(*)Escola Superior de Enxeñaría Informática

Presentation

In 1991, the University School of Technical Engineering in Computer Management of the University of Vigo was created in the Campus of Ourense together with the degree of Technical Engineering in Computer Management, in order to respond to the needs of graduates in Computer Science demanded by the Galician society. In 1999, after the concession to this Centre of the second cycle of the degree in Computer Engineering, it changed its name to Escuela Superior de Enxeñería Informática (ESEI).

Currently, the Centre offers the following degrees:

- **Degree in Computer Engineering**: A degree adapted to the EEES that incorporates two different professional profiles that are highly attractive in the Galician socio-economic environment:

    - Software Engineering
    - Information Technologies

- **Degree in Artificial Intelligence**: provides the broad, in-depth and multidisciplinary training required by professionals in this field and which is essential to successfully build the intelligent services and applications that are having such an important impact on our lives at all levels.

    This is an inter-university degree in the Galician University System, of four courses (240 ECTS), in which the subjects of the first two courses are common to the three universities (A Coruña, Santiago and Vigo). In the third and fourth years, the University of Vigo develops the orientation in Intelligent Information Systems (SII).

- **University Master's Degree in Computer Engineering**: a degree linked to the profession of Computer Engineering, with 90 ECTS and one and a half years adapted to the EHEA. Its objective is to provide the graduate student with in-depth training in management and administration in the area of information technology, as well as solid knowledge in specific technologies associated with different professional profiles in this field. Graduates acquire technical, communication and leadership skills that enable them to start up their own business or to join management positions in the ICT area in companies and organisations.
- **Master's Degree in Artificial Intelligence**: an inter-university degree, offered by the Universities of A Coruña, Santiago de Compostela and Vigo, which is a complete programme for the training of professionals and entrepreneurs in this branch of knowledge.

All the information about the Centre and its degrees is available on the website esei.uvigo.es.

Organization chart

Management Team Director:

Arno Formella

- He is responsible for the running of the School, implementing the agreements of the collegiate bodies, executing the budget and representing the Centre both within the University and before institutions and society in general.

- Email: formella(at)uvigo.es
- Telephone: +34 988 387 002

Deputy Director of Planning:

Francisco Javier Rodríguez Martínez

- He is responsible for the planning, definition, implementation, evaluation and monitoring of the procedures and processes of the ESEI.
- Email: franjrm(at)uvigo.es
- Telephone: +34 988 387 022

Deputy Director of Academic Organisation:

Rosalía Laza Fidalgo

- She is responsible for the organisation of teaching at the School: timetables, exam calendars, teaching control, control of tutorials...
- Email: rlaza(at)uvigo.es
- Telephone: +34 988 387 013

Deputy Director of Quality:

Eva Lorenzo Iglesias

- She is in charge of ensuring compliance with the Internal Quality Assurance System.
- Email: eva(at)uvigo.es
- Telephone: +34 988 387 019

Secretary of the Centre:

María Encarnación González Rufino

- She is in charge of taking the minutes of the School's collegiate bodies, as well as certifying the agreements taken in them.
- Email: secretaria.esei(at)uvigo.es
- Telephone: +34 988 387 016

Within the management team, the secretary of the school, María Encarnación González Rufino, is the **Equality Liaison Officer**, and is responsible for the dynamisation and implementation of equality policies. This person is the liaison with the **Equality Unit** of the University of Vigo to contribute to the application and monitoring of the measures proposed in the I Plan for Equality between women and men of the University of Vigo, with a view to achieving a more balanced participation of women and men in our University.

In addition to the management team, there are several professors in charge of coordinating the degree courses:

Coordinator of the Degree in Computer Engineering:

Eva Lorenzo Iglesias

Email: eva(at)uvigo.es

Phone: +34 988 387 019

Coordinator of the Degree in Artificial Intelligence:

Lourdes Borrajo Diz

Email: lborrajo(at)uvigo.es

Phone: +34 988 387 028

Coordinator of the Master's Degree in Computer Engineering:

Alma Gómez Rodríguez

Email: alma(at)uvigo.es

Phone: +34 988 387 008

Coordinator of the Master's Degree in Artificial Intelligence:

Analia María García Lourenço

- Email: analia(at)uvigo.es
- Teléfono: +34 988 387 029

Location

Escola Superior de Enxeñería Informática.

Campus de Ourense - Universidad de Vigo

Edificio Politécnico. As Lagoas s/n

32004 - Ourense (Spain)

Teléfonos: +34 988 387000, +34 988 387002

Fax: +34 988 387001

Web: esei.uvigo.es

Regulations and legislation

Available on the Centre's website (esei.uvigo.es)

Center services

teaching equipment

14 computer laboratories with 24 individual workstations and different operating systems

1 Electronics Technology laboratory

1 Computer Architecture laboratory

1 end-of-degree project laboratory

6 theory classrooms

6 seminars for group tutorials

added values

Classes in English in various subjects

Guidance teacher in the first year.

E-mail for students.

Storage directory for students, accessible from the Internet.

E-learning platform.

Wireless Internet access from all over campus.

Campus library with 120,000 volumes.

Alumni Delegation.

Premises for student associations.

University residence.

Hall of Degrees and Assembly Hall.

Cafeteria.

Máster universitario en Inteligencia artificial

Subjects

Year 1st

Code	Name	Quadmester	Total Cr.
O06M193V01101	AI Fundamentals	1st	3
O06M193V01102	Data engineering	1st	3
O06M193V01103	Reasoning and planning	1st	6
O06M193V01104	Natural language understanding	1st	6
O06M193V01105	Machine learning I	1st	6
O06M193V01106	Computer vision I	1st	3
O06M193V01107	Intelligent robotics I	1st	3
O06M193V01201	Explainable and Trustworthy AI	2nd	3
O06M193V01202	Multiagent systems	2nd	6
O06M193V01203	Knowledge and reasoning under uncertainty	2nd	3
O06M193V01204	Language modelling	1st	3
O06M193V01205	Web intelligence and semantic technologies	1st	6
O06M193V01206	Deep learning	1st	6
O06M193V01207	Machine learning II	2nd	3
O06M193V01208	Evolutionary computation	2nd	3
O06M193V01209	Computer vision II	2nd	6
O06M193V01210	Intelligent robotics II	2nd	6
O06M193V01211	AI project management	2nd	3
O06M193V01212	Process Mining	2nd	3
O06M193V01213	Intelligent real-time systems	2nd	3

Year 2nd

Code	Name	Quadmester	Total Cr.
O06M193V01301	Computational aspects of cognitive science	1st	3
O06M193V01302	Text mining	1st	3
O06M193V01303	AI in big data environments	1st	6
O06M193V01304	AI in health	1st	3
O06M193V01305	Intelligent IoT	1st	3
O06M193V01306	Intelligent cibersecurity	1st	3
O06M193V01307	Emergent and entrepreneurial aspects in IA	1st	3
O06M193V01309	Master Thesis	1st	12

IDENTIFYING DATA

AI Fundamentals

Subject	AI Fundamentals
Code	O06M193V01101
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Mandatory	1st	1st

Teaching language	
Department	
Coordinator	García Lourenco, Analia María
Lecturers	García Lourenco, Analia María
E-mail	analia@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24
General description	

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

IDENTIFYING DATA

Data engineering

Subject	Data engineering
Code	O06M193V01102
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st

Teaching language	English
Department	
Coordinator	García Lourenco, Analia María
Lecturers	García Lourenco, Analia María
E-mail	analia@uvigo.es
Web	http://http://moovi.uvigo.gal
General description	The aim of this course is to introduce the basics of data engineering, notably in the scope of Big Data. The acquired skills will allow the analysis and the efficient management of heterogeneous information, both structured and non structured, within the development of AI applications, whenever traditional methods show insufficiency.

Training and Learning Results

Code	
A1	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A2	CB7 - Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
A3	CB8 - the complexity of making judgments based on information that, while incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
B2	Successfully address all stages of an Artificial Intelligence project.
B3	Search and select useful information needed to solve complex problems, handling with fluency the bibliographic sources of the field.
B4	Elaborate adequately and with certain originality written compositions or motivated arguments, write plans, work projects, scientific articles and formulate reasonable hypotheses in the field.
B5	Work in teams, especially multidisciplinary teams, and be skilled in time management, people management and decision making.
C16	Knowledge of the process and tools for data processing and preparation from data acquisition or extraction, cleaning, transformation, loading, organization and access.
D3	Utilizar las herramientas básicas de las tecnologías de la información y las comunicaciones (TIC) necesarias para el ejercicio de su profesión y para el aprendizaje a lo largo de su vida.
D7	Develop the ability to work in interdisciplinary or transdisciplinary teams to offer proposals that contribute to sustainable environmental, economic, political and social development.
D8	Value the importance of research, innovation and technological development in the socioeconomic and cultural progress of society.
D9	Have the ability to manage time and resources: develop plans, prioritize activities, identify critical ones, set deadlines and meet them.

Expected results from this subject

Expected results from this subject	Training and Learning Results
RA1: Develop the capacity to analyse and model data for processing in intelligent systems.	A1 A2 C16 D3 D9
RA2: Know and understand the process of extraction, cleaning, transformation, load and preprocessing of data.	A3 B2 B3 C16 D3 D7 D9

RA3: Know and learn how to use multidimensional and NoSQL databases.	A2
	B3
	B4
	D8
RA4: Know the foundations of data lakes and data warehouses.	A2
	A3
	B2
	B5
	D3
	D7
	D8

Contents

Topic	
Concepts and foundations of Data Engineering	Concepts and basic definitions, problems of efficient data load in Big Data scenarios, massive data storage and access.
Techniques of data cleaning and preparation	Common techniques. Definition of processing flows. Quality metrics.
Efficient advanced structures and data warehouses for Big Data	Data warehouses and multidimensional databases, data lakes, NoSQL databases.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	12	0	12
Laboratory practical	10	30	40
Essay questions exam	3	20	23

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

Methodologies

	Description
Lecturing	The teacher will introduce given subjects to the students with the aim to acquire information valuable within a specific scope. CONTINUOUS EVALUATION Mandatory character Facultative attendance GLOBAL EVALUATION Mandatory character
Laboratory practical	Problem or problems of practical character whose resolution requires the understanding and application of the theoretical and practical contents covered by the course. The students can work the solution to the proposed problems individually or in groups. CONTINUOUS EVALUATION Mandatory character Mandatory attendance (min. 75% of lab practices) GLOBAL EVALUATION Mandatory character

Personalized assistance

Methodologies	Description
Lecturing	Doubts related to the methodologies and case studies discussed in class will be addressed.
Laboratory practical	Doubts related to the case studies to be analyzed will be addressed.

Assessment

	Description	Qualification	Training and Learning Results			
Laboratory practical	Several laboratory practices aimed to evaluate the understanding of the knowledge exposed in theory and/or practical classes. Learning results evaluated: RA3, RA4	60	A2	B2 B5	C16	D3 D7
Essay questions exam	The exam covers all the topics of the course. Students must develop, relate, organise and present the knowledge they have on each given topic in a reasoned and well-articulated answer. Learning results evaluated: RA1, RA3, RA4	40	A1 A2 A3	B3 B4	C16	D7 D8 D9

Other comments on the Evaluation

CONTINUOUS EVALUATION SYSTEM

TEST 1: Laboratory practical

Description: Several practices aimed to evaluate the understanding of the knowledge exposed in theory and/or practical classes (min. 2).

Methodology to be applied: Laboratory practical.

% Qualification: 60%.

Minimum %: *To pass this part of the course the student has to obtain a grade equal or greater than 5 points (out of 10).*

Training: A2,B2,B5,C16,D3,D7.

Learning results: *RA3, RA4*

TEST 2: Essay questions exam

Description: The exam covers all the topics of the course. Students must develop, relate, organise and present the knowledge they have on each given topic in a reasoned and well-articulated answer.

Methodology to be applied: Lecturing and laboratory practical.

% Qualification: 40%.

Minimum %: To pass this part of the course the student has to obtain a grade equal or greater than 5 points (out of 10).

Training: A1,A2,A3,B3,B4,C16,D7,D8, D9

Learning results: RA1, RA3, R4

GLOBAL EVALUATION SYSTEM

Procedure for choosing the global evaluation modality: students are considered to have chosen the global evaluation system if they do not take Test 1 of the continuous evaluation system.

TEST 1: Laboratory practical

Description: Several practices aimed to evaluate the understanding of the knowledge exposed in theory and/or practical classes (min. 2).

Methodology to be applied: Laboratory practical.

% Qualification: 60%.

Minimum %: To pass this part of the course the student has to obtain a grade equal or greater than 5 points (out of 10).

Training: A2,B2,B5,C16,D3,D7.

Learning results: RA3, RA4

TEST 2: Essay questions exam

Description: The exam covers all the topics of the course. Students must develop, relate, organise and present the knowledge they have on each given topic in a reasoned and well-articulated answer.

Methodology to be applied: Lecturing and laboratory practical.

% Qualification: 40%.

Minimum %: To pass this part of the course the student has to obtain a grade equal or greater than 5 points (out of 10).

