



IIA-CSIC
INSTITUT
D'INVESTIGACIÓ
EN INTEL·LIGÈNCIA
ARTIFICIAL

2024

Annual Report

Institut d'Investigació
en Intel·ligència Artificial

ANNUAL REPORT 2024

Institut d'investigació en Intel·ligència Artificial IIIA-CSIC

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Institut d'investigació en Intel·ligència Artificial IIIA-CSIC

TABLE OF CONTENTS

WELCOME.....	5
1. ABOUT.....	6
1.1. ORGANISATION CHART.....	7
2. PERSONNEL.....	8
2.1. THE IIIA BY GENDER.....	9
2.2. RESEARCH STAFF.....	10
2.3. STUDENTS.....	11
2.4. ADMINISTRATIVE STAFF.....	11
2.5 IT SUPPORT STAFF.....	11
2.6. VISITORS.....	12
2.7. THE EVOLUTION OF THE INSTITUTE.....	13
3. BUDGET.....	14
4. RESEARCH LINES & PROJECTS.....	15
4.1 LEARNING SYSTEMS.....	15
4.2. LOGIC AND REASONING.....	19
4.3. MULTIAGENT SYSTEMS.....	24
5. SCIENTIFIC PRODUCTIVITY.....	29
5.1. PUBLICATIONS	
5.2. PATENTS	
5.3. BOOKS	
5.4. DOCTORAL THESES	
6. ALLIANCES.....	30
6.1. ASSOCIATED UNITS.....	30
6.2. NETWORKS.....	31
7. TRANSFERENCE ACTIVITIES.....	32
8. COMMUNICATION & OUTREACH.....	33
9. AWARDS & RECOGNITION.....	35

WELCOME

The IIIA-CSIC continues to grow and evolve with remarkable momentum. In 2024, our institute reached a significant milestone — a community of over one hundred members — reflecting our steady expansion in both research scope and human talent. This growth fuels our capacity to explore new frontiers in artificial intelligence while deepening our multidisciplinary approach.

Our research now brings together expertise from computer science, law, sociology, and education, among other disciplines, consolidating our vision of AI as a profoundly human-centred field. The upcoming opening of our new Robotics Laboratory will further strengthen our experimental and applied research capabilities, enabling closer integration between intelligent reasoning, perception, and embodied action.

We are proud to see our number of PhD students continue to rise, along with the quality and visibility of our scientific publications. Our institute's influence within the Catalan and Spanish research landscape continues to expand, as we contribute to shaping the ethical, social, and strategic directions of AI.

As always, we remain committed to open science, the responsible use of AI for societal benefit, and strong collaboration across the scientific community. We hope this annual report reflects the energy, creativity, and purpose that drive the IIIA forward.

Carles Sierra – IIIA's Director



1. ABOUT

The Artificial Intelligence Research Institute (IIIA) is a publicly funded research centre under the Spanish National Research Council (CSIC), situated on the campus of the Universitat Autònoma de Barcelona. Established in 1994 as the continuation of a pioneering research group active since 1985, the IIIA relocated from the Centre for Advanced Studies (CEAB) in Blanes to its current facilities in Bellaterra.

Recognised as one of Spain's leading centres in Artificial Intelligence (AI), the IIIA possesses extensive expertise across a broad spectrum of AI disciplines, including machine learning, knowledge representation, multiagent systems, reasoning technologies, natural language processing, optimisation, semantics, law, and science and technology studies.

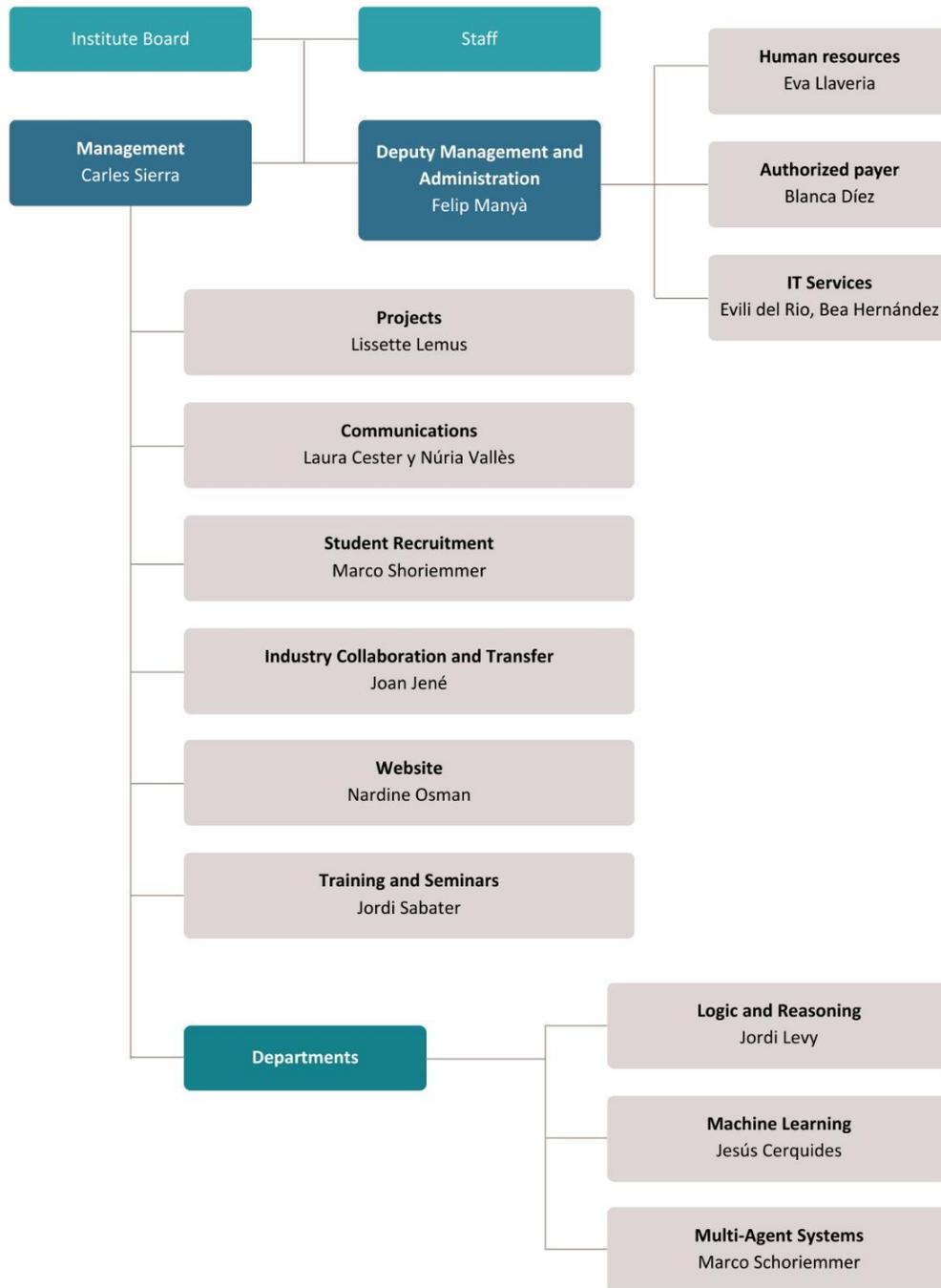
The Institute's research agenda is organized around three core areas: Machine Learning, Multiagent Systems, and Reasoning and Logic. In addition, the Technological Development Unit (UDT-IA) focuses on promoting innovation and facilitating technology transfer.

IIIA maintains a strong international presence, with over 3,000 publications since 1985, and plays a prominent role in the global AI community. Institute members hold leadership positions in editorial boards (JAAMAS, AIJ, JAIR, Fuzzy Sets and Systems), scientific committees (IFAAMAS, IJCAI Board of Trustees), and conference organizations (IJCAI 2007, 2011, 2017; AAMAS 2004, 2009).

A central mission of the IIIA is the education and mentoring of future generations of AI researchers. Since its inception, the Institute has supervised 117 doctoral theses covering a wide array of topics, from foundational mathematical methods to applied AI, demonstrating its commitment to advancing both knowledge and expertise in the field.

