



Fons Europeu de  
Desenvolupament Regional

Una manera de fer Europa

UNIÓ EUROPEA



**GENERALITAT  
VALENCIANA**

Conselleria d'Educació,  
Investigació, Cultura i Esport



VNIVERSITAT  
ID VALÈNCIA



**CSIC**

CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS



# Artemisa

**ARTificial Environment for ML and Innovation in  
Scientific Advanced Computing**

*Jose Enrique García Navarro*



**Artemisa** created from using funds of the FEDER 2014-2020 Comunidad Valenciana (IDEFEDER/2018/048, budget: 1 M€). The project and funding ended June this year.



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## Committee Members

Juan José Hernández Rey  
Nuria Rius Dionís  
Benito Gimeno Martínez

Investigador responsable del proyecto  
Directora del IFIC (ex officio)  
Vicedirector IFIC (ex officio)

Francisco Javier Albiol Colomer  
Vicent Giménez Gómez  
Arantza Oyanguren Campos  
José Salt Cairols  
Francisco Javier Sánchez Martínez  
Verónica Sanz González

Física Experimental  
Física Teórica  
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Jefe de la Unidad de Informática del IFIC  
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**Thanks to Juanjo for the amazing job with Artemisa !!!**

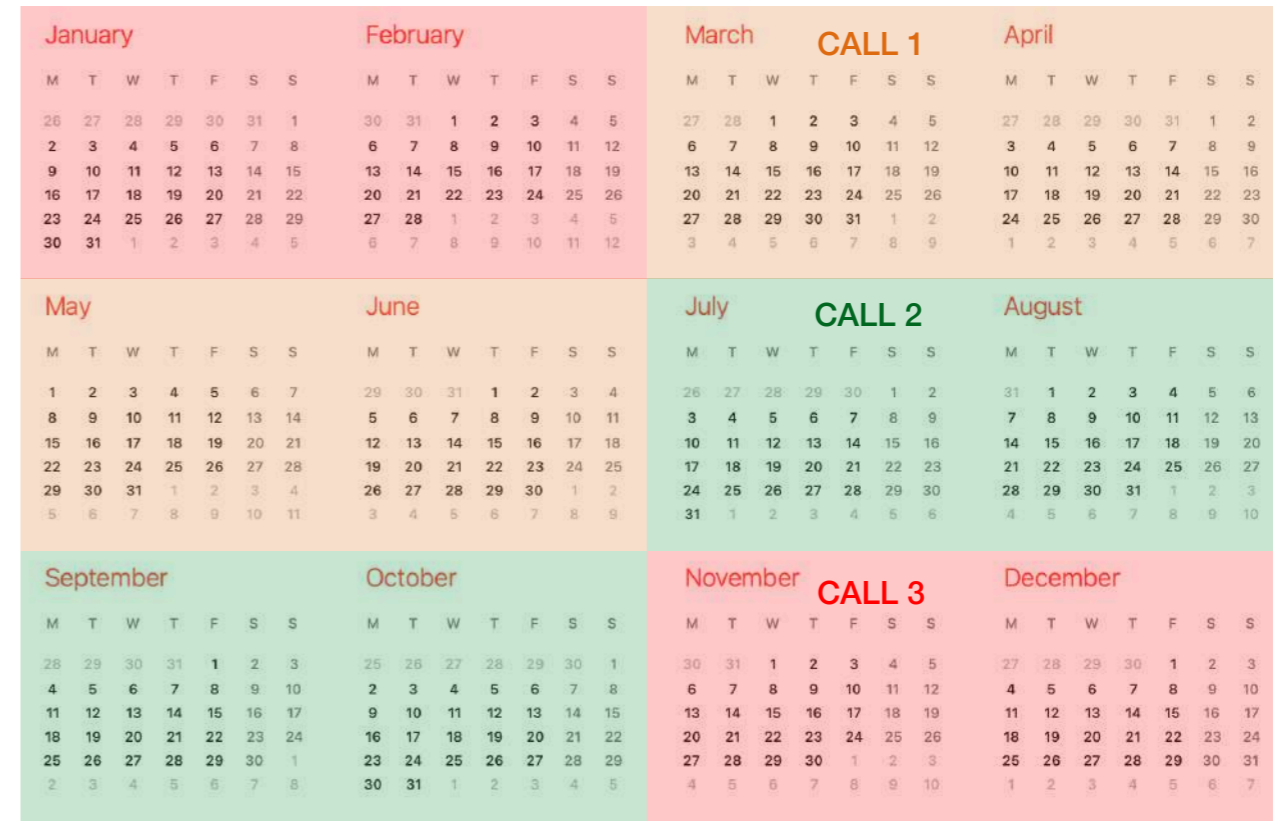
(I am just reporting the work)

