

Problem Solving

Code: 106570
ECTS Credits: 6

2024/2025

Degree	Type	Year
2504392 Artificial Intelligence	OB	2

Contact

Name: Pedro Meseguer Gonzalez

Email: pedro.meseguer@uab.cat

Teachers

(External) Instructor/a prácticas 1

(External) Instructor/a prácticas 2

(External) Jordi Levy Diaz

(External) Pedro Meseguer González

Teaching groups languages

You can view this information at the [end](#) of this document.

Prerequisites

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Objectives and Contextualisation

This subject will offer a complete vision (including algorithmic methods) of what is meant by problem solving in AI.

Competences

- Analyse and solve problems effectively, generating innovative and creative proposals to achieve objectives.
- Design, implement, analyse and validate efficient and robust algorithmic solutions to computational problems derived from the design of intelligent systems.

- Identify, understand and apply the fundamental concepts and techniques of knowledge representation, reasoning and computational learning for the solution of artificial intelligence problems.
- Introduce changes to methods and processes in the field of knowledge in order to provide innovative responses to society's needs and demands.
- Students can apply the knowledge to their own work or vocation in a professional manner and have the powers generally demonstrated by preparing and defending arguments and solving problems within their area of study.

Learning Outcomes

1. Analyse a situation and identify areas for improvement.
2. Analyse and solve problems effectively, generating innovative and creative proposals to achieve objectives.
3. Apply metaheuristics and evolutionary and bio-inspired computing techniques to solve optimisation problems.
4. Conceptualise and model game problems as search problems.
5. Students can apply the knowledge to their own work or vocation in a professional manner and have the powers generally demonstrated by preparing and defending arguments and solving problems within their area of study.
6. Understand constraint satisfaction techniques for representing and solving problems in the field of AI.
7. Understand model-based reasoning and inference in AI.
8. Understand the concepts of combinatorial explosion and heuristics.
9. Understand the state space representation of a given problem and its search-based resolution.

Content

HEURISTIC SEARCH

Blind search

Heuristic search

Heuristics

LOCAL SEARCH. METAHEURISTICS.

Optimization

Metaheuristics

Online search

ADVERSARIAL SEARCH. GAMES.

Zero-sum games.

Mini-max. Alpha-beta.

Modern strategies: MCTS

CONSTRAINT REASONING

Definitions and examples

Constraint networks and arc consistency

Look-ahead

BOOLEAN SAT

Introduction and applications

Resolution and DPLL

Learning and backjumping

Restarts and clause deletion

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Preparation of problems and practices	35.5	1.42	1, 2, 3, 4, 5, 6, 7, 8, 9
Sessions of theory and problems	50	2	1, 2, 3, 4, 5, 6, 7, 8, 9
Type: Autonomous			
Assimilation of sessions of theory and problems	60	2.4	1, 2, 3, 4, 5, 6, 7, 8, 9

The sessions will be face-to-face in class and will be organized to introduce the contents of the subject through n

In addition, there will be classes of problems and/or practices to strengthen the contents of the theory classes.

Other activities may be the reading and presentation of articles related to the subject.

The dynamic and proactive attitude of the student body, in order to achieve the skills of the subject, will be espec

Classes will be organized in two sessions of two hours per week with all students.

Most of the classes will be theory, with problem/practice classes interspersed.

Students will know in advance when those kinds of problems/practices will happen.

Students are encouraged to bring their own laptop to class if they have one.

Special attention will be devoted to the practice classes. These will be unfolded in parallel

(that is, the group will be divided in two, and each half will be taught by a different instructor).

A small number of practices will be developed by each group of students and sent to the instructors.

If instructors consider that a group does not pass a particular practice, the group,

after receiving the feedback, will have a second opportunity to correct and present the practice.

In the theory classes, the concepts that are detailed in the syllabus of the subject will be worked on.

In some cases, the possibility of making explanatory videos available to the student that

the student must watch before the class session will be considered.