Given contemporary challenges and the profound impact of AI across multiple spheres of life—including critical areas such as health, education, or democracy—IIIA is actively developing a meaningful interdisciplinarity perspective. By bringing together experts in AI research from legal, social, ethical, and related domains, IIIA is already addressing complex questions that transcend technical boundaries, and ensuring that its innovations are not only scientifically robust but also socially responsible and aligned with emerging regulatory frameworks and human values.

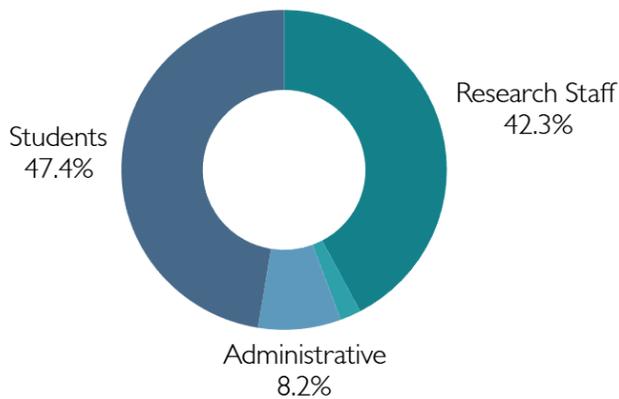
1.1. ORGANISATION CHART



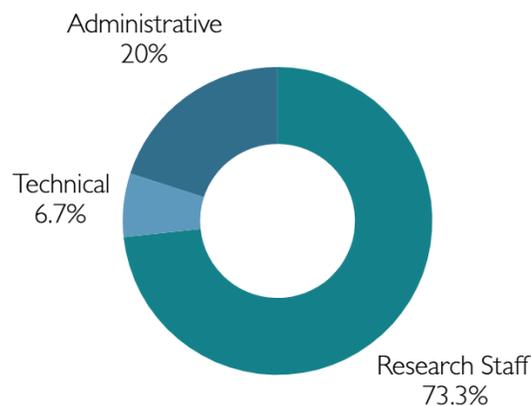
2. PERSONNEL

During 2024, changes in human resources at the IIIA reflect a period of consolidation in its scientific and organisational structure. The Institute has moved towards a more stable staffing arrangement, based on a core group of permanent researchers supported by administrative and technical staff. This structure supports continuity in research activities while allowing flexibility through contracted personnel. Permanent researchers are primarily involved in coordination and long-term planning, while contracted staff contribute specific expertise linked to ongoing projects.

Staff Composition



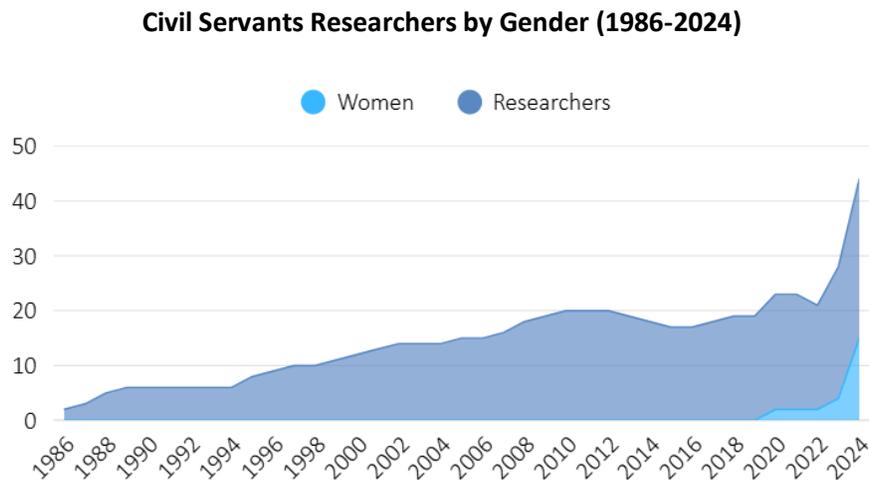
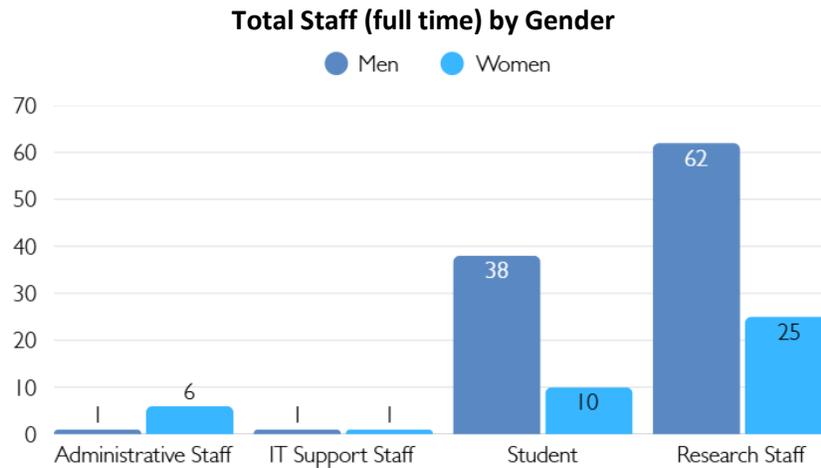
Permanent Staff



2.1. THE IIIA BY GENDER

In 2024, women made up slightly over one third of the total full-time staff, nearly doubling their representation compared to previous years.

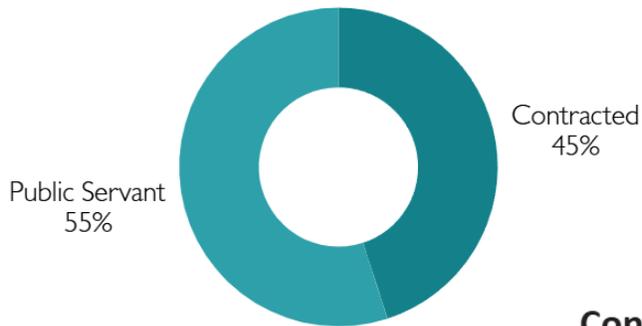
The increase is most pronounced in administrative positions, where women constitute the majority, and in technical roles, which have achieved gender balance. Although women remain underrepresented in research positions, their numbers have increased, while increasing the number of women scientists remains a key challenge for IIIA in the coming years.



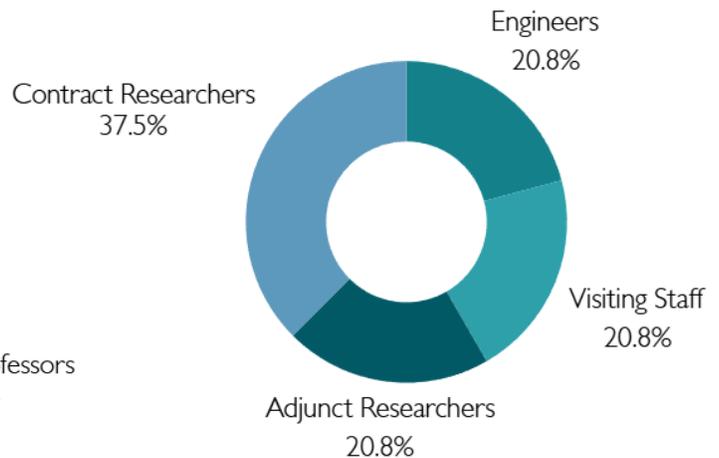
2.2. RESEARCH STAFF

In 2024, IIIA's research staff included permanent and temporary positions. Permanent researchers ensure continuity and coordination, while contracted, postdoctoral, adjunct, and visiting staff provide flexibility, specialised expertise, and support for research and technical activities. This composition maintains continuity while sustaining ongoing research.

