Course	**DataScience and Artificial Intelligence**				
Subject	**Data Science Topics**				
Academic year	2023-24	*Curricular year*	1	*Study period*	2-sem
Type of subject	Compulsory	*Student workload (H)*	Total: 168	Contact: 60	ECTS 6
Professor(s)	Paulo Vieira				

X *Area/Group Coordinator* ☐ *Head of Department*	*(select)*	Miguel Salgado

Planned

1. LEARNING OBJECTIVES

1. Know the data life cycle.

2. Know computational thinking.

3. Learn computational models and Machine Learning (ML) models.

4. Classify the computational complexity of decision problems.

5. Classify the complexity of Machine Learning models

6. Know how to prepare data for ML's

7. Apply imputation methods

8. Know dimensionality reduction techniques

9. Know basic notions of public and private key cryptography

10 Know the threats to learning

11. Know the notions of privacy contained in RGPD.

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2. PROGRAMME

1. The data life cycle and associated technologies.

2. Computational models

3. Machine Learning (ML) models: Clustering, regression and classification models

4. Intractability and classification of problems by best case, worst case, and average case

5. Complexity analysis of ML models in time and space

6. Data preparation for ML models and application of imputation methods

7. Principal components analysis

7.1 Multivariate analysis

7.2 Principal components identification

7.3 Dimensionality reduction algorithms

8. Public and private key cryptographic systems and their use in different contexts

9. Security and privacy in learning

10. Deontology compliant with RGPD in the construction and use of datasets

(1000 characters max)

3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

Content 1 is consistent with objective 1

Content 2 is coherent with objectives 2, 3

Content 3 is coherent with objective 3

Content 4 is coherent with objective 4

Table of contents 5 is coherent with objective 5

Content 6 is coherent with objectives 6, 7

Content 7 is coherent with objectives 6, 7, 8

Content 8 is coherent with objective 9, 10

Content 9 is coherent with objective 10

Content 10 is coherent with objective 11

(1000 characters max)

4. MAIN BIBLIOGRAPHY

1- Sipser, Michael (2005). Introdução à Teoria da Computação. Editora, Cengage CTP. ISBN: 8522104999,9788522104994

3- Boavida, F.; Bernardes, M. (2019). Introdução à Criptografia. Editora FCA. ISBN 978-972-722-902-4

4- Sanjeev Arora, Boaz Barak (2009). Computational complexity - A modern approach (2009). Cambridge University Press. ISBN 9780521424264, 0521424267.

5- https://gdpr.eu (guia da ue).[Out, 2021]

7- Cady, F. (2017). The data science handbook. John Wiley & Sons.ISBN 9781119092926.

6. https://scikit-learn.org/stable/ [março 2023]

7. Scikit-learn: Machine Learning in Python, Pedregosa *et al.*, JMLR 12, pp. 2825-2830, 2011.

8. I.T. Jolliffe (2010). Principal Component Analysis, second edition. Springer. ISBN - 0-387-95442-2

9. Anderson, T. (2003). An Introduction to Multivariate Statistical Analysis. Wiley-Interscience. ISBN: 0471360910, 9780471360919.

(1000 characters max)

5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)

Teaching methodologies: Lectures and problem-solving classes with resolution of exercises

Evaluation

Continuous Assessment: 40%   practical work + 60% written assessment test

Other evaluation seasons: written assessment test

(1000 characters max)

6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES

1. Expository lecture is consistent with the objectives due to the need to present the theoretical content to students.

2.Interactive lecture in theoretical-practical classes is consistent with the objectives because student/teacher interaction helps students learn the concepts and allows the teacher to perceive the kind of difficulties in understanding and using the concepts.

3. Resolution of exercises, in theoretical-practical classes, is coherent with the objectives, because the application of theoretical contents in practical exercises allows the consolidation of knowledge.

(3000 characters max)

7. ATTENDANCE

As there are no specific rules beyond what is determined in the context of the course and the IPG, the

attendance will not be taken into account as an evaluation factor.

8. CONTACTS AND OFFICE HOURS

Paulo Vieira, pavieira@ipg.pt, gab-36-ESTG.IPG, tuesday:14:00-16:00

9. OTHERS

DELETE SECTION 9. IN COMPLETED SUBJECT DESCRIPTION

DATE

February 2024

SIGNATURES

Professor(s), Area/Group Coordinator or Head of Department signatures

Assinatura na qualidade de (clicar)

(signature)

Assinatura na qualidade de (clicar)

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