DEPARTMENT OF COMPUTER SCIENCE AND NUMERICAL ANALYSIS
University of Cordoba

Activities Report
Course 2021/2022

1. Introduction

This report aims to reflect a summary of the teaching and research activities of the Department of Computer Science and Numerical Analysis of the University of Córdoba during the 2021/22 academic year.
This Department is made up of three areas of knowledge:

Mathematical Analysis (3 teachers and 2 male professors).
Computer Science and Artificial Intelligence (5 professors and 25 male professors).

Teaching is taught in 6 centers and a total of 18 degrees and 2 master's degrees. The members of this Department are made up of 8 research groups that throughout the 21/22 academic year published more than 60 articles in indexed journals and participated in 16 research projects and 7 R&D&I contracts with companies.

2. Department Personnel

2.1 Management Team

Director: Ángel Carmona Poyato.
Secretary: Amelia Zafra Gómez.

2.2 Teaching staff

Mathematical Analysis Area	
Carmen Calzada Canalejo	University Professor
Enrique Delgado Avila	Interim Substitute Professor
Marina Esteban Pérez	Assistant Professor Doctor
José Antonio Sánchez Pelegrín	Contracted Professor Doctor
Mercedes Marin Beltran	University Professor

Computer Science Area	
Antonio Calvo Cuenca	Professor of University Schools
Ángel Carmona Poyato	Professor of University Schools
Gonzalo Cerruela García	University Professor
Aida de Haro García	University Professor

Juan Carlos Fernández Caballero	University Professor
Nicolás Luis Fernández García	University Professor
Carlos García Martínez	University Professor
Nicolás García Pedrajas	University Professor
Enrique García Salcines	Contracted Professor Doctor
Eva Lucrecia Gibaja Galindo	University Professor
Miguel Ángel Gómez Nieto	University Professor
David Guijo Rubio	Interim Substitute Professor
Pedro Antonio Gutiérrez Peña	University Professor
César Hervás Martínez	University Professor
José María Luna Ariza	Contracted Professor Doctor
Maria Luque Rodriguez	Contracted Professor Doctor
Irene Luque Ruiz	University Professor
Francisco José Madrid Cuevas	University Professor
Manuel Jesus Marin Jimenez	University Professor
Luis Rafael Martínez Carrillo	Interim Substitute Professor
Rafael Medina Butcher	University Professor
Jose Maria Moyano Murillo	Interim Substitute Professor
Rafael Muñoz Salinas	University Professor
Domingo Ortiz Boyer	University Professor
Juan Antonio Romero del Castillo	University Professor
Christopher Romero Morales	University Professor
José Raúl Romero Salguero	University Professor
Sebastian Ventura Soto	University Professor
Enrique Yeguas Bolívar	University Professor
Amelia Zafra Gómez	University Professor

2.3 Administration and Services Personnel

Miguel Ángel Sanz Gómez	Administrative Manager

2.4 Personal Researcher or Teacher in Training

Rafael Aguilar Ortega	Scholarship under Project
Javier Barbero Gómez	FPI Scholarship
Rafael Barbudo Lunar	FPU Scholarship
Rafael Berral Soler	Scholarship under Project
Aurora Esteban Toscano	FPU Scholarship
Pablo García Ruiz	Scholarship under Project
Antonio Manuel Gómez Orellana	Scholarship under Project
Aurora Esteban Toscano	FPU Scholarship
Manuel Mendoza Hurtado	FPU Scholarship
Antonio Rafael Moya Martín-Castaño	FPU Scholarship
Aurora Ramírez Quesada	Doctor Research Staff
Francisco Rodríguez Ramírez	FPI Scholarship
Javier Sánchez Monedero	Distinguished Research Staff
Victor Manuel, Vargas Yun	FPU Scholarship
Jorge Zafra Palma	Scholarship under Project

2.5 Student Collaborators and Honorary Collaborators

Student collaborator	Cano Arcos, Pilar
Student collaborator	Berrios Carmona, Mario
Student collaborator	Espantaleón Pérez, Ricardo
Student collaborator	García Pozo, Pedro Pablo
Student collaborator	Herrera Poch, Fernando