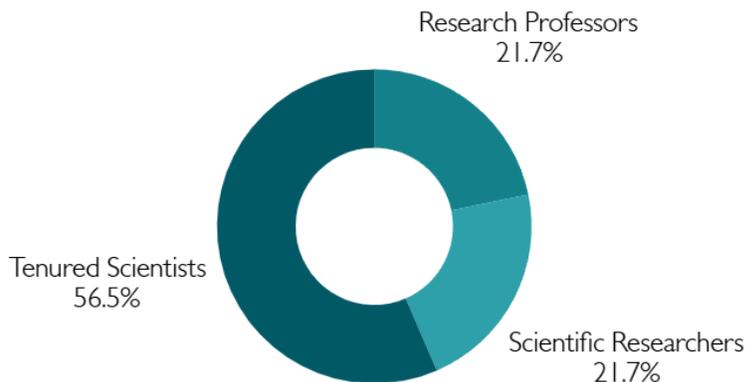
Researchers Employment Type 2024



Contracted Research Staff 2024

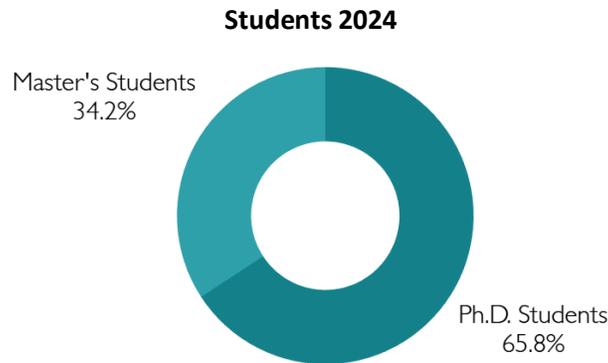


Public Servant Research Staff 2024



2.3. STUDENTS

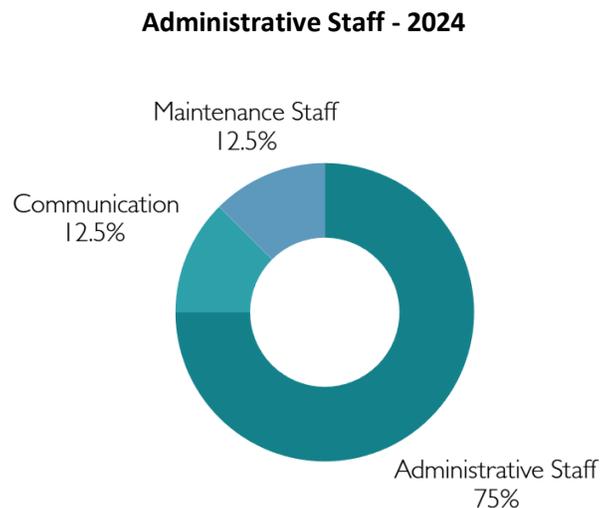
The institute includes a community of postgraduate students, both doctoral and master candidates. In recent years, their numbers have grown, showing the strengthening of the research and training environment.



2.4. ADMINISTRATIVE STAFF

In 2024, IIIA expanded its administrative and support staff, continuing a gradual growth over several years. Several administrative positions are funded from the institute's own resources rather than external grants.

The strengthened administrative structure provides more stable support for research, improves internal coordination, and ensures the smooth day-to-day operation of the institute.

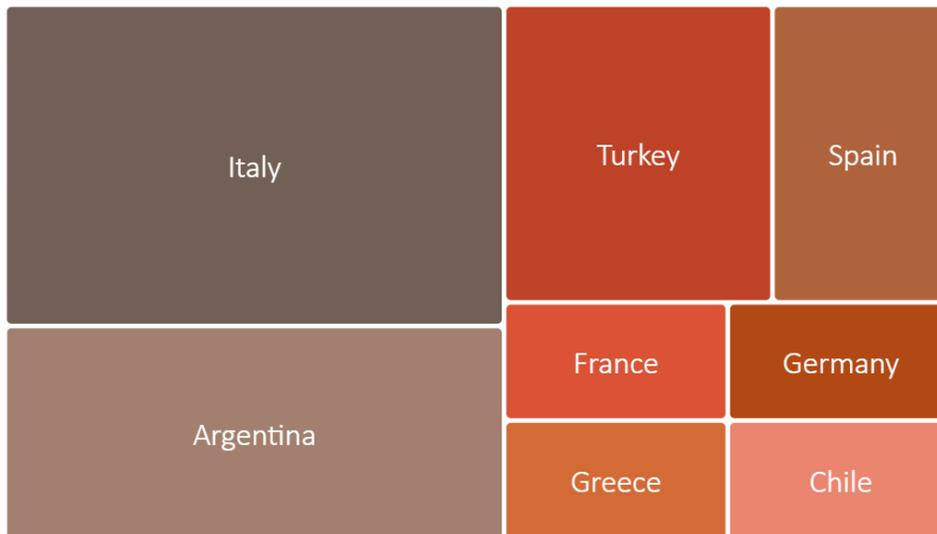


2.5 IT SUPPORT STAFF

The IT Support Staff consists of two professionals

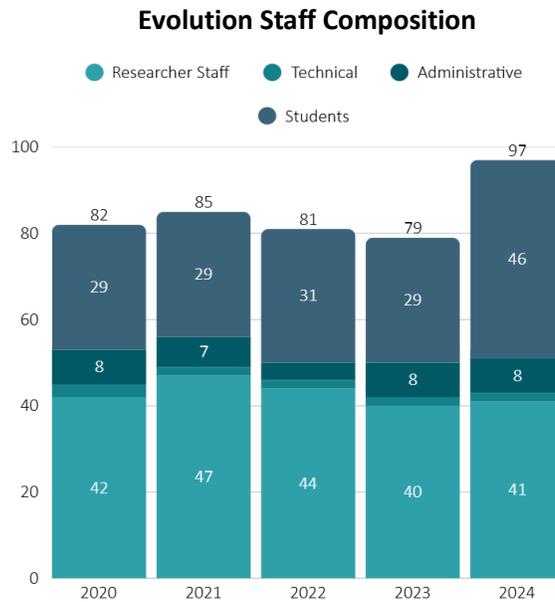
2.6. VISITORS

In 2024, we had 24 visitors, mainly from Italy (8), Turkey (5) and Argentina (4).

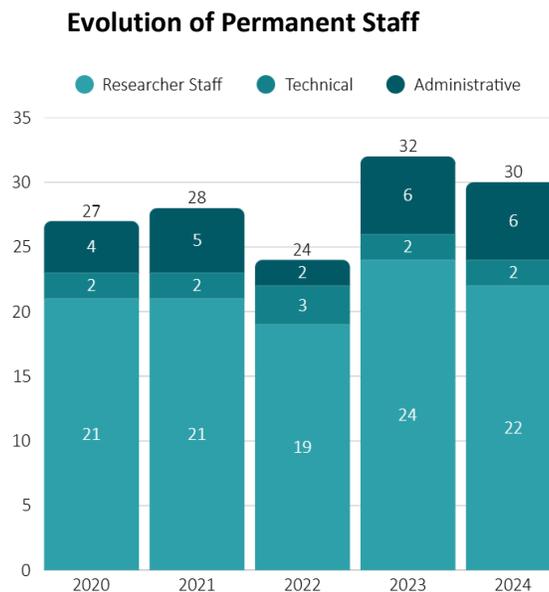


2.7. THE EVOLUTION OF THE INSTITUTE

By 2024, IIIA had 97 full-time staff, with growth in student numbers and research, administrative, and technical positions, reflecting the institute's expanded capacity for research and training.



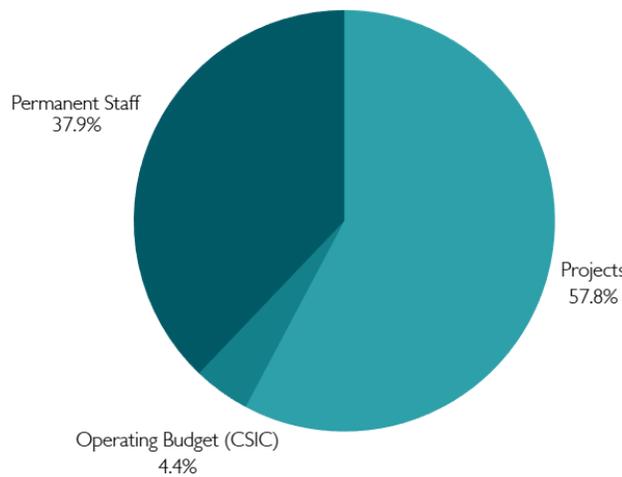
Despite retirements and normal staff turnover, the number of permanent staff has increased and remained stable. This demonstrates the institute's commitment to continuity, retaining expertise, and maintaining an experienced workforce to support ongoing research activities.