Training: A1,A2,A3,B3,B4,C16,D7,D8, D9

Learning results: RA1, RA3, R4

CRITERIA OF EVALUACION FOR EXTRAORDINARY AND END OF CAREER CALLS

The continuous and global evaluation systems described above will be used.
MINUTES QUALIFICATION PROCESS
Regardless of the evaluation system and the call, in case of failing any part of the evaluation, but the overall score is higher than 4 (out of 10), the grade in the minutes will be 4).**EVALUATION DATES**
The dates of the tests corresponding to the continuous evaluation system will be published in the calendar of activities, available on the website of the ESEI https://esei.uvigo.es/docencia/horarios/.The official exam dates for the different calls, officially approved by the ESEI Xunta de Centro, are published on the ESEI website https://esei.uvigo.es/docencia/exames/.USE OF MOBILE DEVICES**
All students are reminded of the prohibition of the use of mobile devices in exercises and practices, in compliance with Article 13.2.d) of the University Student Statute, regarding the duties of university students, which establishes the duty to "Refrain from the use or cooperation in fraudulent procedures in evaluation tests, in the work performed or in official university documents."CONSULTATION/REQUEST FOR TUTORIALS can be consulted through the faculty member's personal page, accessible through https://esei.uvigo.es/docencia/profesorado/.
OTHER CONSIDERATIONS
If plagiarism is detected in any of the works (essays or project), the final grade will be "Suspenso" (0) and the situation will be notified to the School's Board to take the appropriate disciplinary actions. If translation errors cause any contradictions between the various versions of this syllabus, the English will be the prevailing version.

Sources of information
Basic Bibliography

Sadalage, Fowler, **NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence**, 978-0321826626, 1, Addison-Wesley, 2012

Avi Silberschatz, Henry F. Korth, S. Sudarshan, **Database System Concepts**, 978-9390727506, 6, McGraw-Hill, 2010

Ihab F. Ilyas and Xu Chu, **Data Cleaning. Association for Computing Machinery**, 978-1-4503-7152-0, Association for Computing Machinery, 2019

Alex Gorelik, **The Enterprise Big Data Lake: Delivering the Promise of Big Data and Data Science**, 978-1491931554, O Reilly Media, Inc., 2019

Matt Casters, Roland Bouman, Jos van Dongen,, **Pentaho Kettle Solutions: Building Open Source ETL Solutions with Pentaho Data Integration**, 978-0470635179, Wiley, 2013

Complementary Bibliography

Recommendations

Other comments
Follow the proposed methodology, class assistance and participation, devoting the necessary time to the study and the development of the proposed project and specific problems/case studies with the help of the teacher.
The virtual campus will be used to improve the communication between the students and the teachers, to store the necessary materials and to support in the processes of evaluation.

IDENTIFYING DATA

Reasoning and planning					
Subject	Reasoning and planning				
Code	O06M193V01103				
Study programme	Máster universitario en Inteligencia artificial				
Descriptors	ECTS Credits		Choose	Year	Quadmester
	6		Mandatory	1st	1st
Teaching language					
Department					
Coordinator	Gómez Rodríguez, Alma María				
Lecturers	Gómez Rodríguez, Alma María				
	Otero Cerdeira, Lorena				
E-mail	alma@uvigo.es				
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24				
General description					

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

IDENTIFYING DATA
Natural language understanding

Subject	Natural language understanding
Code	O06M193V01104
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	6		Mandatory	1st	1st

Teaching language	English
Department	
Coordinator	Darriba Bilbao, Víctor Manuel
Lecturers	Darriba Bilbao, Víctor Manuel
E-mail	darriba@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24
General description	The course introduces the basic concepts and techniques associated with natural language processing, the starting point for the design of information exploitation and dialogue environments based on human language, both at the lexical and syntactic, semantic and pragmatic levels. The objective is to introduce the student to the complexity inherent to the analysis of human natural language, mainly associated to the ambiguity and contextual dependencies it presents, and to the design of data structures and algorithms that allow its practical treatment.

Training and Learning Results

Code	
A1	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A2	CB7 - Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
A5	CB10 - That students possess the learning skills that will enable them to continue studying in a manner that will be largely self-directed or autonomous.
B1	Maintain and extend sound theoretical approaches to enable the introduction and exploitation of new and advanced technologies in the field of Artificial Intelligence.
B3	Search and select useful information needed to solve complex problems, handling with fluency the bibliographic sources of the field.
B4	Elaborate adequately and with certain originality written compositions or motivated arguments, write plans, work projects, scientific articles and formulate reasonable hypotheses in the field.
C1	Understanding and mastering techniques for text processing in natural language
C2	Understanding and mastery of the fundamentals and techniques of semantic processing of linked, structured, and unstructured documents, and of the representation of their content.
C3	Understanding and knowledge of the techniques of representation and processing of knowledge through ontologies, graphs, and RDF, as well as the tools associated with them.
D2	Master the oral and written expression and comprehension of a foreign language.
D3	Utilizar las herramientas básicas de las tecnologías de la información y las comunicaciones (TIC) necesarias para el ejercicio de su profesión y para el aprendizaje a lo largo de su vida.
D7	Develop the ability to work in interdisciplinary or transdisciplinary teams to offer proposals that contribute to sustainable environmental, economic, political and social development.
D8	Value the importance of research, innovation and technological development in the socioeconomic and cultural progress of society.

Expected results from this subject

Expected results from this subject	Training and Learning Results
To know, understand and analyze the formal representation of diverse lexical, syntactic and semantic phenomena of natural language.	A1 A5 B1 B3 B4 C1 D2 D8

To know, understand and know how to use the technologies, frameworks and libraries for the construction of natural language processing systems.	A1
	A2
	A5
	B3
	B4
	C1
	C2
	D2
	D3
	D7
To design, implement and know how to use algorithms and data structures to treat and support the various phenomena characteristic of natural language.	A1
	A2
	A5
	B1
	B3
	B4
	C1
	C2
	C3
	D2
	D3
	D7
	D8
To know, understand and analyze natural language processing techniques for processing and disambiguation at the lexical, syntactic and semantic levels.	A1
	A2
	A5
	B1
	B3
	B4
	C1
	C2
	C3
	D2
	D3
	D7
	D8
To know and understand the problems posed by ambiguity and imprecision in natural language data sources and techniques to solve them.	A1
	A2
	A5
	B1
	B3
	B4
	C1
	C3
	D2
	D3
	D7
	D8

Contents

Topic	
Introduction.	Levels of analysis.
	Ambiguity and contextual dependencies.
Lexical analysis.	Segmentation.
	Dictionaries and thesauri.
	Part-of-speech tagging.
Syntactic parsing.	Algebraic grammars.
	Mildly context-sensitive grammars.
	Dependency grammars.
	Probabilistic grammars.

Semantic parsing.

Lexical semantics.

Semantic dependencies.

Semantic graphs.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	21	21	42
Laboratory practical	14	48	62
Problem solving	9	25	34
Objective questions exam	3	9	12

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

Methodologies

	Description
Lecturing	Theoretical classes, in which the content of each topic is exposed. The student will have copies of the slides beforehand and the professor will promote an active attitude, asking questions to clarify specific aspects and leaving open questions for the student's reflection.
Laboratory practical	Practical classes with the use of computers, which allow the student to familiarize himself/herself from a practical point of view with the issues presented in the theoretical classes.
Problem solving	Problem-based learning, seminars, case studies and projects.

Personalized assistance

Methodologies	Description
Lecturing	The teachers will attend the students in individualized mentoring sessions, dedicated to the orientation in the study and to the resolution of doubts on the contents, duties and activities of the course.
Laboratory practical	The teachers will attend the students in individualized mentoring sessions, dedicated to the orientation in the study and to the resolution of doubts on the contents, duties and activities of the course.
Problem solving	The teachers will attend the students in individualized mentoring sessions, dedicated to the orientation in the study and to the resolution of doubts on the contents, duties and activities of the course.

Assessment

	Description	Qualification	Training and Learning Results			
Laboratory practical	The delivery of the practicals must be done within the deadline established in the virtual campus and must follow the specifications indicated in the statement for both presentation and defense.	50	A1 A2 A5	B3 B4	C1 C2 C3	D2 D3 D7 D8
Objective questions exam	Compulsory realization. The mastery of the theoretical and operative knowledge of the subject will be evaluated.	50	A1 A2	B1	C1 C2 C3	D2

Other comments on the Evaluation

EVALUATION CRITERIA FOR ALL STUDENTS IN ALL OPPORTUNITIES

Students must achieve at least 40% of the maximum grade for each part (theory, practice) and in any case the sum of both parts must reach a 5 to pass the course. If any of the above requirements is not met, the grade for the course will be established according to the lowest grade obtained.

In case of not reaching the minimum grade in one of the parts, the student will have a second opportunity in which only the delivery of that part will be required.

The delivery of the practicals must be done within the deadline established in the virtual campus and must follow the specifications indicated in the statement for both its presentation and defense.

The student who submits all the compulsory practicals or attends the objective test in the official evaluation period will be

considered "Presented".

If fraud is detected in the answers to exercises or tests, the provisions of Article 42, paragraph 1 of the "Regulation on the evaluation, grading and quality of teaching and learning process of the student body" (https://secretaria.uvigo.gal/uv/web/normativa/public/show/565) will be applied: the student will be graded with a zero (fail)" in the corresponding semester.

EXAM DATES

The official exam dates for the different opportunities, will be published on the ESEI website: https://esei.uvigo.es/docencia/exames/

CONSULTATION/REQUEST OF TUTORING SESSIONS

Tutoring sessions schedules can be consulted through the faculty's personal page, available at https://esei.uvigo.es/docencia/profesorado/

Sources of information
Basic Bibliography
Manning, C., & Schutze, H., **Foundations of statistical natural language processing**, 1, MIT Press, 1999
Goldberg, Y., **Neural network methods for natural language processing. Synthesis lectures on human language technologies**, 1, Morgan Claypool, 2017
Eisenstein, J., **Introduction to Natural Language Processing**, 1, MIT Press, 2019
Jurafsky, D. & Martin, J. H., **Speech and Language Processing**, 3 (draft), https://web.stanford.edu/~jurafsky/slp3/, 2022
Jurafsky, D. & Martin, J. H., **Speech and Language Processing**, 2, Prentice Hall, 2008
Indurkhya, N. & Damerau, F.J. (Eds.), **Handbook of Natural Language Processing**, 2, Routledge, 2010
Complementary Bibliography
Chollet, F., **Keras: The python deep learning library**, Astrophysics Source Code Library, 2018
Russell, S., Norvig, P., **Artificial Intelligence: A Modern Approach**, 4, Pearson, 2022
Manning, C.D., Raghavan, P., Schütze, H., **Introduction to Information Retrieval**, 1, Cambridge University Press, 2008
Kübler, S., McDonald, R., & Nivre, J., **Dependency Parsing. Synthesis lectures on human language technologies**, 1, Morgan Claypool, 2009

Recommendations
Subjects that continue the syllabus
Web intelligence and semantic technologies/O06M193V01205
Language modelling/O06M193V01204
Text mining/O06M193V01302

Subjects that are recommended to be taken simultaneously
Machine learning I/O06M193V01105

Other comments
All students are reminded of the prohibition of the use of mobile devices in exercises, practices and exams, in compliance with article 13.2.d) of the Statute of the University Student, regarding the duties of the university student body, which establishes the duty to "Refrain from using or cooperating in fraudulent procedures in assessment tests, in the work carried out or in official university documents."

IDENTIFYING DATA

Machine learning I

Subject	Machine learning I
Code	O06M193V01105
Study programme	Máster universitario en Inteligencia artificial

Descriptors ECTS Credits		Choose	Year	Quadmester
6		Mandatory	1st	1st

Teaching language	English
Department	
Coordinator	Darriba Bilbao, Víctor Manuel
Lecturers	Darriba Bilbao, Víctor Manuel
E-mail	darriba@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24
General description	This course presents an overview of machine learning. The syllabus explains the different techniques and methods, including supervised and unsupervised learning. In the practical part, real cases will be solved.

Training and Learning Results

Code	
A1	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A2	CB7 - Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
A3	CB8 - the complexity of making judgments based on information that, while incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A4	CB9 - Students should be able to communicate their conclusions and the ultimate knowledge and rationale behind them to specialized and non-specialized audiences in a clear and unambiguous manner.
B2	Successfully address all stages of an Artificial Intelligence project.
B3	Search and select useful information needed to solve complex problems, handling with fluency the bibliographic sources of the field.
B4	Elaborate adequately and with certain originality written compositions or motivated arguments, write plans, work projects, scientific articles and formulate reasonable hypotheses in the field.
B5	Work in teams, especially multidisciplinary teams, and be skilled in time management, people management and decision making.
C10	Ability to build, validate and apply a stochastic model of a real system from observed data and the critical analysis of the results obtained
C11	Understanding and mastery of the main data analysis techniques and tools, both from a statistical and machine learning point of view, including those dedicated to the processing of large volumes of data, and the ability to select the most appropriate ones for problem solving.
C12	Ability to plan, formulate and resolve all stages of a data project, including understanding and mastery of basic fundamentals and techniques for searching and filtering information in large data collections.
C15	Knowledge of computer tools in the field of machine learning, and ability to select the most appropriate for solving a problem.
D3	Utilizar las herramientas básicas de las tecnologías de la información y las comunicaciones (TIC) necesarias para el ejercicio de su profesión y para el aprendizaje a lo largo de su vida.
D4	To develop for the exercise of a citizenship respectful of democratic culture, human rights and gender perspective.
D7	Develop the ability to work in interdisciplinary or transdisciplinary teams to offer proposals that contribute to sustainable environmental, economic, political and social development.
D8	Value the importance of research, innovation and technological development in the socioeconomic and cultural progress of society.
D9	Have the ability to manage time and resources: develop plans, prioritize activities, identify critical ones, set deadlines and meet them.

