

Teaching guide

IDENTIFICATION DETAILS

Degree:	Business Analytics		
Field of Knowledge:	Social and Legal Science		
Faculty/School:	Law, Business and Governance		
Course:	ARTIFICIAL INTELLIGENCE		
Type:	Optional	ECTS credits:	6
Year:	2	Code:	5351
Teaching period:	Fourth semester		
Area:	IT applied to Business Analytics		
Module:	Disciplinary Training		
Teaching type:	Classroom-based		
Language:	English		
Total number of student study hours:	150		

Teaching staff	E-mail
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SUBJECT DESCRIPTION

The subject will be focused on the study of intelligent agents: how they receive percepts from the environment, reason and choose actions. We will study the concept of rationality, the nature of environments and different agents' structures. The subject will cover solving problems by searching, including classical, local and adversarial searching algorithms (deterministic and nondeterministic, under full and partial observability). Within adversarial search, we will cover optimal decision in games, including stochastic and partially observable environments. We will analyze knowledge, reasoning and planning of utility-based agents.

GOAL

The main goal of the course is to provide students with the knowledge required to understand, model and program computer agents that can learn, plan and solve problems autonomously, particularly (but not only) in business settings.

The specific aims of the subject are:

Understand the key concepts of artificial agent from the perspective of rationality, environment, actions and rewards.

Develop the necessary skills to quantitatively model problems and solve them through agent-based algorithms.

Learn to quantify uncertainty, reason probabilistically and understand the concepts of complex decision-making in environments under uncertainty.

PRIOR KNOWLEDGE

The subject will build on the knowledge acquired by the student in Introduction to Statistics and Probability, Algorithms, Programming and Algebra. The student should be familiar with algorithms and data structures in general. Key concepts will be developed using pseudo-code, using Python code as a tool to show a particular implementation. The idea is to focus more on the structure of the programs than on the syntax and semantics of a particular language. By the end of the course, the student should be able to connect pseudo-code and its particular Python implementation and make small changes or extensions to functions or snippets.

COURSE SYLLABUS

Part I Artificial Intelligence

-Introduction to intelligent agents

Part II Problem Solving

-Classical Search

-Adversarial Search

Part III Uncertain Knowledge and Reasoning

-Probabilistic Reasoning

-Making Complex Decisions

EDUCATION ACTIVITIES

AI is demanding both in terms of conceptual understanding and programming (data structures and algorithms). Lectures will begin with a compelling case, and then approach it with a bottom up approach, starting with concepts and developing the solving strategy up to the pseudo-code.

Students are required to bring a computer to class with Python (most recent stable version), an IDE (PyCharm or similar) and Git installed. If you don't have this environment, please install it before the first day of class. Code will be distributed using a dedicated GitLab repository (create an account if you don't already have it). We will use live coding and build, modify, and extend code from the textbooks or created by the lecturer. Students are expected, at the beginning of each class, to have the environment open and access to a recent version of the repository.

Individual work will be required to prepare the class by reading the corresponding sections of the textbook and familiarizing with the code that will be discussed in class: the lecturer will assume some familiarity with the code that will be used during the lecture. It is therefore a requirement to study the main sections of the code BEFORE class, using a Flipped Learning Approach. During the live coding sections of the class, students will sometimes work in pairs to develop or modify code.

There will at least one graded Assignment throughout the term. Questions will refer to **key concepts** or pseudo-code discussed in earlier classes. The idea of the Assignments is to provide early feedback both to the student and the professor.

Assignments are individual work and plagiarism will be controlled. A student may be asked, at any time, to reproduce the pseudo-code submitted (with identical or similar data) and/or explain his or her code/answers. If the student is not able to do so, the University will consider that the student has not submitted original, individual work as required by this teaching guide for quizzes, assignments, and the final exam.

Plagiarism, as well as the use of illegitimate means in the evaluation tests, will be sanctioned in accordance with the provisions of the Evaluation Regulations and the University's Coexistence Regulations.

