Artemisa

Artificial Environment For ML And Innovation In Scientific Advanced Computing
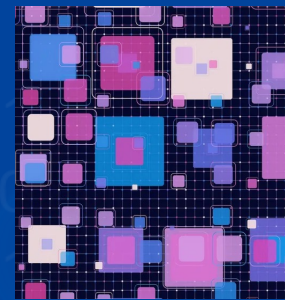
Jose.Enrique.Garcia@ific.uv.es

Nov 19th, 2025

AI Timeline

1950 —
Alan
Turing's AI
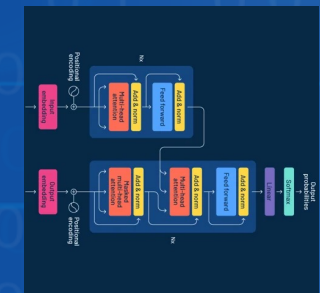paper

1966 —
First AI
chatbot

1980 —
Flurry of
expert
systems

1987-1993 — Second AI winter

2012 —
AlexNet
begins deep
learning era

2017 —
Invention of
transformer
architecture

1950　1966　1980　1987　1993　2012　2017

1956　1974　1986　1997　2016　2022
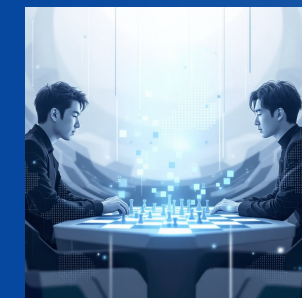
1956 —
The
Dartmouth
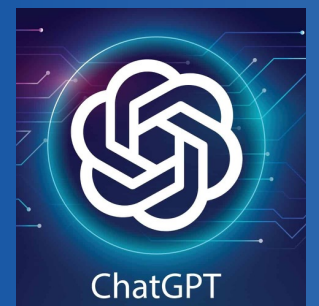workshop

1974-1980 — First AI winter

1986 —
Foundations
of Deep
Learning

1997 —
Deep Blue
defeats Garry
Kasparov

2016 —
AlphaGo
defeats Lee
Sedol

2022 —
Launch of
ChatGPT

AI Models

AI Models

Convolutional neural networks

Multi-layered 'deep' neural networks, that are particularly adapted to image classification tasks by being able to identify the relevant features required to solve the problem.

Transfer learning

Old idea of using concepts learned in one domain on a new unknown one, this idea has enabled the use of deep convolutional nets trained on labelled data to transfer already-discovered visual features to classify images from different domains with no labels.

Generative adversarial networks

Pitching the computer against itself by co-evolving the neural network classifier with the difficulty of the training data set.

Reinforcement learning

A method for finding optimal strategies for an environment by exploring many possible scenarios and assigning credit to different moves based on performance.

LLMs y ChatGPT

Large Language Models (LLMs)

Large Language Models are general-purpose Artificial Intelligence models developed within the field of Natural Language Processing (NLP) that can understand and generate human-like text.

ChatGPT

1.Generative

This tool generates written data. After receiving a substantial amount of natural human language, it uses what it has learned to generate a response.

2.Pre-trained

ChatGPT is pre-trained on human language patterns to produce written content that makes sense and is as accurate as possible, similar to how we would write it.

3.Transformer

The 'transformer' algorithm allows ChatGPT to process incredibly large volumes of data and condense them into simple conversational text.

AI in Our Life

AI in Our Life

Virtual Assistants

Virtual assistants like Siri, Alexa, and Google Assistant manage voice commands, reminders, and smart home control.

Recommendation Systems

Netflix, Amazon, and Spotify provide personalized content recommendations based on user preferences.

Smart Home

Smart devices like Nest thermostats and Philips Hue enable home automation and energy management.

Navigation

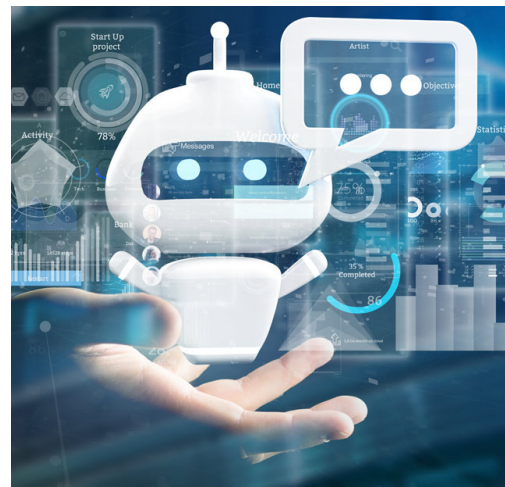Navigation tools such as Google Maps and Waze offer real-time traffic updates and optimized routes.

AI in Our Life

Healthcare & Fitness

Wearables (Fitbit, Apple Watch,…) track health and enable virtual doctor visits.

Customer Service

Chatbots provide instant help and resolve inquiries.