Expected results from this subject

Expected results from this subject	Training and Learning Results

Ability to identify if a problem can be solved using a machine learning technique.	A3
	B2
	B3
	B4
	C12
	D4
	D7
	D8
	D9
Obtain the ability to choose the most appropriate learning technique for a problem depending on the nature of the data.	A1
	A2
	A4
	B2
	C11
	C15
	D3
	D8
Ability to design and develop a learning model in a real programming environment.	A1
	A2
	A3
	A4
	B5
	C10
	C15
	D3
	D7
	D9
Master the different learning models and be able to apply them to real-world problems.	A2
	B2
	B3
	C11
	C15
	D3
	D8
Know and understand the difference between classification and regression problems.	A1
	A3
	B3
	C10
	C11
Understand how to compare the results of the different types of machine learning.	A2
	A4
	C10
	C12
	C15
	D4
	D8
	D9

Contents

Topic	
Supervised learning	Introduction to learning
	Artificial Neural Networks
	Support Vector Machines
	Decision trees
	Regression
	Instance-based learning
Ensemble modeling	Ensemble modeling
Preprocessing, evaluation and regularization	Preprocessing and feature extraction techniques.
	Model creation and evaluation.
	Complexity & Regularization.

	Unsupervised learning: clustering
Unsupervised learning	
	Unsupervised neural networks
Reinforcement learning	Markov decision processes
	Reinforcement learning

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	21	42	63
Laboratory practical	13	24	37
Project based learning	9	19	28
Objective questions exam	2	20	22

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

Methodologies

	Description
Lecturing	Theoretical teaching of the subject matter of the course
Laboratory practical	Solve practical problems by using the different techniques that will be explained in the theory classes.
Project based learning	Writing, under the supervision of the teacher, of reports explaining the resolution of the problems carried out in the laboratory practices and the results obtained.

Personalized assistance

Methodologies	Description
Laboratory practical	Practical work carried out with the advice of the teacher.
Project based learning	Writing of the explanatory report under the teacher's supervision.

Assessment

	Description	Qualification	Training and Learning Results			
Laboratory practical	Resolution of real world problems using the methodology, for which several techniques explained in theory will be used, and the student will be stimulated to generate new ideas for the resolution of these problems.	20	A1 A2	B2 B3 B5	C12 C15	D3 D7
Project based learning	Writing of the report on the resolution of the real problems carried out in the laboratory practices. The writing of the report will include a bibliographic review of the most important works related, written in English for the most part, documentation on the problem to be solved, methodology used, and comparison of the results found in the application of the different techniques, as well as a critical evaluation of both the results obtained and the information used.	30	A3 A4	B2 B3 B4 B5		D4 D8 D9
Objective questions exam	Test questions about the contents of the course, based on the different machine learning techniques and their applications.	50	A2	B3	C10 C11	D4 D8 D9

Other comments on the Evaluation

EVALUATION CRITERIA FOR ALL STUDENTS IN ALL OPPORTUNITIES

Students must achieve at least 40% of the maximum mark for each part (theory, practice) and in any case the sum of both parts must exceed 5 to pass the subject. If any of the above requirements is not met, the grade of the call will be established according to the lowest grade obtained.

In the second opportunity, the evaluation will be carried out with the same criteria, and a new term will be opened for the delivery of the practical works.

The deliveries of the practices must be made within the period established in the virtual campus and must follow the specifications indicated in the statement both for their presentation and their defense.

Students will have the condition of "Presented" if you attend the theoretical test in the official evaluation period.

If fraud is detected in the answers to exercises or tests, the provisions of Article 42, paragraph 1 of the "Regulation on the evaluation, grading and quality of teaching and learning process of the student body"

(https://secretaria.uvigo.gal/uv/web/normativa/public/show/565) will be applied: the student will be graded with a zero (fail)" in the corresponding semester.

EXAM DATES

The official exam dates for the different opportunities, will be published on the ESEI

website: https://esei.uvigo.es/docencia/exames/

CONSULTATION/REQUEST OF TUTORING SESSIONS

Tutoring sessions schedules can be consulted through the faculty's personal page, available at

https://esei.uvigo.es/docencia/profesorado/

Sources of information

Basic Bibliography

D. Borrajo, J. González, P. Isasi, **Aprendizaje automático**, 1, Sanz y Torres, 2006

T.M. Mitchell, **Machine Learning**, 1, McGraw-Hill, 1997

B. Sierra, **Aprendizaje automático: conceptos básicos y avanzados. Aspectos prácticos utilizando el software WEKA**, 1, Pearson Education, 2006

S. Dzeroski, N. Lavrac, **Relational Data Mining**, 1, Springer, 2001

D. Aha, **Lazy Learning**, 1, Kluwer Academics Publishers, 1997/2013

R. Sutton, A. Barto, **Reinforcement Learning. An Introduction**, 2, MIT Press, 2018

A. Webb, **Statistical Pattern Recognition**, 3, Wiley, 2011

E. Alpaydin, **Introduction to Machine Learning**, 4, MIT Press, 2020

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Machine learning ll/O06M193V01207

Deep learning/O06M193V01206

Evolutionary computation/O06M193V01208

Other comments

All students are reminded of the prohibition of the use of mobile devices in exercises, practices and exams, in compliance with article 13.2.d) of the Statute of the University Student, regarding the duties of the university student body, which establishes the duty to "Refrain from using or cooperating in fraudulent procedures in assessment tests, in the work carried out or in official university documents."

IDENTIFYING DATA

Computer vision I

Subject	Computer vision I
Code	O06M193V01106
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Mandatory	1st	1st

Teaching language	English
Department	
Coordinator	Formella , Arno
Lecturers	Formella , Arno
E-mail	formella@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24
General description	(*)https://formella.webs.uvigo.es/doc/vci23

Training and Learning Results

Code	
A1	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A2	CB7 - Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
A5	CB10 - That students possess the learning skills that will enable them to continue studying in a manner that will be largely self-directed or autonomous.
B1	Maintain and extend sound theoretical approaches to enable the introduction and exploitation of new and advanced technologies in the field of Artificial Intelligence.
B3	Search and select useful information needed to solve complex problems, handling with fluency the bibliographic sources of the field.
B5	Work in teams, especially multidisciplinary teams, and be skilled in time management, people management and decision making.
C23	Understanding and mastering the basic concepts and techniques of digital image processing.
C24	Ability to apply different techniques to computer vision problems.
C25	Knowledge and skills to design systems for detection, classification and tracking of objects in images and video.
C26	Understanding and mastery of the forms of representation of signals and images according to their data, as well as their fundamental characteristics and their forms of representation.
D3	Utilizar las herramientas básicas de las tecnologías de la información y las comunicaciones (TIC) necesarias para el ejercicio de su profesión y para el aprendizaje a lo largo de su vida.
D4	To develop for the exercise of a citizenship respectful of democratic culture, human rights and gender perspective.
D8	Value the importance of research, innovation and technological development in the socioeconomic and cultural progress of society.

Expected results from this subject

Expected results from this subject	Training and Learning Results
New	A1
	A2
	A5
	B1
	B3
	B5
	C23
	C24
	C25
	C26
	D3
	D4
	D8

New	A1
	A2
	A5
	B1
	B3
	B5
	C23
	C24
	C25
	C26
	D3
	D4
	D8
New	A1
	A2
	A5
	B1
	B3
	B5
	C23
	C24
	C25
	C26
	D3
	D4
	D8
New	A1
	A2
	A5
	B1
	B3
	B5
	C23
	C24
	C25
	C26
	D3
	D4
	D8

Contents

Topic

Planning

| | Class hours | Hours outside the classroom | Total hours |

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

Methodologies

Description

Personalized assistance

Assessment

| Description | Qualification | Training and Learning Results |

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

IDENTIFYING DATA

Intelligent robotics I

Subject	Intelligent robotics I
Code	O06M193V01107
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Mandatory	1st	1st

Teaching language	English
Department	Defense University Center At Spanish Naval Academy
Coordinator	Suárez García, Andrés
Lecturers	Suárez García, Andrés
E-mail	andsuarez@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24
General description	

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

IDENTIFYING DATA

Explainable and Trustworthy AI

Subject	Explainable and Trustworthy AI
Code	O06M193V01201
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Mandatory	1st	2nd

Teaching language	
Department	
Coordinator	García Lourenco, Analia María
Lecturers	García Lourenco, Analia María
E-mail	analia@uvigo.es
Web	http://www.usc.gal/es/estudios/masteres/ingenieria-arquitectura/master-universitario-intelixencia-artificial
General description	

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information
Basic Bibliography
Complementary Bibliography

Recommendations

IDENTIFYING DATA

Multiagent systems

Subject	Multiagent systems
Code	O06M193V01202
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	6		Optional	1st	2nd

Teaching language	
Department	
Coordinator	González Moreno, Juan Carlos
Lecturers	Gómez Rodríguez, Alma María
	González Moreno, Juan Carlos
E-mail	jcmoreno@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24
General description	

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

IDENTIFYING DATA

Knowledge and reasoning under uncertainty

Subject	Knowledge and reasoning under uncertainty				
Code	O06M193V01203				
Study programme	Máster universitario en Inteligencia artificial				
Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Optional	1st	2nd
Teaching language					
Department					
Coordinator	García Lourenco, Analia María				
Lecturers	García Lourenco, Analia María				
E-mail	analia@uvigo.es				
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24				
General description					

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information
Basic Bibliography
Complementary Bibliography

Recommendations

IDENTIFYING DATA

Language modelling

Subject	Language modelling
Code	O06M193V01204
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Optional	1st	1st

Teaching language	English
Department	
Coordinator	Darriba Bilbao, Víctor Manuel
Lecturers	Darriba Bilbao, Víctor Manuel
E-mail	darriba@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24
General description	The course introduces the student to the modeling of human language, i.e. the generation of models that allow estimating the plausibility of a text, an essential phase in the design of any application based on the exploitation of its communicative mechanisms. The student will be trained to master the theoretical principles and techniques that allow their construction, both those based on discrete representations of the elements of the language and on continuous representations. Special attention will be given to modeling in contexts of scarce linguistic resources, whether this is motivated by the treatment of novel domains of knowledge or by the exploitation of languages of limited diffusion.

Training and Learning Results

Code	
A1	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A2	CB7 - Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
A5	CB10 - That students possess the learning skills that will enable them to continue studying in a manner that will be largely self-directed or autonomous.
B1	Maintain and extend sound theoretical approaches to enable the introduction and exploitation of new and advanced technologies in the field of Artificial Intelligence.
B3	Search and select useful information needed to solve complex problems, handling with fluency the bibliographic sources of the field.
B4	Elaborate adequately and with certain originality written compositions or motivated arguments, write plans, work projects, scientific articles and formulate reasonable hypotheses in the field.
C1	Understanding and mastering techniques for text processing in natural language
C2	Understanding and mastery of the fundamentals and techniques of semantic processing of linked, structured, and unstructured documents, and of the representation of their content.
C3	Understanding and knowledge of the techniques of representation and processing of knowledge through ontologies, graphs, and RDF, as well as the tools associated with them.
D2	Master the oral and written expression and comprehension of a foreign language.
D3	Utilizar las herramientas básicas de las tecnologías de la información y las comunicaciones (TIC) necesarias para el ejercicio de su profesión y para el aprendizaje a lo largo de su vida.
D7	Develop the ability to work in interdisciplinary or transdisciplinary teams to offer proposals that contribute to sustainable environmental, economic, political and social development.
D8	Value the importance of research, innovation and technological development in the socioeconomic and cultural progress of society.

Expected results from this subject

Expected results from this subject	Training and Learning Results

To know how to use the techniques and methods of natural language processing to solve real problems of analysis of texts in natural language.	A2 A5 B1 B3 B4 C1 C3 D2 D3 D7
To know, understand and analyze deep learning techniques applied to natural language processing.	A1 A2 A5 B1 B3 C1 C2 D2 D3 D7 D8
To know how to use deep learning techniques and methods to solve practical problems in natural language processing.	A1 A2 A5 B1 B3 B4 C1 C2 D2 D3 D7 D8
To know and understand the environmental problems posed by the computational cost of deep learning techniques when applied to text analysis	A1 B1 C1 C2 D2 D8

Contents

Topic	
Language models	N-gram based language models Neural based language models
Distributional semantics models	Linguistic hypothesis about distributional meaning Classic models of distributional semantics Neural models representing static meaning (word embeddings) Neural models representing dynamic-contextual meaning Compositional models
Sequence labeling	Use and fine-tuning of models for sequence labeling
Text-To-Text models	Text-To-Text models

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	10	10	20
Laboratory practical	5	15	20
Project based learning	6	28	34
Objective questions exam	1	0	1

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

Methodologies

	Description
Lecturing	Teachers present a topic to students with the aim of providing a set of information with a specific scope.

		Laboratory practical	The teachers of the discipline present to the students one or more practical problems that require the comprehension and application of the theoretical and practical contents included in the syllabus of the subject. Students can work on solving problems individually or as a team. These activities may require autonomous work, although guided by the teacher of the subject.

Laboratory practical	The teachers of the discipline present to the students one or more practical problems that require the comprehension and application of the theoretical and practical contents included in the syllabus of the subject. Students can work on solving problems individually or as a team. These activities may require autonomous work, although guided by the teacher of the subject.
Project based learning	Students are presented with practical projects that require an important part of their total dedication to the topic. In addition, and due to the scope of the work to be performed, it is necessary for the student to use not only management skills, but also technical skills.

Personalized assistance

Methodologies	Description
Laboratory practical	The teachers will attend the students in individualized mentoring sessions, dedicated to the orientation in the study and to the resolution of doubts on the contents, duties and activities of the discipline.
Project based learning	The teachers will attend the students in individualized mentoring sessions, dedicated to the orientation in the study and to the resolution of doubts on the contents, duties and activities of the discipline.

Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	Continuous monitoring of class attendance and student participation	5	A1 B4	B1 C2 C3	C1	D2 D8
Project based learning	Deliveries of proyects must be made within the period established in the virtual campus and must follow the specifications indicated in the assigment both for their presentation and their defense. Mandatory.	50	A1 A2 A5	B1 B3 B4	C1 C2 C3	D2 D3 D7 D8
Objective questions exam	Mastery of theoretical and operational knowledge of the subject will be assessed. Mandatory.	45	A1 B4	B1 C2 C3	C1	D2 D8

Other comments on the Evaluation

EVALUATION CRITERIA FOR ALL STUDENTS IN ALL OPPORTUNITIES

Students must achieve a minimum of 40% of the maximum mark of the "Laboratory Practices" and "Objective Test" parts, and in any case the sum of the three parts must be greater than 5 to pass the subject. If any of the above requirements is not met, the grade for the course will be established according to the lowest grade obtained.