\*A good news is that Juanjo became a member of the “Digital Economy” Discussion Board (Mesa Temática) of the S3-CV (Estrategia de Especialización Inteligente)



# Artemisa Committee

- Project Management :
  - 3 Calls per year, 4 months each
  - Accepting projects during one month
- Projects are discussed and evaluated by the committee. Everything is documented.
- Forum for discussion of AI activities and initiatives
- Several Meetings during the year besides evaluation meetings



**Comite Asesor**

Reuniones del Comité Asesor de Artemisa

December 2021

- 02 Dec Reunión Comité Asesor de Artemisa

October 2021

- 20 Oct Reunión Comité Asesor de Artemisa

September 2021

- 23 Sep Artemisa y actividades de AI en el IFIC (Reunión Comité Asesor Artemisa y Comisión de Inteligencia Artificial del IFIC)



# AI in Science





# AI in Science

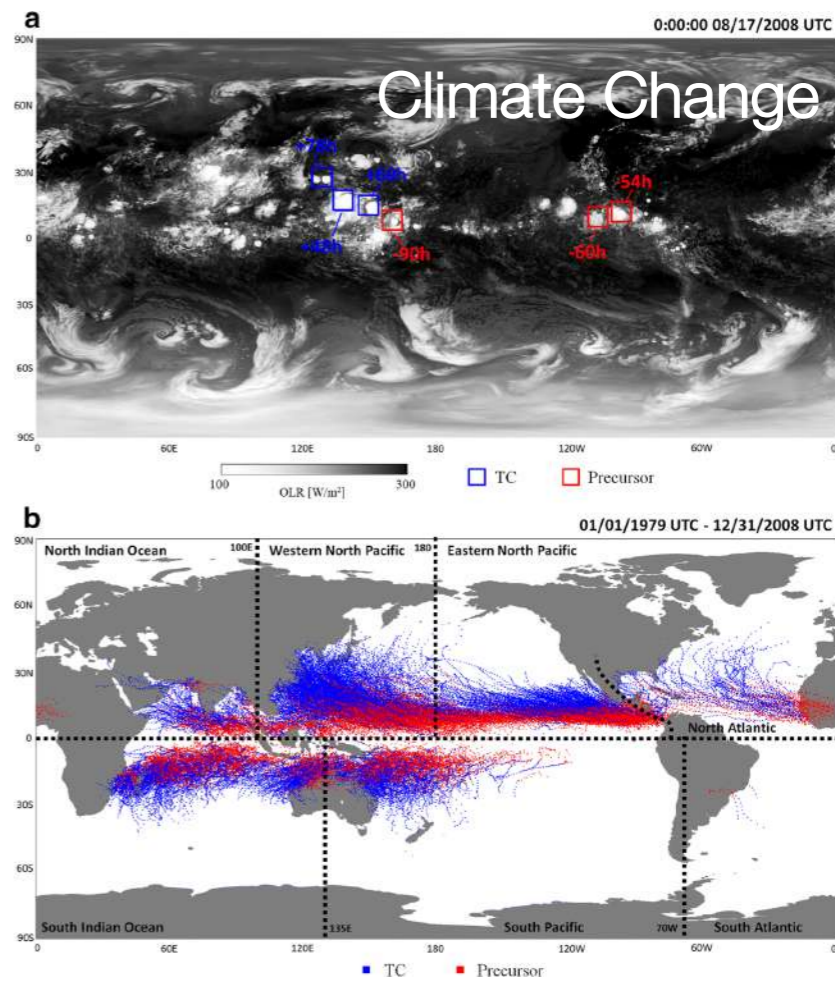
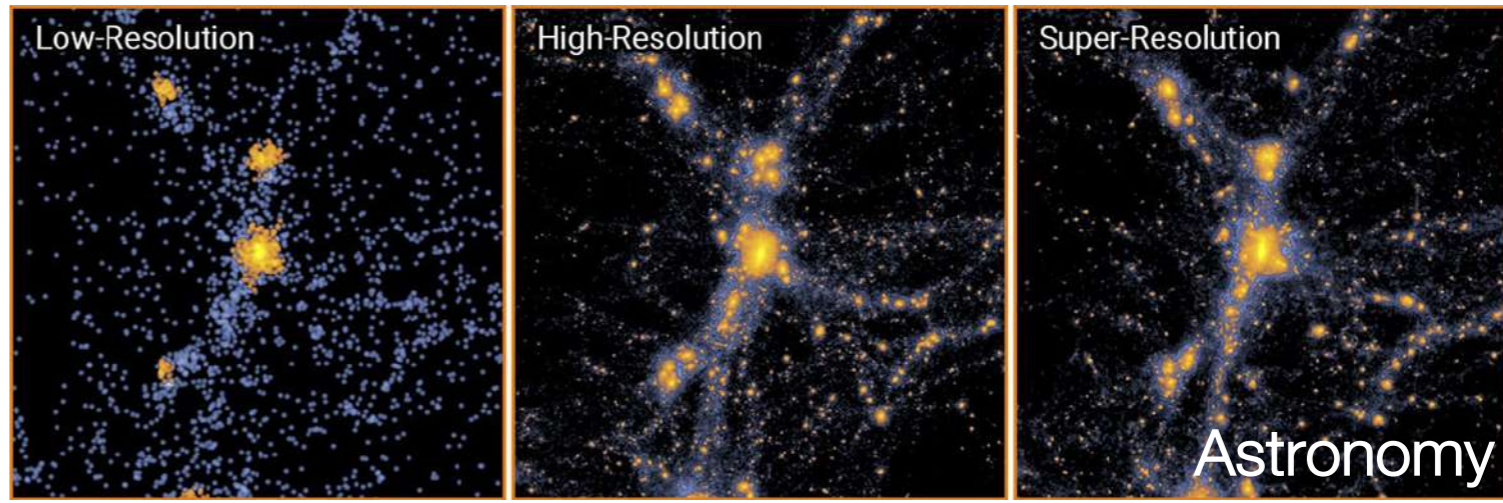
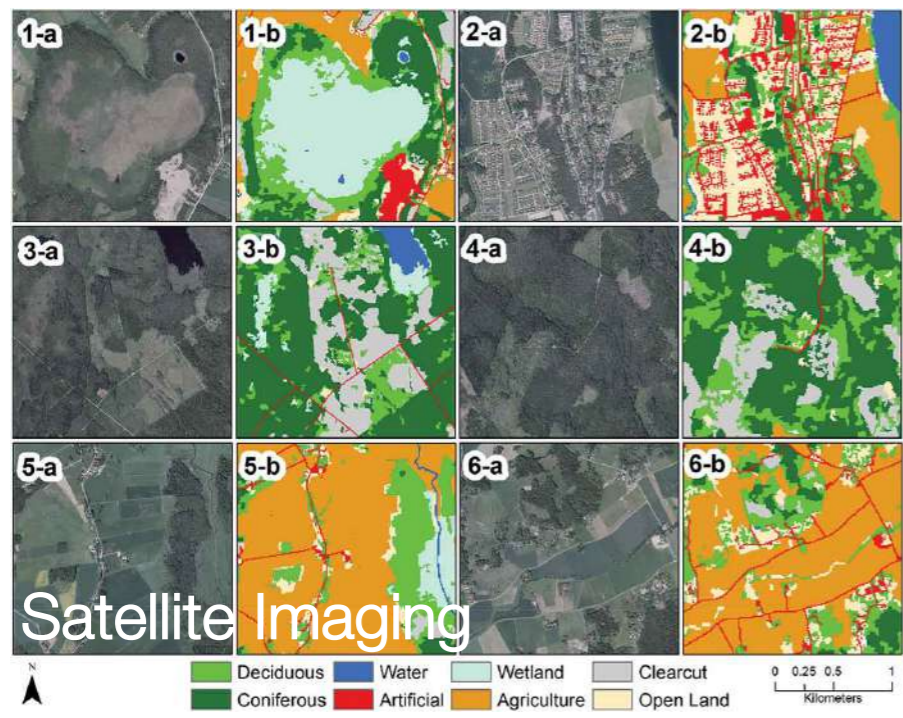