Finance & Banking

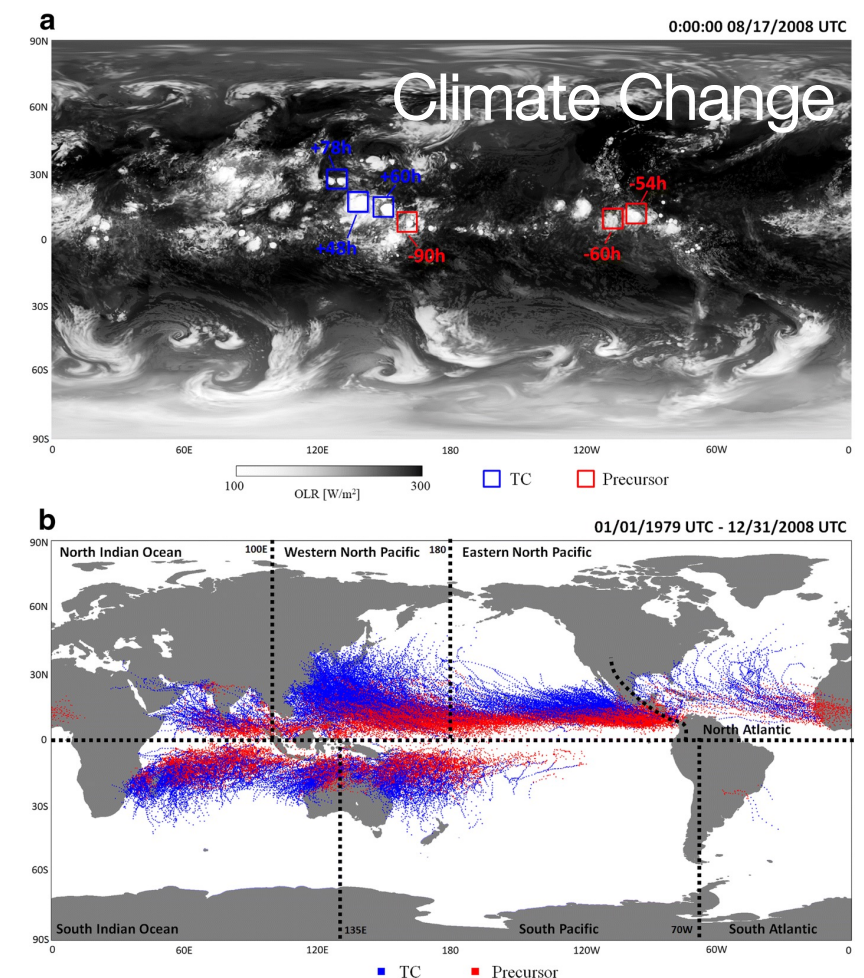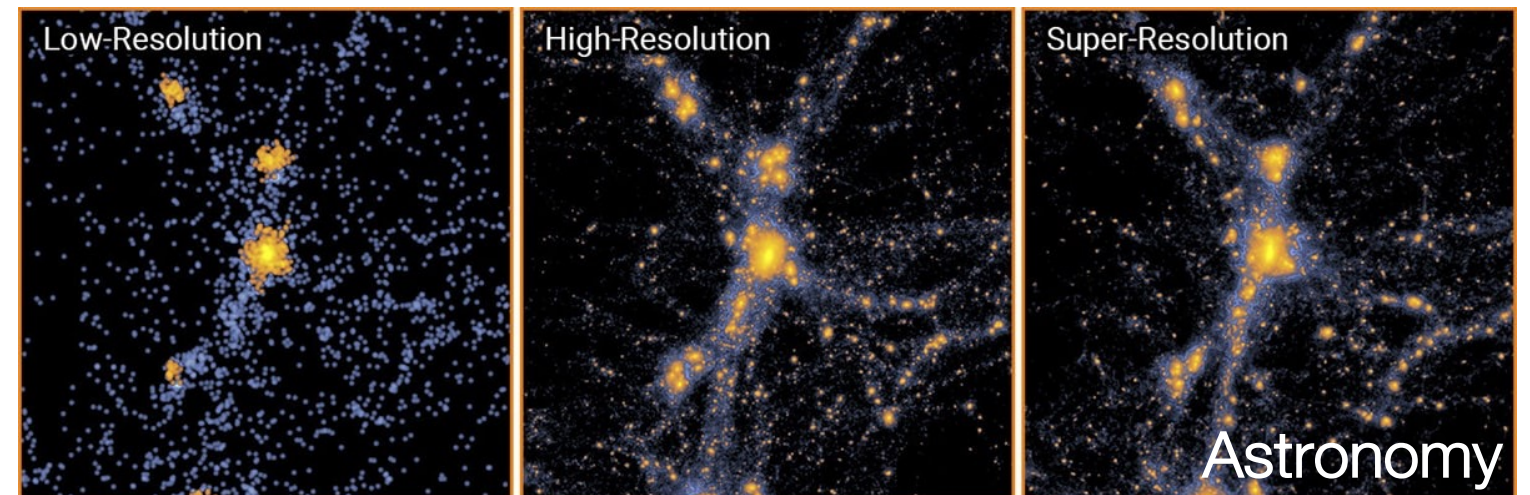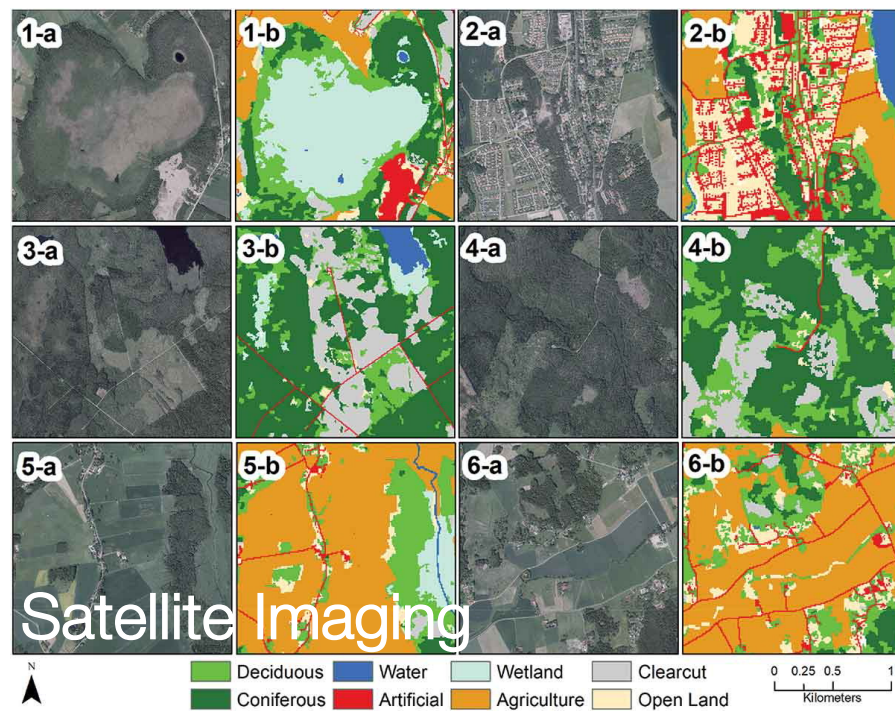Apps monitor transactions and guide budgeting.

