

**DEPARTMENT OF COMPUTER SCIENCE AND
NUMERICAL ANALYSIS
University of Cordoba**

Activities Report
Course 2022/2023

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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 2022/23 academic year.

This Department is made up of two areas of knowledge:

- Mathematical Analysis (3 teachers and 1 professor).
- Computer Science and Artificial Intelligence (6 professors and 25 male professors).

Teaching is taught in 6 centers and a total of 19 degrees and 3 masters. The members of this Department are integrated into 7 research groups that throughout the 22/23 academic year published more than 50 articles in indexed journals and participated in 15 research projects and 5 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
Marina Esteban Pérez	Assistant Professor Doctor
José Antonio Sánchez Pelegrín	Contracted Professor Doctor
Mercedes Marin Beltran	University Professor

Computer Science Area	
José Manuel, Mayor Llergo	Interim Substitute Professor
Antonio Calvo Cuenca	Professor of University Schools
Ángel Carmona Poyato	Professor of University Schools
Gonzalo Cerruela García	University Professor
José Manuel Cuevas Muñoz	Interim Substitute 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 Emilio García Pedrajas	University Professor
Enrique García Salcines	Contracted Professor Doctor
Eva Lucrecia Gibaja Galindo	University Professor
Miguel Ángel Gómez Nieto	University Professor
Pedro Antonio Gutiérrez Peña	University Professor
César Hervás Martínez	Emeritus Professor
José María Luna Ariza	University Professor
Maria Luque Rodriguez	Contracted Professor Doctor
Irene Telesfora 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
Rafael Muñoz Salinas	University Professor
Domingo Ortiz Boyer	University Professor
Aurora Ramírez Quesada	Interim Substitute Teacher
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
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2.4 Personal Researcher or Teacher in Training

Rafael Aguilar Ortega	Hired under Project
Javier Barbero Gómez	FPI Contractor
Rafael Barbudo Lunar	FPU Contractor
Rafael Berral Soler	Hired under Project
Aurora Esteban Toscano	FPU Contractor
Pablo García Ruiz	Hired under Project
Antonio Manuel Gómez Orellana	FPI Contractor
David Guijo Rubio	Hired Margarita Salas
Aurora Esteban Toscano	FPU Contractor
María Isabel Jiménez Velasco	FPU Contractor
Manuel Mendoza Hurtado	Contracted (Own plan)
Antonio Rafael Moya Martín-Castaño	FPU Contractor
Francisco Rodríguez Ramírez	Hired Margarita Salas
Javier Sánchez Monedero	Hired Beatriz Galindo
Victor Manuel, Vargas Yun	FPU Contractor
Jorge Zafra Palma	Hired under Project

2.5 Student Collaborators and Honorary Collaborators

Student Collaborator / Honorary Collaborator		
Student collaborator	Berrios Carmona	Mario
Student collaborator	Delgado Cabanillas	the father
Student collaborator	Flowers Barranco	Jose Manuel
Student collaborator	Almoguera Fountains	Angel
Student collaborator	Garcia Moreno	Miguel Angel
Student collaborator	Garcia Pozo	Pedro Pablo
Student collaborator	Mr. Lujano	Antonio
Student collaborator	Luna Escudero	Christian
Student collaborator	Moreno Cano	Francisco
Student collaborator	Merida Pine	Alvaro
Honorary Contributor	Aguilera Aguilera	Eusebio

Honorary Contributor	Mayor Llergo	Jose Manuel
Honorary Contributor	Ayllón Gavilán	Rafael
Honorary Contributor	Lunar Bearded	Rafael
Honorary Contributor	Berchez Moreno	Francisco
Honorary Contributor	Gómez Bachelor	Sergio
Honorary Contributor	From the Lopez Tower	Joseph
Honorary Contributor	Garrido Jurado	Sergio
Honorary Contributor	Gomez Fernandez	Juan Francisco
Honorary Contributor	Jiménez Vílchez	Alfonso
Honorary Contributor	Nostrils	Ilias
Honorary Contributor	Olivencia Polo	Fernando Agustín
Honorary Contributor	Osuna Zamorano	Jose Antonio
Honorary Contributor	Tinedo Rodríguez	Diego
Honorary Contributor	Toribio Castro	Luis

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 offered by the Department.

NUMBER OF CENTERS IN WHICH TEACHING IS PROVIDED	6
NUMBER OF GRADES IN WHICH TEACHING IS PROVIDED	19
NUMBER OF MASTER'S DEGREES IN WHICH TEACHING IS PROVIDED	3
NUMBER OF SUBJECTS IN WHICH TEACHING IS PROVIDED	75
NUMBER OF ENROLLMENTS MADE BY STUDENTS	4271
TOTAL NUMBER OF HOURS TAUGHT	5937

Table 1. Global data on the teaching provided by the Department in the 2022/23 academic year.

The teaching activity specific to the two areas and classified by centers and grades is reflected in tables 2 and 3. The number of enrollments is considered by accounting for the enrollments made in the different subjects of each of the Grades considered, which is the information of the that the Department has.

