INT428:ARTIFICIAL INTELLIGENCE ESSENTIALS

L:3 T:0 P:1 Credits:4

Course Outcomes: Through this course students should be able to

CO1 :: describe basic knowledge representation, problem solving, and learning methods of artificial intelligence.

CO2 :: compare uninformed and informed search strategies to solve AI problems.

CO3 :: discuss knowledge representation and statistical reasoning methods for AI.

CO4 :: analyze different AI strategies for game playing and NLP essentials.

CO5 :: explain Generative AI fundamentals and prompt engineering for crafting effective prompts.

CO6 :: apply the learned skills and techniques through hands-on tasks that involve a combination of GPT tools, data analysis, visualization, and presentation creation.

Unit I

Introduction : What is intelligence?, what is artificial intelligence?, Foundations of artificial intelligence(AI), History of AI, Basics of AI, Artificial Intelligence Problems, Artificial Intelligence Techniques, applications of AI, branches of AI, Modern AI tools and their Applications

Problem Spaces and Search : Defining the problem as a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in designing search problems

Unit II

Uninformed Search Strategies : Breadth first search (BFS), Depth first search (DFS), Bi-directional Search, Iterative Deepening

Informed Search Strategies : Heuristic functions, Generate and Test, Hill Climbing, Simulated Annealing, Best first search, A* algorithm, Constraint satisfaction

Unit III

Knowledge Representation : Approaches in knowledge representation, Issues in knowledge representation, Propositional logic, Predicate logic, Forward versus backward reasoning

Statistical reasoning methods : Probability & Bayes' theorem, Bayesian networks, Dempster Shafer-Theory, Certainty factors & rule-based systems

Unit IV

Game playing : Evaluation function, Minmax Problem, The min-max search procedure, Alpha-beta cutoffs, Alpha-beta pruning

Natural Language Processing : Introduction to NLP, NLP phases, Construction of parse tree, Spell checking, Bag of words model, Soundex algorithm, Applications of NLP, Chatbots, Alexa, Siri, Cortana

Unit V

Introduction to Generative AI : Fundamentals of Generative AI, Generative AI model types, How Gen AI works, Difference between GPTs and search engines

Prompt Engineering : Fundamentals of prompt, Importance of Prompt Engineering, Overview of language models, Key elements of a good prompt, Prompt Patterns, Prompt Tuning

Unit VI

ChatGPT Advance Data Analysis : ChatGPT Advanced Data Analysis vs. ChatGPT, Building Data Visualization and Creating a Presentation, Working with structured data, Working with media, Zip files for automation, Working with small documents, Appropriate use of ChatGPT Advanced Data Analysis, Human and AI Process planning, Error identification techniques, Error handling

Advanced topics in Artificial Intelligence : Machine Learning and its types, Overview of Neural Networks, Overview of Genetic Algorithms, Overview of Fuzzy Logics

List of Practicals / Experiments:

List of Practicals

- Implement state space search and production system to solve water jug problem.
- Implement Breadth First Search (BFS) and Depth First Search (DFS).
- Implement Best first search on a given problem.

- Using AI tools for content creation and editing of text and presentation
- Using AI tools for image, audio and video editing
- Implement Bayes theorem and Bayesian network and perform inference.
- Implement the Minimax algorithm with Alpha-Beta pruning for a simple game.
- Create a web application where users can drag and drop documents to get AI-generated summaries.
- Implement a chatbot to automate customer support for common queries.
- Use ChatGPT Advanced Data Analysis to build data visualizations and create presentations based on structured data.

Text Books:

1. ARTIFICIAL INTELLIGENCE by RICH, KNIGHT, MCGRAW HILL EDUCATION

References:

1. INTRODUCTION TO GENERATIVE AI by NUMA DHAMANI AND MAGGIE ENGLER, Manning Publications

2. ARTIFICIAL INTELLIGENCE: A MODERN APPROACH by STUART RUSSELL, PETER NORVIG, PEARSON