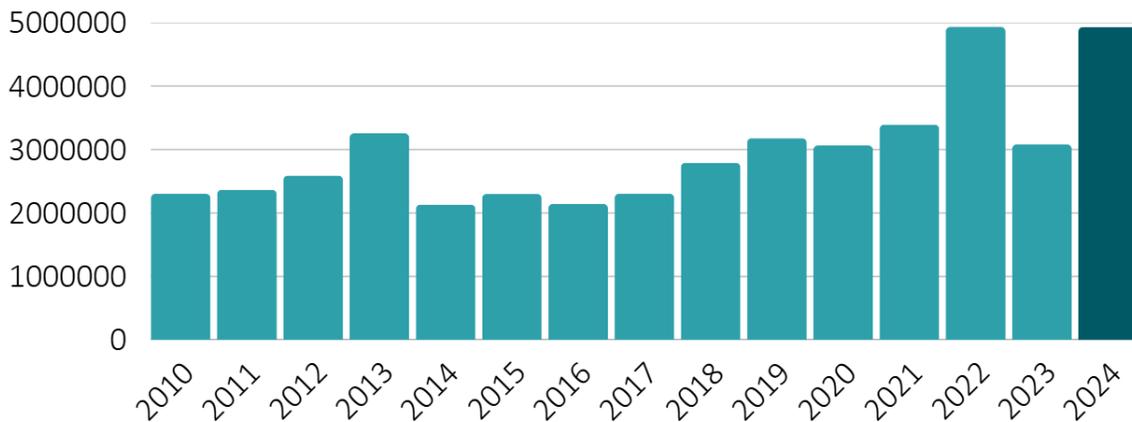
3. BUDGET

In 2024, IIIA operated with a total budget of €4,930,848.42. Of this amount, 37.9% (€1,867,294.68) was allocated to permanent staff costs, while 4.4% (€215,137) came from projects and contracts. In addition, 57.8% (€2,848,416.74) of the budget was linked to research projects. Over the past three years, the Institute’s budget has increased by around 25%, reflecting both the consolidation of its research activity and its ability to attract external funding. The share of funding obtained through projects compares favourably with that of similar institutions.

Budget -2024



The following graph illustrates the evolution of the IIIA budget between 2010 and 2024, based on the CSIC’s *Productividad por cumplimiento de objetivos* (PCO) dataset, highlighting the steady increase and consolidation of resources over time.



4. RESEARCH LINES & PROJECTS

4.1 LEARNING SYSTEMS

The Learning Systems group conducts advanced research on the development of machine learning algorithms, models, software, and applications. Its work spans both theoretical and practical perspectives, including Probabilistic Graphical Models, Case-Based Reasoning, Transfer Learning, and Deep Learning.

On the application side, the group focuses on diverse domains such as Social Networks, Music, Robotics, Multiagent Systems, Bioinformatics, and Healthcare. By combining methodological innovation with real-world applications, the group advances the capabilities of machine learning while addressing complex societal and technological challenges.

Head of Department: Jesús Cerquides

Research Team: Eva Armengol, Rocco Ballester Benito, Jesús Cerquides, David Gómez Guillén, Bjoern Komander, Ramon López de Màntaras (ad honorem), Oguz Mulayim, Pau Oliver Tarres, Enric Plaza, Pol Rodríguez Farres, Alessia Sabia, Martí Sánchez Fibla, Antoni Valls Cifre, Borja Velasco.

PROJECTS:

DI-ROCCO : Aprovechamiento de la Computación Cuántica para Mejorar el Aprendizaje Federado y la Optimización (2024-2027)

PI: Jesus Cerquides Bueno

Collaborating organisations: Strategic Platform

Total funding amount: 37.799,99€

The project examines how to integrate quantum computing into federated learning in order to optimise its methods. It also investigates the use of quantum annealers for optimisation tasks, seeking novel solutions to complex problems and advancing the state of the art.

EUROVA: European Oocyte Biology Research Innovation Training Net (2019-2024)

PI: Jesús Cerquides Bueno

European Commission

Total funding amount: 2.678.919,00€

EUROVA, a European network funded by the European Commission (Marie Skłodowska-Curie Actions), is a multidisciplinary project focused on oocyte biology. It will train 15 researchers in fertility preservation and enhancement, including ovarian tissue cryopreservation and reimplantation in cancer patients, oocyte therapies for metabolic disorders, the adaptation of assisted reproductive technologies to save the northern white rhinoceros, and the development of a multispecies compendium.

HumanE-AI-Net: HumanE AI Network (2020-2024)

PI: Jesús Cerquides Bueno

European Commission

Total funding amount: 11.996.875,00€

HumanE AI Net brings together European research centres, universities, and key industries to develop human-centric AI, combining AI expertise with cognitive, social, and HCI sciences. It aims to create robust, trustworthy AI that enhances human capabilities, respects European values, and generates a scientific, social, and economic innovation ecosystem.

Knowledge for improving indoor AIR quality and HEALTH (2022-2026)

PI: Jesús Cerquides Bueno

European Commission

Total funding amount: 7.984.484,00€

K-HEALTHinAIR is an interdisciplinary research project that aims to increase knowledge about chemical and biological indoor air pollutants affecting human health, and to provide solutions for more accurate monitoring and improvement of indoor air quality.

VISOR EEG: DispositiVo reglStro hOlter seRas EEG (2022-2025)

PI: Jesús Cerquides Bueno

Ministerio de Ciencia e Innovación

Total funding amount: 1.020.015,00€

The main objective of the project is to develop an outpatient EEG Holter monitoring system using wearable, discreet, and non-invasive devices, allowing patients to carry out their daily activities while their brain electrical activity is being recorded in a more convenient and comfortable manner. In addition, the system will provide quantitative and qualitative analysis of EEG signal features through artificial intelligence algorithms.

GUARDEN: SafeGUARDing biodivErsity aNd critical ecosystem services across sectors and scales (2022-2025)

PI: Jesús Cerquides Bueno

European Commission

Total funding amount: 4.556.888,75€

GUARDEN aims to protect biodiversity by placing it at the core of policies and decision-making. The project will develop decision-support applications and multi-actor partnerships, using deep learning, Earth observation, and hybrid models to expand geolocated data, predict ecosystem status under human and climatic pressures, and propose indicators applicable to local management.

QCDI: Quantum Cognitive Digital Industry (2022-2025)

PI: Jesús Cerquides Bueno

Private funding: Enzyme Advising Group

Total funding amount: 246.000,00€

Research on privacy preservation in federated learning within an industrial context, with a focus on cybersecurity.

Desafia2030: Desarrollo de una estrategia de formación y seguimiento de los desafíos éticos del uso de la inteligencia Artificial en una perspectiva 2030 (2023-2024)

PI: Enric Plaza Cervera

Funding call: ACCIONES DE MOVILIDAD PARA LA PROMOCIÓN DE LA COLABORACIÓN CIENTÍFICA INTERNACIONAL DEL CSIC CON INSTITUCIONES EXTRANJERAS

Total funding amount: 48.000,00€

Design and implementation of a collaborative strategy to study and monitor the ethical challenges associated with AI over the next decade, along with the creation of content to raise awareness and provide training for diverse audiences on this topic.

The project has four main objectives: (a) design a training strategy, produce educational materials, and implement a course on the ethical aspects of AI; (b) publish joint research on AI foundations, case studies, and ethical challenges; (c) lay the groundwork for an AI usage observatory; and (d) develop proposals for a stable interinstitutional collaboration, including shared resources, joint theses, and AI monitoring.

Participants include CSIC (IIIA, IRI, IFS) and the Instituto de Estudios Superiores de Monterrey (ITESM).

4.2. LOGIC AND REASONING

The Logic and Reasoning group conducts advanced research on the logical and mathematical modelling of reasoning, focusing on areas such as mathematical fuzzy logic, uncertainty models, logics for incomplete information, and computational argumentation. The group combines rigorous theoretical foundations with the design of efficient algorithms to solve complex satisfaction and optimisation problems, employing techniques based on SAT, constraint programming, and metaheuristics.

Positioned at the intersection of theory and practical application, the group aims to advance our understanding of formal reasoning while providing computational tools that can be applied to real-world decision-making, artificial intelligence, and knowledge-based systems. Through this approach, the group contributes to both the development of AI methodologies and their responsible and effective deployment in complex domains.

