AI001-*Programming with Artificial Intelligence Techniques*

DURATION: 5 Days; Instructor-led

WHAT YOU WILL LEARN

The demand for automating human intensive jobs is one of the main focus of Industry Revolution 4. Artificial Intelligence (AI) is one of the long going Technology intended to substitute or complement human role in handling jobs.

Despite various technology vendors provide solution related to AI in the market (such as Cloud based services or Code Libraries), there are situation the developers should use their own AI skill in implementing more intelligent software solution.

This course is to introduce basic AI techniques in programming. The techniques introduce here can be used in languages such as C++, C#, Java, Python or others common programming languages. Due to time constraint and the course complexity, only one of these languages in used for the entire training.

Upon completion of this course, participants should be able to:

- Appreciate what AI is about
- Knowing the areas of application of AI
- Gain new perspective in understanding of complex problem
- Equip themselves with basic AI techniques in programming
- Solve more complex problem where normal techniques fail to achieve the feasible solution

AUDIENCE

- Programmers of C++, C#, Java or Python who want to learn more advance AI techniques in writing programs,
- Academics such as lecturers or researchers who want to learn how to apply the AI knowledge in writing solid code for demonstration

PREREQUISITES

REQUIRED PREREQUISITES:

- Must understand the programming language fundamentals

METHODOLOGY

This course will be conducted with heavy hands on exercises, discussions, and case study with minimum theory.

Examples from various languages depending on the audience language background will be provided to ensure the effective understanding of the course contents.

COURSE OUTLINES

Module 1– Brief Introduction to Artificial Intelligence

- The History in brief
- Is Computer intelligence?
- What is Intelligence means?
- How to conclude saying that Machine has Intelligence? – The Turing Test
- The Definition of Artificial Intelligence (AI)
- The sub-Areas of AI
- The Application Areas of AI

Module 2- Common ground of different AI Sub-Areas

- Problem Solving Techniques
- Knowledge Representation Techniques
- The Scope of this training
- Exercise: Solving Magic-3x3 Problem

Module 3 – Problem Complexity

- The Big-O Notation
- Branch & Bound Brute Force Technique
- The power of Recursion
- Exercise: Solving 8-Queens Problem
- The power of Modeling
- Leverage on Constraints to reduce problem complexity
- Student Challenge: Send-More-Money
- Converting Tail-Recursion to Iteration
- Student Challenge: Sudoku

Module 4- Non-Polynomial Hardness

- Case Study: Magic 4x4
- HP-Hard Problems
- Exponential Explosion
- Reduce complexity with Pruning Technique
- Exercise: Magic 4x4
- Difference between Operational Research and AI approach in dealing with HP-Hard problem

Module 5- Problem Solving as Search Space Traversal

- Types of Problem Search Space
- State and Transition
- Initial and Goal States
- State Abstraction
- Branching Factor
- Reducing Problem Complexity with Search Space Pruning
- What is the Objective?
- Case study:8 Puzzle

Module 6– Searching Techniques

- Blind Search: Depth First Search and Breadth-First Search
- Limited Depth Bound Technique
- What is Heuristic?
- Heuristic Function and Cost Function
- Intelligent Search: Best-First
- The "Fail-First" Heuristic
- Open-Closed List Algorithm
- Exercise: Solving 8 Puzzle Problem

Module 7– 2 Player Game

- The Min-Max Tree
- State evaluation
- The Back-Up Value
- Look ahead
- Alpha-Beta Pruning technique
- Exercise: Tic-Tac-Toe

Module 8– Conclusion

- Why AI is important in IR4?
- What kind of Jobs will be replaceable by AI?
- Foreseeable near future AI applications
- What's next in learning AI?
- Closing Remarks