Student collaborator	Call Nuflo, Francisco
Student collaborator	Marín Sanz, Tomás
Student collaborator	Martin Luque, Elena
Student collaborator	Rivera Gavilán, Marcos
Honorary collaborator	Bérchez Moreno, Francisco
Honorary collaborator	Espejo Muñoz, Álvaro
Honorary collaborator	Gómez Fernández, Juan Francisco
Honorary collaborator	Jiménez Velasco, María Isabel
Honorary collaborator	Jiménez Vílchez, Alfonso
Honorary collaborator	Olivence Pole, Fernando Augustine
Honorary collaborator	Osuna Zamorano, José Antonio
Honorary collaborator	Salado Cid, Ruben
Honorary collaborator	Tinedo Rodríguez, Diego
Honorary collaborator	Toribio Castro, Luis
Honorary collaborator	Torre López, José de la

3. Teaching Activity

Below, the teaching activity of the two areas that make up the department is reflected in a series of tables. This information is extracted from the Teaching Plans of these areas.

Table 1 shows general data on the teaching provided by the Department.

NUMBER OF CENTERS IN WHICH TEACHING IS PROVIDED	6
NUMBER OF GRADES IN WHICH TEACHING IS PROVIDED	18
NUMBER OF MASTER'S DEGREES IN WHICH TEACHING IS PROVIDED	3
NUMBER OF SUBJECTS IN WHICH TEACHING IS PROVIDED	74
NUMBER OF ENROLLMENTS MADE BY STUDENTS	4258
TOTAL NUMBER OF HOURS TAUGHT	5558

Table 1. Global data on the teaching provided by the Department in the 2021/22 academic year.

The teaching activity specific to the two areas and classified by centers and grades is reflected in tables 2 and 3.

	GRADE	***SUBJECTS***	***NUMBER OF REGISTRATIONS***	***HOURS***
SCIENCE FACULTY	CHEMICAL	2	205	164
	PHYSICAL	6	496	512
	BIOCHEMISTRY	1	59	81
	TOTAL	9	760	757

Table 2. Teaching Activity in degrees in the area of Mathematical Analysis in the 2021/22 academic year.

	GRADE	SUBJECTS	NUMBER OF REGISTRATIONS	HOURS
SCIENCE FACULTY	PHYSICAL	2	121	104
	BIOCHEMISTRY	1	46	84
	TOTAL F. C.	3	167	188
HIGHER POLYTECHNIC SCHOOL OF CÓRDOBA	MECHANICAL ENGINEERING	1	105	168
	ELECTRIC ENGINEERING	1	53	84
	ELECTRONIC ENGINEERING	1	102	168
	INFORMATICS ENGINEERING	34	2434	3468
	TOTAL E.P.S.C.	37	2694	3888
HIGHER POLYTECHNICAL SCHOOL OF AGRONOMICS AND FORESTRY ENGINEERS	FOREST ENGINEERING	1	39	26
	AGRI-FOOD AND RURAL ENVIRONMENT ENGINEERING + FOREST ENGINEERING	1	10	
	AGRI-FOOD AND RURAL ENVIRONMENT ENGINEERING + OENOLOGY	1	9	44
	AGRI-FOOD AND RURAL ENVIRONMENT ENGINEERING	1	71	
	TOTAL E.T.S.I.A.M.	4	129	70
BELMEZ HIGHER POLYTECHNIC SCHOOL	CIVIL ENGINEERING	1	40	54
	TOTAL E.P.S.B.	1	40	54
FACULTY OF PHILOSOPHY AND LETTERS	TRANSLATION AND INTERPRETATION	1	100	180
	TRANSLATION AND INTERPRETATION + ENGLISH STUDIES	1	33	
	TRANSLATION AND INTERPRETATION (ENGLISH) + HISPÁNIC FILOLOGÍA	1	12	
	TRANSLATION AND INTERPRETATION (FRENCH) + HISPANIC FILOLOGY	1	5	
	DEGREE IN TOURISM + TRANSLATION AND INTERPRETATION (ENGLISH)	1	19	
	TOTAL F. F. L.	5	169	180
FACULTY OF LABOR SCIENCES	TOURISM	1	48	135
	TOTAL C. T.	1	48	135
TOTAL	17	51	3247	4515

Table 3. Teaching Activity in degrees in the area of Computer Science and Artificial Intelligence in the 2021/22 academic year.