Head of the Group: Jordi Levy

Research Team: Mehmet Anil Akbay, Christian Blum, Eduardo Calò, Camilo José Chacón Sartori, Vicent Costa, Pilar Dellunde, Gonçal E. Imaz, Raúl Espejo Boix, Francesc Esteva (ad honorem), Tommaso Flaminio, Diego Fraile Parra, Valeria Giustarini, Lluís Godo, Jordy Levy, Francesco Manfucci, Felip Manyà, Vanina Martínez, Pedro Meseguer, Jaume Reixach i Perez, Guillem Rodríguez Corominasa, Sara Ugolini, Elifnaz Yangin, Daniel Gibert, Joan Ramon Soler.

PROJECTS:

Modalities in Substructural Logics: Theory, Methods and Applications (2021-2026)

PI: Tommaso Flaminio

European Commission

Total funding amount: 142 600,00€

Modal logics are a family of systems extending the expressive power of the classical calculus to reason about “modes of truth”. The project MOSAIC puts forward a systematic study of modal logics in which the modal operators are based upon the ground of substructural logics, weaker deductive systems than classical logic. MOSAIC also explores the applications of substructural modal logics in knowledge representation; legal reasoning; data privacy and security; logical analysis of natural language.

Transporte y entrega de mercancías sostenibles en ciudades (2022-2024)

PI: Christian Blum

Total funding amount: 91.425,00€

Ministerio de Ciencia e Innovación

In a nutshell, this project deals with *sustainable city logistics* in the context of *two-echelon electric vehicle routing problems* considering more and/or different restrictions and constraints than the models that are currently found in the literature. We consider advances in this field essential for *mitigating climate change* and for *reducing the pollution of urban environments*.

Caracterización y cuantificación de desinformación en contenido de redes sociales (2023-2026)

PI: Vanina Martínez

Consejo Superior de Instituciones Científicas (CSIC)

Social media platforms have become central channels of human interaction, shaping users' beliefs and decisions while also exposing them to risks such as misinformation, toxic content, and abuse. Although recent advances in machine learning have improved the detection of these phenomena, current tools remain limited due to the multidimensional and subjective nature of online content, which often requires contextual knowledge, domain expertise, and common sense to interpret. This project aims to develop knowledge-based AI models combined with state-of-the-art Natural Language Processing methods to automatically identify and quantify multiple dimensions of social media content—such as toxicity, coherence, and argumentative quality—in order to better assess and characterize instances of misinformation and support both platform moderators and users.

Algebraic constructions in substructural logics (2023-2026)

PI: Sara Ugolini

Consejo Superior de Instituciones Científicas (CSIC)

Total funding amount: 50.000€

This project investigates residuated lattices, algebraic structures that provide the equivalent semantics of substructural logics (which include intuitionistic, relevance, fuzzy, and linear logic), and their applications to the study of nonclassical logics.

A main aim is to develop a uniform approach to existing and novel constructions used to build new residuated structures from known ones. Moreover, the developed tools are used to derive and describe logical properties, such as deductive interpolation.

Procesamiento de inconsistencias basado en lógica para sistemas inteligentes explicables: fundamentos (2023-2026)

PI: Lluís Godo / Felip Manyà

Ministerio de Ciencia e Innovación

The use of formal logic-based languages as a means for knowledge representation and reasoning is key in the construction of explainable systems handling inconsistencies. In this project, we aim at developing both theoretical foundations as well as methods and tools to represent and handle conflicting information within automated decision-making explainable systems.

Técnicas avanzadas de inteligencia computacional usadas en beneficio del desarrollo sostenible (2023-2026)

PI: Christian Blum / Juan Antonio Rodríguez-Aguilar

Ministerio de Ciencia e Innovación

Total funding amount: 183.500,00€

The 2030 Agenda promotes 17 SDGs to achieve peace and prosperity without harming the planet. This project applies computational intelligence in four areas: sustainable urban logistics with electric vehicles, competency-based personalized education, intelligent health systems beyond supervised learning, and virtual communities with equitable conversational agents, contributing to SDGs 11, 4, and 3.

La forma del razonamiento: lógicas multivaluadas y incertidumbre (2023-2027)

PI: Tommaso Flaminio

Ministerio de Ciencia e Innovación

Total funding amount: 68.625,00€

Logic can be broadly understood as the science of correct reasoning. The project SHORE aims at developing a uniform logical, geometric, and algebraic representation for uncertainty theories. More specifically, for subjective uncertainty theories, such uniform geometric treatment is crucial both at the level of theory and to that of applications as this will allow a comprehensive and general treatment of uncertainty.

4.3. MULTIAGENT SYSTEMS

The Multiagent Systems (MAS) group conducts cutting-edge research in autonomous agents and multiagent systems, covering areas such as negotiation, organisational control, trust and reputation, optimisation, semantics, and recommender systems. Positioned at the intersection of CSIC's SOCIETY and MATTER areas, the group engages in interdisciplinary research with high socio-economic impact, addressing real-world challenges through AI.

Guided by a human-centred vision, the MAS group develops systems that align with ethical and social values, empower users in AI-mediated interactions, promote diversity, and explore new forms of collaboration between humans and autonomous agents. Through this approach, the group combines technical excellence with societal relevance, advancing both science and the responsible application of AI.

Head of the Group: Marco Schorlemmer

Research Team: Alba Aguilera, Davide Audrito, Víctor Bermejo, Filippo Bistaffa, Pompeu Casanovas Romeu, Olena Chebanyuk, Dave de Jonge, Thiago Freitas Dos Santos, Pere García Calvés, Andrea Guillen Gil, Mohammed Zakaria Mohammed Hassan, Jairo Alejandro Lefebre Lobaina, Roger Xavier Lera Leri, Zhou Long, Alejandra López de Aberasturi Gómez, Arnau Mayoral Macau, Nieves Montes, Pablo Noriega, Nardine Osman, Shuxian Pan, Israel Puerta Merino, Juan A. Rodríguez Aguilar, Laura Rodríguez Cima, Manel Rodríguez Soto, Jordi Sabater Mir, Marco Schorlemmer, Carles Sierra, Núria Vallès Peris

PROJECTS:

ALLIES : “Artificial intelligence In sustainable dEvelopment goal (2024-2028)

PI: Carles Sierra

European Commission

Total funding amount: 1.623.840,00€

ALLIES (“Artificial intelligence In sustainable dEvelopment goals”) is a new excellent collaborative postdoctoral programme led by the Spanish National Research Council (CSIC) and coordinated through the Artificial Intelligence Research Institute (IIIA) for the recruitment of 17 postdoctoral researchers to provide a new dimension through highly interdisciplinary & intersectoral research in the broad topic of Artificial Intelligence (AI) in alignment with the SDGs while maintaining the highest research quality standards. The programme includes the participation of 18 different CSIC research institutes expert in the fields of AI, Big Data, Machine Learning, Robotics & Data Science as Implementing organisations recruiting fellows.

EQC : Laboratorio de interacción humano-IA (2024-2026)

PI: Carles Sierra

Total funding amount: 186.585,49€

The human–AI interaction laboratory focuses on the study and computational modelling of the elements involved in the development of social intelligence in artificial agents, with the goal of creating agents capable of perceiving, reasoning, and acting in rich social environments. The project consists of equipping this laboratory by providing the necessary resources to study and develop human-centred artificial intelligence systems and to facilitate collaboration between humans and artificial entities in diverse contexts.

NL4XAI: Interactive Natural Language Technology for Explainable Artificial Intelligence (2019-2024)

PI: Carles Sierra

European Commission

Total funding amount: 2.843.888,00€

NL4XAI is a research and training project aimed at developing the next generation of explainable artificial intelligence technologies. It will train 11 creative and entrepreneurial early-stage researchers to design AI systems that are self-explanatory, fostering the translation of advanced AI research into products and services with tangible economic and social impact. The consortium brings together 10 beneficiaries and 9 partner organisations, combining academic excellence and cross-sector collaboration to advance the field of Explainable AI (XAI).

