SUBJECT TEACHING GUIDE

256 - PHYSICS AND ASTRONOMY

University Master's Degree in Data Science

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	University Master's Degree in Data Science			Type and Year	Optional. Year 1
Faculty	Faculty of Sciences				
Discipline	DATA LABORATORIES				
Course unit title and code	256 - PHYSICS AND ASTRONOMY				
Number of ECTS credits allocated	3	Term		Semester based (2)	
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	INSTITUTO DE FISICA DE CANTABRIA
Name of lecturer	ALICIA CALDERON TAZON
E-mail	alicia.calderon@unican.es
Office	IFCA - Edificio Juan Jordá. Planta: - 1. DESPACHO (S104)
Other lecturers	BIUSE CASAPONSA GALI DIEGO TUCCILLO AIRAM EDUARDO MARCOS CABALLERO PEDRO JOSE FERNANDEZ MANTECA LARA LLORET IGLESIAS

3.1 LEARNING OUTCOMES
- Know the portals, databases, repositories, and the most relevant software and tools to approach a case of use in the area of particle physics and astrophysics
- Know how to model problems in the area of the particle physics and astrophysics using Data Science techniques and identify which critical points can impact the achievement of objectives.

4. OBJECTIVES

The subject will begin with an exposition of some basic concepts including simple but relevant examples, which will be analyzed individually and discussed in common.

The most relevant standards and applications will be reviewed, together with the actors involved in the development of it.

6. COURSE ORGANIZATION

CONTENTS	
1	Neural networks for separation of components from the cosmic microwave background
2	Separation of galaxies with Machine Learning
3	Estimation of cosmological parameters.
4	Deep Learning techniques in particle physics

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Assessment of oral presentations of works	Others	No	Yes	60,00
Follow-up of activities	Others	No	No	40,00
TOTAL				100,00

Observations

Observations for part-time students

The calendar will be adapted as much as possible so that they can attend the most important sessions for the follow-up of the subject.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Abadi, M., Barham, P., Chen, J., Chen, Z., Davis, A., Dean, J., ... & Kudlur, M. (2016, November). TensorFlow: A System for Large-Scale Machine Learning. In OSDI (Vol. 16, pp. 265-283).

Madrazo, C. F., Cacha, I. H., Iglesias, L. L., & de Lucas, J. M. (2017). Application of a Convolutional Neural Network for image classification to the analysis of collisions in High Energy Physics. arXiv preprint arXiv:1708.07034.

Vasconcellos, E. C., De Carvalho, R. R., Gal, R. R., LaBarbera, F. L., Capelato, H. V., Velho, H. F. C., ... & Ruiz, R. S. R. (2011). Decision tree classifiers for star/galaxy separation. The Astronomical Journal, 141(6), 189.

https://arxiv.org/abs/1708.07034