Entertainment

AI-driven video games, interactive storytelling. Creating immersive experiences, adapting content based on user interactions
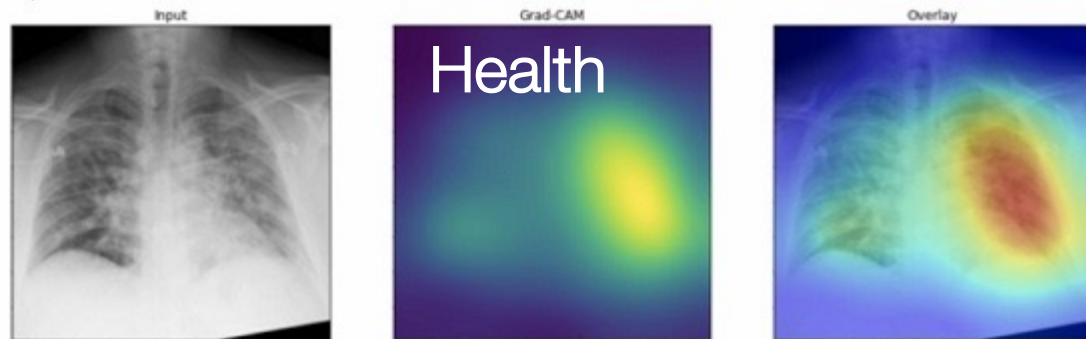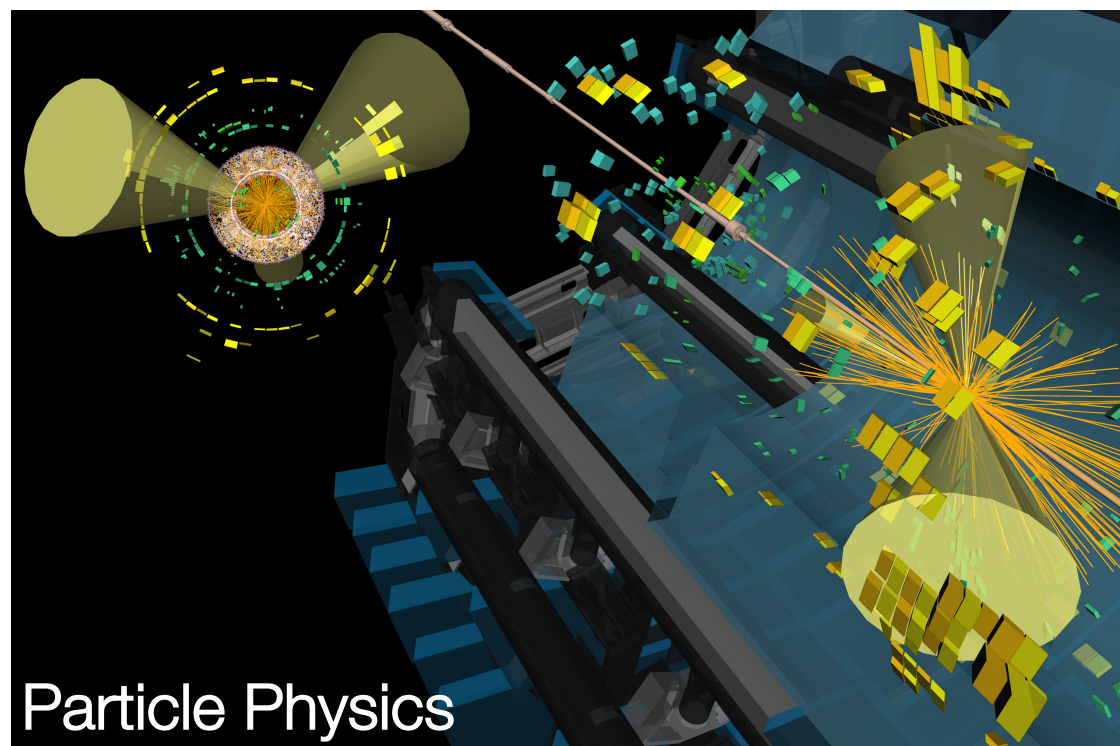
AI in Science

