ARTIFICIAL INTELLIGENCE

LEI/3, LMA/3, MBE/1

University of Beira Interior, Department of Informatics

Hugo Pedro Proença

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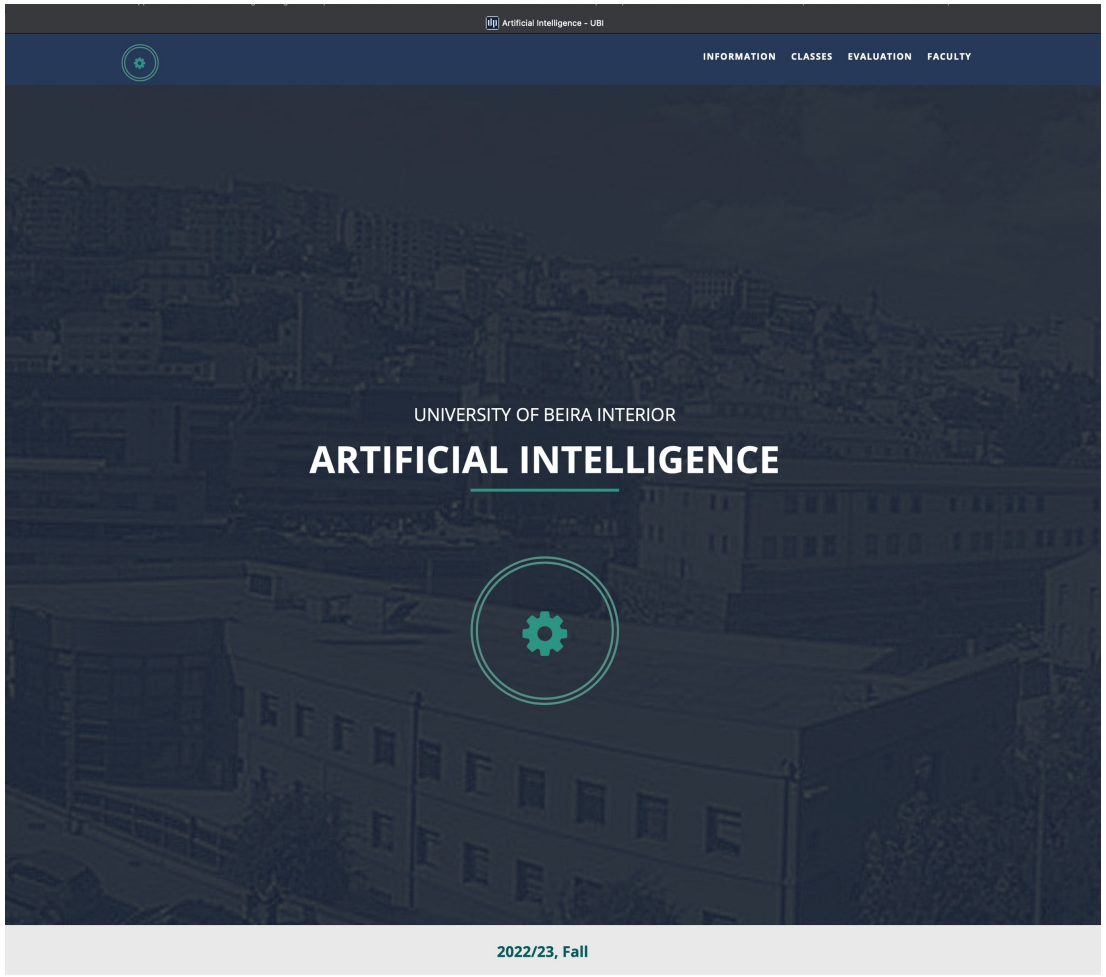
Weekly Schedule

	MON	R	TUE	R	WED	R	THU	R	FRI	R
8-9	-	-	-	-	-	-	-	-	-	-
9-10	T	6.01	P	6.14	-	-	P	6.14	-	-
10-11	T	6.01	P	6.14	-	-	P	6.14	-	-
11-12	-	-	-	-	-	-	-	-	-	-
12-13	-	-	-	-	-	-	-	-	-	-
13-14	-	-	-	-	-	-	-	-	-	-
14-15	Atendimento	Gab	P	6.14	-	-	-	-	-	-
15-16	Atendimento	Gab	P	6.14	-	-	-	-	-	-
16-17	-	-	-	-	-	-	-	-	-	-
17-18	-	-	-	-	-	-	-	-	-	-
18-19	-	-	-	-	-	-	-	-	-	-

