IART - Inteligência Artificial/Artificial Intelligence - LEIC

Planeamento da Unidade Curricular / Course Plan - 2024/2025

Week	Date	Theoretical Class	Kahoots	Dates	Practical Classes	Assignments	Exams
1	12-Feb	0. Curricular Unit Presentation. I. Introduction to Artificial Intelligence (AI). Definition of AI. Fundamentals, Scope, Evolution and Chronology of AI. Machine Learning. Neural Networks. Generative AI. Agents and Agentic AI, Reinforcement Learning. Robotics. Problems and Approaches of AI and Intelligent Systems. AI Applications. Practical Examples of Application and Exercises. II. Intelligent Agents and Multi-Agent Systems. The Concept of Agent. Environments. Agent Architectures: Reactive, Deliberative, Goal-Based, Utility-Based, Learning and BDI. Multi-Agent Systems.	Kahoot 1	---------	---------- 1st Week ----------	---------	---------
2	19-Feb	III. Problem Solving Methods. Problem Formulation. State Space. Search Strategy. Uninformed Search: Breadth First, Depth First, Uniform Cost, Iterative Deepening, Bidirectional Search. Intelligent Search: Greedy Search, A* Algorithm, Weighted A*. Practical Examples of Application and Exercises. III. Problem Solving Methods. Search with Adversaries: Game Search, Minimax Algorithm, Alpha-Beta Cuts. Presentation of Assignment 1.	Kahoot 2	17-20 Feb	Problem Solving Methods. Problem Formulation. State Space. Search Strategy. Uninformed Search. Intelligent Search: Greedy Search, A* Algorithm. Resolution of Exercise 1. Presentation of Assignment 1.	**Assignment 1: Student Work Selection.**	----------
3	26-Feb	III. Problem Solving Methods. Search with Adversaries: Monte Carlo Tree Search, Search with Imperfect Information. Practical Examples of Application and Exercises. IV. Optimization and Metaheuristics. Formulation of Decision/Optimization Problems. Local Search. Hill-Climbing Algorithm.	Kahoot 3	24-27 Feb	Problem Solving Methods. Search with Adversaries: Minimax Algorithm. Resolution of Exercise 2. Work Monitoring/Support for Assignment 1.	Assignment 1: Work.	----------
4	5-Mar	IV. Optimization and Metaheuristics. Individual Based Meta-Heuristic; Simulated Annealing; Tabu Search. Practical Examples of Application and Exercises. IV. Optimization and Metaheuristics. Population-Based Metaheuristics. Genetic Algorithms and Evolutionary Computation. "Ant Colony". Particle Swarm Optimization. Practical Examples of Application and Exercises.	Kahoot 4	05-11 Mar	Optimization and Metaheuristics: Problem Formulation. Hill-Climbing, Simulated Annealing, Genetic Algorithms. Resolution of Exercise 3. Work Monitoring/Support for Assignment 1.	Assignment 1: Work.	----------
5	12-Mar	V. Knowledge Engineering. Knowledge Representation and Reasoning. Propositional and Predicate Logic. Semantic Networks, Frames, Rules, and Ontologies. Logic Programming and Programming with Constraints. Constraint Satisfaction. V. Knowledge Engineering. Reasoning with Uncertain Knowledge. Knowledge-Based Systems. Practical Examples of Application and Exercises.	Kahoot 5	12-13 Mar	Work Monitoring/Support for Assignment 1.	**Assignment1: CheckPoint Delivery (14 Mar)**	----------
6	19-Mar	VI. Machine Learning. Introduction to Machine Learning. History and Motivation for Machine Learning. Main Types of Machine Learning: Supervised Learning, Unsupervised Learning and Reinforcement Learning. Deep Learning Concept. Applications of Machine Learning. Practical Examples of Application and Exercises. VI. Machine Learning (ML): Supervised Learning. Practical Knowledge Discovery and Data Mining. Methodologies: KDD, SEMMA and CRISP-DM. Data: Types, Data Quality, Preprocessing and Transformation. Model Interpretation and Evaluation. ML Tools, Libraries. Application Examples.	Kahoot 6	17-20 Mar	Assignment 1: Checkpoint Presentation (17-20 Mar).	**Assignment 1: Checkpoint Presentation (17-20 Mar).**	----------
7	26-Mar	VI. Machine Learning (ML): Algorithms. Decision Trees. K-Nearest Neighbour. Artificial Neural Networks: Basic principles and fundamental algorithms. Support Vector Machines. Practical Application Examples. VI. Machine Learning (ML): Artificial Neural Networks. Practical Application Examples. Introduction/Presentation of Assignment 2.	Kahoot 7	24-27 Mar	Work Monitoring/Support for Assignment 1.	Assignment 1: Work.	----------
8	2-Apr	VI. Machine Learning: Reinforcement Learning. Concepts of State, Action, Policy, Reward and Value. Exploration-Exploitation Tradeoff. Markov Decision Processes. Tools and Libraries. VI. Machine Learning: Reinforcement Learning. Algorithms: Qlearning, SARSA. Deep Reinforcement Learning. Algorithms: DQN, PPO and SAC. Choosing the Best Learning Method. Practical Application Examples.	Kahoot 8	31Mar-3Apr	Assignment 1: Final Presentation, Demonstrations and Evaluation (Mar31-Apr3).	**Assignment1: Final Delivery 30 Mar. Final Presentation (Mar31-Apr3).**	----------