Satellite Imaging

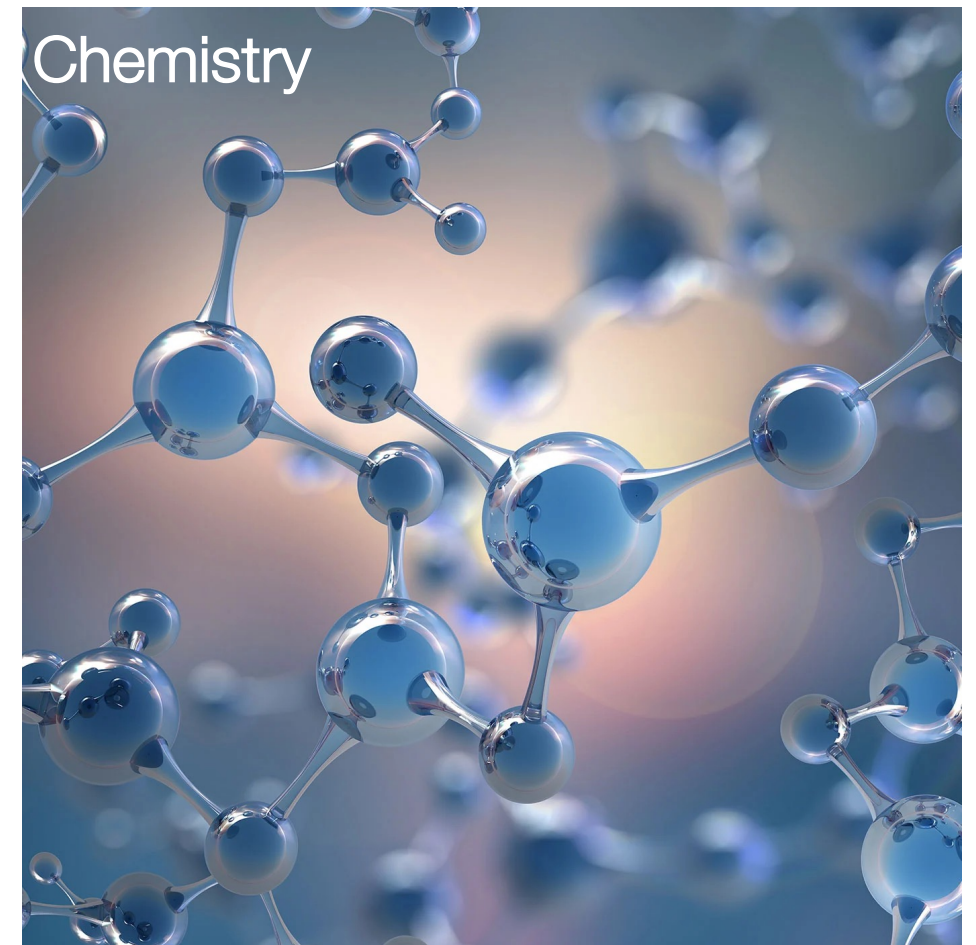Astronomy

Climate Change

Genetics

Health

Chemistry

Particle Physics

image sources: wikipedia / medium.com
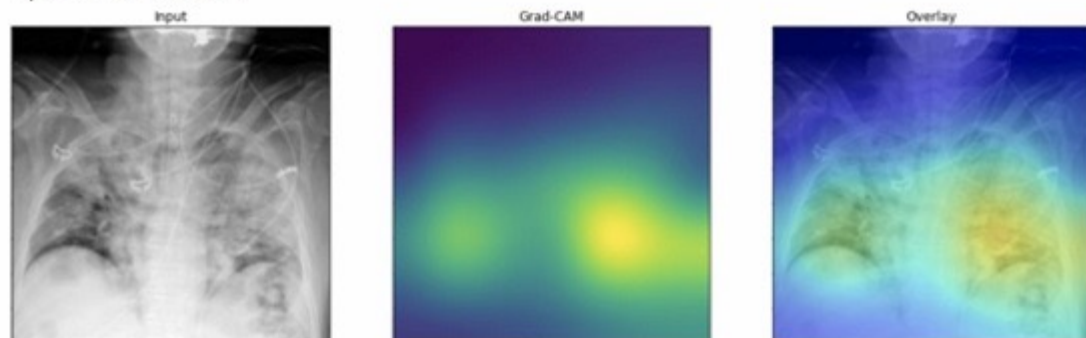
Artemisa

Artificial Environment For MI And Innovation In Scientific Advanced Computing

Artemisa created from using funds of the FEDER 2014-2020 Comunidad Valenciana (**IDEFEDER/2018/048**, bugdet: **1 M€**).

Granted a new project within the call "Recuperación y Resiliencia" (ASFAE/2022/024).

Artemisa (IFIC) is part of the InnDIH (Digital Innovation Hubs) as part of CSIC and Universitat de Valencia.

New **€1.2 Million grant** for **Artemisa** from the program "Equipamiento Científico-Técnico", co-financed by the Ministry of Science and Universities, CSIC, and IFIC.

With this grant, Artemisa will double its current computing capacity.

Plan is to acquire new high-performance GPU servers and improving its storage and data connectivity infrastructure.

The upgrades will strengthen Artemisa's role as a leading facility for AI and machine learning applied to particle physics and other scientific domains.

Artemisa

Artemisa is a GPU-intensive computing infrastructure dedicated to artificial intelligence and machine learning located at IFIC´s data centre. Its advanced features and excellent performance make possible the accelerated development of projects involving artificial intelligence areas.

Artemisa has machine learning capacity for handling large amounts of data to produce empirical models in physics, chemistry, biology and social studies.

The facility is very well endowed with last generation GPUs plus ancillary CPU and disk space. It features some specific equipment such a modern 8-GPU (A100) Server for special applications.

Artemisa Facility Details

#	Usage	General Characteristics	GPU
2	User interface	2 Intel Xeon Gold 6130 (16c), 192 GB RAM	2 GPU NVIDIA
2	Batch	2 Intel Xeon Gold 8160 (24c), 384 GB RAM	1 GPU NVIDIA Tesla V100 32GB
20	Batch	2 Intel Xeon Gold 6248 (20c), 384 GB RAM	1 GPU NVIDIA Tesla V100 32GB
11	Batch	2 AMD EPYC 7532 (32c), 384 GB RAM	1 GPU NVIDIA Ampere A100 40GB
2	Batch	2 x AMD EPYC 9454 (48c) 384 GB RAM	2 GPU H100 NVL 94 GB with NVLink
1	Batch	2 Intel Xeon Platinum 8180 (28c), 768 GB RAM	4 CPUs NVIDIA Tesla V100 32GB SMX2 with NVLink
1	Batch	2 AMD EPYC 7642 (48c), 512 GB RAM	8 GPUs NVIDIA Ampere A100 40GB SMX2 with NVLink
5	Disk Servers	387 TB Lustre	-
3	Disk Servers	150 TB Lustre (SSD)	-

## CHEST SCREENING EVALUATION FOR COVID-19 PATIENTS

A project funded by Instituto de Salud Carlos III and led by IFIC researchers is carrying out radiological imaging analysis using machine learning techniques with the aim of enhancing patient diagnose and evolution assessment.

MACHINE LEARNING @ ATLAS EXPERIMENT
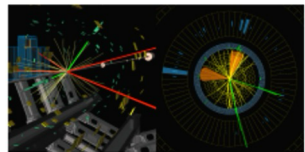
The ATLAS experiment at the Large Hadron Collider (LHC) is looking beyond the Standard Model of particle physics, searching for signs of unknown new physics. An important aspect to be able to find this new physics is the identification of the interesting events within all the events available. Interesting events are called "signal", while others are "background". Individuating these signal events, which are indeed extremely rare, is a really challenging task. The LHC has delivered billions of collisions which have been recorded by the ATLAS detector.

