Name of the Programme: MCA
Course Code: CSA-611
Title of the Course: Artificial Intelligence
Number of Credits: 4 (2L-2T-0P)
Effective from AY: 2022-23

Prerequisites for the course	Strong knowledge of Mathematics; Good command over programming languages; Good Analytical Skills; basic knowledge of Statistics and modelling.	
Objectives:	This course provides students with an in-depth introduction to the five main tribes of Artificial Intelligence-namely Symbolists, Connectionists, Bayesians, Evolutionaries and Analogizers. Symbolists systems include Decision trees, Random decision forests, Production rule systems, inductive programming. Connectionists include Artificial Neural nets, Reinforcement learning, Deep learning Bayesians include Hidden Markov Chains-Graphical Models-Causal inference Evolutionary -biologist - biologically inspired computing Analogizers (psychologists) include k nearest neighbour algorithm. This course is aimed at exploring all facets of AI and obtain in-depth understanding of this facilitating field.	
Content:	**Unit-1** :-Introduction to AI :- The roots of Artificial Intelligence - Five tribe of AI -The symbolist - connectionist -Evolutionaries-The Bayesians-Analogizer **Unit-2**:-Symbolic Tribe (Symbolic AI) Problem-solving-Solving Problems by Searching -Search in Complex Environments - Adversarial Search and Games -Constraint Satisfaction Problems . Knowledge, reasoning, and planning Logical Agents - First-Order Logic - Inference in First-Order Logic - Knowledge Representation - Automated Planning . **Unit-3** :-Bayesian Tribe :- Uncertain knowledge and reasoning - Quantifying Uncertainty -Probabilistic Reasoning-Probabilistic Reasoning over Time -Probabilistic Programming -Making Simple Decisions -Making Complex Decisions -Multiagent Decision Making **Unit-4**:- Connectionism tribe :- Machine Learning - supervised learning -unsupervised learning-Artificial neural networks-perceptron-MLP-deep neural network -CNN-RNN-LSTM -hop field neural network **Unit-5** :- Evolutionaries tribe:- An Overview of Combinatorial Optimization-An Introduction to Genetic Algorithms-Theoretical Foundations of Genetic Algorithms-Genetic Algorithms in Engineering and Optimization-Genetic Algorithms in Natural Evolution-Simulated Annealing and Tabu Search GALib-Genetic Algorithm Optimization Toolbox (GAOT) under Matlab. **Unit-6** :- Analogizers :- constrained optimization ,Margin and SVM-hard margin and soft margin, non-linearity - kernel- different types of kernels-k nearest neighbors **Unit 7** :- Communicating, perceiving, and acting-Natural Language Processing -Deep Learning for Natural Language Processing - Computer Vision -Robotics Conclusions- Philosophy, Ethics, and Safety of AI - Explainable AI - The Future of AI **Problem Solving during Tutorial Slots…** 1. Real-world path planning for pedestrians. In the first part,	1 hour 5 hours 5 hours 5 hours 5 hours 5 hours 4 hours 10 * 3 = 30 hours

	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. 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. 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. 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. 5. Organic path finding -Students develop a "human-like" 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. 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. 7. Compare the performances of a brute-force search and a search employing the Minimum Remaining Values (MRV) heuristic in solving Sudoku puzzles. 8. The students need to understand and extend an existing implementation of the back-propagation algorithm and use it to recognize static hand gestures in images. 9. Students learn about feedforward neural networks and the backpropagation algorithm by implementing a perceptron network for AND and XOR Boolean functions and, given an implementation of a feedforward network, learn digit recognition using the MNIST data set. 10. In this assignment students extend a Tic Tac Toe program to Ultimate Tic Tac Toe and implement a different search strategy than the example code.	
Pedagogy:	Lectures/ tutorials/assignments/self-study.	
References/ Readings	Main Reading :- 1. Master algorithm by pedro domingos 2. Artificial Intelligence -Modern approach -Russel and Norvig- 4th Edition 3. Hands on Machine learning with sci-kit learn and tensorflow- Orellie 4. Deep learning with python by Francois - 5. Elements of statistical learning - Trevor Hastie,Robert and Jerome -springer. 6. Bayesian reasoning and machine learning - David barber 7. Genetic algorithm by David E Goldberg.	

	8. Artificial Intelligence- A Modern Approach (3rd edition) by norvig , russel 9. Artificial Intelligence By Example-2nd edition by Denies Rothman,PACKT 10. Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning 11. Human Compatible: Artificial Intelligence and the Problem of Control by Stuart Russel References 1. Artificial Intelligence - A guide for thinking humans by Melaine Mitchell. 2. A world without work - by Daniel susskind. 3. Genius Makers -Cade Metz 4. what computer still cannot do by Hubert Dreyfus 5. The alignment problem -Brian Christian 6. Clara and sun by Kazuo Ishiguro 7. Rebooting AI by Gary Marcus and Ernest Davis 8. Four futures -Peter Frase 9. Flake, The Computational Beauty of Nature, MIT Press, 1998. 10. von Neumann, The Computer and the Brain. Yale University Press, 1958 11. https://formtek.com/blog/artificial-intelligence-the-five-tribes-of-ai/	
Course Outcomes	By the end of the course , students will be able to - ● understand a wide variety of AI algorithms. ● learn to apply different tribes in different applications. ● understand how to apply a variety of learning algorithms to data. ● understand how to perform evaluation of learning algorithms and model selection. ● further learn to understand the need to understand Master algorithm - unification of all algorithms to solve complex problems. ● carry out the mini project work with respect to the different paradigms.	

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