



POLITÉCNICA

INTERNATIONAL
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COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros
Informáticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000889 - Image Processing, Analysis And Classification

DEGREE PROGRAMME

10AZ - Master Universitario En Innovación Digital

ACADEMIC YEAR & SEMESTER

2024/25 - Semester 2

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1. Description

1.1. Subject details

Name of the subject	103000889 - Image Processing, Analysis And Classification
No of credits	5 ECTS
Type	Optional
Academic year of the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	10AZ - Master Universitario en Innovación Digital
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2024-25

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Jose Crespo Del Arco (Subject coordinator)	5214	jose.crespo@upm.es	W - 14:30 - 20:30 (Note: planned office hours. See possible changes in Moodle.)
Raul Alonso Calvo	2315	raul.alonso@upm.es	M - 10:00 - 13:00 W - 10:00 - 13:00 (Note: planned office hours. See possible changes in Moodle.)

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

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Programming skills.
- Program development in a general purpose language such as C, C++, Java, Python.

4. Skills and learning outcomes *

4.1. Skills to be learned

CB06 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación

CE-CD04 - Capacidad para aplicar métodos avanzados para clasificación, modelado, segmentación y predicción a partir de un conjunto de datos

4.2. Learning outcomes

RA54 - Poseer destrezas fundamentales de la programación que permitan la implementación de algoritmos y el uso de estructuras de datos típicos en ciencia de datos. e distintos tipos de herramientas (software o metodológicas y conceptuales) necesarias para el correcto y eficaz desarrollo de software, incluyendo entornos y librerías en el contexto de ciencia de datos.

* 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.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

Outline

This subject covers techniques for image processing and analysis techniques, as well as methods for image classification.

Morphological approaches will be covered within the image processing and analysis,

For image classification, relevant features for clustering and learning will be treated. Approaches and applications for image indexation and image serching will be studied.

Learning Goals

Be aware of the foundations of image processing and analysis

Learn filtering techniques, and segmentation methods for separating regions of interest

Extract relevant features of input images.

Analyse some relevant image classification methods, and study image indexation and image searching techniques and applications.

5.2. Syllabus

1. Introduction
2. Filtering
 - 2.1. Introduction
 - 2.2. Morphological filtering
 - 2.3. Other techniques
3. Segmentation and extraction of features and regions of interest
 - 3.1. Introduction to image segmentation and feature extraction
 - 3.2. Morphological approaches
 - 3.3. Other methods
4. Image classification
 - 4.1. Introduction
 - 4.2. Image features for clustering and learning
 - 4.3. Indexation of images
 - 4.4. Image search applications

6. Schedule

6.1. Subject schedule*

Week	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1	Topic 1,2 Duration: 03:00 Lecture Topic 2 Duration: 01:00 Laboratory assignments			
2	Topic 2 Duration: 02:00 Lecture Topic 2 Duration: 02:00 Laboratory assignments			
3	Topic 3 Duration: 02:00 Lecture Topic 3 Duration: 02:00 Laboratory assignments			Computer assignment 1 Online test Progressive assessment Not Presential Duration: 02:00
4	Topic 3 Duration: 02:00 Lecture Topic 3 Duration: 02:00 Laboratory assignments			
5	Topic 4 Duration: 02:00 Lecture Topic 4 Duration: 02:00 Laboratory assignments			Computer assignment 2 Online test Progressive assessment Not Presential Duration: 02:00
6	Topic 4 Duration: 00:30 Lecture Topic 4 Duration: 02:00 Laboratory assignments Presentation and report, exercises Duration: 01:30 Additional activities			Presentation and Report. Note: several days Individual presentation Progressive assessment Presential Duration: 01:30

7	<p>Topic 4 Duration: 02:00 Laboratory assignments</p> <p>Presentation and report, exercises Duration: 02:00 Additional activities</p>			<p>Presentation and Report. Note: several days Individual presentation Progressive assessment Presential Duration: 02:00</p>
8	<p>Topic 4 Duration: 01:00 Laboratory assignments</p> <p>Presentation and report, exercises, written or oral exam Duration: 03:00 Additional activities</p>			<p>Presentation and Report. Note: several days Individual presentation Progressive assessment Presential Duration: 02:00</p> <p>Computer assignment 3 Online test Progressive assessment Not Presential Duration: 02:00</p>
9				<p>Computer assignment 1 Online test Global examination Not Presential Duration: 02:00</p> <p>Computer assignment 2 Online test Global examination Not Presential Duration: 02:00</p> <p>Presentation and Report. Note: several days Individual presentation Global examination Presential Duration: 04:00</p> <p>Computer assignment 3 Online test Global examination Not Presential Duration: 02:00</p> <p>Written or oral exam Problem-solving test Global examination Presential Duration: 03:00</p> <p>Written or oral exam Problem-solving test Progressive assessment Presential Duration: 03:00</p>

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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.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
3	Computer assignment 1	Online test	No Presential	02:00	10%	/ 10	CB06
5	Computer assignment 2	Online test	No Presential	02:00	25%	/ 10	CB06
6	Presentation and Report. Note: several days	Individual presentation	Face-to-face	01:30	5%	5 / 10	CB06
7	Presentation and Report. Note: several days	Individual presentation	Face-to-face	02:00	5%	5 / 10	CB06
8	Presentation and Report. Note: several days	Individual presentation	Face-to-face	02:00	5%	5 / 10	CB06
8	Computer assignment 3	Online test	No Presential	02:00	35%	/ 10	CB06 CE-CD04
9	Written or oral exam	Problem-solving test	Face-to-face	03:00	15%	5 / 10	CB06

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
9	Computer assignment 1	Online test	No Presential	02:00	10%	/ 10	CB06
9	Computer assignment 2	Online test	No Presential	02:00	25%	/ 10	CB06
9	Presentation and Report. Note: several days	Individual presentation	Face-to-face	04:00	15%	5 / 10	CB06
9	Computer assignment 3	Online test	No Presential	02:00	35%	/ 10	CB06 CE-CD04
9	Written or oral exam	Problem-solving test	Face-to-face	03:00	15%	5 / 10	CB06

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
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Exam	Problem-solving test	Face-to-face	00:30	15%	5 / 10	CB06
Presentation and Report	Individual presentation	Face-to-face	00:20	15%	5 / 10	CB06
Computer assignments	Problem-solving test	Face-to-face	02:15	70%	/ 10	CB06 CE-CD04

7.2. Assessment criteria

To pass the subject, at least 50 % of the total points must be achieved.

The indicated dates are tentative.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
"Digital image processing", Rafael C. Gonzalez, Richard E. Woods; Prentice Hall, 2nd. ed., 2002.	Bibliography	
"Morphological Image Analysis: Principles and Applications", Pierre Soille; Heidelberg: Springer, 2nd. ed., 2003.	Bibliography	
"Python Data Science Handbook", Jake VanderPlas, O'Reilly, 2016.	Bibliography	
"Deep Learning with Python", Francois Chollet, Manning Publications, 2017.	Bibliography	

Moodle	Web resource	
http://www.dlsiis.fi.upm.es/master_muss/asigPAI.html	Web resource	
BoofCV: http://boofcv.org/	Web resource	
OpenCV: http://opencv.org/	Web resource	
Classroom	Others	
Computers	Equipment	

9. Other information

9.1. Other information about the subject