CORPORIS: Theory and Computation of Embodied Conceptualisation for Information Systems (2020-2024)

PI: Marco Schorlemmer

Ministerio de Ciencia e Innovación

Total funding amount: 36.179,00€

CorporIS is developing a category-theoretical model of embodied conceptualisation, focusing on how image schemas shape music theory and creativity. By implementing this model through functional programming, the project aims to create a computational tool for validating metaphorical inferences. Ultimately, CorporIS seeks to bridge universal cognitive structures with cross-cultural diversity, using musical concepts to demonstrate how abstract schemas drive human understanding and creative expression.

TAILOR: Foundations of Trustworthy AI - Integrating Reasoning, Learning and Optimization (2020- 2024)

PI: Carles Sierra

European Commission

Total funding amount: 12.000.000,00€

This project advances Trustworthy AI through the integration of learning, optimisation, and reasoning. By combining data-driven machine learning with formal reasoning and principled optimisation, it aims to develop AI systems that are more data-efficient, robust, and reliable. The project promotes neurosymbolic and hybrid approaches to ensure that AI systems can generalise beyond past data, respect domain knowledge and constraints, and provide transparent and trustworthy decisions in complex real-world settings.

RHYMAS: Real-time Hybrid Multiscale Agent-based Simulations for emergency training (2021-2024)

PI: Jordi Sabater / Nardine Osman

Ministerio de Ciencia e Innovación

Total funding amount: 76.351,00€

The use of computer simulations as a tool for training qualified professionals on the skills needed in their jobs has a long tradition in many areas (healthcare, military, emergencies, transport, etc.). In general, these are areas where reproducing the training scenario in the real world is costly, dangerous, or directly unfeasible. The RHYMAS (Real-time Hybrid Multiscale Agent-based Simulations) simulation framework enables the creation of simulated emergency scenarios that integrate artificial agents and humans and that are driven by agents reasoning about norms, values, and goals. It is being designed specifically for training firefighters and is being developed in collaboration with the “Escola de Bombers, Protecció civil i Agents Rurals de Catalunya”. By integrating advanced Artificial Intelligence with human-in-the-loop environments, RHYMAS addresses the critical limitations of traditional training models: lack of real-time adaptability, scalability, and integration of complex social dynamics.

SGR21: Ajuts a Grups de Recerca Consolidats / Projecte de Recerca "IDT- Institut de Dret i Tecnologia (2021-2024)

PI: Pompeu Casanovas

AGAUR – Generalitat de Catalunya

Total funding amount: 60.000,00€

2021 SGR 00532 IDT-UAB Institute of Law and Technology. Financial Support to the Research Groups of Excellence GRC. DOGC n. 8634, 25/03/2022. 1/01/2022- 30/06/2025. UAB Reserch Center; CSIC Associated Unit (Resolució de Presidencia 23/06/2023). It promotes an interdisciplinary approach to Law, Technology and IA, including: Data protection and ethical monitoring, legal-governance models,

LawTech and FinTech, Web of Data, legal ontologies, Industry 4.0, blockchain, and automated legal compliance.

VALAWAI: Value-Aware Artificial Intelligence (2022-2026)

PI: Carles Sierra

European Commission

Total funding amount: 3.926.807,26€

VALAWAI develops a Value-Aware AI approach, i.e., systems capable of acquiring and maintaining a value system, using it to evaluate the morality of actions, and understanding users' values and motivations. The project creates a toolkit based on two scientific foundations: an architecture inspired by the Global Neuronal Workspace model and a moral decision-making framework grounded in psychology and social cognition. Its application is demonstrated in social networks, social robots, and medical protocols, with the aim of integrating ethics into the technology itself and reinforcing a more reliable, robust, and trustworthy European AI.

smartNorms: Verificació intel·ligent de normes de la construcció en base a models BIM (2022-2024)

PI: Marco Schorlemmer

AGAUR – Generalitat de Catalunya

Total funding amount: 99.693,22€

Despite digital advancements, AEC compliance remains a manual, error-prone process because regulations are written in natural language. The smartNorms project addresses this by combining Building Information Modelling (BIM) with AI to automate code verification. By streamlining documentation and improving interoperability between agencies, the project aims to significantly reduce time, costs, and risks, thereby enabling more efficient, high-quality electronic administration in construction.

iTRUST: Interventions against polarisation in society for TRUSTworthy social media: From diagnosis to therapy (2022-2026)

PI: Carles Sierra / Vanina Martínez

Ministerio de Ciencia e Innovación

Total funding amount: 207.870,00€

Digitalisation is reshaping society, but trust is essential for constructive discourse and cooperation. Hate speech and fake news undermine trust, fostering polarisation. The iTRUST project targets public health, gender equality, and climate change by creating a large annotated dataset, developing methods to analyse trust-related patterns, studying their impact on polarisation, and deploying AI tools to counter harmful online behaviours. The consortium of experts in rhetoric, political science, linguistics, AI, and computational argumentation aims to build a pan-European foundation for trustworthy AI, engaging the public through outreach with media and cultural partners.

VAE: Value-awareness engineering (2022-2024)

PI: Nardine Osman

Ministerio de Ciencia e Innovación

Total funding amount: 1.967.650,00€

The project Value-Awareness Engineering (VAE) aims at developing trustworthy and reliable AI systems that place human needs and values at the centre of the digital transition. Current AI systems are not value-aware and can behave harmfully or unethically. VAE argues that just as human morality is guided by values, AI systems should also reason about and align with human values, and be capable of explaining their behaviour in moral terms.

Building on moral philosophy and agreement technologies, VAE seeks to engineer AI systems that understand, respect, and justify actions according to human values, in line with European fundamental rights and AI regulation goals.

TELSEC4TAI: Inteligencia Artificial Fiable: retos técnicos, éticos, legales, culturales y socio-económicos (2023-2024)

PI: Carles Sierra

Total funding amount: 13.500,00€

The TELSEC4TAI thematic network brings together 12 highly recognized research groups at both national and international levels, aiming to build a strong community capable of leading research in Trustworthy Artificial Intelligence (TAI). The network promotes collaboration with other leading international groups, industry partners, and among its own members. Additionally, it seeks to raise social awareness about the importance of advancing a new generation of intelligent devices that uphold and promote principles of non-discrimination and fairness, while being able to explain their decisions in a clear and understandable way for people.

TRANSICIONES EDUCATIVAS IA: La inteligencia artificial en las transiciones educativas. oportunidades y riesgos (2023-2025)

PI: Núria Vallès Peris

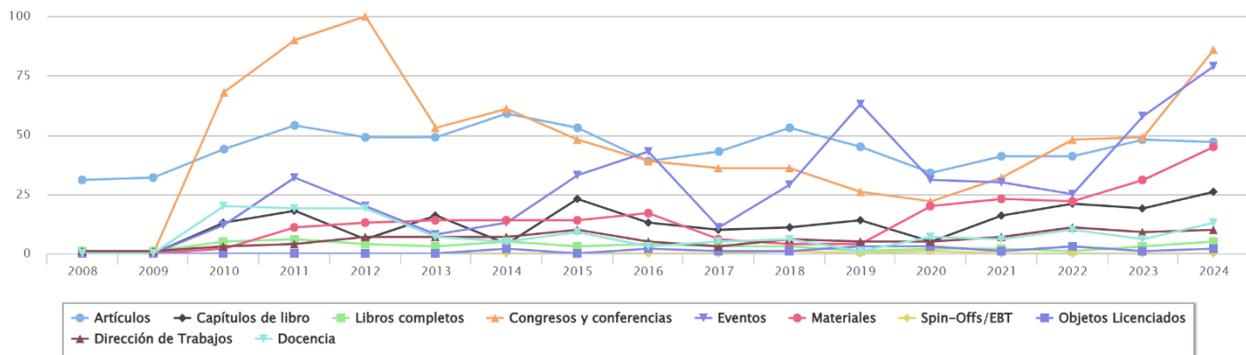
Private Funding: Ayuda en Acción

Total funding amount: 31.297,30€

The emergence of generative artificial intelligence in Spanish vocational education (FP) has sparked an urgent debate about its educational impact. In this context, we conducted a pioneering study analyzing how this technology is being used in FP centres by both teachers and students. The report reveals widespread use of tools such as ChatGPT, particularly in higher-level programs, but without a clear pedagogical strategy or FP-specific resources. Far from offering immediate solutions, generative AI reflects and amplifies existing tensions: the gap between theory and practice, content automation, and the fragility of guidance systems. The study proposes ten recommendations for responsible integration, focusing on equity, critical digital literacy, and the central role of teachers. It emphasizes that the discussion on AI should be driven by the real needs of the educational community, not by technological promises.