image sources: wikipedia / medium.com



# AI in Science

A) COVID Positive



B) COVID Positive

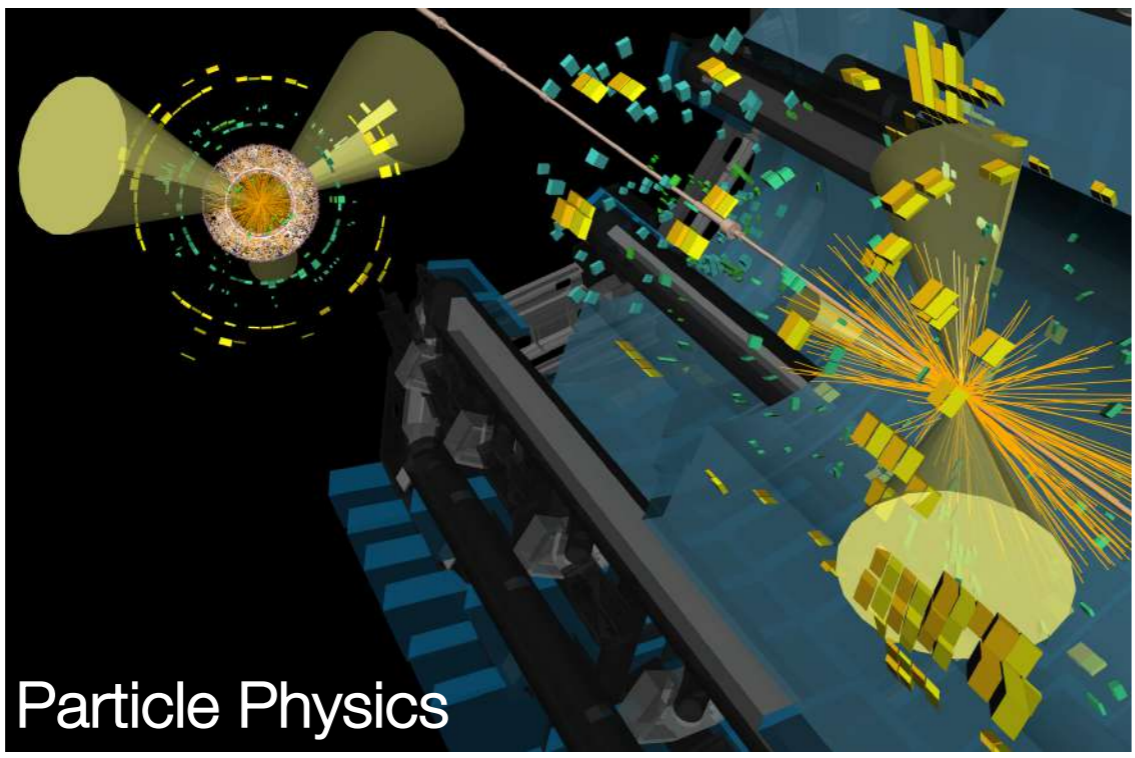
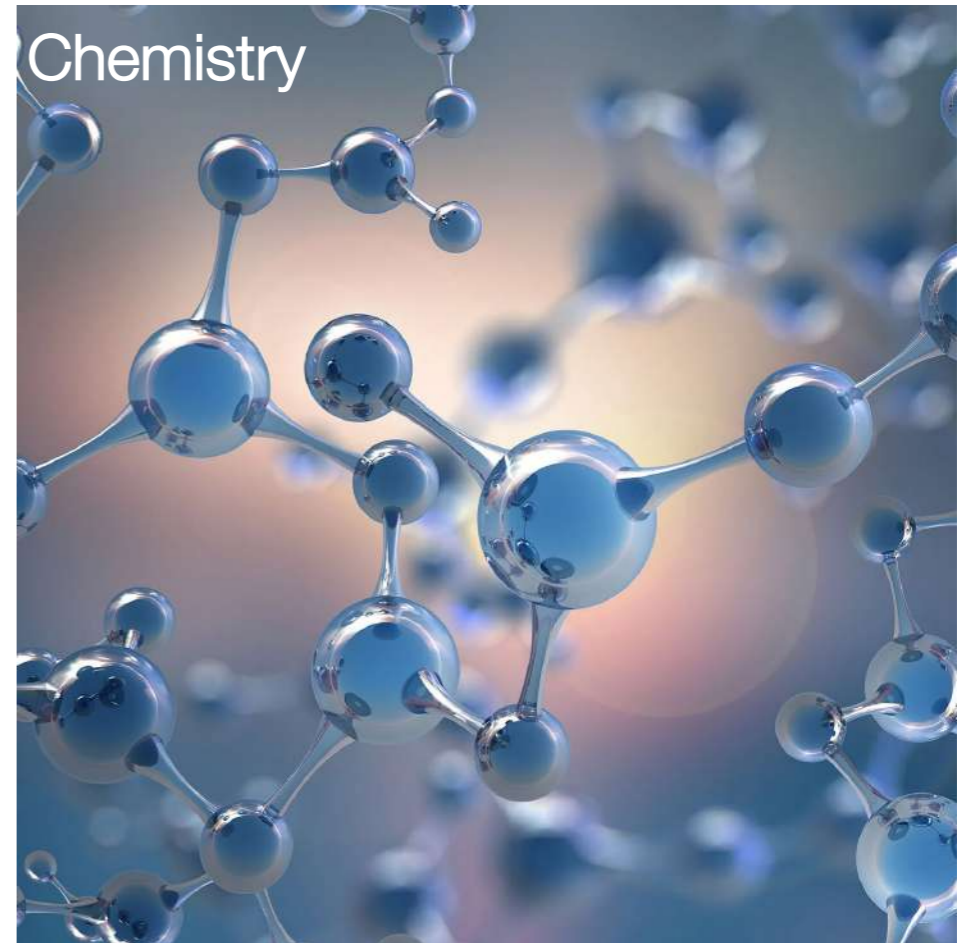
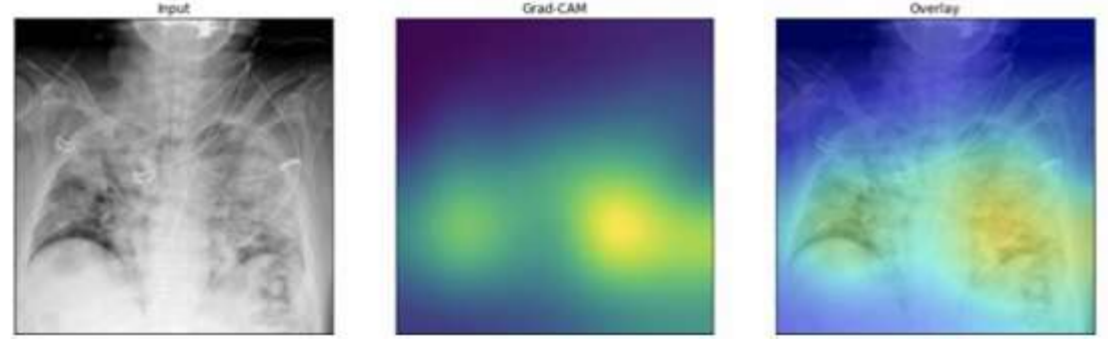


