**Name of the Programme** : **M.Sc. in Data Science**
**Course Code** : **CSD-507**
**Title of the Course** : **Fundamentals of AI (Practical)**
**Number of Credits** : **2 (0L-0T-2P)**
**Total Contact Hours** : **60 hours (0L-0T-60P)**
**Effective from AY** : **2023-24**

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| **Pre-requisites for the course** | Artificial Intelligence theory, probability and statistics, linear algebra, and Python programming | |
| **Course Objectives:** | To develop a basic understanding of<br>1. Problem solving<br>2. Knowledge representation<br>3. Reasoning and learning methods of AI<br>4. Implementing AI algorithms | |
| **Content:** | Assignment-1 -Real-world path planning for pedestrians. In the first part, students implement A* over a map that includes roads/paths as well as elevations. In the second part, students collect actual data through walking around the real world, and the cost model is then learned via regression techniques. | **10 hours** |
| | Assignment-2 -Solve maze via search -this assignment involves formulating maze-solving as a search problem, image processing (via OpenCV) as a step in maze-solving, as well as guided performance/quality analysis of representational parameters | **10 hours** |
| | Assignment 3-Within the context of an artificial intelligence course, students are taught to identify ethical issues within technical projects and to engage in moral problem solving with regard to such issues. | **10 hours** |
| | Assignment 4-Neural network for face recognition using tensor flow -build feedforward neural networks for face recognition using TensorFlow. Students then visualize the weights of the neural networks they train. The visualization allows students to understand feedforward one-hidden layer neural networks in terms of template matching, and allows students to explore overfitting. | **10 hours** |

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| | Assignment -5 -Organic path finding -Students develop a "humanlike" pathfinding technique by specializing a generic search algorithm with custom action cost and heuristic cost functions. Students apply classical search algorithms and reflect on example organic paths to achieve "human-like" pathfinding. | **10 hours** |
| | Assignment - 6 -Implement a genetic algorithm in Python to evolve strategies for Robby the Robot to collect empty soda cans that lie scattered around his rectangular grid world. And also Compare the performances of a brute-force search and a search employing the Minimum Remaining Values (MRV) heuristic in solving Sudoku puzzles. | **10 hours** |
| **Pedagogy:** | lectures/practical/ tutorials/assignments/self-study | |
| **References /Readings:** | 1. GF Luger, (2002). Artificial Intelligence, Pearson Education, 2002.<br>2. M.C. Trivedi, (2019). A Classical Approach to Artificial Intelligence, Khanna Book Publishing.<br>3. Nilsson, N. J. (1998). Artificial intelligence: a new synthesis. Morgan Kaufmann.<br>4. Padhy, N. P. (2005). Artificial intelligence and intelligent systems (Vol. 337). Oxford: Oxford University Press.<br>5. Russell, S. J., & Norvig, P. (2010). Artificial intelligence a modern approach. London.<br>6. V., Rich, E., Knight, K., & Nair, S. (2009). Artificial Intelligence. Tata McGraw Hill. | |
| **Course Outcomes:** | 1. Students will demonstrate a deep understanding of feedforward neural networks and the backpropagation algorithm.<br>2. Students will be able to extend an existing implementation of the backpropagation algorithm to recognize static hand gestures in images.<br>3. Students will learn digit recognition using the MNIST dataset, applying their knowledge of feedforward neural networks and backpropagation.<br>4. Implementation of Advanced Search Strategies in Game Playing. | |

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