5. SCIENTIFIC PRODUCTIVITY

Up to 2024, the Institute has shown steady growth in its academic and scientific activity, with a strong emphasis on research output and active participation in conferences and scientific meetings. In recent years, this activity has been complemented by increased involvement in the supervision of academic work, the development of research and teaching materials, and engagement in scholarly events.



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5.1.1 LEARNING SYSTEMS

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5.2. PATENTS

Over the course of 2024, the institute registered two protected innovations: one software and one trade secret. The software, **GREENROUTES**, is a program for calculating green routes that minimize exposure to pollutants. The trade secret cannot be publicly disclosed due to confidentiality, although its reference is available in VATC.

5.3. BOOKS

During 2024, the institute's researchers contributed to the publication of several books across different languages and fields. Highlights include:

- *100 cosas que hay que saber sobre Inteligencia Artificial*, a Spanish-language book by Ramon Lopez de Màntaras that explores key concepts in artificial intelligence.
- *Construct, Merge, Solve & Adapt. A Hybrid Metaheuristic for Combinatorial Optimization*, an English-language work by Christian Blum on advanced optimization techniques.
- *Ètica i ecosistemes jurídics. Del coneixement social a la intel·ligència artificial*, a Catalan-language book by Pompeu Casanovas examining the intersection of law, ethics, and artificial intelligence.
- *Ficciones con ciencia*, a Spanish-language book by Pedro Meseguer exploring the relationship between science and literature.
- *Inteligencia Artificial. Transformando la gestión de políticas y bienes públicos en la era digital*, a Spanish-language publication by Carles Sierra, Lissette Lemus del Cueto, Txetxu Ausín, Jorge Hernández Moreno, Jesús Cerquides Bueno, and Ángela Ribeiro Seijas on the impact of AI on public policy and asset management.

5.4. DOCTORAL THESES

In 2024, four doctoral theses were successfully defended by students affiliated with the IIIA, reflecting the Institute's ongoing commitment to advancing research at the intersection of Artificial Intelligence and real-world applications:

Value Engineering for Autonomous Agents

Author: Nieves Montes

University: Universitat Politècnica de Catalunya

Advisors: Carles Sierra, Nardine Osman

This thesis develops autonomous agents capable of reasoning about norms and values, incorporating social considerations via Theory of Mind. It introduces methods for value-aligned normative systems, a formal rule language with game-theoretical analysis, and enhanced agent architectures, enabling dynamic, socially aware, value-based decision-making.

A Multi-Scenario Approach to Continuously Learn and Understand the Evolution of Norm Violations

Author: Thiago Freitas dos Santos

University: Universitat Autònoma de Barcelona

Advisors: Nardine Osman, Marco Schorlemmer

This work presents ML approaches for normative systems in online communities, supporting continuous learning of evolving norm violations. By combining detection with interpretability across tabular and text data frameworks, it allows users to understand and refine models, achieving effective violation detection and adaptability in low-resource settings.

Integrating AI in Assisted Reproduction: Enhancing Fertility Treatments through Deep Learning

Author: Georgios Athanasiou

University: Universitat Autònoma de Barcelona

Advisors: Jesus Cerquides Bueno, Josep Lluís Arcos Rosell

This thesis applies AI to assisted reproduction, analysing cumulus oocyte complexes and refining segmentation despite noisy expert annotations. The work advances fertility treatments and wildlife conservation by improving the precision and efficiency of reproductive technologies.

Developing Efficient Routing Algorithms for Sustainable City Logistics

Author: Mehmet Anil Akbay

University: Universitat Autònoma de Barcelona

Advisor: Christian Blum

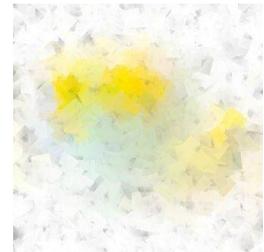
Focusing on sustainable urban logistics, this thesis integrates electric vehicles and multi-echelon distribution into vehicle routing problems. It develops advanced routing models and a self-adaptive CMSA algorithm, providing robust and scalable solutions that balance operational efficiency with energy minimization and environmental considerations.

6. ALLIANCES

6.1. ASSOCIATED UNITS

Research Group on AI and Law – Universitat Autònoma de Barcelona (UAB)
- Associated unit since 26 June 2023.

The Research Group on AI and Law, the new associated unit between the IIIA and the Institute of Law and Technology (IDT) of the UAB, seeks to cooperate and jointly research in the field of Artificial Intelligence (AI) regulation from an ethical and legal perspective.



The objectives include equipping IIIA-CSIC researchers with ethical and legal knowledge, understanding the complexity of regulatory systems in specific scenarios, collaborating on research projects of excellence, developing joint research proposals and establishing a Legal Knowledge Hub. It also aims to train young researchers in the field, contribute to the IIIA-CSIC's gender policy, and promote collaboration in leading projects in the field of AI regulation and law, especially on issues related to human rights and ethical values.

Virtual Worlds, Visualisation and Artificial Intelligence Group – Universidad de Barcelona (UB) -
Associated unit since 02 Jun 2020.

The WAI research group is composed of researchers from different areas related to Computer Graphics, Human-Computer Interaction and Artificial Intelligence. Specifically, we work on Data Visualization, 3D Virtual Worlds, Gamification and Serious Games, Natural Language Processing, Recommender Systems, Machine Learning/Data Science, Multiagent Systems, Conversational Agents and how Ethics relate to Artificial Intelligence.



Most of our research is applied to Education, Medicine, Personalization, and Social Interaction/Citizen Participation. The WAI research group is part of the Language and Computation Centre (CLiC) SGR group, and the WAI researchers are also members of the Universitat de Barcelona Institute of Complex Systems (UBICS) and the Institute of Mathematics of the University of Barcelona (IMUB).

6.2. NETWORKS

European Association for Artificial Intelligence EurAI – EURAI

The European Association for Artificial Intelligence EurAI (formerly ECCAI) was founded in July 1982 as the representative body of the European Artificial Intelligence community. Its aim is to promote the study, research and application of Artificial Intelligence in Europe. The association is composed of 28 European scientific associations concerned with artificial intelligence. Carles Sierra was President of EurAI between 2020 and 2024.



European Laboratory for Learning and Intelligent Systems – ELLIS

The focus of the ELLIS unit in Barcelona is to promote fundamental research in machine learning and related fields (vision, robotics, natural language processing), and to foster interdisciplinary research in AI, in the interactions of AI systems with humans and societies, a topic with important implications for the life sciences and humanities. The ELLIS Unit Barcelona brings together researchers from 9 academic institutions: the 5 major universities of Barcelona, as well as the 4 public research centres in the region dedicated to AI.



Artificial Intelligence Research Alliance of Catalonia – AIRA

The Artificial Intelligence Research Alliance of Catalonia (AIRA) is the Catalan government's alliance to promote "scientific research, talent management and the acceleration of the development of solutions based on AI in Catalonia". AIRA is promoted by the Department of Vice-Presidency and Digital and Territorial Policies and the Department of Research and Universities as part of the Catalan Artificial Intelligence Strategy.



Associació Catalana d'Intel·ligència Artificial – ACIA

The Associació Catalana d'Intel·ligència Artificial (ACIA) is a non-profit association dedicated to the promotion of Artificial Intelligence (AI) in Catalan society. Its main objective is to facilitate communication between people and organisations involved in AI and to promote social, cultural, scientific, economic and governmental awareness of AI. Several members of the IIIA are members of the ACIA, and some of them have served as its presidents.



7. TRANSFER ACTIVITIES

The main objective of the Artificial Intelligence Technology Development and Transfer Unit (UDT-IA) is to facilitate the dissemination of knowledge generated within the institute to society by establishing collaborations with both companies and educational institutions. These collaborations can take various forms, ranging from private contracts with companies to collaborative projects at both national and European levels. In addition, programmes that promote cooperation between companies and universities, such as industrial doctorates, are encouraged.