DARK MACHINES
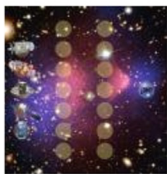
Dark Machines (www.darkmachines.org) is an initiative to develop and apply machine learning methods to accelerate dark matter searches. It is composed of more than 300 high-energy physicists, astroparticle physicists and astrophysicists, from theory and experiment, as well as computer scientists.

IDENTIFYING SYMMETRIES THROUGH AI
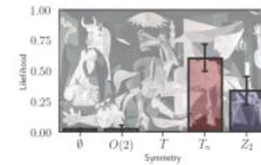
Since the dawn of humanity, our species has tried to decipher the world around us, through art, literature, music or science. The skills developed and the tools used are different, as different as the audiences targeted. But the goals are basically the same: to dealing with complexity using the tools at hand.

MACHINE LEARNING IN MAGNETIC RESONANCE
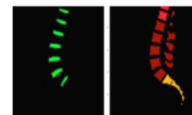
Low back pain (LBP) is a very prevalent pathology and a frequent cause of disability. It is associated with rising costs for the health system and for society in developed countries, affecting 70% of the general population at some time in their lives, with an annual incidence of 40%

The multidisciplinary group lead by María de la Iglesia-Vayá from the Prince Felipe Research Center (CIPF) uses Artemisa to develop the first massive and open-access data repository of lumbar MRI for International collaborative research.

CUSTOM-DHM: DIGITAL HUMAN MODELING APPLICATIONS

The objective of the project is to advance in the integration of 3D models of the body in the development of digital products and applications, developing innovative tools that allow their 3D and / or 4D analysis for the clothing, health and wellness, audiovisual and orthopedic sectors, or any other sector that is interested in incorporating digital information from users.

IDENTIFYING WEED SPECIES IN CROP FIELDS

Convolutional Neural Networks (CNN) are currently being implemented in a wide variety of applications. This subdomain of Artificial Intelligence shows a powerful performance in machine vision applications and may be used to categorise and classify objects, amongst other image processing tasks.

In the Artificial Perception Group of the Centre for Automation and Robotics (CAR) we are interested in identifying and classifying weed species within crop fields, which is a very specific problem, as the system will only need to process images of soil and plants.

## NEUROCONVO: BRAIN WAVES WITH NEURAL NETWORKS
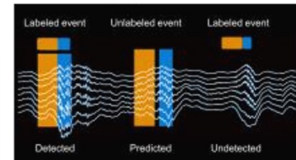
The brain generates activity in the form of oscillations. Brain waves span from very slow rhythms, typical of sleep, to faster oscillations during attention and cognitive processing. Moreover, changes of brain oscillations are markers of some neurological diseases. Given the dynamism of brain activity, these events are far from stationary and thus their identification in real time is a daunting task.

SENTIFLEX
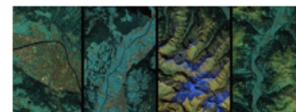
Machine learning is one of the keys in the development of modern Earth Observation satellite missions. Model training requires precise Earth simulation as basis of applications such as vegetation monitoring, prospecting for minerals, soil use and climate change studies, among others.

## NON-INVASIVE SCREENING FOR MENINGITIS
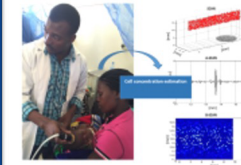
165 newborns die every day of Bacterial Meningitis (BM), an aggressive infection that leaves severe sequelae among 30% of survivors. Rapid detection, particularly in this age group, is difficult due to the little specificity and overlap of its symptoms with those of more common and less severe diseases. Current strategy to improve prognosis is the prompt antibiotic treatment after an early diagnosis by means of a lumbar puncture (LP), invasive and potentially harmful procedure.

## SOLAR STORMS AND THE SPANISH CRITICAL INFRASTRUCTURES
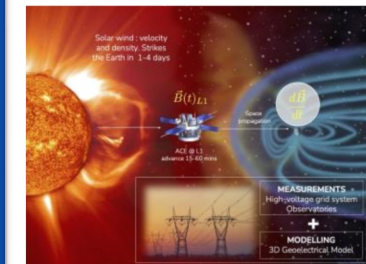
In the last decades, our society has become more interdependent and complex than ever before. Local impacts can cause global issues, as the current pandemic clearly shows, affecting the health of millions of human beings. It is also highly dependent on relevant technological structures, such as communications, transport, or power distribution networks, which can be very vulnerable to the effects of Space Weather. The latter has its origin in solar activity and their associated events, such as solar flares and...