Each student will have to complete the face-to-face classes with autonomous personal work in carrying out the re

problems and practices that are proposed and that should serve to finish understanding the contents of the subj

It should be keep in mind that the syllabus of the subject has a logical continuity throughout the course,

so that in order to follow a class correctly it is necessary to have assimilated what has been explained in previous

The management of the teaching of the subject will be done through the UAB Virtual Campus platform,

which will be used to view the materials, manage the practice groups, make the corresponding deliveries,

see the notes, communicate with the teachers, etc.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Individual evaluation	0.6	4	0.16	1, 2, 3, 4, 5, 6, 7, 8, 9
Problem delivery/practices	0.4	0.5	0.02	1, 2, 3, 4, 5, 6, 7, 8, 9

The assessment of the subject will take into account two types of assessment activities: Two midterm exams as a

The final grade of the course is obtained by combining the assessment of these activities as follows:

Final Grade = (0.6 the two partial tests of individual evaluation) + (0.4 practices)

Individual evaluation: a minimum grade of 5 must be achieved to pass the subject.

Practices: a minimum grade of 5 in this activity must be obtained in order to pass the subject.

Individual assessment: this section includes the results of the individual tests that will be done throughout the cou

There will be partial tests that will be done during the academic period of the course and a final test during the off

This final test will be a recovery test and will only have to be taken by students who have not passed one of the t

If one of the two parts has been passed, but the other has not,

only the part of the subject corresponding to the part that has not been passed must be retaken in this test.

- A minimum grade of 4.5 must be obtained in each of the two parts in order to pass the course.

- The final grade will be the average of the two partials:

Individual Assessment = (0.5 * Partial1) + (0.5 * Partial 2)

Recovery:

- First partial: a student who fails the first partial can recover it in the final exam.

- Second partial: a student who fails the first partial can recover it in the final exam.
- Practices: in case of not reaching 5 in the practices, the group has to resubmit the corrected work one week late

Not assessable: A student will be considered non-assessable (NA) if he / she does not participate in the present
 does not take any of the following assessment tests: Part 1, Part 2, Final Recovery Test.

Suspended: If the calculation of the final grade is equal to or higher than 5 but does not reach the minimum requi
 the final grade will be suspended and a 4.5 will be placed on the grade of the transcript of the student.

Honors: Granting an honors degree is the decision of the faculty responsible for the subject. UAB regulations stat
 who have obtained a final grade equal to or higher than 9.00. Up to 5% MH of the total number of students enroll

Important Note: Copies and plagiarism Without prejudice to other disciplinary measures deemed appropriate, and in accordance with current academic regulations, irregularities committed by a student that may lead to a variation in the grade will be graded with a zero (0). Assessment activities qualified in this way and by this procedure will not be recoverable. If it is necessary to pass any of these assessment activities to pass the subject, this subject will be suspended directly, without the opportunity to retake it in the same course. These irregularities include, but are not limited to: • The total or partial copy of an internship, report, or any other assessment activity • Let copy • Present a group work not done entirely by the group members • Present as own materials prepared by a third party, even if they are translations or adaptations, and in general works with non-original and exclusive elements of the student • Have communication devices (such as mobile phones, smart watches, etc.) accessible during individual theoretical-practical assessment tests (exams). • Talk to classmates during individual theoretical-practical assessment tests (exams); • Copying or attempting to copy other students during the theoretical-practical assessment tests (exams); • Use or attempt to use writings related to the subject during the performance of the theoretical-practical assessment tests (exams), when these have not been explicitly allowed. In these cases, the numerical grade of the transcript will be the lower value between 3.0 and the weighted average of the grades (and therefore it will not be possible to pass it by compensation). Copy of the program code will be used in the evaluation of problem and practice deliveries. Note on planning assessment activities: The dates of continuous evaluation and delivery of works will be published at the beginning of the course and may be subject to schedule changes for reasons of adaptation to possible incidents. These changes will always be reported to the Virtual Campus as it is understood that this is the usual platform for the exchange of information between teachers and students.

Bibliography

Artificial Intelligence. A modern approach. Stuart Russell, Peter Norvig. 4th edition. Pearson, 2020.

Software

To be decided.

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	711	English	first semester	afternoon
(PLAB) Practical laboratories	711	English	first semester	afternoon
(PLAB) Practical laboratories	712	English	first semester	afternoon
(TE) Theory	71	English	first semester	afternoon