image sources: wikipedia / medium.com



# Artemisa





# 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.



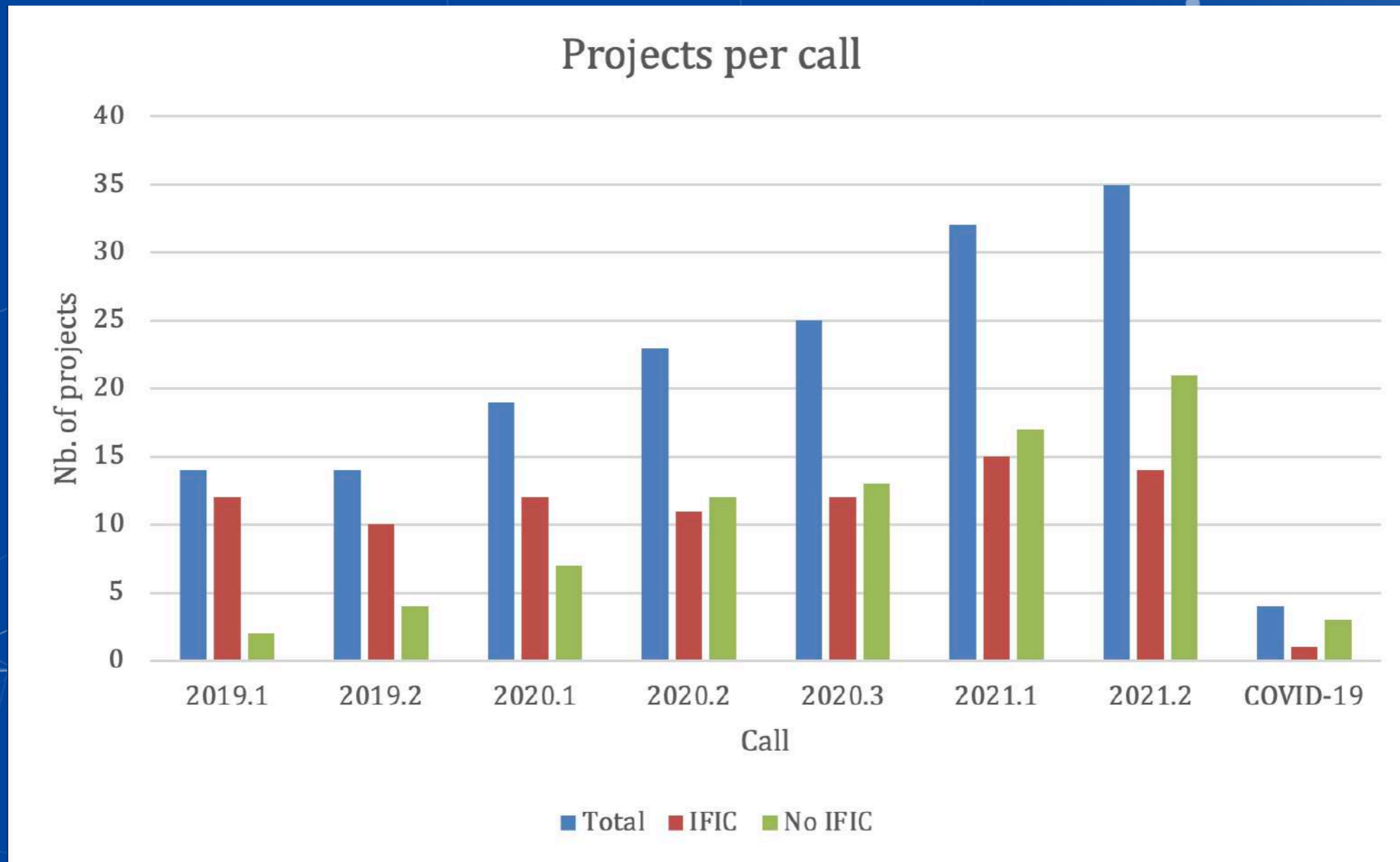


## Artemisa Facility

- 23 servers equipped with NVIDIA GPU Volta V100.
- **New** 11 servers with two processors and one GPU NVIDIA Ampere A100
- Two multi-GPU Servers: one 4-V100 GPU and one **New** 8-A100 GPU
- **Artemisa** also boasts a last generation CPU and storage system.



