

Course Introduction to Artificial Intelligence

SDS ING-INF/05

ETCS 6

Course modules (if any) None

Year 2023/24

Semester Second

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Office hour At the end of the lesson or by appointment agreed by e-mail.

LEARNING OUTCOMES

The course aims to provide students with the basic knowledge about AI in the contemporary world.

More in detail, the teaching aims to have the student achieve the following learning outcomes.

1. KNOWLEDGE AND UNDERSTANDING SKILLS:

At the end of the course, the student must be able to...

- Know the disciplinary complexity behind Artificial Intelligence;
- Learn what an intelligent agent is;
- Understand the elements involved in the operation of an intelligent agent;
- Understand how AI is prepared to solve complex real-world problems;
- Learn what a logical agent is and how it works;
- Understand how knowledge representation occurs for a logical agent;
- Gain awareness of how automated planning works.

2. APPLIED KNOWLEDGE AND UNDERSTANDING SKILLS:

At the end of the course, the student must be able to...

- Be able to deduce the main implications arising from the use of such advanced technology;
- Be able to distinguish under what circumstances it is best to make use of such technology;
- Develop critical skills useful in guiding ethical use of technology.

3. COMMUNICATION SKILLS:

At the end of the course, the student must acquire the fluency in the specialized language of the subject.

DETAILED PROGRAM

The following topics will be specifically addressed during the course:

1. General Aspects

Introduction to AI

Turing's approach

The cognitive modeling approach

The "laws of thought" approach

The rational agent approach

The foundations of AI

Philosophy
Mathematics
Economics
Neuroscience
Psychology
Computer engineering
Control theory and cybernetics
Linguistics
History of AI evolution

2. State of the art

3. Risks and benefits of AI

4. Intelligent agents

Introduction
Agents and environments
Good behaviour: the concept of rationality
The nature of the environments
The properties of the environments
The structure of agents
Simple reflex agents
Model-based simple reflex agents
Goal-based agents
Utility-based agents
Learning agents
How the components of an agent program work

5. Solving problems by searching

Introduction
Problem-solving agents
Searching for problems and solutions
Real-world problems
Measuring problem-solving performance

6. Logical agents

Knowledge-based agents
Logics

7. Knowledge representation

Ontological engineering
Categories and objects
Physical composition
Measures
Natural kinds
Mental objects and modal logic
Semantic networks

8. Automated Planning

Definition of classical planning

Algorithms for classical planning
Hierarchical planning
Solving scheduling problems

9. Quantifying uncertainty

Acting in uncertainty
Uncertainty and rational decisions
Probability

Monographic lectures

AI and art
AI and games
AI and natural language

RECOMMENDED PRE-REQUISITES (IF ANY)

None

TEACHING METHODOLOGIES

The educational activities will be carried out through mostly through frontal lectures. At the beginning of every class an interactive summary of the previous class is conducted. Also, discussion is fostered about relevant themes for modern society.

FINAL EXAMINATION METHODOLOGIES

The final exam consists in a written test, including closed questions, open questions and graphs to be completed. Each question assigns a variable number of points, depending on its difficulty. The points awarded for each question are highlighted in the test. Attending students can participate in two mid-terms, each one referred to half of the course programme. The final grade consists in the sum of the two grades.

EVALUATION CRITERIA

At the end of the course, the following skills of the student will be evaluated:

1. **KNOWLEDGE AND UNDERSTANDING SKILLS:** having acquired the basic Upon Completion of this course, students should know the fundamentals of AI, the disciplines involved and its evolutionary history. They should also have a general understanding of the agents that operate through AI and the main areas of application. Finally, they should have an overall knowledge of how an artificial intelligence "thinks."
2. **APPLIED KNOWLEDGE AND UNDERSTANDING SKILLS:** Upon completion of the course, students should be able to apply the knowledge gained in the course to real cases.
3. **COMMUNICATION SKILLS:** By the end of the course, students should have acquired the specialized language of the subject and be able to correctly expound on the topics covered.

FINAL GRADING INFORMATION AND CRITERIA

The final score is expressed in thirtieth grade, with the possibility of honors. The final score reflects the student's preparation as follows:

Score	Description
< 18 not sufficient	Fragmentary and superficial knowledge of contents, errors in applying concepts, insufficient exposure.
18-20	Sufficient but still general knowledge of contents, elementary exposure, uncertainties in the application of theoretical notions.
21-23	Appropriate, but not deep, knowledge of contents, good ability in applying theoretical notions as well as presenting them in a simple way.
24-25	Appropriate and vast knowledge of contents, discrete ability in applying them, good ability in presenting notions in a comprehensive way.
26-27	Precise and comprehensive knowledge of the topics, good ability in applying the acquired knowledge, good analytical skills, clear and correct exposure.
28-29	Extensive, comprehensive and deep knowledge of contents, good applicative skills, good ability of analysis and synthesis, confident and correct exposure.
30 30 with honors	Very broad, comprehensive and deep knowledge of the contents, well-established ability to apply the acquired notions, excellent ability of analysis, synthesis as well as ability to create interdisciplinary links, fluency of exposure.

COURSE MATERIAL

For the preparation of the exam, in addition to the material provided during the lessons, the following **mandatory texts** are needed:

1. Artificial Intelligence: A Modern Approach, 4th Edition, S. Russell, P. Norvig, 2021

OTHER ADVICES

Students belonging to the 'part-time/workers' category or being unable to take part in the lessons are suggested to directly contact the professor in order to analyze, together, specific training needs.