Artificial Intelligence Syllabus

Module: Artificial Intelligence

Semester: 2nd Year 2022

S.N	CONTENT	HOUR	REMARKS
1	Introduction to Artificial Intelligence	3	
	• Artificial Intelligence (AI), • AI Perspectives: acting and thinking humanly, acting and thinking rationally • History of AI • Foundations of AI: Philosophy, Economics, Psycology, Sociology, Linguistics • Neuroscience, Mathmatics, Computer Science, Control Theory • Applications of AI • Risk and Benefits		Lecture / Tutorial presentation
2	Intelligent Agents	2	
	• Agents and Environments • Good Behavior: The Concept of Rationality • The Nature of Environment • The structure of Agents		Lecture / Tutorial presentation
3	Problem Solving by Searching	9	
	• Solving Problems by Searching, Search Strategies: Informed, Uninformed, Performance evaluation of search strategies: Time Complexity, Space Complexity, Completeness, Optimality • Uninformed Search: Depth First Search, Breadth First Search, Depth Limited Search, Iterative Deepening Search, Uniform Cost Search, • Bidirectional Search Informed Search, Heuristic Function, Admissible Heuristic, Informed Search Techniques: Greedy Best First Search, A* Search, Optimality and Admissibility in A*, Hill Climbing Search, Simulated Annealing Search • Game Playing, Adversarial Search Techniques: Mini-max Search, Alpha -Beta Pruning • Constraint Satisfaction Problems, Examples of Constraint Satisfaction Problems		Lecture / Tutorial Presentation/ demonstration

4	Knowledge Representation	6	
	• Definition and importance of Knowledge, Issues in Knowledge Representation, Knowledge Representation Systems, • Properties of Knowledge Representation Systems • Types of Knowledge Representation Systems: Semantic Nets, Frames, Conceptual • Dependencies, Scripts, Rule Based Systems (Production System), Propositional Logic, Predicate Logic • Propositional Logic(PL): Syntax, Semantics, Formal logic -connectives, truth tables, tautology, validity, well -formed -formula, Inference using Resolution, Backward Chaining and Forward Chaining • Predicate Logic: FOPL, Syntax, Semantics, Quantification, Inference with FOPL: By converting into PL (existential and universal instantiation), Unification and lifting, Inference using resolution		Lecture / Tutorial Presentation /demonstration
5	Machine Learning	9	
	• Introduction to Machine Learning, • Concepts of Learning, Supervised, Unsupervised and Reinforcement Learning • Linear Regression and Classification • Ensemble Learning • Statistical-based Learning: Naive Bayes Model • Developing Machine Learning Systems		Lecture / Tutorial 2 LABS Required Presentation/ demonstration
6	Deep Learning	6	
	• Introduction, • Biological Neural Networks Vs. Artificial Neural Networks (ANN), • Mathematical Model of ANN, • Activation Functions: Linear, Step Sigmoid, • Types of ANN: Feed-forward, Recurrent, Single Layered, Multi-Layered, • Application of Artificial Neural Networks, Learning by Training ANN, • CNN, • RNN, • Supervised vs. Unsupervised Learning, • Hebbian Learning, • Perceptron Learning, • Back - propagation Learning, • transfer learning		Lecture / Tutorial 1 LABS Required presentation/ demonstration

7	Reinforcement Learning	3	
	• Learning from Rewards • Passive Reinforcement Learning • Active Reinforcement Learning • Generalization in Reinforcement Learning • Policy Search • Applications of Reinforcement Learning		Lecture / Tutorial presentation/demonstration
8	Natural Language Processing	3	
	• Language Models, • Grammar, Parsing, • Augmented Grammars, • Complications of Real Natural Language • Natural Language Tasks		Lecture / Tutorial presentation/ demonstration
9	Deep Learning for NLP	3	
	• Word Embeddings, • Recurrent Neural Networks for NLP, • Sequence-to-Sequence Models, • The Transformer Architecture, • Pretraining and Transfer Learning, • State of the art		Lecture / Tutorial presentation/ demonstration
8	Computer Vision & Robotics	3	
	• Computer Vision: Image Formation, Simple Image Features, Classifying Images, Detecting Objects, The 3D World, Using Computer Vision • Robotics: Robot Hardware, Robotic Perception, Planning and Control, Planning Uncertain Movements, Reinforcement Learning in Robotics, Humans and Robots, Application Domains		Lecture / Tutorial presentation/ demonstration

LAB PREPARATION

S.N	Chapter Unit	Lab Hour	Requirements
1	5	3	● Python installation ● Installation of ML packages ● Running a simple ML algorithms
2	5	3	Using Machine Learning Algorithms: ● Running NLP Projects ● Running Computer Vision Projects ● Running Data Science Projects
3	6	3	Using Deep Learning Algorithms: ● Running NLP Projects ● Running Computer Vision Projects ● Running Data Science Projects