In case of not reaching the minimum score in the "Laboratory Practices" or "Objective Test" parts, the student will have a second opportunity in which only the delivery of the failed part will be required.

Grades will not be saved between academic years.

The delivery of the practicals must be done within the deadline established in the virtual campus and must follow the specifications indicated in the statement for both its presentation and defense.

The student who submits all the compulsory practicals or attends the objective test in the official evaluation period will be considered "Presented".

If fraud is detected in the answers to exercises or tests, the provisions of Article 42, paragraph 1 of the "Regulation on the evaluation, grading and quality of teaching and learning process of the student body" (https://secretaria.uvigo.gal/uv/web/normativa/public/show/565) will be applied: the student will be graded with a zero (fail)" in the corresponding semester.

EXAM DATES

The official exam dates for the different opportunities, will be published on the ESEI

website: https://esei.uvigo.es/docencia/exames/

CONSULTATION/REQUEST OF TUTORING SESSIONS

Tutoring sessions schedules can be consulted through the faculty's personal page, available at

https://esei.uvigo.es/docencia/profesorado/

Sources of information

Basic Bibliography

Jurafsky, Daniel & James H. Martin, **N-gram Language Models.**, https:// web.stanford.edu/~jurafsky/slp3, 2022

Jurafsky, Daniel & James H. Martin, **Vector Semantics and Embeddings**, https:// web.stanford.edu/~jurafsky/slp3, 2022

Jurafsky, Daniel & James H. Martin, **Neural Networks and Neural Language Models**, https:// web.stanford.edu/~jurafsky/slp3, 2022

Jurafsky, Daniel & James H. Martin, **Sequence Labeling for Parts of Speech and Named Entities**, https:// web.stanford.edu/~jurafsky/slp3, 2022

Complementary Bibliography

Baroni, Marco, Raffaella Bernardi & Roberto Zamparelli, **Frege in space: A program for compositional distributional semantics**, University of Colorado Boulder, 2014

Baroni, Marco, Georgiana Dinu & Germán Kruszewski, **Don⬚t count, predict! A systematic comparison of context-counting vs. context-predicting semantic vectors**, Association for Computational Linguistics, 2014

Church, Kenneth Ward, Zeyu Chen & Yanjun Ma, **Emerging trends: A gentle introduction to fine-tuning**, Cambridge University Press, 2021

Devlin, Jacob, Ming-Wei Chang, Kenton Lee & Kristina Toutanova, **BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding**, Association for Computational Linguistics, 2019

Erk, Katrin, **Vector space models of word meaning and phrase meaning: A survey**, Wiley & Sons, 2012

Hirschberg, Julia & Manning, Christopher D., **Advances in natural language processing**, AAAS, 2015

Linzen, Tal, **Issues in evaluating semantic spaces using word analogies**, Association for Computational Linguistics, 2016

Lenzi, Alessandro, **Distributional Models of Word Meaning.**, Annual Review of Linguistics, Vol. 4, 2018

Mikolov, Tomas, Wen-tau Yih & Zweig Geoffrey, **Linguistic Regularities in Continuous Space Word Representations**, Association for Computational Linguistics, 2013

Taher Pilehvar, Mohammad & Jose Camacho-Collados, José, **Embeddings in Natural Language Processing: Theory and Advances in Vector Representations of Meaning**, MIT Press, 2021

Recommendations

Subjects that continue the syllabus

Web intelligence and semantic technologies/O06M193V01205

Text mining/O06M193V01302

Subjects that are recommended to be taken simultaneously

Machine learning ll/O06M193V01207

Deep learning/O06M193V01206

Subjects that it is recommended to have taken before

Machine learning I/O06M193V01105

Natural language understanding/O06M193V01104

Other comments

All students are reminded of the prohibition of the use of mobile devices in exercises, practices and exams, in compliance with article 13.2.d) of the Statute of the University Student, regarding the duties of the university student body, which establishes the duty to "Refrain from using or cooperating in fraudulent procedures in assessment tests, in the work carried out or in official university documents."

IDENTIFYING DATA

Web intelligence and semantic technologies

Subject	Web intelligence and semantic technologies
Code	O06M193V01205
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	6		Optional	1st	1st

Teaching language	
Department	
Coordinator	Seara Vieira, Adrián
Lecturers	Seara Vieira, Adrián
E-mail	adrseara@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24
General description	

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information
Basic Bibliography
Complementary Bibliography

Recommendations

IDENTIFYING DATA

Deep learning

Subject	Deep learning
Code	O06M193V01206
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	1st	1st

Teaching language	
Department	
Coordinator	Rodríguez Liñares, Leandro
Lecturers	Olivieri Cecchi, David Nicholas Rodríguez Liñares, Leandro
E-mail	leandro@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&assignatura=614544013&any_academic=2024_25
General description	

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information

Basic Bibliography

François Chollet, **Deep Learning with Python**, 978-1617296864, 2, Manning, 2021

Aurélien Géron, **Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow**, 978-1098125974, 3, O'Reilly Media, 2022

Mohamed Elgendy, **Deep Learning for Vision Systems**, 978-1617296192, 1, Manning, 2020

Jakub Langr, Vladimir Bok, **GANs in Action: Deep learning with Generative Adversarial Networks**, 978-1617295560, 1, Manning, 2019

David Foster, **Generative Deep Learning: Teaching Machines To Paint, Write, Compose, and Play**, 978-1098134181, 2, O'Reilly Media, 2023

Complementary Bibliography

Andrew Ferlitsch, **Deep Learning Patterns and Practices**, 978-1617298264, 1, Manning, 2021

Andrew W. Trask, **Grokking Deep Learning**, 978-1617293702, 1, Manning, 2019

Recommendations

IDENTIFYING DATA

Machine learning II

Subject	Machine learning II				
Code	O06M193V01207				
Study programme	Máster universitario en Inteligencia artificial				
Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Optional	1st	2nd
Teaching language					
Department					
Coordinator	Olivieri Cecchi, David Nicholas				
Lecturers	Olivieri Cecchi, David Nicholas				
E-mail	dnolivieri@gmail.com				
Web	http://https://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&assignatura=614544014&any_academic=2024_25&any_academic=2024_25				
General description					

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information

Basic Bibliography

Bahri, M., Bifet, A., Gama, J., Gomes, H. M., & Maniu, S, **Data stream analysis: Foundations, major tasks and tools. Wiley nterdisciplinary Reviews: Data Mining and Knowledge Discovery**, doi: 10.1002/widm.1405, 11 (3), Wiley nterdisciplinary Reviews, 2021

Bifet, A., Gavalda, R., Holmes, G., & Pfahringer, B, **Machine learning for data streams: with practical examples in MOA.**, 978-0-262-03779-2, MIT Press, 201

Gomes, H. M., Read, J., Bifet, A., Barddal, J. P., & Gama, J, **Machine learning for streaming data: state of the art, challenges, and opportunities**, doi: 10.1145/3373464.3373470, 21(2), 6-22, ACM SIGKDD Explorations Newsletter, 2019

Hoi, S. C., Sahoo, D., Lu, J., & Zhao, P., **Online learning: A comprehensive survey**, doi: 10.1016/j.neucom.2021.04.112, Volume 459, 12 October 2021, Pages 249-289, Neurocomputing, 2021

Li, T., Sahu, A. K., Talwalkar, A., & Smith, V., **Federated learning: Challenges, methods, and future directions**, doi: 10.1109/MSP.2020.2975749, Volume: 37 Issue: 3, IEEE signal processing magazine, 2020

Lu, J., Liu, A., Dong, F., Gu, F., Gama, J., & Zhang, G, **Learning under concept drift: A review.**, doi: 10.1109/TKDE.2018.2876857, Volume: 31, Issue: 12,, IEEE Transactions on Knowledge and DataEngineering, 2019

Orabona, F., **A modern introduction to online learning**, arXiv:1912.13213, arXivpreprint, 2019

Gama, J., liobait, I., Bifet, A., Pechenizkiy, M., & Bouchachia, A., **A survey on concept drift adaptation**, doi: 10.1145/2523813, Vol. 46, No. 4, ACM computing surveys(CSUR), 2014

Complementary Bibliography

Yang, Q., Liu, Y., Chen, T., & Tong, Y., **Federated machine learning: Concept and applications**, doi: 10.1145/3298981,

Recommendations

Evolutionary computation

Subject	Evolutionary computation			
Code	O06M193V01208			
Study programme	Máster universitario en Inteligencia artificial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	English			
Department				
Coordinator	Formella , Arno			
Lecturers	Formella , Arno			
E-mail	formella@uvigo.es			
Web	http://formella.webs.uvigo.es/doc/ec24			
General description	The course introduces the student to the modeling of systems capable of adapting to their environments and learning from their experience, imitating the evolutionary processes of nature. In this context, the student will be instructed not only in the use of different techniques for the search of solutions inspired by the prevalence or subsistence strategies of a population, but also in the application of meta-heuristics for their optimization.			

Training and Learning Results

Code	
A1	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A2	CB7 - Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
A3	CB8 - the complexity of making judgments based on information that, while incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
B2	Successfully address all stages of an Artificial Intelligence project.
B3	Search and select useful information needed to solve complex problems, handling with fluency the bibliographic sources of the field.
B4	Elaborate adequately and with certain originality written compositions or motivated arguments, write plans, work projects, scientific articles and formulate reasonable hypotheses in the field.
B5	Work in teams, especially multidisciplinary teams, and be skilled in time management, people management and decision making.
C10	Ability to build, validate and apply a stochastic model of a real system from observed data and the critical analysis of the results obtained
C11	Understanding and mastery of the main data analysis techniques and tools, both from a statistical and machine learning point of view, including those dedicated to the processing of large volumes of data, and the ability to select the most appropriate ones for problem solving.
C12	Ability to plan, formulate and resolve all stages of a data project, including understanding and mastery of basic fundamentals and techniques for searching and filtering information in large data collections.
C15	Knowledge of computer tools in the field of machine learning, and ability to select the most appropriate for solving a problem.
D3	Utilizar las herramientas básicas de las tecnologías de la información y las comunicaciones (TIC) necesarias para el ejercicio de su profesión y para el aprendizaje a lo largo de su vida.
D7	Develop the ability to work in interdisciplinary or transdisciplinary teams to offer proposals that contribute to sustainable environmental, economic, political and social development.
D8	Value the importance of research, innovation and technological development in the socioeconomic and cultural progress of society.
D9	Have the ability to manage time and resources: develop plans, prioritize activities, identify critical ones, set deadlines and meet them.

Expected results from this subject

Expected results from this subject	Training and Learning Results

RA1: Know the basic concepts of evolutionary computation, of classical evolutionary algorithms and of bioinspired algorithms.	A1
	A2
	A3
	B2
	B3
	B4
	B5
	C10
	C11
	C12
	C15
	D3
	D7
	D8
	D9
RA2: Have the ability to design bioinspired models of complex real systems.	A1
	A2
	A3
	B2
	B3
	B4
	B5
	C10
	C11
	C12
	C15
	D3
	D7
	D8
	D9
RA3: Know and apply techniques based on evolutionary systems, artificial neural networks and other bioinspired models.	A1
	A2
	A3
	B2
	B3
	B4
	B5
	C10
	C11
	C12
	C15
	D3
	D7
	D8
	D9
RA4: Identify the appropriate data-driven solution search techniques according to the type of problem. Understand the different possibilities of combination or hybridization between global evolutionary search methods and other local search metaheuristics.	A1
	A2
	A3
	B2
	B3
	B4
	B5
	C10
	C11
	C12
	C15
	D3
	D7
	D8
	D9

RA5: Know different adaptive bioinspired models and handle tools and environments currently used in the field of the bioinspired algorithms.	A1 A2 A3 B2 B3 B4 B5 C10 C11 C12 C15 D3 D7 D8 D9

Contents

Topic	
Introduction to algorithms of optimisation	General scheme of evolutionary algorithms. Basic concepts: search domain, constraints, penalties. No Free Lunch theorem. Basic concepts of multi-objective optimization.
Paradigms and meta-heuristic of nature-inspired algorithms	Bio-inspired metaheuristics. Swarm intelligence.
Specific algorithms of evolutionary computation	Genetic algorithms. Evolutionary strategies. Genetic programming. Examples of swarm intelligence: Particle Swarm Optimization, Arficial Bee Algorithm, Bacterial Colony Optimization, Ant Algorithms. Examples of other bio-inspired evolutionary algorithms.
Advances in the automatic adaptation of evolutionary algorithms	Automatic adaptation of the defining parameters of an evolutionary algorithm. Aplication of memetic algorithms (local search at individuals in population based algorithms). Use of hyper-heuristics.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	10.5	10.5	21
Laboratory practical	10.5	31.5	42
Case studies	5	0	5
Essay	2	2	4
Objective questions exam	3	0	3

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

Methodologies

	Description
Lecturing	Oral exhibition complemented with the use of audiovisual means and the introduction of some questions headed to the students, with the purpose to transmit knowledges and facilitate the learning. In addition to the time of oral exhibition by part of the professor, this formative activity requires of the student the dedication of a time to prepare and review by own account the material object of the class. CONTINUOUS EVALUATION mandatory assistance non-mandatory GLOBAL EVALUATION mandatory

Laboratory practical	Classes devoted to that the students develop practical works that involve to tackle the resolution of complex problems, and the analysis and design of solutions that constitute a half for his resolution. This activity can require of the students the oral presentation of the works made. The works made by the students can done individually or in groups. CONTINUOUS EVALUATION mandatory assistance non-mandatory GLOBAL EVALUATION mandatory
Case studies	Present to the students a state-of-the-art work, real or fictitious, that presents a specific topic. The students has to apply the theoretical knowledge of the subject to look for solution to the problem. Like general norm, case studies will make in groups. The distinct groups of work will present and share their solutions. CONTINUOUS EVALUATION mandatory assistance non-mandatory GLOBAL EVALUATION non-mandatory

Personalized assistance

Methodologies	Description
Laboratory practical	The professor will attend the students in sessions of laboratory with the aim of orientation to the resolution of the exercises and practical works of the subject.
Case studies	The professor will attend the students in sessions of office hours dedicated to the orientation in the study and the resolution of doubts on the contents and works of the subject. Use a remote platform with capacity of forums of discussion both between the students and with the professor.