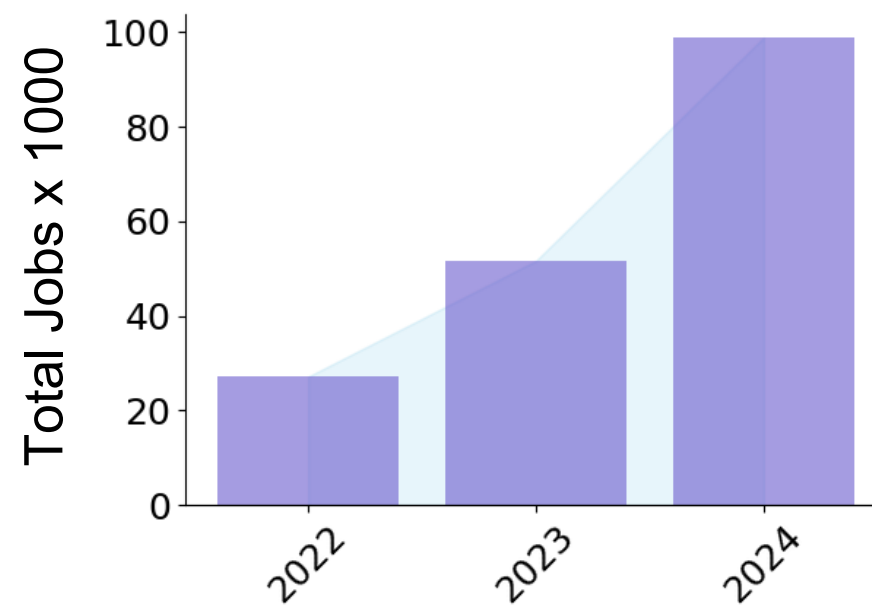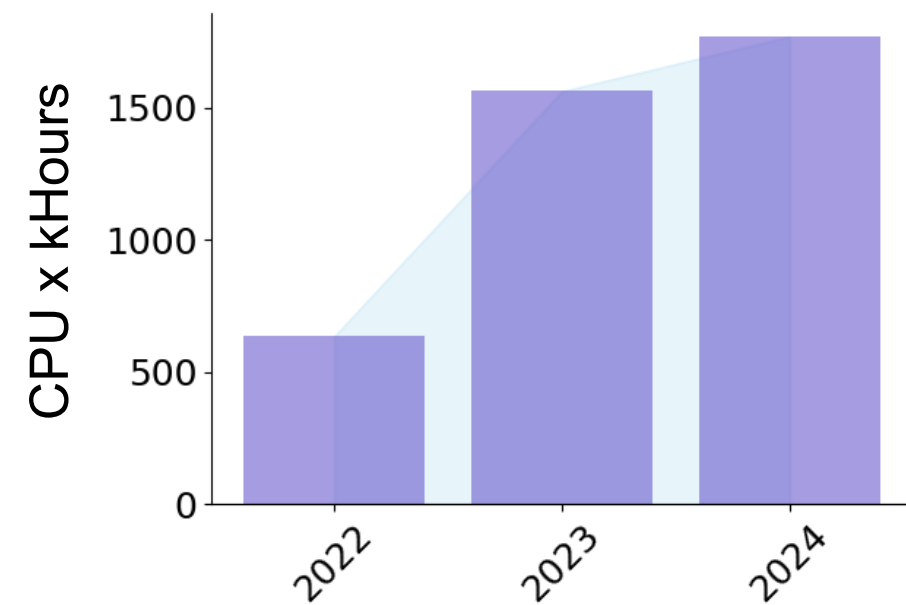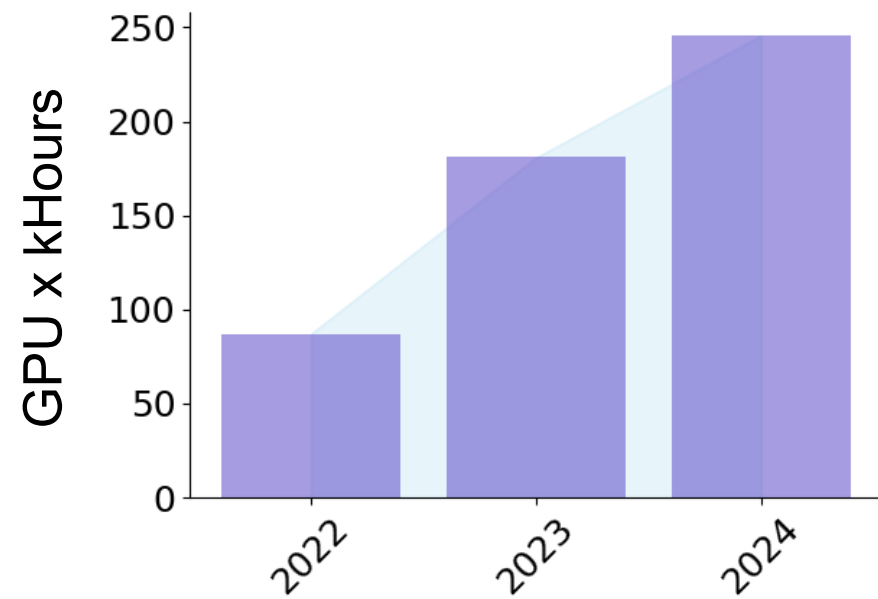# Artemisa in Numbers