Teaching in Master's degrees in the Department's areas can be summarized in table 4.

AREA	SUBJECTS	NUMBER OF REGISTRATIONS	HOURS
COMPUTER SCIENCE AND A.I.	14	251	286
TOTAL	14	251	286

Table 4. Teaching in Masters in the area of Computer Science and Artificial Intelligence in the 2021/22 academic year.

The Final Degree Projects, the Final Master's Projects and the Theses directed by the department can be summarized in table 5.

AREA	END OF DEGREE WORKS	MASTER'S END PROJECTS	THESIS
COMPUTER SCIENCE AND A.I.	49	0	4
TOTAL	49	0	4

Table 5. Final Degree Projects, Final Master's Projects and Theses directed by the Department areas (Data for the 20/21 academic year, which are the last available).

In the section related to Teaching Innovation projects, the coordination/participation of members from the different areas is reflected in table 6.

AREA	COORDINATORS	PARTICIPANTS
COMPUTER SCIENCE AND A.I.	2	11
TOTAL	2	11

Table 6. Coordination/Participation in Teaching Innovation Projects. (20/21 academic year data, which are the latest available).

4. Research Activity

The research activity will be reflected classified by the research groups to which the Department's professors are assigned. The information shown has been provided by those responsible for each of the research groups.

4.1 Software, Knowledge and Database Engineering Group

Website: http://www.uco.es/iscbd/iscbd/

Responsible: Irene Luque Ruiz.

Members of the CCIA area:

Miguel Ángel Gómez Nieto.
Gonzalo Cerruela García.

Lines of investigation:

Near Field Communication (NFC) y RFID.
Intelligent Environments (AmI).
Pervasive computing.
Mobile computing.
Context-awareness.
Knowledge-based systems.
Representation of knowledge.
Production, clustering and screening models.
Computational Chemistry and Chemometrics.
QSPR/QSAR.
Teaching Innovation.

Number of articles indexed: 7.
National research projects: 1.
Regional research projects: 1.
R&D&i contracts with companies: 1.

4.2 Group Learning and Artificial Neural Networks

*Website:*http://www.uco.es/grupos/ayrna/
Responsible: César Hervás Martínez.

CCIA area members:

Pedro Antonio Gutiérrez Peña
Juan Carlos Fernández Caballero.
David Guijo Rubio.
Antonio Manuel Gómez Orelllana.
Javier Barbero Gómez
Victor M. Vargas Yun.

Lines of investigation:

Application of classification models for the area of Aerobiology.
Application of classification models for the area of Agronomy.
Application of classification models to carry out Plant Distribution.
Application of classification models to predict noise in engines.
Application of classification models to predict wind.
Application of classification models for the area of Analytical Chemistry.
Application of classification models for the Health area.
Development of evolutionary computing software to execute classification methodologies.
Development of multi-objective evolutionary algorithms to carry out classification methodologies.
Development of machine learning methodologies.
Development of ordinal classification through evolutionary computing. Carrying out projects for teaching innovation related to intelligent computing.
Development of applications based on evolutionary computing to solve web data mining problems. Development and study of new base functions for the different nodes of Artificial Neural Networks.
Development of Evolutionary Artificial Neural Networks algorithms.
Development of distributed evolutionary computing applications.

Number of articles indexed: 13.
Number of Communications to international Congresses: 5.
Research Projects: 5.
R&D&i contracts with companies: 2.

4.3 Applications of Artificial Vision

Website: http://www.uco.es/grupos/ava/

Responsible: Rafael Medina Butcher.