Tests	Description
Essay	The professor will attend the students in sessions of office hours dedicated to the orientation in the study and the resolution of doubts on the contents and works of the subject.

Assessment

	Description	Qualification	Training and Learning Results			
Lecturing	Continuous evaluation: part of the evaluation of the students is based on the evolution and work in the frame of the subject and on the participation in the formative activities. (RA1, RA2, RA3, RA4, RA5)	5	A1 A2 A3	B3		D8
Laboratory practical	Continuous evaluation: part of the evaluation of the students is based on the evolution and work in the frame of the subject and on the participation in the formative activities. (RA1, RA2, RA3, RA4, RA5)	5	A1 A2 A3	B2 B4	C12 C15	D7 D8
Essay	Evaluation of practical works: evaluation of the solutions proposed by the students to the excercises. The evaluation of excercises is carried out by means of a correction by the professor, a defence of the solution done by the student in a written comment or in an oral presentation of the developed solution.	50	A1 A2 A3	B2 B3 B4 B5	C10 C11 C12 C15	D3 D7 D8 D9
Objective questions exam	Final examination: written evaluation at the end of the subject, oriented especially to evaluate the understanding of the theory and laboratory excercises. (RA1, RA2, RA3, RA4, RA5)	40	A1 A2 A3	B3 B4	C10 C11 C12 C15	D8

Other comments on the Evaluation

CONTINUOUS ASSESSMENT SYSTEM

TEST 1: Evaluation in master class

Description: Active participation in theory classes.

Methodology(s) applied(s): Objective oral questions.

% Qualification: 5%

% Minimum (if any): there is no

Assessed skills: A1, A2, A3, B3, D8

Assessed learning outcomes: RA1, RA2, RA3, RA4, RA5

TEST 2: Evaluation in laboratory practices

Description: Active participation in practical classes.

Methodology(s) applied(s): Objective oral questions.

% Qualification: 5%

% Minimum (if any): there is no

Assessed skills: A1, A2, A3, B2, B4, C12, C15, D7, D8

Assessed learning outcomes: RA1, RA2, RA3, RA4, RA5

TEST 3: Work evaluation (part 1, at the end of the first half of the academic period)

Description: Objective test that will include evaluation of the application of theoretical concepts and resolution of exercises.

Methodology(s) applied(s): Delivery of solutions developed with report.

% Qualification: 25%

% Minimum (if any): there is no

Assessed skills: A1, A2, A3, B2, B3, B4, B5, C10, C11, C12, C15, D8

Assessed learning outcomes: RA1, RA2, RA3, RA4, RA5

TEST 4: Work evaluation (part 2, at the end of the academic period)

Description: Objective test that will include evaluation of the application of theoretical concepts and resolution of exercises.

Methodology(s) applied(s): Delivery of solutions developed with report.

% Qualification: 25%

% Minimum (if any): there is no

Assessed skills: A1, A2, A3, B2, B3, B4, B5, C10, C11, C12, C15, D8

Assessed learning outcomes: RA1, RA2, RA3, RA4, RA5

TEST 5: Objective questions exam (during exam period)

Description: Objective test that will include short questions and development questions.

Methodology(s) applied(s): Written exam.

% Qualification: 40%

% Minimum (if any): there is no

Assessed skills: A1, A2, A3, B3, B4, C10, C11, C12, C15, D8

Assessed learning outcomes: RA1, RA2, RA3, RA4, RA5

All students who take any of the tests 2 and 3 are understood to accept the continuous assessment procedure described above. If a student does not appear for any of the tests, a grade of 0 will be assigned to it.

GLOBAL EVALUATION SYSTEM

Procedure for choosing the global assessment modality: It is considered that the student opts for the global assessment system if they do not take Test 1 of the continuous assessment system).

TEST 1: Theoretical, practical and/or laboratory evaluation.

Description: Objective test that will include evaluation of theoretical concepts and resolution of exercises.

Methodology(s) applied(s): Problem solving, Examination of objective questions. They must appear in the top table.

% Rating: 100%

Minimum % (if applicable): reach 50%

Assessed skills: All of the subject.

Evaluated learning outcomes: All of the subject.

EVALUATION CRITERIA FOR EXTRAORDINARY CALL AND FINAL DEGREE

The global evaluation systems previously exposed will be used.

RECORD QUALIFICATION PROCESS

The sum of the sections described above will appear in the minutes.

EVALUATION DATES

The dates of the tests corresponding to the continuous assessment system will be published in the calendar of activities, available on the ESEI website https://esei.uvigo.es/docencia/horarios/.

The official exam dates of the different calls, officially approved by the Xunta de Centro of the ESEI, are published on the ESEI website https://esei.uvigo.es/docencia/exames/.

USE OF MOBILE DEVICES

All students are reminded of the prohibition of the use of mobile devices in exercises and practices, in compliance with article 13.2.d) of the University Student Statute, regarding the duties of university students, which establishes the duty to "Refrain from using or cooperation in fraudulent procedures in the evaluation tests, in the works that are carried out or in official documents of the university."

CONSULTATION/REQUEST FOR TUTORIALS

The tutorials can be consulted through the personal page of the teaching staff, accessible through https://esei.uvigo.es/docencia/profesorado/

Sources of information
Basic Bibliography
Dan Simon, **Evolutionary Optimization Algorithms.**, 978-0-470-93741-9, Wiley, 2013
A. E. Eiben, **Introduction to Evolutionary Computing (Natural Computing Series)**, 978-3-662-44873-1, Springer, 2010

Complementary Bibliography

Recommendations

IDENTIFYING DATA

Computer vision II

Subject	Computer vision II			
Code	O06M193V01209			
Study programme	Máster universitario en Inteligencia artificial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	1st	2nd
Teaching language	English			
Department				
Coordinator				
Lecturers	García Lourenco, Analia María			
E-mail				
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24			
General description				

Training and Learning Results

Code	
A1	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A2	CB7 - Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
A5	CB10 - That students possess the learning skills that will enable them to continue studying in a manner that will be largely self-directed or autonomous.
B1	Maintain and extend sound theoretical approaches to enable the introduction and exploitation of new and advanced technologies in the field of Artificial Intelligence.
B3	Search and select useful information needed to solve complex problems, handling with fluency the bibliographic sources of the field.
B5	Work in teams, especially multidisciplinary teams, and be skilled in time management, people management and decision making.
C23	Understanding and mastering the basic concepts and techniques of digital image processing.
C24	Ability to apply different techniques to computer vision problems.
C25	Knowledge and skills to design systems for detection, classification and tracking of objects in images and video.
C26	Understanding and mastery of the forms of representation of signals and images according to their data, as well as their fundamental characteristics and their forms of representation.
D3	Utilizar las herramientas básicas de las tecnologías de la información y las comunicaciones (TIC) necesarias para el ejercicio de su profesión y para el aprendizaje a lo largo de su vida.
D4	To develop for the exercise of a citizenship respectful of democratic culture, human rights and gender perspective.
D8	Value the importance of research, innovation and technological development in the socioeconomic and cultural progress of society.

Expected results from this subject

Expected results from this subject	Training and Learning Results
New	A1 A2 A5 B1 B3 B5 C23 C24 C25 C26 D3 D4 D8

New		A1
		A2
		A5
		B1
		B3
		B5
		C23
		C24
		C25
		C26
		D3
		D4
		D8
New		A1
		A2
		A5
		B1
		B3
		B5
		C23
		C24
		C25
		C26
		D3
		D4
		D8
New		A1
		A2
		A5
		B1
		B3
		B5
		C23
		C24
		C25
		C26
		D3
		D4
		D8

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

IDENTIFYING DATA

Intelligent robotics II					
Subject	Intelligent robotics II				
Code	O06M193V01210				
Study programme	Máster universitario en Inteligencia artificial				
Descriptors	ECTS Credits		Choose	Year	Quadmester
	6		Optional	1st	2nd
Teaching language					
Department					
Coordinator	García Lourenco, Analia María				
Lecturers	García Lourenco, Analia María				
E-mail	analia@uvigo.es				
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24				
General description					

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

IDENTIFYING DATA

AI project management

Subject	AI project management				
Code	O06M193V01211				
Study programme	Máster universitario en Inteligencia artificial				
Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Mandatory	1st	2nd
Teaching language					
Department					
Coordinator	García Lourenco, Analia María				
Lecturers	García Lourenco, Analia María				
E-mail	analia@uvigo.es				
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24				
General description					

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

IDENTIFYING DATA

Process Mining

Subject	Process Mining			
Code	O06M193V01212			
Study programme	Máster universitario en Inteligencia artificial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	2nd
Teaching language				
Department				
Coordinator	García Lourenco, Analia María			
Lecturers	García Lourenco, Analia María			
E-mail	analia@uvigo.es			
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24			
General description				

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

IDENTIFYING DATA

Intelligent real-time systems

Subject	Intelligent real-time systems
Code	O06M193V01213
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	2nd

Teaching language	English
Department	
Coordinator	González Moreno, Juan Carlos
Lecturers	González Moreno, Juan Carlos
E-mail	jcmoreno@uvigo.es
Web	http://https://moovi.uvigo.gal/
General description	The main objective of this subject is to provide students with the minimum knowledge necessary for problem solving in the field of intelligent systems in real time, and the appropriate understanding of how to approach the resolution of these problems, but paying special attention to real time management.

Training and Learning Results

Code	
A1	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A2	CB7 - Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
A4	CB9 - Students should be able to communicate their conclusions and the ultimate knowledge and rationale behind them to specialized and non-specialized audiences in a clear and unambiguous manner.
A5	CB10 - That students possess the learning skills that will enable them to continue studying in a manner that will be largely self-directed or autonomous.
B1	Maintain and extend sound theoretical approaches to enable the introduction and exploitation of new and advanced technologies in the field of Artificial Intelligence.
B2	Successfully address all stages of an Artificial Intelligence project.
B5	Work in teams, especially multidisciplinary teams, and be skilled in time management, people management and decision making.
C19	Knowledge of different application areas of AI-based technologies and their capacity to offer a differentiating added value.
C20	Ability to combine and adapt different techniques, extrapolating knowledge between different fields of application.
C21	Knowledge of techniques that facilitate the organization and management of AI projects in real environments, resource management and task planning in an efficient way, taking into account concepts of knowledge dissemination and open science.
C22	Knowledge of techniques that facilitate the security of data, applications and communications and their implications in different AI application areas.
C30	Be able to pose, model and solve problems requiring the application of artificial intelligence methods, techniques and technologies.
D3	Utilizar las herramientas básicas de las tecnologías de la información y las comunicaciones (TIC) necesarias para el ejercicio de su profesión y para el aprendizaje a lo largo de su vida.
D7	Develop the ability to work in interdisciplinary or transdisciplinary teams to offer proposals that contribute to sustainable environmental, economic, political and social development.
D8	Value the importance of research, innovation and technological development in the socioeconomic and cultural progress of society.
D9	Have the ability to manage time and resources: develop plans, prioritize activities, identify critical ones, set deadlines and meet them.