Course Web Page

- http://di.ubi.pt/~hugomcp/ia



- News
- Course Program, Evaluation Criteria, Bibliography
- Classes (Theoretical Slides + Practical Sheets + Exercises)
- Evaluation (Practical + Exam Marks)

Evaluation Criteria

- **Assiduity (A)** To get approved at this course, students should attend to - at least - 80% of the theoretical and practical classes

- **Practical Project (P)** The practical projects of this course weights 30% (6/20) of the final mark
  - **(P1)** Practical Project 1: Search and Optimization (3/20);
    - Due Date: Monday, November 14th, 2022.
  - **(P2)** Practical Project 2: Learning (3/20);
    - Due Date: Monday, January 9th, 2023.
  - To get approved at the course, a minimal mark of 5/20 should be obtained in the practical project part;
  - The practical project mark is conditioned to an individual presentation and discussion by each student;

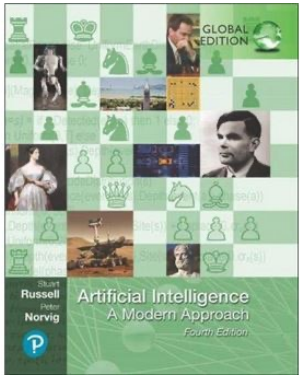
- **Written Test (F)** Monday, January 9th, 2023, 09:00. Room 6.01

- **Mark (M)** M = (A >= 0.8) * (P * 6/20 + F * 14/20)

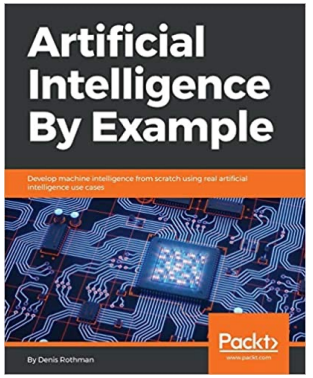
- **Admission to Exams** Students with M >= 6 are admitted to final exams
  - The practical projects mark is considered for all examination epochs;

Main Bibliography

- Stuart Russell and Peter Norvig. *Artificial Intelligence: A Modern Approach*. Global Edition, ISBN-13: 978-1292401133, 2022.



- Denis Rothman. *Artificial Intelligence by Example*. Expert Insight ISBN-13: 978-1839211539, 2020.



- Michael Woolridge. *A Brief History of Artificial Intelligence*, Flatiron Books, ISBN-13: 978-1250770738, 2021.

Course Program

- 1. Artificial Intelligence - Introduction
  - 1.1 Definitions
  - 1.2 Foundations / History
  - 1.3 Ethical Issues: Risks and Benefits
- 2. Intelligent Agents
  - 2.1 Internal Structure
  - 2.2 Environments
  - 2.3 States
- 3. **Problem Solving - Search**
  - 3.1 Search Algorithms
  - 3.2 Uninformed Search
  - 3.3 Informed Search (Heuristic-based)
  - 3.4 Search in Complex Environments
    - 3.4.1 Local Search and Optimisation
    - 3.4.2 Search in Partially Observable Environments

Course Program

- 4. Problem Solving - Adversarial Search
  - 4.1 Game Theory
  - 4.2 Alpha-Beta Tree Search
  - 4.3 Monte Carlo Tree Search
- 5. Problem Solving - Constraint Satisfaction Problems (CSPs)
  - 5.1 Definition
  - 5.2 Constraint Propagation in CSPs
  - 5.3 Backtracking Search for CSPs
  - 5.4 Local Search in CSPs
- 6. **Knowledge Representation and Planning**
  - 6.1 Logical Agents
  - 6.2 First Order Logic (FOL)
  - 6.3 Inference in FOL

Course Program

- 7. **Learning**
  - 7.1 Taxonomy
  - 7.2 Decision Trees, Linear Regression and Classification
  - 7.3 Model Selection and Optimisation
  - 7.4 Nonparametric Models
  - 7.5 Ensemble Learning
  - 7.6 Probabilistic Models
- 8. Neural Networks and Deep Learning
  - 8.1 Feed Forward Nets
  - 8.2 Convolutional Networks
  - 8.3 Learning Algorithms
  - 8.4 Recurrent Neural Networks
  - 8.5 Transfer Learning and Cross-Domain Learning
- 9. Reinforcement Learning
  - 9.1 Rewards
  - 9.2 Passive Reinforcement Learning
  - 9.3 Active Reinforcement Learning
  - 9.4 Q-Learning and Deep Q-Learning