



Teaching Guide

Teaching Guide				
Identifying Data				2024/25
Subject (*)	Basic Algorithms of Artificial Intelligence		Code	614G03019
Study programme	Grao en Intelixencia Artificial			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Second	Obligatory	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Ciencias da Computación e Tecnoloxías da Información			
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General description	Agents who apply problem solving methods usually use state representations on which approximate solution search procedures are built, which are not always optimal, but have a sufficient quality for the time and computing resources available. Students will know and know how to apply the most common general-purpose algorithms and heuristics to solve search problems with state representations, both through uninformed strategies and based on some approximate knowledge of the problem (informed search). More complex contexts that condition these strategies will also be dealt with, such as the existence of adversaries or restrictions in the search process. The course will also address planning algorithms in the field of Artificial Intelligence.			

Study programme competences / results

Code	Study programme competences / results
A12	Conocer los fundamentos de los algoritmos de la inteligencia artificial y la optimización, entender su complejidad computacional y saber aplicarlos a la resolución de problemas.
B2	Que el alumnado sepa aplicar sus conocimientos a su trabajo o vocación de una forma profesional y posea las competencias que suelen demostrarse por medio de la elaboración y defensa de argumentos y la resolución de problemas dentro de su área de estudio.
B4	Que el alumnado pueda transmitir información, ideas, problemas y soluciones a un público tanto especializado como no especializado.
B8	Capacidad para diseñar y crear modelos y soluciones de calidad basadas en Inteligencia Artificial que sean eficientes, robustas, transparentes y responsables.
B9	Capacidad para seleccionar y justificar los métodos y técnicas adecuadas para resolver un problema concreto, o para desarrollar y proponer nuevos métodos basados en inteligencia artificial.
B10	Capacidad para concebir nuevos sistemas computacionales y/o evaluar el rendimiento de sistemas existentes, que integren modelos y técnicas de inteligencia artificial.
C1	Capacidad para comunicar y transmitir sus conocimientos, habilidades y destrezas.
C3	Capacidad para crear nuevos modelos y soluciones de forma autónoma y creativa, adaptándose a nuevas situaciones. Iniciativa y espíritu emprendedor.
C5	Capacidad para desarrollar modelos, técnicas y soluciones basadas en inteligencia artificial que resulten éticas, no discriminatorias y confiables.

Learning outcomes

Learning outcomes	Study programme competences / results		
Apply and implement search methods with informed and uninformed strategies in problems represented as state spaces.	A12	B2 B9 B10	C5



Know different problem solving algorithms based on the search in a space of possible configurations.	A12	B2 B8 B9 B10	C1
Know how to solve adversarial search problems	A12	B2 B8 B9 B10	C1
Know how to solve search and optimisation problems with constraints.	A12	B2 B4 B8 B9 B10	C1 C3 C5
Know and know how to model and solve basic planning problems.	A12	B2 B8 B9 B10	C1

Contents	
Topic	Sub-topic
Topic 1.- Introduction.	What is AI? Brief history. Risks and benefits. Intelligent agents: rationality and types. Types of environments.
Topic 2.- Problem solving by means of search	Uninformed search algorithms: breadth, uniform cost, depth, bidirectional and variants. Informed search algorithms (greedy search, A* algorithm, memory-constrained search). Heuristic functions
Topic 3.- Constraint satisfaction problems.	Definition, variants Inference in constraint propagation Backtracking search Local search
Topic 4.- Automatic planning	Classical planning. Algorithms and Heuristics. Hierarchical planning and searches. Planning in non-deterministic domains. Time, ordering, resources Analysis of planning approaches
Topic 5.- Searching in complex environments	Local search algorithms (hill climbing, simulated cooling, evolutionary algorithms). Search with non-deterministic actions. Search in partially observable environments. Online search.
Topic 6.- Adversarial search and games	Game theory. Optimal decisions in games. Heuristic search alpha-beta trees. Monte Carlo tree search. Stochastic games. Partially observable games. Limitations of the algorithms.



Planning

Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student's personal work hours	Total hours
Supervised projects	A12 C1	8	15	23
Guest lecture / keynote speech	A12 B2 B4 B8 B9 B10	30	37	67
Mixed objective/subjective test	A12 B2 B4 B8 B9 B10 C1 C3 C5	2	14	16
Laboratory practice	B2 B8 B9 B10 C3 C5	22	12	34
Personalized attention		10	0	10

(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

Methodologies	Description
Supervised projects	Work will be carried out on different aspects of theoretical interest of the subject. Students will analyse real problems that show the application of the algorithms and techniques described in the theory classes.
Guest lecture / keynote speech	Used during the theoretical classes to expose a basic core of knowledge that students will later have to know how to use and expand in their laboratory practices and in the carrying out of tutored work
Mixed objective/subjective test	There will be a test at the end of the term on the contents covered throughout the course.
Laboratory practice	Students will tackle practical work related to the development and application of different search and planning algorithms.

Personalized attention

Methodologies	Description
Guest lecture / keynote speech Laboratory practice Supervised projects	Desenvolverase unha atención personalizada para as prácticas de aula e o traballo supervisado

Assessment

Methodologies	Competencies / Results	Description	Qualification
Mixed objective/subjective test	A12 B2 B4 B8 B9 B10 C1 C3 C5	It makes up 50% of the mark. It will not be possible to pass the subject if a mark lower than 4.5 is obtained in this section.	50
Laboratory practice	B2 B8 B9 B10 C3 C5	Active and continuous work during the practical classes will be taken into account in its assessment. It constitutes 40% of the mark. It will not be possible to pass the subject if the final mark for the practical classes is lower than 4.5.	40
Supervised projects	A12 C1	It constitutes 10% of the final grade.	10

Assessment comments

A realización fraudulenta de probas ou actividades de avaliación, unha vez comprobada, implicará directamente a cualificación de suspenso na convocatoria na que se comprometa: o estudante será cualificado con "suspenso" (nota numérica 0) na convocatoria correspondente do curso académico, sexa a comisión do delito na primeira convocatoria ou na segunda. Para iso modificarase a súa calificación no seu expediente da primeira oportunidade, se fora o caso.

Sources of information



Basic	Stuart Russel and Peter Norvig. Artificial Intelligence. A modern approach. 4 edición, 2021. Moret et al. Fundamentos de Intelixencia Artificial. Servizo de publicacións da UDC. J.T. Palma, R. Marín Morales. Inteligencia Artificial, Técnicas, métodos y aplicaciones, McGraw Hill, 2008
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Programming I/614G03006 Programming II/614G03007 Algorithms/614G03008 Mathematical Optimisation/614G03005
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.