Expected results from this subject

Expected results from this subject	Training and Learning Results
RA1: Know the characteristics and functions of a real-time systems.	A1 A2 A4 B1 C20 D3 D8

RA2: Ability to design and program a real-time system.	A1
	A2
	A4
	B1
	B5
	C20
	D3
	D7
	D8
RA3: Know the most common programming languages for real-time systems, both synchronous and asynchronous.	A1
	A2
	A4
	A5
	B1
	B5
	C20
	C21
	D3
	D7
	D8
	D9
RA4: Know the production of reliable software components, with special attention to fault tolerance and error recovery.	A1
	A2
	A4
	A5
	B1
	B5
	C20
	C21
	C22
	D3
	D7
	D8
	D9
RA5: Know the basics of concurrent programming, communication and synchronization in real-time systems.	A2
	A5
	B2
	C21
	C22
	C30
	D7
	D9
RA6: Know the temporal requirements of the functionalities of the language and the strategies to satisfy them, both in the synchronous and asynchronous case.	A1
	A2
	A4
	A5
	B1
	B5
	C20
	C22
	D3
	D7
	D8
	D9
RA7: Know the architectures of integration of artificial intelligence in real-time systems, with a view to an efficient treatment of planning.	A4
	A5
	B1
	B2
	C19
	C21
	C30
	D3
	D8
	D9

Contents

Topic

Real-time systems.	Introduction.
	RTS design.
	Intelligent Systems in RT.
Determinism and reliability.	Determinism.
	Reliability.
	Fault tolerance.
	Exception handling.
Parallelism.	Concurrence.
	Synchronous and asynchronous hypothesis.
	Real time.
	Planning.
	Distribution.
Planning.	Strategies.
	Verification of behavior.
	Architectures.
Implementation languages.	General purpose languages.
	Agent-based languages.
	Simulation.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	12	12	24
Laboratory practical	8	24	32
Case studies	1	2	3
Project based learning	0	16	16

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

Methodologies

	Description
Lecturing	Presentation by the teacher of the main contents of the subject. CONTINUOUS ASSESSMENT Mandatory character Attendance: Mandatory OVERALL ASSESSMENT Mandatory character
Laboratory practical	Presentation and supervision by the teacher of practical problems that complement the theoretical contents seen in the master classes and in the presentations. CONTINUOUS ASSESSMENT Mandatory character Attendance: Mandatory OVERALL ASSESSMENT Mandatory character
Case studies	Teacher will present to Students a work scenario, real or fictitious, that exposes a certain problem. Students must solve it and present the solution through a video of about 10' in length; the solution will be elaborated by applying the knowledge acquired along the course. CONTINUOUS ASSESSMENT Mandatory character Attendance: Mandatory OVERALL ASSESSMENT Mandatory character
Project based learning	The teacher will propose to the students a series of practical projects for their resolution using the contents seen both in theory and in the laboratory. The solution will be composed of an annotated code and a memory that adequately describes the solution provided. CONTINUOUS ASSESSMENT Mandatory character Attendance: Mandatory OVERALL ASSESSMENT Mandatory character

Personalized assistance

Methodologies	Description

	Description	Qualification	Training and Learning Results			
Lecturing	At the end of each topic, problems/exercises will be proposed that will be used for an evaluation through continuous monitoring of the subject. It allows the evaluation of RA1, RA3, RA4, RA5 and RA6 To release this assessment test, the student must get 5 points or more in their final grade. In the case of opting for the global evaluation, on the date of the exam the students will be able to answer the exercises that are presented.	40	A1	B1	C19 C20 C21 C22 C30	
Case studies	Presentation of a video with its own solution to a proposed case study. It allows the evaluation of RA1, RA3, RA4, RA5, RA6 and RA7 This methodological test is compulsory, both in continuous and global evaluation. To release this part of the evaluation, the student must get 5 points or more in their grade. Late deliveries and those that are delivered in a different format than the order will be rated 0.	20	A4 A5	B1	C19 C20 C21 C22 C30	D8 D9
Project based learning	The solution (code + explanatory memory) to a practical project proposed and assigned will be evaluated. It allows the evaluation of RA2, RA4, RA6, and RA7 This test will be evaluated with the applications provided to be carried out in groups of 2 people. This methodological test is compulsory, both in continuous and global evaluation. The delivery must be made on the dates and in the manner indicated. Late deliveries and those that are delivered in a different format than asked will be rated with 0. The delivery could require a defense by the members of the group on the date and in the manner indicated. To release this assessment test, the student must get 5 points or more in their final grade	40	A1 A2 A4 A5	B2 B5	C19 C20 C21 C22 C30	D3 D7 D8 D9

Assessment

Other comments on the Evaluation

CONTINUOUS ASSESSMENT SYSTEM

TEST 1: Resolution of problems and/or exercises

Description: *Resolution of exercises and/or problems proposed at the end of each topic to evaluate the comprehension of the unit and carry out continuous monitoring of the subject. These exercises will be carried out and delivered offline.*

Methodology(s) applied(s): Lecturing.

Qualification: 40%

Minimum: For the release of this part of the subject, the student must obtain a grade equal to or greater than 5 points (out of 10) in the final grade of the test, which will be calculated cumulatively by adding the points achieved in each installment.

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TEST 2: Elaboration of Memory and Video

Description: *Preparation of a video and a brief report that presents/defends the student's solution to the assigned case study. The work will be developed in pairs and delivered offline on the date to be determined.*

Methodology(s) applied: Case studies

Qualification: 20%

Minimum: *For the release of this part of the subject, the student must obtain a score equal to or greater than 5 points (out of 10) in the evaluation of both the memory and the video. Late deliveries and those that do not meet the parameters set for delivery will be scored with 0 points.*

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TEST 3: Development of a practice and a practice report

Description: After the second week, a "Project" will be proposed to be developed and solved in pairs. The solution will evolve over the weeks with the support of laboratory classes in which doubts will be solved and the feasibility of the proposed solution will be continuously verified.

Methodology(s) applied: Project Based Learning

Qualification: 40%

Minimum: *For the release of this part of the subject, the student must obtain a grade equal to or greater than 5 points (out of 10) in the evaluation, both in the code and in the report. Once the delivery has been made, a defense of the work carried out may be required in order to verify its authorship.*

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- The final grade for the subject is calculated using the weighted average of the previous tests. In order to take said average, the student must achieve at least a 4 in each of the tests.
- If, at the end of the course, a student presents a grade of less than 4, in two or more of the previous tests, his/her grade will be determined by the minimum value between the average of the grades and 4.
- All the deliveries of the previous tests that are not carried out on time and in the requested form will be graded with a 0.

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GLOBAL EVALUATION SYSTEM

Procedure for choosing the global assessment modality: Since the default assessment system is CONTINUOUS ASSESSMENT, it is considered that all enrolled students opt for said system. In case of wanting to be evaluated through the GLOBAL EVALUATION system, "Once the period of one month from the beginning of the semester has passed, a period of 5 working days will be enabled for the students enrolled in the subject to formally state their intention to benefit from the GLOBAL EVALUATION system

TEST 1: Theory Exam

Description: *Objective test that will include the evaluation of the theoretical concepts seen throughout the course and resolution of exercises/problems proposed in the Continuous Assessment System.*

Applied Methodology(s): Lecture

Qualification: 40%

Minimum: *For the release of this part of the subject, the student must obtain a grade equal to or greater than 5 points (out of 10).*

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TEST 2: Elaboration of Memory and Video

Description: *Preparation of a video and a brief memory that presents/defends the student's solution to a determined case study. The work will be delivered on the date determined prior to the final exam.*

Methodology(s) applied: Case study

Qualification: 20%

Minimum: *For the release of this part of the subject, the student must obtain a score equal to or greater than 5 points (out of 10) in the evaluation of both the memory and the video. A late delivery or one that does not conform to the parameters set for the delivery will be qualified with 0 points*.

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TEST 2: Development of a practice and a practice report

Description: *Delivery of a solution to a "Project" that will be proposed for students who use this system and that must be delivered on the date (prior to the exam date) and in a manner determined. The solution will consist of a code with the solution and a report that explains and defends the proposed solution.*

Methodology(s) applied: Project Based Learning

Qualification: 40%

Minimum: For the release of this part of the subject, the student must obtain a grade equal to or greater than 5 points (out of 10) in the evaluation, both in the code and in the report. Once the delivery has been made, the defense of the work carried out may be required in order to verify its authorship on the examination date by answering several questions related to the assigned "Project".

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- The final grade for the subject is calculated using the weighted average of the previous tests. In order to take said average, the student must achieve at least a 4 in each of the tests.
- If, at the end of the course, a student presents a grade of less than 4, in one or more of the previous tests, their grade will be determined by the minimum value between the average of the grades of said tests and four.
- All the deliveries of the previous tests that are not carried out on time and in the requested form will be graded with a 0.

EVALUATION CRITERIA FOR EXTRAORDINARY CALL AND FINAL DEGREE

The continuous and global evaluation systems described above will be used.

RECORD QUALIFICATION PROCESS

Regardless of the evaluation system and the call, if any part of the evaluation is not passed, but the overall score is greater than 4 (out of 10), the qualification in the minutes will be 4.

EVALUATION DATES

The dates of the tests corresponding to the continuous assessment system will be published in the calendar of activities, available on the ESEI website https://esei.uvigo.es/docencia/horarios/.

The official exam dates of the different calls, officially approved by the Xunta de Centro of the ESEI, are published on the ESEI website https://esei.uvigo.es/docencia/horarios/.

USE OF MOBILE DEVICES

All students are reminded of the prohibition of the use of mobile devices in exercises and practices, in compliance with article 13.2.d) of the University Student Statute, regarding the duties of university students, which establishes the duty to "*Refrain from using or cooperation in fraudulent procedures in the evaluation tests, in the works that are carried out or in official documents of the university.*"

CONSULTATION/REQUEST FOR TUTORIALS

The tutorials can be consulted through the personal page of the teaching staff, accessible through https://esei.uvigo.es/docencia/profesorado/

Sources of information
Basic Bibliography
Alan Burns, Andy Wellings, **Sistemas de tiempo real y lenguajes de programación**, 84-7829-058-3, 3ª, Addison-Wesley, 2003

Olivier Boissier, Rafael H. Bordini, Jomi Hubner, Alessandro Ricci, **Multi-Agent Oriented Programming: Programming Multi-Agent Systems Using JaCaMo**, 978-0-262-04457-8, MIT Press, 2020

Complementary Bibliography

Manuel I. Capel Tuñón, **Programación Concurrente y en tiempo real: Fundamentos y aplicaciones**, Garceta, 2022

Rafael H. Bordini, Jomi Fred Hübner, Michael Wooldridge, **Programming Multi-agent systems in Agent-Speak with Jason**, 978-0-470-02900-8, Wiley, 2007

Ammar Attoui, **Real-time and multi-agent systems**, 1852332522, Springer, 2000

Recommendations

Subjects that it is recommended to have taken before

Multiagent systems/O06M193V01202

IDENTIFYING DATA

Computational aspects of cognitive science

Subject	Computational aspects of cognitive science				
Code	O06M193V01301				
Study programme	Máster universitario en Inteligencia artificial				
Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Optional	2nd	1st
Teaching language					
Department					
Coordinator	García Lourenco, Analia María				
Lecturers	García Lourenco, Analia María				
E-mail	analia@uvigo.es				
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24				
General description					

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

IDENTIFYING DATA

Text mining

Subject	Text mining
Code	O06M193V01302
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Optional	2nd	1st

Teaching language	English
Department	
Coordinator	Fernández González, Daniel
Lecturers	Fernández González, Daniel
	Fernandez Lanza, Santiago
E-mail	danifg@uvigo.es
Web	http://moovi.uvigo.gal
General description	The course introduces the student to the derivation of information and knowledge from the analysis of a collection of documents in natural language, which refers to almost all generated and stored data.
	The student will be trained in content analysis on enriched document representation models to address specific applications in different domains.
	Special attention will be paid to the extraction of relevant information, the determination of the contextual polarity (sentiment) of a content, and the automatic response to questions posed directly in natural language.
	In short, the goal is to answer fundamental questions in the development of interfaces, decision support environments, and access to new knowledge.

Training and Learning Results

Code	
A1	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A2	CB7 - Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
A5	CB10 - That students possess the learning skills that will enable them to continue studying in a manner that will be largely self-directed or autonomous.
B1	Maintain and extend sound theoretical approaches to enable the introduction and exploitation of new and advanced technologies in the field of Artificial Intelligence.
B3	Search and select useful information needed to solve complex problems, handling with fluency the bibliographic sources of the field.
B4	Elaborate adequately and with certain originality written compositions or motivated arguments, write plans, work projects, scientific articles and formulate reasonable hypotheses in the field.
C1	Understanding and mastering techniques for text processing in natural language
C2	Understanding and mastery of the fundamentals and techniques of semantic processing of linked, structured, and unstructured documents, and of the representation of their content.
C3	Understanding and knowledge of the techniques of representation and processing of knowledge through ontologies, graphs, and RDF, as well as the tools associated with them.
D2	Master the oral and written expression and comprehension of a foreign language.
D3	Utilizar las herramientas básicas de las tecnologías de la información y las comunicaciones (TIC) necesarias para el ejercicio de su profesión y para el aprendizaje a lo largo de su vida.
D7	Develop the ability to work in interdisciplinary or transdisciplinary teams to offer proposals that contribute to sustainable environmental, economic, political and social development.
D8	Value the importance of research, innovation and technological development in the socioeconomic and cultural progress of society.

Expected results from this subject

Expected results from this subject	Training and Learning Results

New
A1
A2
A5
B1
B3
B4
C1
C2
C3
D2
D3
D7
D8

Contents

Topic	
Introduction to text mining.	Concepts and definitions. Techniques and applications.
Information retrieval.	Concepts and definitions. Typical architectures, technical and tools. Current trends.
Question answering.	Concepts and definitions. Typical architectures, technical and tools. Current trends.
Information extraction.	Concepts and definitions. Typical architectures, technical and tools. Current trends.
Sentiment analysis.	Concepts and definitions. Typical architectures, technical and tools. Current trends.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	10	10	20
Laboratory practical	5	15	20
Mentored work	5	29	34
Objective questions exam	1	0	1

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

Methodologies

	Description
Lecturing	Presentation of the theoretical content of the course.
	In order to facilitate the understanding of the same and to increase the interest of the student, various examples and exercises will be included, in which the active participation of the student may be required.
	Various examples and exercises in which the active participation of the student may be required. An active attitude is promoted by encouraging questions and proposing open-ended questions for the student's reflection.
Laboratory practical	Hands-on problems that involve the use of specific tools and the programming of software related to the course content.
	CONTINUOUS ASSESSMENT
	Character: mandatory
	Attendance: not mandatory
	GLOBAL ASSESSMENT
	Character: mandatory
	Attendance: not mandatory

Mentored work	One or more individual theoretical-practical works, deliverable and evaluable, on the theoretical aspects presented in the course and worked on in the practical activities developed by the students.	
	This is an autonomous task that will have occasional guidance from the teacher. The result will be expressed in one or more reports with a structure to be determined.	
	CONTINUOUS ASSESSMENT Character: mandatory Attendance: not mandatory	
	GLOBAL ASSESSMENT Character: mandatory Attendance: not mandatory	

Personalized assistance

Methodologies	Description
Laboratory practical	The teacher will guide the student in the laboratory for the realization of the projects that will be evaluated at the end of the course, answering doubts and questions individually.
Mentored work	Follow-up of students' work, solving general doubts and sharing specific theoretical/practical problems related to the course topics.