DISTRIBUTION OF WORK TIME

CLASSROOM-BASED ACTIVITY	INDEPENDENT STUDY/OUT-OF-CLASSROOM ACTIVITY
60 hours	90 hours

SKILLS

Basic Skills

Students must have demonstrated knowledge and understanding in an area of study that is founded on general secondary education. Moreover, the area of study is typically at a level that includes certain aspects implying knowledge at the forefront of its field of study, albeit supported by advanced textbooks

Students must be able to apply their knowledge to their work or vocation in a professional manner and possess skills that can typically be demonstrated by coming up with and sustaining arguments and solving problems within their field of study

Students must have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that include reflections on pertinent social, scientific or ethical issues

Students must be able to convey information, ideas, problems and solutions to both an expert and non-expert

audience

Students must have developed the learning skills needed to undertake further study with a high degree of independence

General Skills

Capacity for achieving objectives, problem-solving and decision-making in the environment of quantitative and qualitative mass data.

Capacity for critical, self-critical, analytical and reflexive thought.

Specific skills

Know how to manage quantitative and computer tools for decision-making.

Be able to understand the basics, paradigms and techniques of intelligent systems, and analyse, design and build computer systems, services and applications which use these techniques in the field of big data.

Understand the function and market of company information intelligence systems and big data, and their main uses and components for providing information, and knowledge that allows for better decision-making in companies.

LEARNING RESULTS

Understand the nature of intelligent agents, actions and environments and use the key concepts related to problem solving in AI.

Understand representations of complex environments and ability to define problems quantitatively

Capacity to describe and analyze how agents can develop policies through the interaction with the environment

Develop and apply AI models to solve simple problems and evaluate their performance.

LEARNING APPRAISAL SYSTEM

Evaluation items, ordinary call:

[1] Written exam covering theory and practice: 60% of the final grade

[2] Assignments (individual work based on case): 30% of the final grade

[3] Participation and class attendance (10%) of the final grade

Criteria to pass:

- At least a 5 (out of 10) in the written exam

- At least an average grade of 5 (out of 10) in the weighted average of in class activities [2] and assignments [3] Assignments will have a due date. Students can submit late after this due date and up one week after the due date, but the grade of the late assignments will be reduced daily by 5% as a penalty, up to a maximum of 35%. No submissions will be allowed after 1 week.

Presenting all assignments and class quizzes is not a requirement, but the grade of a missed assignment will be zero and will be averaged with the rest of the submissions.

Alternative evaluation system:

For students with an approved academic waiver or UFV students participating in an exchange program: student may obtain an academic waiver for reasons of work, incompatibility of schedules, illness or others deemed by the Career Directorate, from the Academic Coordination Office, providing the required documentation. Once granted, both the affected teacher and the student who has requested it from the Office of Academic Affairs ("Coordinación Académica") will be officially notified. In any case, it is the student's responsibility to be aware and follow the requirements of the course, as well as its evaluation system.

For students in second or successive enrollments: these students may benefit from the continuous assessment system, as long as they meet all the requirements, including class attendance. Otherwise, they must follow the alternative evaluation system. They don't need to file the request for an academic waiver, but they must notify the corresponding professor by email so that they can take the alternative evaluation system into account.

Students, who are exempt from the obligation to attend class, either because of the second or successive enrollments, or because they have express authorization from the Direction of the Degree, will be evaluated using the same evaluation system. 5% of class participation may be obtained by attending at least three tutorials with the teacher responsible for the course.

Evaluation extraordinary call:

Students who have not reached the minimum grade in the exam [1], having therefore failed in the ordinary call, may opt to retake the exam in the extraordinary call.

Students who have not reached the minimum grade in the average of class activities and practices ([2] and [3]), having therefore failed in the ordinary call, may opt for the resubmit assignments in the extraordinary call.

Students who fail one or both parts in the extraordinary call will have to retake the course in its entirety (all parts) in the new ordinary call.

Plagiarism, as well as the use of illegitimate means in the evaluation tests, will be sanctioned in accordance with the provisions of the Evaluation Regulations and the University's Coexistence Regulations.

BIBLIOGRAPHY AND OTHER RESOURCES

Basic

Stuart Russell and Peter Norvig Artificial Intelligence. A Modern Approach 4th