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9	9-Apr	VII. Natural Language Processing (NLP). Introduction to NLP. Levels of Processing. Classical approach. Grammars with Defined Clauses. Statistical Approach. Text Mining. NLP Tasks. Languages Resources. NLP Applications. VII. Natural Language Processing (NLP). Machine Learning in NLP. Basic Text Processing: Normalization, Tokenization, Segmentation. Text Classification. Bag of Words. Naive Bayes. Generative vs Discriminative Classifiers. Word Embeddings. Deep Learning in NLP. Practical Application Examples.	Kahoot 9	7-10 Apr	Supervised Learning. Resolution of Exercise 4. Introduction/Presentation of Assignment 2.	**Assignment 2: Student Work Selection.**	**Exam 1 (Apr 10) - 14h30m**
10	16-Apr	---------- Easter ----------	- Easter -	14-17 Apr	---------- Easter ----------	Assignment 2: Work.	----------
11	23-Apr	VIII. Advanced Topics in Artificial Intelligence - Perception / Vision, Multi-Agent Systems, Communication, Interaction, Planning, Scheduling. Deep Learning. LLMs and GPTs. Practical Application Examples. Exercise Resolution. Revisions for Final Exams. Work Monitoring/Support for Assignment 2.	Kahoot 10	22-28 Apr	Reinforcement Learning. Resolution of Exercise 5. Work Monitoring for Assignment 2.	Assignment 2: Work.	----------
12	30-Apr	VIII. Advanced Topics in Artificial Intelligence. Intelligent Simulation, Social Intelligence. Intelligent Robotics, Robot Learning. Applications of Artificial Intelligence and Intelligent Systems. Scientific Projects with AI. Practical Application Examples. VIII. Advanced Topics in Artificial Intelligence - The Future of AI. IA and the Society. Explainable AI. Beneficial AI. Ethical Machine. Weak AI and strong AI. Super Intelligence. The Technological Singularity.	Kahoot 11	29-30Apr	Assignment 2: Checkpoint Presentation (29-30 Apr + online sessions).	**Assignment2: CheckPoint Delivery (28 Apr). Presentation (Apr 29-30).**	----------
13	7-May	---------- Queima das Fitas ----------	----------	5-8 May	------- Queima das Fitas -------	Assignment 2: Work.	----------
14	14-May	VIII. Advanced Topics in Artificial Intelligence - Perception / Vision, Multi-Agent Systems, Communication, Interaction, Planning, Scheduling. DeepLearning and GPTs. Practical Application Examples. Exercise Resolution. Revisions for Final Exams. Work Monitoring/Support for Assignment 2.	Kahoot 12	13-17 May	Natural Language Processing. Resolution of Exercise 6. Work Monitoring for Assignment 2.	Assignment 2: Work.	----------
15	21-May	VIII. Advanced Topics in Artificial Intelligence. Intelligent Simulation, Social Intelligence Intelligent Robotics, Robot Learning. Applications of Artificial Intelligence and Intelligent Systems. Scientific Projects with AI. Practical Application Examples. VIII. Advanced Topics in Artificial Intelligence - The Future of AI. IA and the Society. Explainable AI. Beneficial AI. Ethical Machine. Weak AI and strong AI. Super Intelligence. The Technological Singularity.	Kahoots 13-15	19-22 May	Work Monitoring/Support for Assignment 12	**Assignment 2 Delivery (25 May)**	----------
16	28-May	----------	---------	26-29 May	Assignment 2: Final Presentation, Demonstrations and Evaluation (May 26-29).	**Assignment2: Final Presentation (26-29 May).**	----------
17	19-Jun	Exam 2	----------	9-Jun	----------	----------	**Exam 2 (9 Jun - 16h30m))**
18	19-Jun	Final/Appeal Exam	----------	26-Jun	----------	----------	**Final/Appeal Exam (26 Jun)**