Assessment

	Description	Qualification	Training and Learning Results			
Laboratory practical	Evaluation of the proposed hands-on exercises by submitting a writen report and/or the developed code. The submission of these exercises is mandatory. They will have a delivery date and, optionally, a defense date. - MINIMUM SCORE: 4 points out of 10 - LEARNING OUTCOMES: RA1	40	A2	B1	C1 C2 C3	D3 D8
Mentored work	Evaluation of the writen report of the supervised research work (or works) of theoretical-practical nature assigned to each student. The ability to synthesize, completeness and adequate presentation of ideas and concepts related to the chosen topic will be evaluated. The submission of these papers is compulsory. They will have a due date and, optionally, a defense date - MINIMUM SCORE: 4 points out of 10 - LEARNING OUTCOMES: RA1	35	A1 A5	B3 B4	C1 C2 C3	D2 D8
Objective questions exam	Written test that evaluates the content and competencies reviewed in the lectures and the theoretical aspects of their implementation in the practical sessions. The type of test will consist of a series of multiple choice or short answer questions on specific concepts. It will take place on the official date indicated in the academic calendar. - MINIMUM SCORE: no minimum score required - LEARNING OUTCOMES: RA1	25	A1 A2	B1	C1 C2 C3	

Other comments on the Evaluation

(1) CONTINUOUS ASSEMENT SYSTEM

TEST 1: Practical hand-on exercises

Description: Evaluation of the writen reports and the code of the laboratory hand-on exercises delivered on the

stipulated dates.

Applied methodology: Laboratory practical

% Qualification: 40%

Minimum %: grade equal to or greater than 4 points (out of 10)

Evaluated learning results: A2, B1, C1, C2, C3, D3, D8

Expected results: RA1

TEST 2: Tutored work/essay

Description: Evaluation of the writen report of the supervised research work (or works) of theoretical-practical nature

assigned to each student.

Applied methodology: Mentored work

% Qualification: 35%

Minimum %: grade equal to or greater than 4 points (out of 10)

Evaluated learning results: A2, A5, B3, B4, C1, C2, C3, D2, D8

Expected results: RA1

TEST 3: Final exam

Description: Multiple-choice final test on the theoretical contents of the subject.

Applied methodology: Objective questions exam

% Qualification: 25%

Minimum %: no minimum score required

Evaluated learning results: : A1, A2, B1, C1, C2, C3

Expected results: RA1

ADDITIONAL CLARIFICATIONS

- To pass the subject it is necessary to reach the minimums indicated in the previous tests and to add in the final weighted grade a minimum of 5 points out of 10.
- In the case of finding unethical behavior (copying, plagiarism) in any of the deliveries made (total or partial), the total contribution of the corresponding evaluation element on the final grade will be annulled.

(2) GLOBAL ASSEMENT SYSTEM

Procedure for the choice of the global assessment modality:

- The continuous assessment modality is assumed by default.
- Students who opt for the global evaluation must communicate it via Moovi, using the mechanisms that are enabled and within the stipulated period, once the period of one month from the beginning of the term has passed.

TEST 1: Practical hand-on exercises

Description: Evaluation of the writen reports and the code of the laboratory hand-on exercises delivered on the

stipulated dates.

Applied methodology: Laboratory practical

% Qualification: 40%

Minimum %: grade equal to or greater than 5 points (out of 10)

Evaluated learning results: A2, B1, C1, C2, C3, D3, D8

Expected results: RA1

TEST 2: Tutored work/essay

Description: Evaluation of the writen report of the supervised research work (or works) of theoretical-practical nature

assigned to each student.

Applied methodology: Mentored work

% Qualification: 35%

Minimum %: grade equal to or greater than 5 points (out of 10)

Evaluated learning results: A2, A5, B3, B4, C1, C2, C3, D2, D8

Expected results: RA1

TEST 3: Final exam

Description: Multiple-choice final test on the theoretical contents of the subject.

Applied methodology: Objective questions exam

% Qualification: 25%

Minimum %: grade equal to or greater than 5 points (out of 10)

Evaluated learning results: : A1, A2, B1, C1, C2, C3

Expected results: RA1

ADDITIONAL CLARIFICATIONS

- To pass the subject it is necessary to reach the minimums indicated in the previous tests and to add in the final weighted grade a minimum of 5 points out of 10.
- In the case of finding unethical behavior (copying, plagiarism) in any of the deliveries made (total or partial), the total contribution of the corresponding evaluation element on the final grade will be annulled.

(3) ASSESSMENT CRITERIA FOR EXTRAORDINARY AND FINAL CALLS

- The continuous and global evaluation systems described above will be used.

- In these calls, students must only take the tests in which they have not obtained the minimum grade indicated.

(4) GRADING PROCESS

In the case of students who pass part of the evaluated elements, but do not reach the minimum required to pass the whole

subject, the grade to be included in the respective minutes will be calculated as the minimum between the weighted

average of the parts passed and 4.9.

(5) EVALUATION DATES

The official exam dates of the different calls, officially approved by the Xunta de Centro of the ESEI, are published on the ESEI website https://esei.uvigo.es/docencia/horarios/.

(6) USE OF MOBILE DEVICES

All students are reminded of the prohibition of the use of mobile devices in exercises and practices, in compliance
with article 13.2.d) of the University Student Statute, regarding the duties of university students, which establishes the duty
to "Refrain from using or cooperating in fraudulent procedures in the assessment activities, in the delivered assignments or
in official documents of the university."

(7) TUTORING SCHEDULE AND PERSONAL TUTORING REQUEST

The tutoring schedule, and the way to request a personal tutoring, is published in the personal page of the teaching staff,
accessible through https://esei.uvigo.es/docencia/profesorado/.

Sources of information

Basic Bibliography

Apuntes y material proporcionado por el profesorado.,

Berry, M. W., & Kogan, J. (Eds.)., **Text mining: applications and theory.**, 978-0-470-74982-1, 1, John Wiley & Sons., 2010

Complementary Bibliography

Taeho Jo, **Text Mining: Concepts, Implementation, and Big Data Challenge (Studies in Big Data Book 45)**,
978-331991814, 1, Springer, 2019

Recommendations

Subjects that it is recommended to have taken before

Natural language understanding/O06M193V01104

Language modelling/O06M193V01204

Other comments

Course coordinated by the University of Vigo

AI in big data environments

Subject	AI in big data environments
Code	O06M193V01303
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	6		Optional	2nd	1st

Teaching language	English
Department	
Coordinator	Fernandez Lanza, Santiago
Lecturers	Fernández González, Daniel Fernandez Lanza, Santiago
E-mail	sflanza@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24
General description	The every time greater quantity of accessible information through Internet does that the efficient processing of big quantities of data was every time of greater interest. This has carried to the development of new technicians of storage and processing of *ingentes quantities of information, technicians that adapt of natural form to the systems distributed. The main aim of this matter is to provide to the students the knowledges and necessary skills to comprise, develop and apply technicians of artificial intelligence (*IA) in surroundings of *Big Dates.

Training and Learning Results

Code	
A1	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A2	CB7 - Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
A3	CB8 - the complexity of making judgments based on information that, while incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
B2	Successfully address all stages of an Artificial Intelligence project.
B3	Search and select useful information needed to solve complex problems, handling with fluency the bibliographic sources of the field.
B4	Elaborate adequately and with certain originality written compositions or motivated arguments, write plans, work projects, scientific articles and formulate reasonable hypotheses in the field.
B5	Work in teams, especially multidisciplinary teams, and be skilled in time management, people management and decision making.
C10	Ability to build, validate and apply a stochastic model of a real system from observed data and the critical analysis of the results obtained
C11	Understanding and mastery of the main data analysis techniques and tools, both from a statistical and machine learning point of view, including those dedicated to the processing of large volumes of data, and the ability to select the most appropriate ones for problem solving.
C12	Ability to plan, formulate and resolve all stages of a data project, including understanding and mastery of basic fundamentals and techniques for searching and filtering information in large data collections.
C15	Knowledge of computer tools in the field of machine learning, and ability to select the most appropriate for solving a problem.
D3	Utilizar las herramientas básicas de las tecnologías de la información y las comunicaciones (TIC) necesarias para el ejercicio de su profesión y para el aprendizaje a lo largo de su vida.
D7	Develop the ability to work in interdisciplinary or transdisciplinary teams to offer proposals that contribute to sustainable environmental, economic, political and social development.
D8	Value the importance of research, innovation and technological development in the socioeconomic and cultural progress of society.
D9	Have the ability to manage time and resources: develop plans, prioritize activities, identify critical ones, set deadlines and meet them.

Expected results from this subject

Expected results from this subject	Training and Learning Results

New	A2
	B2
	C10
	C11
	C12
	C15
	D3
New	A1
	A2
	A3
	B3
	B4
	B5
	C10
	C11
	C12
	C15
	D3
	D7
	D8
	D9
New	A1
	A2
	A3
	B2
	B3
	B4
	B5
	C10
	C11
	C12
	C15
	D3
	D7
	D8
	D9
New	A1
	A2
	A3
	B2
	C12
	C15
	D3
	D7
	D9
New	A1
	A2
	B3
	B5
	C11
	C15
	D3
	D7
	D9
New	A1
	A3
	B2
	B3
	B5
	C11
	C12
	C15
	D3
	D7
	D8
	D9

New

A2
A3
B2
B3
C10
C11
C15
D3
D9

Contents

Topic	
(*)Introdución ao Big Data	(*)Que é Big Data Aplicacións Big Data Analítica Big Data Problemática da análise de datos en contornas Big Data
(*)Preparación e visualización de datos	(*)Técnicas de preprocesado de datos Técnicas de visualización
(*)Infraestructuras para o almacenamento e procesamento de Big Data: Apache Hadoop e Apache Spark	(*)Procesamento distribuido e infraestructuras Aprendizaxe por lotes en plataformas paralelas e distribuidas Aprendizaxe distribuida en vertical e horizontal
(*)Tratamento de datos en continuo	(*)Aprendizaxe incremental Aprendizaxe en tempo real Problemas de cambio de concepto

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	14	44	58
Mentored work	9	20	29
Lecturing	20	21	41
Objective questions exam	2	20	22

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

Methodologies

	Description
Laboratory practical	(*)Clases prácticas en el aula de informática, que permiten al alumno familiarizarse desde un punto de vista práctico con las cuestiones expuestas en las clases teóricas.
Mentored work	(*)Aprendizaje basado en problemas, seminarios, estudio de casos o proyectos, que permiten que el alumnado adquiera determinadas competencias en base a la resolución de ejercicios, estudio de casos y realización de proyectos.
Lecturing	(*)Clases de teoría, en las que se expone el contenido de cada tema. El alumno dispondrá de copias de las transparencias con anterioridad y el profesor promoverá una actitud activa, realizando preguntas que permitan aclarar aspectos concretos y dejando cuestiones abiertas para la reflexión del alumno.

Personalized assistance

Methodologies	Description
Laboratory practical	
Mentored work	

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical	(*)Avaliación de traballos prácticos: 50% dá nota Avaliaranse as solucións propostas polo alumnado ás prácticas expostas. A avaliación de prácticas pode levar a cabo mediante unha corrección por parte do profesor, unha defensa da solución achegada por parte do alumno ante o profesor ou unha presentación oral da solución desenvolvida. Todos os traballos deberán ser entregados antes das datas que se especificarán e deberán cumprir uns requisitos mínimos de calidade para ser tidos en consideración. Valorarase o grao de cumprimento das especificacións, a metodoloxía e rigorosidade e a presentación de resultados	50	A1 B2 C10 D3 A2 B3 C11 D7 A3 B4 C12 D8 B5 C15 D9

| Objective questions exam | (*)Preguntas sobre os contidos da asignatura (que poden ser de tipo test ou problemas para resolver), baseada nas distintas técnicas avanzadas de aprendizaxe automática e as súas aplicacións. | 50 | A1 A2 A3 | B2 | C10 C11 C12 C15 | D8 D9 |

Other comments on the Evaluation

Sources of information

Basic Bibliography

Apuntes y material proporcionado por el profesorado.,

Tom White, **Hadoop: The Definitive Guide, 4th Edition**, 4, O'Reilly Media, Inc., 2015

Bill Chambers, Matei Zaharia, **Spark: The Definitive Guide**, 1, O'Reilly Media, Inc., 2018

Complementary Bibliography

Rezaul Karim, Sridhar Alla, **Scala and Spark for Big Data Analytics**, 1, Packt Publishing, 2017

Nick Pentreath, **Machine Learning with Spark**, 1, Packt Publishing, 2015

Michael Bowles, **Machine Learning with Spark and Python: Essential Techniques for Predictive Analytics**, 2, Wiley, 2019

Recommendations

Subjects that it is recommended to have taken before

Machine learning I/O06M193V01105

Machine learning II/O06M193V01207

Deep learning/O06M193V01206

Data engineering/O06M193V01102

IDENTIFYING DATA

AI in health

Subject	AI in health
Code	O06M193V01304
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Optional	2nd	1st

Teaching language	
Department	
Coordinator	García Lourenco, Analia María
Lecturers	García Lourenco, Analia María
E-mail	analia@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24
General description	

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information
Basic Bibliography
Complementary Bibliography

Recommendations

IDENTIFYING DATA

Intelligent IoT

Subject	Intelligent IoT
Code	O06M193V01305
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Optional	2nd	1st

Teaching language	Spanish English
Department	
Coordinator	Diaz-Cacho Medina, Miguel Ramón
Lecturers	Diaz-Cacho Medina, Miguel Ramón
E-mail	mcacho@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&assignatura=614544023&any_academic=2024_25&any_academic=2024_25
General description	(*)Materia coordinada por la UDC. Ver web de la UDC.