CPU

GPU
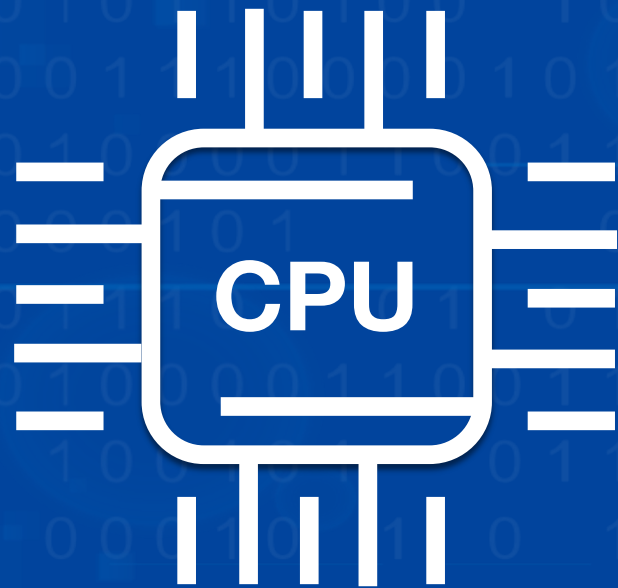
3600 CPUs

49 GPUs

**+1500k Hours
Delivered in 2024**
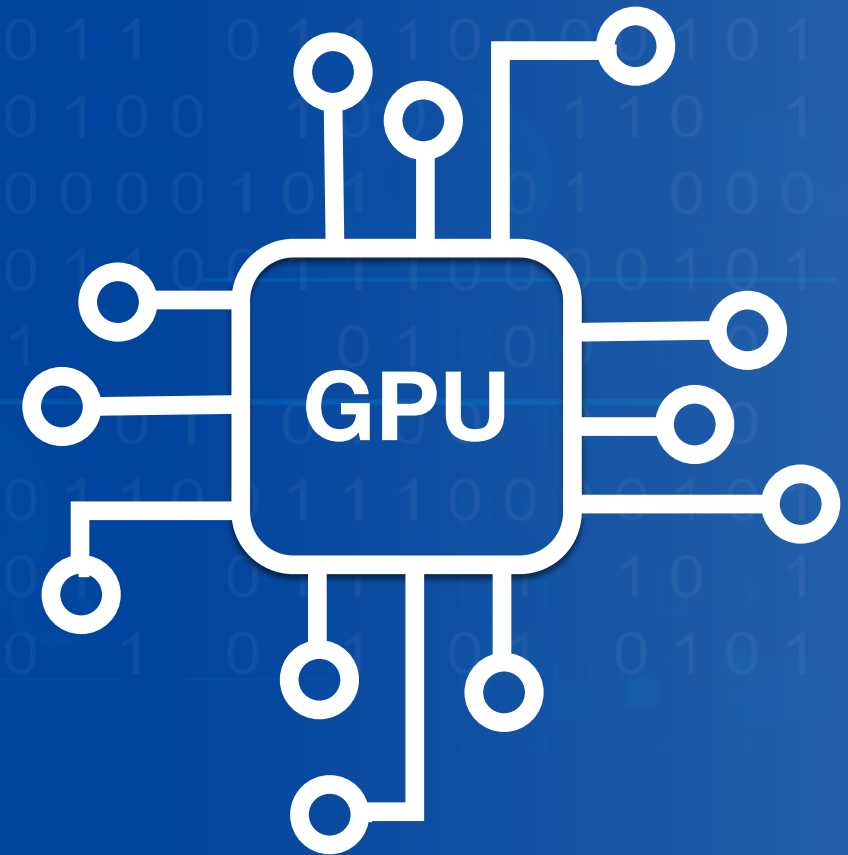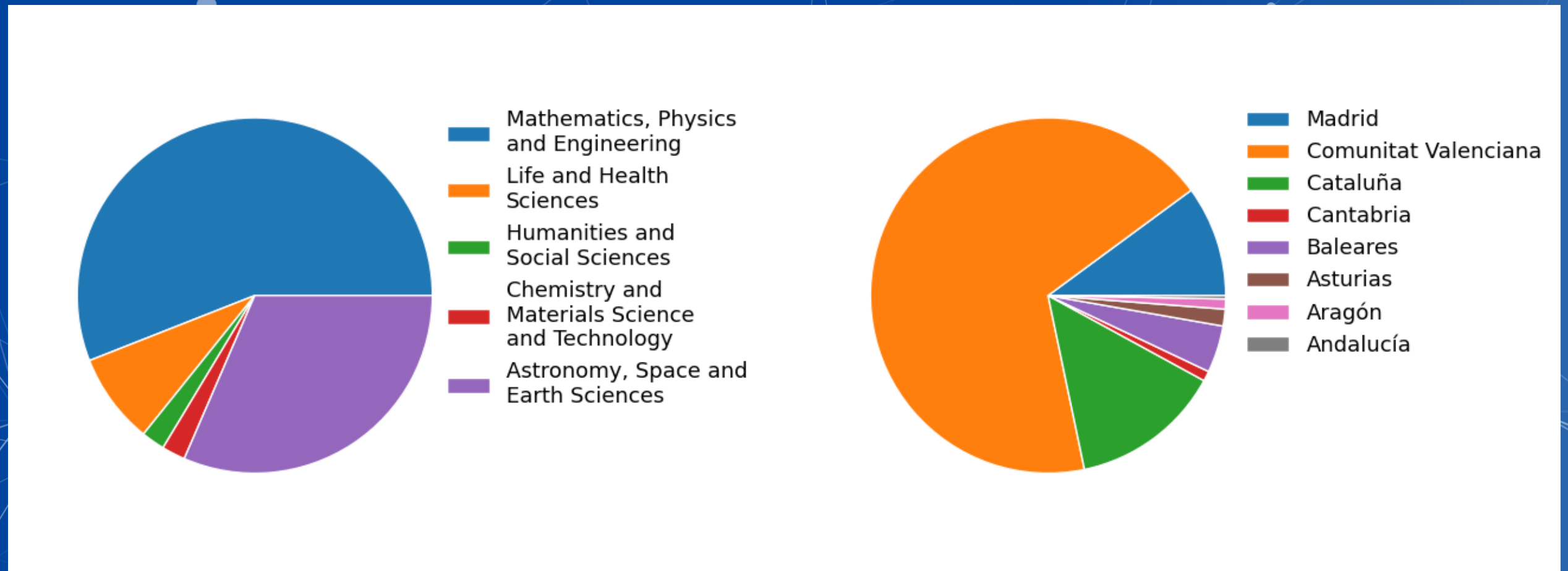
**~250k Hours
Delivered in 2024**

