ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

595030066 - Introduction To Machine Learning

DEGREE PROGRAMME

59EC - Grado en Ingenieria Electronica de Comunicaciones

ACADEMIC YEAR & SEMESTER

2020/21 - Semester 1

Index

Learning guide

1. Description

1.1. Subject details

Name of the subject	595030066 - Introduction To Machine Learning
No of credits	3 ECTS
Type	Optional
Academic year ot the programme	Fourth year
Semester of tuition	Semester 7
Tuition period	September-January
Tuition languages	English
Degree programme	59EC - Grado en Ingenieria Electronica de Comunicaciones
Centre	59 - Escuela Tecnica Superior de Ingenieria y Sistemas de Telecomunicacion
Academic year	2020-21

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Miguel Chavarrias Lapastora (Subject coordinator)	A4204	miguel.chavarrias@upm.es	Tu - 15:30 - 17:30 Schedules are subject to possible changes. Please, confirm the latest version with the lecturer

Eduardo Juarez Martinez	A4204	eduardo.juarez@upm.es	W - 08:30 - 10:30 Schedules are subject to possible changes. Please, confirm the latest version with the lecturer

* 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 and debugging using C language and optionally Python

4. Skills and learning outcomes *

4.1. Skills to be learned

CE B2 - Conocimientos básicos sobre el uso y programación de los ordenadores, sistemas operativos, bases de datos y programas informáticos con aplicación en ingeniería.

CG 02 - Capacidad de búsqueda y selección de información, de razonamiento crítico y de elaboración y defensa de argumentos dentro del área.

CG 03 - Capacidad para expresarse correctamente de forma oral y escrita y transmitir información mediante documentos y exposiciones en público.

CG 04 - Capacidad de abstracción, de análisis y de síntesis y de resolución de problemas.

CG 05 - Capacidad de trabajo en equipo y en entornos multidisciplinares.

CG 06 - Capacidad de adaptación, negociación, resolución de conflictos y de liderazgo.

CG 07 - Capacidad para el diseño, la gestión y la dirección de proyectos.

CG 08 - Capacidad de organización, planificación y de toma de decisiones.

CG 12 - Habilidad para las relaciones interpersonales y el trabajo en un contexto nacional e internacional, con capacidad para expresarse de forma oral y escrita en lengua inglesa.

CG 13 - Habilidades de aprendizaje con un alto grado de autonomía.

4.2. Learning outcomes

RA1129 - Capacidad para utilizar herramientas CAD para la construcción de redes neuronales

RA1130 - Capacidad para utilizar aceleradores hardware para el desarrollo de redes neuronales

RA1118 - Capacidad para conocer, entender y utilizar redes neuronales en el contexto del aprendizaje máquina

* 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

The course is focused on introducing the basic concepts related to machine learning. As it is intended to provide an introduction, during the first part of the course the fundamentals related to the development of machine learning algorithms and some use-cases will be explained. The course approach is eminently practical and is based on a Neural Compute Stick module especially devoted to the development of neural networks for computer vision.

The methodology of the course is project-based. The course is divided in two parts: In the first part, basic machine learning concepts will be introduced. Specifically, the fundamental ideas of neural networks will be reviewed. In addition, groups of students will be established to collaborately review different parts of the project proposal. The results will be shared with the student colleagues in a presentation. The second part of the course will be focused on the project proposal. Besides a presentation, students are required to write a report of achieved results.

5.2. Syllabus

1. Introduction to Machine Learning: basic concepts
2. Neural networks development with a Neural Compute Stick module
   2.1. Neural networks basic concepts and use cases
   2.2. Working environment based on OpenVINO
   2.3. Movidius NCS module features
   2.4. Movidius NCS module hands-on: examples
3. Neural network project

6. Schedule

6.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Distant / On-line	Assessment activities
1			**Introduction to Machine Learning basic concepts** Duration: 02:00 Lecture	
2			**Introduction to Neural networks: basic concepts and relevant use cases** Duration: 02:00 Lecture	
3			**Introduction to Neural networks: basic concepts and relevant use cases** Duration: 02:00 Lecture	
4			**Introduction to OpenVINO and Movidius framework** Duration: 02:00 Lecture	
5			**Movidius NCS module hands-on lab.** Duration: 02:00 Laboratory assignments	
6			**Movidius NCS module hands-on lab.** Duration: 02:00 Laboratory assignments	
7			**Movidius NCS module hands-on lab.** Duration: 02:00 Laboratory assignments	
8				**Presentation: initial approach of the project.** Group work Continuous assessment Presential Duration: 02:00 **Initial report of the project.** Group work Continuous assessment Not Presential Duration: 00:00
9			**Movidius NCS module hands-on lab.** Duration: 02:00 Laboratory assignments	
10			**Final project development** Duration: 02:00 Laboratory assignments	

11			**Final project development** Duration: 02:00 Laboratory assignments	
12			**Final project development** Duration: 02:00 Laboratory assignments	
13				**Final project presentation** Group presentation Continuous assessment Presential Duration: 02:00 **Final report of the project** Group presentation Continuous assessment Not Presential Duration: 00:00
14				
15				
16				
17				**Evaluation of the project** Problem-solving test Final examination Presential Duration: 01:00 **Written exam. Machine Learning and neural networks fundamentals.** Written test Final examination Presential Duration: 01:00

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.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
8	Presentation: initial approach of the project.	Group work	Face-to-face	02:00	15%	/ 10	CG 05 CG 13 CG 08 CE B2 CG 02 CG 03 CG 04 CG 12 CG 07 CG 06
8	Initial report of the project.	Group work	No Presential	00:00	15%	/ 10	CG 05 CG 13 CG 08 CE B2 CG 02 CG 03 CG 04 CG 12 CG 07 CG 06
13	Final project presentation	Group presentation	Face-to-face	02:00	30%	/ 10	CG 08 CE B2 CG 05 CG 13 CG 02 CG 03 CG 04 CG 12 CG 07 CG 06
13	Final report of the project	Group presentation	No Presential	00:00	40%	/ 10	CG 05 CG 08 CE B2 CG 13 CG 02 CG 03 CG 04 CG 12 CG 07

							CG 06

7.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Evaluation of the project	Problem-solving test	Face-to-face	01:00	70%	/ 10	CG 08 CE B2 CG 02 CG 03 CG 04 CG 12 CG 07 CG 13
17	Written exam. Machine Learning and neural networks fundamentals.	Written test	Face-to-face	01:00	30%	/ 10	CG 13 CG 08 CE B2 CG 02 CG 03 CG 04 CG 12 CG 07

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Written exam. Machine Learning and neural networks fundamentals.	Written test	Face-to-face	01:00	30%	/ 10	CG 08 CE B2 CG 02 CG 03 CG 04 CG 12 CG 07 CG 13
Evaluation of the project	Problem-solving test	Face-to-face	01:00	70%	/ 10	CG 13 CG 08 CE B2 CG 02 CG 03 CG 04 CG 12 CG 07

7.2. Assessment criteria

- Continuous assessment will be based on the work done in class during the team sessions, intermediate presentation and portfolios and the final group presentations.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Movidius Neural Compute Stick	Web resource	https://software.intel.com/content/www/us/en/develop/articles/intel-movidius-neural-compute-stick.html

9. Other information

9.1. Other information about the subject

This course will be taught in English language. All the materials will be exclusively provided in English language.