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	10	20	30
Lecturing	10	20	30
Objective questions exam	2	13	15

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

Methodologies

	Description
Laboratory practical	
Lecturing	

Personalized assistance

Methodologies	Description
Laboratory practical	
Lecturing	

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical		0	
Objective questions exam		0	

Other comments on the Evaluation

Sources of information
Basic Bibliography
Complementary Bibliography

Recommendations

IDENTIFYING DATA

Intelligent cibersecurity

Subject	Intelligent cibersecurity
Code	O06M193V01306
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Optional	2nd	1st

Teaching language	English
Department	
Coordinator	Ribadas Pena, Francisco José
Lecturers	Ribadas Pena, Francisco José
E-mail	ribadas@uvigo.es
Web	
General description	The course introduces the student to the development of strategies based on artificial intelligence for the defense of computer systems and networks against malicious attacks that seek to control them or to gain access to the information residing or circulating in them. Students will be trained in the prevention, detection, analysis and elimination of threats in a continuously evolving context. Typical use cases of artificial intelligence in cybersecurity scenarios will be reviewed.

Training and Learning Results

Code	
A1	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context
A2	CB7 - Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
A4	CB9 - Students should be able to communicate their conclusions and the ultimate knowledge and rationale behind them to specialized and non-specialized audiences in a clear and unambiguous manner.
A5	CB10 - That students possess the learning skills that will enable them to continue studying in a manner that will be largely self-directed or autonomous.
B1	Maintain and extend sound theoretical approaches to enable the introduction and exploitation of new and advanced technologies in the field of Artificial Intelligence.
B2	Successfully address all stages of an Artificial Intelligence project.
B4	Elaborate adequately and with certain originality written compositions or motivated arguments, write plans, work projects, scientific articles and formulate reasonable hypotheses in the field.
B5	Work in teams, especially multidisciplinary teams, and be skilled in time management, people management and decision making.
C8	Ability to design and develop secure intelligent systems, in terms of integrity, confidentiality and robustness.
C19	Knowledge of different application areas of AI-based technologies and their capacity to offer a differentiating added value.
C20	Ability to combine and adapt different techniques, extrapolating knowledge between different fields of application.
C21	Knowledge of techniques that facilitate the organization and management of AI projects in real environments, resource management and task planning in an efficient way, taking into account concepts of knowledge dissemination and open science.
C22	Knowledge of techniques that facilitate the security of data, applications and communications and their implications in different AI application areas.
C30	Be able to pose, model and solve problems requiring the application of artificial intelligence methods, techniques and technologies.
D5	To understand the importance of the entrepreneurial culture and to know the means available to entrepreneurs.
D8	Value the importance of research, innovation and technological development in the socioeconomic and cultural progress of society.
D9	Have the ability to manage time and resources: develop plans, prioritize activities, identify critical ones, set deadlines and meet them.

Expected results from this subject

Expected results from this subject	Training and Learning Results

RA1: Know techniques and tools to implement AI-based solutions that allow automated detection of vulnerabilities, attacks, fraudulent content and applications.	A1 A2 B1 B2 C8 C19 C21 C22 D8 D9
RA2: Know, understand and analyze real cases of application of AI techniques in different areas of cybersecurity.	A2 A5 B2 B5 C8 C20 C22 C30 D5 D8
RA3: Learn techniques that facilitate security by design, enable the secure administration of communication systems and networks, allow for risk management, and enable rapid recovery from cybersecurity events.	A1 A2 B1 B4 C21 C22 C30 D5
RA4: Understand the importance of the concept of identity and to learn techniques to ensure data access and privacy.	A2 A4 B4 B5 C8 C20 C22 D8

Contents

Topic
Introduction to cybersecurity and related concepts.
Threat detection and attack prevention models.
Detection of fraudulent content and applications.
Data mining in event management systems.
Identity control, biometrics and behavioral patterns.
Anomaly detection and clustering for the detection of communication attacks.
IA risk management, critical risks and normal profiles, malicious uses, and contingency and recovery plans.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	10	10	20
Laboratory practical	5	15	20
Mentored work	5	29	34
Objective questions exam	1	0	1

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

Methodologies

	Description

Lecturing	Presentation of the theoretical content of the course. In order to facilitate the understanding of the same and to increase the interest of the student, various examples and exercises will be included, in which the active participation of the student may be required. An active attitude is promoted by encouraging questions and proposing open-ended questions for the student's reflection.	
Laboratory practical	Hands-on problems that involve the use of specific tools and the programming of software related to the course content. CONTINUOUS ASSESSMENT Character: mandatory Attendance: not mandatory GLOBAL ASSESSMENT Character: mandatory	
Mentored work	One or more individual theoretical-practical works, deliverable and evaluable, on the theoretical aspects presented in the course and worked on in the practical activities developed by the students. This is an autonomous task that will have occasional guidance from the teacher. The result will be expressed in one or more reports with a structure to be determined. CONTINUOUS ASSESSMENT Character: mandatory Attendance: not mandatory GLOBAL ASSESSMENT Character: mandatory	

Personalized assistance

Methodologies	Description
Laboratory practical	The teacher will guide the student in the laboratory for the realization of the projects that will be evaluated at the end of the course, answering doubts and questions individually.
Mentored work	Follow-up of students' work, solving general doubts and sharing specific theoretical/practical problems related to the course topics.

Assessment

	Description	Qualification	Training and Learning Results			
Laboratory practical	Evaluation of the proposed hands-on exercises by submitting a writen report and/or the developed code. The submission of these exercises is mandatory. They will have a delivery date and, optionally, a defense date. - MINIMUM SCORE: 4 points out of 10 - LEARNING OUTCOMES: RA1, RA2, RA3, RA4	40	A1 A2 A5	B1 B2 B5	C8 C19 C20 C21 C22 C30	D5 D8 D9
Mentored work	Evaluation of the writen report of the supervised research work (or works) of theoretical-practical nature assigned to each student. The ability to synthesize, completeness and adequate presentation of ideas and concepts related to the chosen topic will be evaluated. The submission of these papers is compulsory. They will have a due date and, optionally, a defense date - MINIMUM SCORE: 4 points out of 10 - LEARNING OUTCOMES: RA1, RA2, RA3, RA4	35	A1 A4	B4 B5	C19 C20 C22 C30	D8 D9

Objective questions exam	Written test that evaluates the content and competencies reviewed in the lectures and the theoretical aspects of their implementation in the practical sessions. The type of test will consist of a series of multiple choice or short answer questions on specific concepts. It will take place on the official date indicated in the academic calendar. - MINIMUM SCORE: no minimum score required - LEARNING OUTCOMES: RA1, RA2, RA3, RA4	25	A5 B1 C8 C19 C20 C21 C22 C30

Other comments on the Evaluation

(1) CONTINUOUS ASSEMENT SYSTEM

TEST 1: Practical hand-on exercises

Description: Evaluation of the writen reports and the code of the laboratory hand-on exercises delivered on the

stipulated dates.

Applied methodology: Laboratory practical

% Qualification: 40%

Minimum %: grade equal to or greater than 4 points (out of 10)

Evaluated learning results: A1,A2,A5,B1,B2,B5,C8,C19,C20,C21,C22,C30,D5,D8,D9

Expected results: RA1, RA2, RA3, RA4

TEST 2: Tutored work/essay

Description: Evaluation of the writen report of the supervised research work (or works) of theoretical-practical nature

assigned to each student.

Applied methodology: Mentored work

% Qualification: 35%

Minimum %: grade equal to or greater than 4 points (out of 10)

Evaluated learning results: A1,A4,B4,B5,C19,C20,C22,C30,D8,D9

Expected results: RA1, RA2, RA3, RA4

TEST 3: Final exam

Description: Multiple-choice final test on the theoretical contents of the subject.

Applied methodology: Objective questions exam

% Qualification: 25%

Minimum %: no minimum score required

Evaluated learning results: : A5,B1,C8,C19,C20,C21,C22,C30

Expected results: RA1, RA2, RA3, RA4

ADDITIONAL CLARIFICATIONS

- To pass the subject it is necessary to reach the minimums indicated in the previous tests and to add in the final weighted grade a minimum of 5 points out of 10.
- In the case of finding unethical behavior (copying, plagiarism) in any of the deliveries made (total or partial), the total contribution of the corresponding evaluation element on the final grade will be annulled.

(2) GLOBAL ASSEMENT SYSTEM

Procedure for the choice of the global assessment modality:

- The continuous assessment modality is assumed by default.
- Students who opt for the global evaluation must communicate it via Moovi, using the mechanisms that are enabled and within the stipulated period, once the period of one month from the beginning of the term has passed.

TEST 1: Practical hand-on exercises

Description: Evaluation of the writen reports and the code of the laboratory hand-on exercises delivered on the stipulated dates.

Applied methodology: Laboratory practical

% Qualification: 40%

Minimum %: grade equal to or greater than 5 points (out of 10)

Evaluated learning results: : A1,A2,A5,B1,B2,B5,C8,C19,C20,C21,C22,C30,D5,D8,D9

Expected results: RA1, RA2, RA3, RA4

TEST 2: Tutored work/essay

Description: Evaluation of the writen report of the supervised research work (or works) of theoretical-practical nature

assigned to each student.

Applied methodology: Mentored work

% Qualification: 35%

Minimum %: grade equal to or greater than 5 points (out of 10)

Evaluated learning results: A1,A4,B4,B5,C19,C20,C22,C30,D8,D9

Expected results: RA1, RA2, RA3, RA4

TEST 3: Final exam

Description: Multiple-choice final test on the theoretical contents of the subject.

Applied methodology: Objective questions exam

% Qualification: 25%

Minimum %: grade equal to or greater than 5 points (out of 10)

Evaluated learning results: A5,B1,C8,C19,C20,C21,C22,C30

Expected results: RA1, RA2, RA3, RA4

ADDITIONAL CLARIFICATIONS

- To pass the subject it is necessary to reach the minimums indicated in the previous tests and to add in the final weighted grade a minimum of 5 points out of 10.
- In the case of finding unethical behavior (copying, plagiarism) in any of the deliveries made (total or partial), the total

contribution of the corresponding evaluation element on the final grade will be annulled.

(3) ASSESSMENT CRITERIA FOR EXTRAORDINARY AND FINAL CALLS

- The continuous and global evaluation systems described above will be used.

- In these calls, students must only take the tests in which they have not obtained the minimum grade indicated.

(4) GRADING PROCESS

In the case of students who pass part of the evaluated elements, but do not reach the minimum required to pass the whole subject, the grade to be included in the respective minutes will be calculated as the minimum between the weighted average of the parts passed and 4.9.

(5) EVALUATION DATES

The official exam dates of the different calls, officially approved by the Xunta de Centro of the ESEI, are published on the ESEI website https://esei.uvigo.es/docencia/horarios/.

(6) USE OF MOBILE DEVICES

All students are reminded of the prohibition of the use of mobile devices in exercises and practices, in compliance with article 13.2.d) of the University Student Statute, regarding the duties of university students, which establishes the duty to "Refrain from using or cooperating in fraudulent procedures in the assessment activities, in the delivered assignments or in official documents of the university."

(7) TUTORING SCHEDULE AND PERSONAL TUTORING REQUEST

The tutoring schedule, and the way to request a personal tutoring, is published in the personal page of the teaching staff, accessible through https://esei.uvigo.es/docencia/profesorado/.

Sources of information

Basic Bibliography

William Stallings, **Effective Cybersecurity: A Guide to Using Best Practices and Standards.**, 978-0134772806, 1, Addison-Wesley Professional, 2018

Clarence Chio, David Freeman., **Machine Learning and Security: Protecting Systems with Data and Algorithms, 1ra edición.**, 978-1491979907, 1, O'Reilly, 2018

Chiheb Chebbi, **Mastering Machine Learning for Penetration Testing: Develop an extensive skill set to break self-learning systems using Python, 1ra edición**, 978-1788997409, 1, Packt Publising, 2018

Complementary Bibliography

Alessandro Parisi, **Hands-On Artificial Intelligence for Cybersecurity: Implement smart AI systems for preventing cyber attacks and detecting threats and network anomalies.**, 978-1789804027, 1, Packt Publishing, 2019

ENISA., **ENISA. Agencia de la Unión Europea para la Ciberseguridad. https://www.enisa.europa.eu/**, online,

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Recommendations

Subjects that it is recommended to have taken before

Machine learning I/O06M193V01105

Machine learning II/O06M193V01207

Deep learning/O06M193V01206

Knowledge and reasoning under uncertainty/O06M193V01203

Other comments

Course coordinated by the University of Vigo

IDENTIFYING DATA

Emergent and entrepreneurial aspects in IA

Subject	Emergent and entrepreneurial aspects in IA
Code	O06M193V01307
Study programme	Máster universitario en Inteligencia artificial

Descriptors	ECTS Credits		Choose	Year	Quadmester
	3		Optional	2nd	1st

Teaching language	
Department	
Coordinator	García Lourenco, Analia María
Lecturers	García Lourenco, Analia María
E-mail	analia@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24
General description	

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations

IDENTIFYING DATA

Master Thesis

Subject	Master Thesis			
Code	O06M193V01309			
Study programme	Máster universitario en Inteligencia artificial			

Descriptors	ECTS Credits		Choose	Year	Quadmester
	12		Mandatory	2nd	1st

Teaching language	
Department	
Coordinator	García Lourenco, Analia María
Lecturers	García Lourenco, Analia María
E-mail	analia@uvigo.es
Web	http://guiadocente.udc.es/guia_docent/index.php?centre=614&ensenyament=614544&consulta=assignatures&any_academic=2023_24
General description	

Training and Learning Results

Code

Expected results from this subject

Expected results from this subject	Training and Learning Results

Contents

Topic

Planning

	Class hours	Hours outside the classroom	Total hours

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

Methodologies

	Description

Personalized assistance

Assessment

Description	Qualification	Training and Learning Results

Other comments on the Evaluation

Sources of information

Basic Bibliography

Complementary Bibliography

Recommendations