ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

203000033 - Knowledge Representation And Acquisition

DEGREE PROGRAMME

20BC - Master Universitario en Biologia Computacional

ACADEMIC YEAR & SEMESTER

2020/21 - Semester 1

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	203000033 - Knowledge Representation And Acquisition
No of credits	3 ECTS
Type	Optional
Academic year ot the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	20BC - Master Universitario en Biologia Computacional
Centre	20 - E.T.S. de Ingenieria Agronomica, Alimentaria y de Biosistemas
Academic year	2020-21

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Emilio Serrano Fernandez (Subject coordinator)	2201	emilio.serrano@upm.es	Sin horario. Tutorías primer semestre: Martes: 16:00 - 19:00 Miércoles: 10:00 - 13:00

Javier Bajo Perez	2105	javier.bajo@upm.es	Sin horario. Tutorías primer semestre: Lunes: 11:00 - 12:00 15:00 - 17:00 Miércoles: 10:00 - 11:00 17:00 - 19:00

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Skills and learning outcomes *

3.1. Skills to be learned

CE02 - Utilizar sistemas operativos, programas y herramientas de uso común en biología computacional, así como, manejar plataformas de cómputo de altas prestaciones, lenguajes de programación y análisis bioinformáticos

CE03 - Analizar e interpretar bioinformáticamente los datos que se derivan de las tecnologías ómicas, y proponer soluciones bioinformáticas en relación a dichos datos.

CE05 - Utilizar herramientas de biología computacional para el análisis genómico, incluida la genómica comparativa y biología evolutiva.

CE10 - Conocimiento de las técnicas de representación del conocimiento reutilizables y modelos de razonamiento en entornos centralizados y distribuidos a utilizar en la resolución de problemas que impliquen conducta inteligente.

CG03 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con el area de la Biología Computacional.

CG05 - Que los estudiantes sean capaces de integrar conocimientos en el area de la Biología Computacional, de formular conclusiones, hipótesis o líneas de trabajo a partir de la información disponible, y de formarse una opinion fundamentada sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos.

CT07 - Ser capaz de manejar las tecnologías de la información y comunicación en un contexto profesional.

CT08 - Tener capacidad de análisis y síntesis para interpretar datos relevantes y abordar los problemas desde diferentes perspectivas.

3.2. Learning outcomes

RA46 - Saber aplicar diferentes técnicas de adquisición de conocimientos (con enfoques simbólicos o enfoques evolutivos) para extraer conocimiento de datos en forma de representaciones simbólicas (por ejemplo, reglas)

RA45 - Ser capaz de conocer las características de la representación del conocimiento y su utilidad práctica para la construcción de sistemas inteligentes

RA47 - Saber cómo adquirir y utilizar el conocimiento memorizando casos representativos utilizando el razonamiento basado en casos.

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

4. Brief description of the subject and syllabus

4.1. Brief description of the subject

Symbolic Artificial Intelligence (AI) is based on high-level "symbolic" (human-readable) representations of problems. Compared to the traditional data representation used in computing, AI systems use more complex methods to represent information about the world. This allows AI to solve complex tasks such as diagnosing a medical condition.

In this course, students will learn notions of knowledge representation and reasoning used in AI and the main properties of some of the most commonly used symbolic representations.

Moreover, students will learn specific methods for automatically acquiring knowledge from data or high-level representations. Among others, methods that learn symbolic representations such as rules from data and methods to solve new problems based on the solutions of similar past problems.

Finally, beyond the knowledge representation and acquisition, this course will explore explainable AI methods that allow us to understand the decisions made by intelligent systems so we can trust them.

The course combines both a theoretical and a practical presentation and the students have to develop practical exercises related to the main presented concepts and techniques.

4.2. Syllabus

1. Introduction to Knowledge Representation, Acquisition, and Explainable Artificial Intelligence (KR,A&XAI)
2. KR,A&XAI based on Interpretable Machine Learning
3. KR,A&XAI based on symbolic knowledge representation and automated reasoning
4. KR,A&XAI based on examples: Case-based reasoning
5. Social Computing
   5.1. Social Network Analysis
   5.2. Multi-agent systems

5. Schedule

5.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Distant / On-line	Assessment activities
1			**Lecture on Unit 1** Duration: 02:00	
2			**Lecture on Unit 2** Duration: 02:00	
3			**Lecture on Unit 2** Duration: 02:00	
4			**Lecture on Unit 3** Duration: 02:00	
5			**Lecture on Unit 3** Duration: 02:00	
6			**Lecture on Unit 4** Duration: 02:00	
7			**Lecture on Unit 4** Duration: 02:00	
8			**Lecture Unit 5.1** Duration: 02:00	
9			**Lecture Unit 5.1** Duration: 02:00	
10			**Lecture Unit 5.2** Duration: 02:00	
11			**Lecture Unit 5.2** Duration: 02:00	
12			**Exercises** Duration: 02:00	
13			**Exercises** Duration: 02:00	
14			**Exercises** Duration: 02:00	

15			**Exercises** Duration: 02:00	
16				**Practical project** Continuous assessment Not Presential Duration: 02:00
17				**Practical project** Final examination Not Presential Duration: 02:00

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
16	Practical project		No Presential	02:00	100%	5 / 10	CG03 CT08 CE10 CT07

6.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Practical project		No Presential	02:00	100%	5 / 10	CG03 CT08 CE10 CT07

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Practical project		Face-to-face	00:00	100%	5 / 10	CG03 CT08 CE10 CT07

6.2. Assessment criteria

"Continuous" assessment and "only final" assessment are mutually exclusive. Students who want to follow "only final" assessment must inform the coordinator (emilio.serrano@upm.es) at the beginning of the course, in the first two weeks of the course. Otherwise, continuous assessment is followed.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
UPM Moodle	Web resource	
Biblography	Bibliography	Selected bibliography (papers and text books)