UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Fondamenti di Scienze Cognitive e Intelligenza Artificiale

2425-2-F8501R072

Course title

Foundations of Cognitive Science and Artificial Intelligence

Topics and course structure

This course aims to introduce the foundations of Artificial Intelligence (AI) and cognitive science, understood as the study of the mind in terms of information processing. It will provide some background on how symbolic and neural AI systems work, and how AI orients research into the mechanisms of human intelligence. The course is designed for students with no particular computer science or scientific background; at the same time it aims to achieve a good level of in-depth knowledge, including technical knowledge, through moments of a laboratory nature, because only by 'touching' and seeing these disciplines from the inside is it possible to acquire an accurate and not superficial representation of them.

The course is designed to be fully integrated within the Pedagogical Sciences curriculum. AI systems are increasingly used in educational contexts, and mental processes - in psycho-pedagogical research and in educational and teaching practice - are very often characterised from a cognitivist perspective.

It will be divided into two parts:

1. **Artificial Intelligence**. The basic mechanisms of automatic reasoning systems (algorithms for heuristic search in decision trees) and neural learning will be explored. You will practise using AI software designed for educational purposes and programming a simple neural network using Excel.

2. **Cognitive science**. The idea that mental processes are information-processing processes will be explored, exploring its philosophical and historical assumptions. Alan Turing's contribution to the development of this idea will be discussed; the relationship between minds and mechanisms; the relationship between mind and

brain; the impact of mental simulations in psychological research.

The course will be supported by the material and staff of the RobotiCSS Lab - Laboratory of Robotics for the Cognitive and Social Sciences of the University of Milano-Bicocca (https://www.roboticss.formazione.unimib.it/), located in building U16 and coordinated by the lecturer.

Objectives

Through this course, with constant and participative attendance of the lectures and the Laboratory connected to the course, we intend to promote the following learning, in terms of:

- Knowledge and understanding, at a fundamental but accurate level, of the workings of some Artificial Intelligence systems and the epistemological structure of cognitive sciences.
- Ability to understand the relationship between cognitive science and Artificial Intelligence, appreciating the potential and limitations of a cognitivist approach to the study of the mind and learning processes.

Methodologies

The course will be delivered mainly in an interactive mode: each lesson will provide some basic knowledge and background coordinates, but will solicit dialogue and the active participation of all participants. Approximately 20 hours of lessons will be devoted to laboratory activities (use of AI and neural learning software). Overall, 80% of the lesson hours will be interactive and 20% lecture-style. There will be no intermediate exam.

Online and offline teaching materials

The course's e-learning page will be constantly updated with the slides projected in the classroom, supplementary texts, and results of classroom exercises.
Some in-depth video lectures will be provided, also for the benefit of any non-attending students.

Programme and references

Erasmus students are invited to agree on a programme with the lecturer. They will be allowed to give the exam in English. Please note that the official language of the course is Italian.

Assessment methods

The exam will consist in an oral test, with the purpose of assessing the knowledge and skills acquired, and to highlighting gaps (if any). The test will be evaluated considering the appropriateness of the language, the argumentative capacity and the correctness of the student's statements.

Office hours

The lecturer is available for any further information or requests. Please arrange an appointment by writing to edoardo.datteri@unimib.it.

Programme validity

The programme is valid for two academic years.

Course tutors and assistants

Silvia Larghi
Gilda Bozzi

Sustainable Development Goals

QUALITY EDUCATION