled data
  - Tasks: Clustering, dimensionality reduction
  - Use case: Segmenting real estate markets
- **Activity**: Brainstorm: “What patterns could AI find in data?” (15 min)
- **Resources**: Slides, example: “Clustering Customers”

Session 2: K-Means Clustering

- **Duration**: 1.5 hours
- **Format**: Lecture + Hands-on
- **Content**:
  - Concept: Grouping data into k clusters
  - Steps: Choose k, assign points, refine clusters
  - Code: Cluster a dataset with Scikit-learn
- **Activity**: Cluster a sample dataset (e.g., property features) (45 min)
- **Resources**: Jupyter Notebook, dataset

Session 3: Applications and Visualization

- **Duration**: 1 hour
- **Format**: Hands-on Workshop
- **Content**:
  - Visualize clusters with Matplotlib
  - Real-world uses: Market analysis, customer segmentation
  - Limitations: Choosing k, interpreting results
- **Activity**: Plot and interpret your clusters (30 min)
- **Resources**: Code template, visualization guide

Module 4: Advanced Topics and Ethics

- **Duration**: 2 weeks
- **Objective**: Introduce advanced concepts, ethics, and prepare for a final project.
- **Total Time**: ~6–8 hours

Session 1: Reinforcement Learning and Deep Learning

- **Duration**: 1 hour
- **Format**: Lecture
- **Content**:
  - Reinforcement Learning: Learning via rewards
  - Deep Learning: Neural networks, layers, applications
  - Examples: Game AI, image recognition
- **Activity**: Discussion: “How could RL help real estate?” (15 min)
- **Resources**: Slides, video: “Neural Networks Explained”

Session 2: Ethics in AI and ML

- **Duration**: 1 hour
- **Format**: Lecture + Discussion
- **Content**:
  - Bias: Unfair predictions in models
  - Privacy: Data collection concerns
  - Accountability: Who’s responsible for AI decisions?
- **Activity**: Debate: “Should AI decide property values?” (30 min)
- **Resources**: Case study: “Bias in AI”, ethics checklist

Session 3: Project Kickoff and Q&A

- **Duration**: 1.5 hours
- **Format**: Workshop
- **Content**:
  - Project: Build an ML model (e.g., predict rents, cluster properties)
  - Steps: Choose data, train model, present results
  - Q&A: Address learner questions
- **Activity**: Start project, explore datasets (45 min)
- **Resources**: Project guide, dataset links (Kaggle, UCI)

Module 5: Capstone and Wrap-Up

- **Duration**: 1 week

- **Objective**: Apply skills to a project, review, and plan next steps.
- **Total Time**: ~3–4 hours

Session 1: Project Work and Support

- **Duration**: 1.5 hours
- **Format**: Hands-on Workshop
- **Content**:
  - Work on capstone project
  - Troubleshoot: Data issues, model tuning
  - Tips: Presenting results effectively
- **Activity**: Build and test your model (60 min)
- **Resources**: Code templates, troubleshooting guide

Session 2: Project Presentations and Review

- **Duration**: 1 hour
- **Format**: Presentations
- **Content**:
  - Present capstone projects to peers
  - Feedback: Strengths, areas to improve
  - Review key concepts: AI, ML types, ethics
- **Activity**: Share your project (30 min)
- **Resources**: Presentation tips, rubric

Session 3: Course Wrap-Up

- **Duration**: 1 hour
- **Format**: Lecture + Discussion
- **Content**:
  - Recap: Key learnings from all modules
  - Next steps: Advanced courses, Kaggle, research
  - Certificates and closing remarks
- **Activity**: Self-reflection: “What’s your AI goal?” (15 min)
- **Resources**: Resource list, certificate

Additional Notes

- **Tools Needed**: Python, Scikit-learn, Pandas, NumPy, Matplotlib, Jupyter Notebook
- **Assessment**: Quizzes (10%), activities (30%), capstone project (60%)
- **Support**: Weekly Q&A, email (joel.ekowicho@university.edu), office hours (Wed, 2–4 PM WAT)