

| COURSE MODULE – DATA SCIENCE

COURSE CODE	COSI DAS
COURSE LEVEL	Master
ECTS CREDITS	5
COURSE INSTRUCTOR/S	Prof. José Manuel Benítez Sánchez and Miguel Lastra Leidinger (UGR)
EDUCATION PERIOD	SEMESTER 2
EXPECTED PRIOR-KNOWLEDGE	BSc level basics in Computer Science and Mathematics
LANGUAGE OF INSTRUCTION	English

AIM This course gives the necessary computer science background to perform Data Analysis in terms of Computational Intelligence, Data Mining, Machine Learning and Statistical Learning. To develop their practical and analytical skills, students have to work on case studies practical sessions making use of the R language environment for statistical computing, data analytics and graphics.

TEACHING ACTIVITIES This course is based on lectures, lab classes, exercises as well as homework.

COURSE OUTLINE

- (topic 1) The R programming language
- (topic 2) Data Science (Methodology, Pre-processing, Resampling, Model selection, Model validation)
- (topic 3) Classification (Basic concepts, LDA, kNN, Classification Trees, Random Forests, Artificial Neural Networks, SVM)
- (topic 4) Regression (Basic concepts, Regression Trees, Random Forests, Artificial Neural Networks, SVM)
- (topic 5) Advanced topics (Parallel processing, GPU, Big Data)

PRACTICAL ACTIVITIES Practical works (laboratory sessions and case studies) in order to implement concepts introduced in the lectures, to practice on real applications and to train students.

LEARNING OUTCOMES¹

- *Knowledge and Comprehension* of the fundamentals, principles, applications, limits, relationships, of all concepts and topics covered by this course;
- *Application, Analysis, Synthesis and Evaluation* skills of the main concepts and topics covered by this course;
- Ability to apply/implement concepts and principles introduced in the lectures on practical tasks and on real-world study cases;
- Ability to self-learn, to understand some problems and to suggest/find solutions to solve these problems.

FORM/S OF ASSESSMENT Written exam (65%), Practical works (25%), Class exercises (10%)

ASSESSMENT CRITERION Written exam, Practical works and Class exercises

Excellent - outstanding performance	A
Very Good - above the average standard but with some errors	B
Good - generally sound work with a number of notable errors	C
Satisfactory - fair but with significant shortcomings	D
Sufficient - performance meets the minimum criteria	E
Fail - some more work required before the credit can be awarded	FX
Fail - considerable further work is required	F

¹ The meaning of *keywords* in italic used to define Learning Outcomes are detailed in Annex.

- LITERATURE AND STUDY MATERIALS
- “Machine Learning for Hackers”, Drew Conway, John Myles White, O’Reilly, 2012.
 - “Learning R”, Richard Cotton, O’Reilly, 2013.
 - “An Introduction to Statistical Learning with Applications in R”, G. James, D. Witten, T. Hastie, R. Tibshirani, Springer, 2013.
 - “Applied Predictive Modeling”, Max Kuhn, Kjell Johnson, Springer, 2013.

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