Artemisa in Numbers
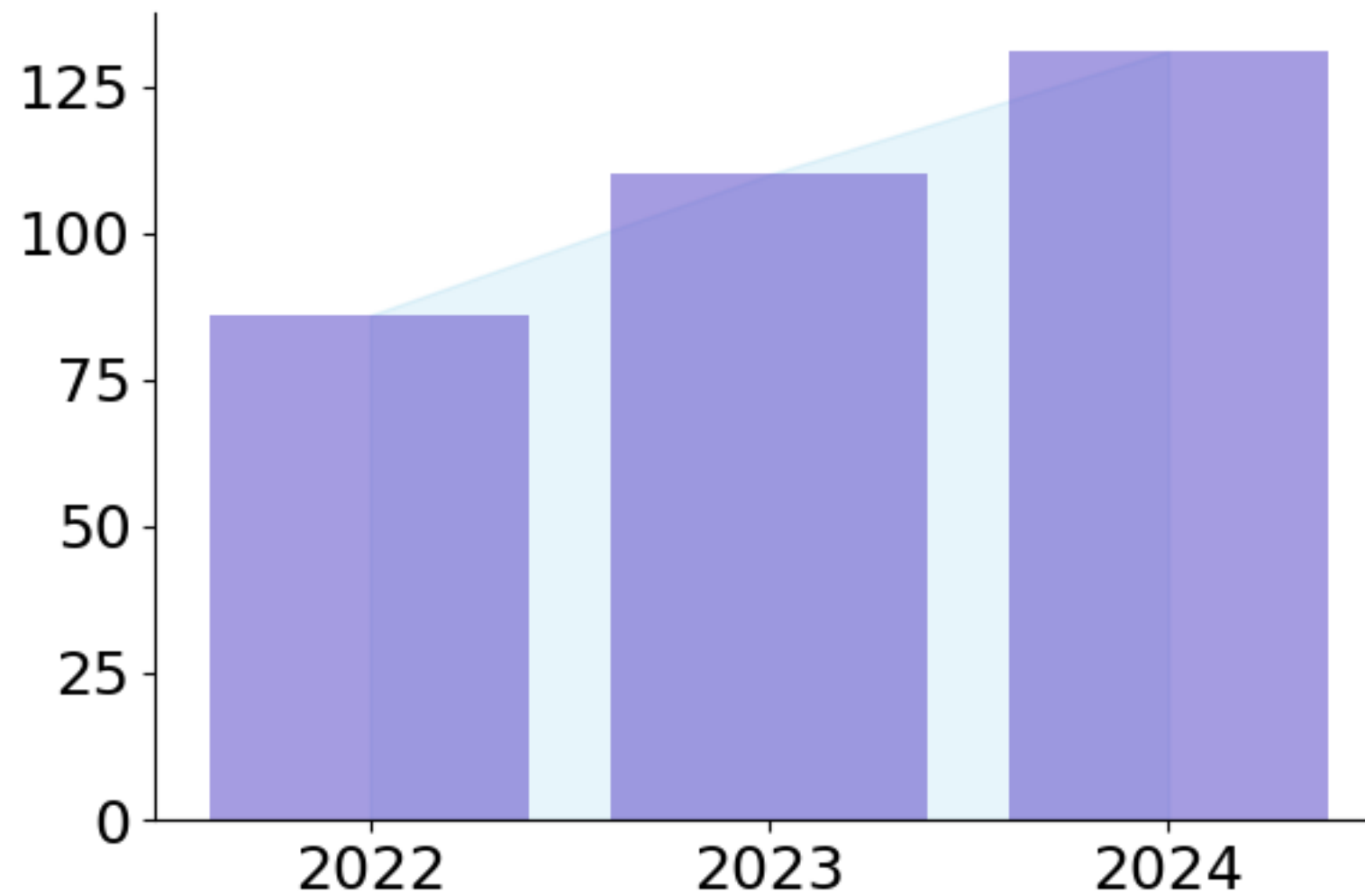
Number of **NEW** projects are increasing yearly

Breakdown by **region** and **research area** for the projects in **Artemisa**. Most of the projects are from "Comunidad Valenciana" and "*Mathematics, Physics and Engineering*" but other regions and fields growing.

What is ISO 27001?

ISO 27001 is the standard created by the International Organisation for Standardization (ISO) which deals with Information Security Management. It is a way of making sure that an entity is managing information security risks and data effectively.
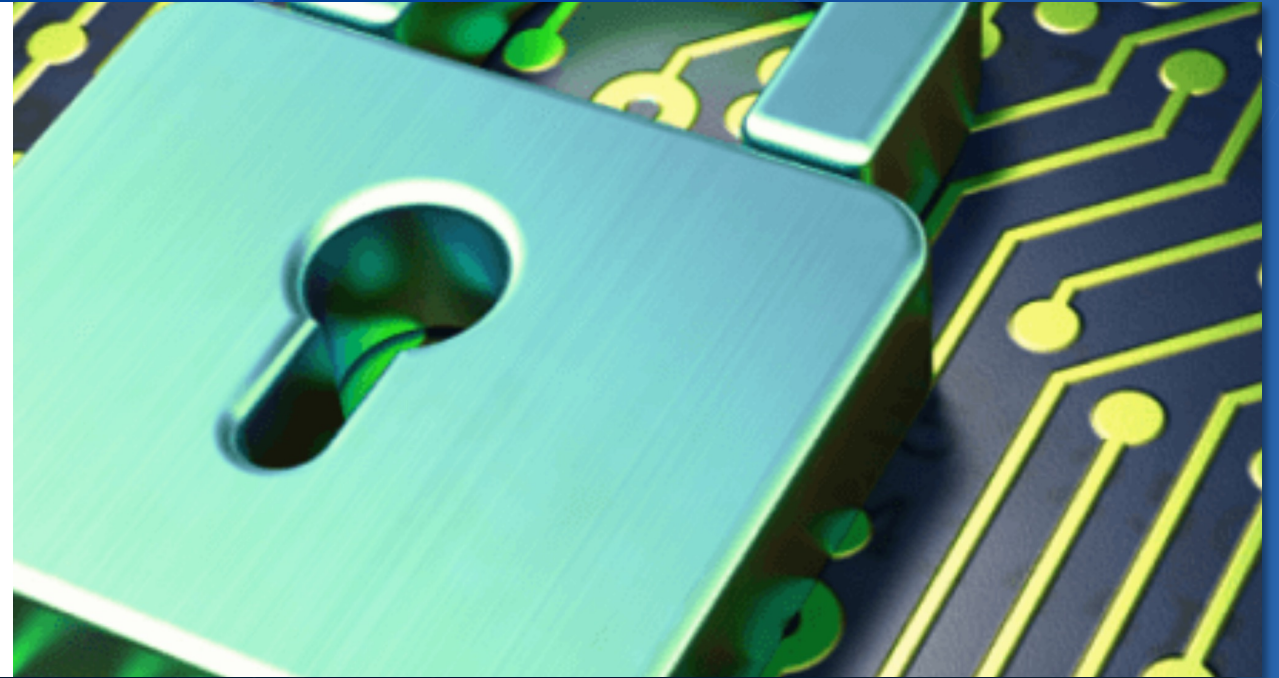
"The ISO 27001 standard helps organisations to establish and maintain an effective Information Security Management System (ISMS), using a continual improvement approach. **You will systematically assess any risks to the organisation's information security and put in place policies and procedures to manage those risks."**

- Project applications :

  - **3 Calls per year, 4 months each**

  - **Call is open for a month, accepting projects during that period.**

- Projects are discussed and evaluated by a committee.

- Access through **Artemisa** Intranet.

ARTificial Environment for ML and Innovation in Scientific Advanced Computing

Jose Enrique García