CCIA area members:

Ángel Carmona Poyato.
Nicolás Luis Fernández García.
Francisco José Madrid Cuevas.
Manuel Jesús Marín Jiménez.
Rafael Muñoz Salinas.
Francisco J. Rodríguez Ramírez.
Enrique Yeguas Bolívar.

Lines of investigation:

Camera pose estimation.
3D scanning.
Augmented reality.
Human pose estimation.
Recognition of interactions.
Recognition for the step.
Detection and tracking in 3D video.
Image Segmentation, Edge Detection, Shape Analysis and polygonal approximations.

Number of articles indexed: 12.
Number of Communications to international Congresses: 2.
National research projects: 2.
Regional Research Projects: 2.

4.4 Computational Intelligence and Bioinformatics

Website: http://cib.uco.es/

Responsible: Nicolás García Pedrajas.

CCIA area members:

Domingo Ortiz Boyer.
Juan Antonio Romero del Castillo.
Aida de Haro García.

Lines of investigation:

Swarms of classifiers.
Multi-label classification.
Unconventional classification.
Selection of instances and features.
Chemoinformatics and Bioinformatics Applications.

Number of articles indexed: 4.
Number of Communications to international Congresses: 1.
National research projects: 1.
Regional Research Projects: 1.

4.5 Knowledge Discovery and Intelligent Systems

Website: http://www.uco.es/kdis/

Responsible: Sebastian Ventura Soto.

CCIA area members:

Cristobal Romero Morales.
Carlos García Martínez.
Amelia Zafra Gómez.
José Raúl Romero Salguero.
Eva L. Gibaja Galindo.
María Luque Rodríguez.
José María Luna Ariza.
Antonio Rafael Moya Martín-Castaño.
Aurora Ramírez Quesada.
Jose Maria Moyano Murillo.
Rafael Barbudo Lunar.
Aurora Esteban Toscano.

Lines of investigation:

Data science.
Big data.
Machine learning.
Soft computing.
Optimization techniques.

Number of articles indexed: 16.
Number of Communications to national Congresses: 3.
Number of Communications to international Congresses: 1.
Research projects: 1.
R&D&i contracts with companies: 3.

4.6 Exponential Technologies and Environmental Intelligence Group

Responsible: Enrique García Salcines.

Members of the CCIA area:

- Enrique García Salcines.

Lines of investigation:

- Blockchain.
- Artificial intelligence.
- Prediction models.
- Internet of Things (IoT) and Ambient Intelligence (AmI).
- Cloud Computing.
- Big data.
- Nanotechnology.
- Virtual and augmented reality.

Number of articles indexed: 7.
National research projects: 1.
R&D&I contracts with companies: 1.

4.7 Research in Dynamic Systems in Engineering

Responsible: Emilio Freires Macias.

Members of the AM area:

Marina Esteban Pérez.

Lines of investigation:

- Dynamic Systems.
- Local and Global Forks.
- Chaotic Dynamics.
- Autonomous Electronic Oscillators.
- Nonlinear Control Systems.
- Mesoscopic systems.
- Hamiltonian systems.
- Periodically Forced Systems.

Number of articles indexed: 7.
Number of Communications to national Congresses: 11.
Number of Communications to international Congresses: 11.
Research projects: 5.

4.8 Lorentzian and Riemannian (Gelori) Geometry

Website: http://www.uco.es/geometria/

Responsible: Rafael María Rubio Ruiz.

Members of the AM area:

- José Antonio Sánchez Pelegrín.

Lines of investigation:

- Analysis of temporal and luminous geodesics in space-times
- Causal structure of spacetimes: trapped surfaces, dynamical horizons, black holes, causal and conformal asymptotic edge
- Transformation groups in space-times
- Hypersurfaces in symmetrical spaces
- Spatial hypersurfaces of constant mean curvature
- Geometric models of mathematical physics
- Variational problems in geometry and their applications in physics
- Surfaces trapped in space-times
- Minimal surfaces

Number of articles indexed: 5.
Number of Communications to international Congresses: 1.
Research projects: 1.