AI for All: AI / ML Technology and Applications

Primary Instructor: Dr Shoab Khan
Instructors: Dr Yasir Jan, Dr Ali Hassan, Dr Hamood Ur Rahman
Teaching Assistance: Muhammad Ahmad, Muneeb Abbas
Contact Person: Muhammad Ahmad (0334 552 5188).
Guest Lectures: one or two Key Innovators in Silicon Valley (trying to get them in the loop)
Multi-Disciplinary Course: CS, SE, EE, CE, EM, PM, Math
Eligibility: Basic Mathematics and Basic Computer Skills, expertise in a domain area for exploration of applicability of AI

Objective

- Understanding of AI/ML concepts
- Rethinking of decision making and workflows using AI/ML
- Exploring the state of the art in deep learning and generative AI

Course Outline

This course introduces techniques in Artificial Intelligence and Machine Learning with focus on their applications to real-world problems. The objective is to extract knowledge from data to help the decision makers take wise decisions and to assist in effective working of individuals and organizations. The course should be a fun to take classes to learn new frontiers of technology without getting bogged down in too much technical details.

Week 1

1. **AI View:** Introduction to AI/ML Technology
    a. AI/ML Workflow
    b. Applications
2. **Policy View**: UAE Strategy for AI
3. **Commercial View**: OpenAI

Week 2

1. **AI View:** Basic Mathematics for ML/AI
    a. Linear Algebra
    b. Graphs
    c. Probability and Statistics
    d. Information Theory
    e. Optimization
2. **Policy View:** Australian's AI Policy
3. **Commercial View:** AI Healthcare Companies Revolutionizing Medicine
4. **Assignment 1**

Week 3

1. **AI View:** Hands-on with Python

    a. Python Basics
    b. ChatGPT writing Python code
    c. Using Python already developed code and libraries
2. **Policy View:** Indian AI for All Policy and Progress
3. **Commercial View:** AI Companies in India
4. **Assignment 2**

Week 4

1. **AI View:** AI Algorithms
    a. Path Search
    b. Swarm Intelligence
    c. Genetic Algorithm
2. **Commercial View:** Apple Practical Approach to AI
3. **Assignment 3**

Week 5

1. **AI View:** AI Algorithms
    a. Decision Tree, Random Forest
    b. Fuzzy Logic
2. **Policy View:** China AI Policy to Lead the World in AI by 2030
3. **Commercial View:** Microsoft Approach to AI
4. **Assignment 4**

Week 6

1. AI View: Modeling
    a. Mathematical Modeling
    b. Constraint Optimization Problem and Solution
2. **Policy View:** AI Strategies and Policies in USA
3. **Commercial View:** Applications of AI in Business
4. **Assignment 5**

Week 7

1. **AI View:** Unsupervised Learning for Data Exploration
    a. Clustering
    b. Dimensionality Reduction
    c. Kernel Density Estimation
2. **Policy View:** EU AI Policy
3. **Commercial View:** How Google Uses AI?
4. **Assignment 6**

Week 8

1. **AI View:** Supervised Learning for Classification and Prediction
    a. Tree-based Models
    b. Support Vector Machine
2. **Commercial View:** How to Build and AI Startup?
3. **Assignment 7**

Week 9

1. **AI View:** Supervised Learning for Classification and Prediction
    a. Linear Classification and Regression
    b. Neural Networks
2. **Policy View:** UK AI Policy
3. **Commercial View:** Intel AI

Week 10

1. **AI View:** Deep Learning
    a. CNN
    b. Recurrent Neural Networks
2. **Policy View**: Japan AI Policy
3. **Commercial View:** How Facebook uses AI?
4. **Assignment 8**

Week 11

1. **AI View:** Generative AI
    a. Transformers and Attention
    b. Deep Generative Modeling
2. **Commercial View: The Other Giants: Amazon, IBM, Oracle, Snowflake**
3. **Project Abstract**

Week 12

1. AI View: AI for Graphs Datatypes
    a. Graph Neural Networks
2. **Commercial View:** Use of AI in CARE

Week 13

1. AI View: Advance Topics
    a. Reinforcement Learning
    b. Autonomous Systems and AI
2. **Project Design Submission and Discussions**

Weeks 14

1. New Frontiers of Artificial Intelligence
2. **Project Design Submission and Discussions**

Week 15

1. New Frontiers of Artificial Intelligence
2. AI policy for Pakistan (the Draft)

Week 16

1. Projects Presentations