SPECIALIZATION STREAMS

AI-ML Stream

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| Course Code | Course Name | Course Category | Credits | | | |
| L | T | P | C |
| CSE 413 | Artificial Intelligence | SE | 3 | 0 | 2 | 4 |

UNIT 1: INTRODUCTION

What is Artificial Intelligence, Foundations and History of Artificial Intelligence, PEAS descriptions, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents.

UNIT 2: SEARCHING

Introduction to Search, Searching for solutions, Uninformed search strategies, Informed search strategies (heuristic search techniques), Local search algorithms.

UNIT 3: MULTI-AGENT SEARCH STRATEGIES AND OPTIMIZATION

Game playing, Adversarial Search (minimax, alpha-beta pruning.), Constraint satisfaction problems , Evaluation function, Population based search (GA, ACO).

UNIT 4: KNOWLEDGE REPRESENTATION AND REASONING

Inference, Propositional Logic, Predicate Logic (first order logic), Logical Reasoning, Forward & Backward Chaining, Resolution; AI languages and tools - Prolog.

UNIT 5: PROBLEM SOLVING

Formulating problems, problem types, Solving Problems by Searching, heuristic search techniques, constraint satisfaction problems, stochastic search methods, and propositional logic. Case studies: 9

TEXTBOOKS

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education, Third Edition, Pearson Education, 2008.

REFERENCES

1. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill, 3rd edition, 2017.
2. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson.

LIST OF PRACTICAL EXPERIMENTS

1. Week 1:

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| Problem statement  Write a program to convert a binary search tree (BST) into a min-heap. Also show the traversals on the given BST.  Example  Input  7  5 3 2 4 8 6 10  Output  2  3 6  4 5 8 10  HInt:  To convert a binary search tree to a heap tree, insert the specified values in the binary search tree and use the heap property. Then use level order traversal to print the output. |

1. Week 2:

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| Given an M × N boggle board, find a list of all possible words that can be formed by a sequence of adjacent characters on the board.  We are allowed to search a word in all eight possible directions, i.e., North, West, South, East, North-East, North-West, South-East, South-West, but a word should not have multiple instances of the same cell.  For example: In the above 4 × 4 boggle board. If the input dictionary is [START, NOTE, SAND, STONED], the valid words are [NOTE, SAND, STONED].  Hint: Use DFS |

1. Week 3:

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| Chess Knight Problem: Given a chessboard, find the shortest distance (minimum number of steps) taken by a knight to reach a given destination from a given source.  Sample Input:    N = 8 (8 × 8 board)  Source = (7, 0)  Destination = (0, 7)    Output: Minimum number of steps required is 6  Hint: USe BFS |

1. Week 4: Given a Directed Acyclic Graph (DAG), print it in topological order using topological sort algorithm. If the graph has more than one topological ordering, output any of them. Assume valid Directed Acyclic Graph (DAG).
2. Week 5: Program for Iterative deepening depth-first search. Compare the results with DFS, for any example problem.
3. Week 6: Implement A\* algorithm. Illustrate with an example (Tic-Tac-Toe).
4. Week 7: Implement Iterative Deepening A\* algorithm (IDA\*).
5. Week 8: Graph clouring/Cryptarithmatic problem.
6. Week 9: Genetic Algorithm (GA)
7. Week 10:  ACO
8. Week 11: Write a program for Usage of rules in Prolog.

Create a family tree program to include following rules 1. M is the mother of P *if* she is a parent of P and is female 2. F is the father of P *if* he is a parent of P and is male 3. X is a sibling of Y *if* they both have the same parent. 4. Then add rules for grandparents, uncle-aunt, sister and brother. Based on the facts, define goals to answer questions related to. .

1. Week 12: Write a prolog program to solve “Water Jug Problem”.
2. Week 13: Write a program to implement a monkey banana/Cannibals problem.
3. Week 14: Write a program to implement 8 Queens Problem.
4. Week 15: Write a program to solve traveling salesman problems.
5. Week 16: Case Study: Path planning using AI algorithm.