	<i>GRADE</i>	<i>SUBJECTS</i>	<i>NUMBER OF REGISTRATIONS</i>	<i>HOURS</i>
SCIENCE FACULTY	CHEMICAL	2	184	164
	PHYSICAL	6	492	521
	BIOCHEMISTRY	1	56	81
	BIOTECHNOLOGY	1	50	43
	TOTAL	10	760	809

Table 2. Teaching Activity in degrees in the area of Mathematical Analysis in the 2022/23 academic year.

	<i>GRADE</i>	<i>SUBJECTS</i>	<i>NUMBER OF REGISTRATIONS</i>	<i>HOURS</i>
SCIENCE FACULTY	PHYSICAL	2	120	105
	BIOCHEMISTRY	1	46	84
	TOTAL F. C.	3	166	189
HIGHER POLYTECHNIC SCHOOL OF CÓRDOBA	MECHANICAL ENGINEERING	1	106	168
	ELECTRIC ENGINEERING	1	53	84
	ELECTRONIC ENGINEERING	1	96	168
	INFORMATICS ENGINEERING	34	2359	3817
	TOTAL E.P.S.C.	37	2614	4237
HIGHER POLYTECHNICAL SCHOOL OF AGRONOMICS AND FORESTRY ENGINEERS	FOREST ENGINEERING	1	33	26
	AGRI-FOOD AND RURAL ENVIRONMENT ENGINEERING + FOREST ENGINEERING	1	14	
	AGRI-FOOD AND RURAL ENVIRONMENT ENGINEERING + OENOLOGY	1	10	44
	AGRI-FOOD AND RURAL ENVIRONMENT ENGINEERING	1	79	
	TOTAL E.T.S.I.A.M.	4	136	70
BELMEZ HIGHER POLYTECHNIC SCHOOL	CIVIL ENGINEERING	1	48	54
	TOTAL E.P.S.B.	1	48	54
FACULTY OF PHILOSOPHY AND LETTERS	TRANSLATION AND INTERPRETATION	1	84	180
	TRANSLATION AND INTERPRETATION + ENGLISH STUDIES	1	31	
	TRANSLATION AND INTERPRETATION (ENGLISH) + HISPÁNICO FILOLOGÍA	1	8	
	TRANSLATION AND INTERPRETATION (FRENCH) + HISPANIC FILOLOGY	1	4	
	DEGREE IN TOURISM + TRANSLATION AND INTERPRETATION (ENGLISH)	1	15	
	TOTAL F. F. L.	5	145	180
FACULTY OF LABOR SCIENCES	TOURISM	1	46	120
	TOTAL C. T.	1	46	120
TOTAL	17	51	3155	4850

Table 3. Teaching Activity in degrees in the area of Computer Science and Artificial Intelligence in the 2022/23 academic year.

Teaching in Master's degrees in the Department's areas can be summarized in table 4. The number of enrollments is considered by accounting for the enrollments made in the different subjects of each of the Degrees considered, which is the information available to the Department.

<i>AREA</i>	<i>SUBJECTS</i>	<i>NUMBER OF REGISTRATIONS</i>	<i>HOURS</i>
COMPUTER SCIENCE AND A.I.	14	356	278
TOTAL	14	356	278

Table 4. Teaching in Masters in the area of Computer Science and Artificial Intelligence in the 2022/23 academic year.

The Final Degree Projects, the Final Master's Projects and the Theses directed by the department can be summarized in table 5. These data correspond to those of the 21/22 academic year, which are the latest available data that have been sent to the Department

<i>AREA</i>	<i>END OF DEGREE WORKS</i>	<i>MASTER'S END PROJECTS</i>	<i>THESIS</i>
COMPUTER SCIENCE AND A.I.	67	11	2
MATHEMATICAL ANALYSIS	4	0	0
TOTAL	71	11	4

Table 5. End of Degree Projects, End of Master's Degree and Theses directed by the areas of the Department (Data for the 21/22 year, which are the last available).

In the section related to Teaching Innovation projects, the coordination/participation of members of the different areas is reflected in table 6. These data correspond to those of the 21/22 academic year, which are the latest available data that have been sent to the Department.

<i>AREA</i>	<i>COORDINATORS</i>	<i>PARTICIPANTS</i>
COMPUTER SCIENCE AND A.I.	0	2
MATHEMATICAL ANALYSIS	0	2
TOTAL	0	4

Table 6. Coordination/Participation in Teaching Innovation Projects. (21/22 course 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 and by the participants in the event that the person responsible for the group does not belong to the Department.

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: 3

Number of Communications to international Congresses: 1.

Research Projects: 2.

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 Orellana.
- 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: 23.

Number of Communications to international Congresses: 11.

Research Projects: 4.

R&D&i contracts with companies: 1.

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: 6.

Number of Communications to international Congresses: 4.

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: 6.

Number of Communications to international Congresses: 1.

Research Projects: 2.

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: 12.

Number of Communications to national Congresses: 1.

Number of Communications to international Congresses: 4.

Research projects: 4.

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 items indexed: 7.

Research projects: 1.

R&D&I contracts with companies: 1.

4.7 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: 4.

Number of Communications to international Congresses: 1.

Research projects: 1.