Alongside these initiatives, the Department offers a range of scientific and technical services, including consultancy and specialised training. While the creation of spin-offs from technologies developed within the institute is a significant part of our work, this Department's primary focus is on direct collaboration with companies and educational institutions to maximise the impact of our knowledge on society. It comprises specialised engineers who work closely with researchers to develop software prototypes and conduct proof-of-concept studies based on artificial intelligence algorithms.

Throughout 2024, the UDT-IA maintained an active presence in both the business and academic spheres, participating in various activities such as meetings with companies, round tables, interviews and networking events. These activities were carried out in collaboration with relevant clusters such as the TECNIO association, the Digital Cluster, the DCA and the RDI-IA. As a result of these collaborations, the department has contributed significantly to the integration of various technologies in companies, including recommender systems, predictive analytics using machine learning, argumentation based on natural language processing and optimisation, among others.

These technologies have helped to improve the efficiency and competitiveness of companies in various sectors. In addition to the above services, the department also provides high performance computing services with our cluster. This enables companies and educational institutions to efficiently and effectively access advanced computing resources for research and development projects. Here are some of the companies we've worked with this year.



8. COMMUNICATION & OUTREACH

2024 has been a year of intense public engagement and reflection on artificial intelligence, with the IIIA strengthening its commitment to disseminating scientific knowledge and fostering a responsible and human-centred understanding of AI.

Through over thirty conferences, interviews, round tables, workshops and outreach programmes, the institute's researchers have contributed to national and international debates on AI ethics, education, creativity, sustainability, and its broader societal impact.

These activities reflect the institute's dual mission: advancing scientific excellence while promoting open, critical dialogue between science and society.

Below, we highlight five of the most significant initiatives carried out in 2024:

Congreso Futuro 2024 – “¿Es realmente inteligente la IA?”

At one of Latin America's most prominent science communication events, Congreso Futuro 2024, Ramón López de Mántaras explored whether AI can truly be considered intelligent. His talk encouraged audiences to question anthropomorphic views of AI and to distinguish between computational power and human cognition, sparking widespread debate on the limits of machine reasoning.

[📄 Event](#) | [📺 Video](#)

Informe “Inteligencia Artificial y Educación” – Oficina C & Spanish Congress of Deputies Session

The IIIA-CSIC's contributions to the national debate on artificial intelligence and education were reflected in the 2024 report “Inteligencia Artificial y Educación” by Oficina C, which analyses the ethical, pedagogical, and social dimensions of applying AI in educational settings. The document incorporates perspectives aligned with the Institute's research on responsible, transparent, and human-centred AI.

In the same context of public deliberation on the societal impact of AI, the Spanish Congress of Deputies held a session in November 2024 to appoint three national experts in AI ethics and policy. Dr. Núria Vallès and Prof. Carles Sierra, from the IIIA-CSIC, were among those selected, acknowledging their significant contributions to responsible AI governance and their leadership in connecting scientific research with public policy. [📄 Report – Oficina C](#) | [📺 Congress session – RTVE](#)

Democracy in the Age of Artificial Intelligence – UNED / European University Institute

Carles Sierra and Núria Vallès participated in this academic event analysing the relationship between AI, democracy and technological policy. Their joint presentation addressed how algorithmic systems influence governance, civic participation and social justice, reinforcing the IIIA's leadership in the ethics and policy dimensions of AI.

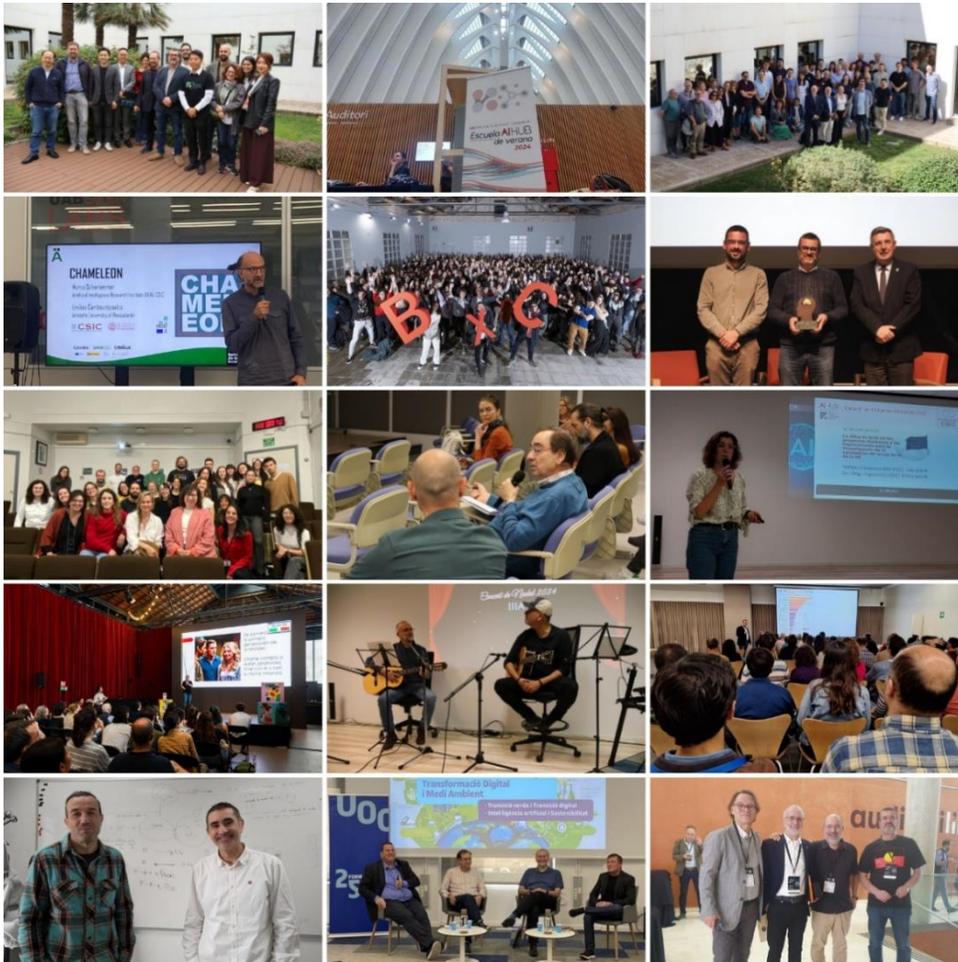
[Event](#)

Foro Transfiere 2024 – Soberanía de los Datos

At Spain's leading innovation forum, Jesús Cerquides took part in the round table “Soberanía de los Datos: Inteligencia Artificial y Big Data”, where he discussed data ownership and ethical challenges associated with AI-driven decision-making. His intervention underlined the institute's engagement with the societal dimensions of data governance.

[Event](#) | [Video](#)

Other outreach and public engagement activities in 2024:



9. AWARDS & RECOGNITION

During 2024, the IIIA and its researchers have been distinguished with several prestigious awards and recognitions that highlight the institute's scientific excellence and international leadership in Artificial Intelligence:

- Ramon López de Màntaras received a Career Achievement Recognition at #AIBigData24 (CIDAI), where he was honoured for his outstanding scientific trajectory and his pioneering contributions to the field of AI. On this occasion, he also delivered a keynote lecture on the concept of “intelligence” in Artificial Intelligence.
- Carles Sierra was appointed Fellow of ELLIS (European Laboratory for Learning and Intelligent Systems), one of the most prestigious distinctions in European AI research, acknowledging his long-standing contributions to multi-agent systems and his leadership in advancing the field.
- The IIIA was granted the Manel Xifra i Boada Award in the category of Applied Research Group or Technological Center. This award recognises the institute's role as a leading centre for Artificial Intelligence research in Spain and its impact on the European scientific and technological landscape.
- Dr. Manel Rodríguez Soto received the Extraordinary Doctorate Prize for the 2022–2023 academic year from the University of Barcelona, in recognition of the excellence and originality of his doctoral dissertation.
- María Vanina Martínez was appointed to the Board of Directors of EURAMAS (European Association for Multi-Agent Systems), further reinforcing the IIIA's active participation and influence in the international AI research community.



2024

Annual Report

Institut d'Investigació
en Intel·ligència
Artificial