Centre for Machine Learning and Intelligence
Generic Elective
Artificial Intelligence in IoT
(Applicable for the UG Students admitted from 2023 – 2024 onwards)

Semester : 1,3,4,6

Subject Code : 23BAIGE1

Hours of Instructions / Week: 5+1

No. of Credits: 6

Objectives:

1. To study the fundamentals of Artificial Intelligence with IoT
2. To implement Artificial Intelligence methods to solve IoT based problems
3. To introduce the advanced concepts like TinyML, Genetic Algorithm and Reinforcement Learning

Unit I: Principles and Foundations of IoT and AI   -15 Hrs

Definition of IoT - IoT reference model, IoT platforms, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation,Introduction to Big data and IoT, Infusion of AI –Introduction to Data science in IoT,Introduction to AI platforms and IoT platforms, Introduction to TensorFlow and Keras.

Unit II: Genetic Algorithm for IoT   -15Hrs

Introduction to genetic algorithms - The genetic algorithm, Crossover, Mutation, Pros and cons, Coding Genetic algorithms using Distributed Evolutionary Algorithms in Python - Genetic algorithm for CNN architecture, (Genetic algorithm for LSTM optimization) *. Rainfall indicator using genetic algorithm, Robotics using genetic algorithm.

Unit III: Reinforcement Learning for IoT   -15 Hrs

Reinforcement Learning terminology, Deep reinforcement learning. Simulated environments - OpenAI gym. Q-learning - Taxi drop-off using Q-tables. Q-Network - Taxi drop-off using Q-Network, (DQN to play an Atari game)*, Double DQN, Dueling DQN. Policy gradients - Pong using policy gradients, actor-critic algorithm, Chatbots using Reinforcement learning, Movie recommendation system using reinforcement learning.

Unit IV: TinyML   -15 Hrs

Introduction to TinyML, Applications of TinyML, Introduction to the Hardware needed for the TinyML, Introduction to the Software needed for TinyML, Introduction to Edge Impulse, Introduction to Edge Impulse, Introduction to TF-Lite.

Unit V: AI for Personal, Home IoT, Industrial IoT and Smart Cities IoT   -15Hrs

Continuous glucose monitoring, Hypoglycemia prediction using CGM data, Heart monitor, Human activity recognition, HAR from videos, Smart lighting, Home surveillance, Electrical

load forecasting in industry, Smart traffic management, Smart parking, (Smart waste management) *.

<div align="right">

* Indicates Self - Study Component

Total Hours: 75

</div>

Reference Books:
1. Amita Kapoor, (2019), *"Hands-On Artificial Intelligence for IoT"*,Packt Publishing.
2. Deepak Khemani, (2017), *"Artificial Intelligence"*, Tata Mc Graw Hill Education (Reprint).

E-Learning Resource:

1. https://www.tutorialspoint.com/internet_of_things/index.htm

Course Outcomes:
CO1: Acquire in-depth knowledge of Artificial Intelligence with IoT
CO2: Understand the concepts of Genetic Algorithm
CO3: Analyze the concept of Reinforcement Learning
CO4: Explore the knowledge of TinyML
CO5: Explore various real world applications using AI-IoT