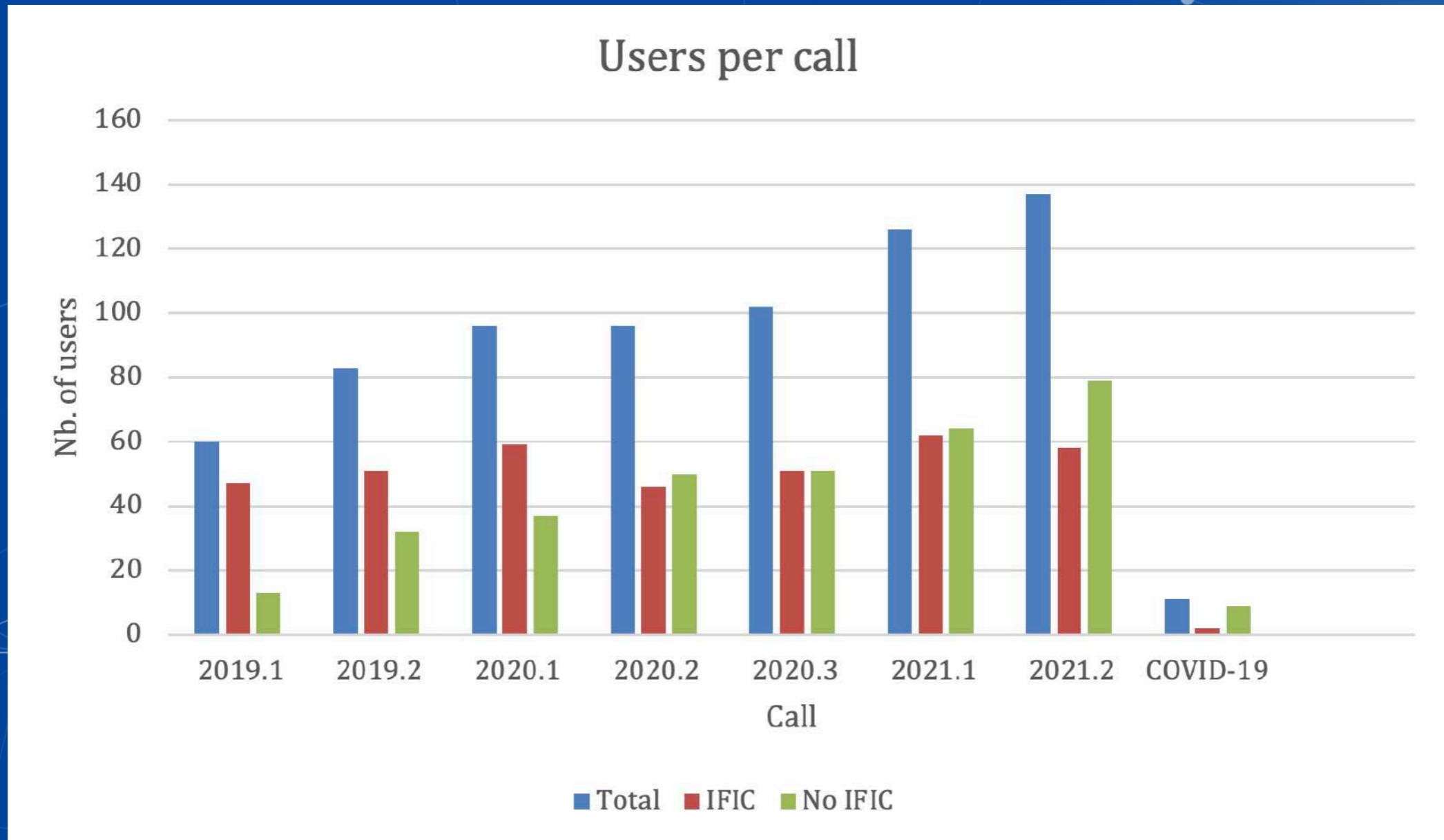
# Artemisa



Projects per call for the last years in **Artemisa**. Infrastructure is becoming more known outside IFIC and no-IFIC projects are increasing over time.

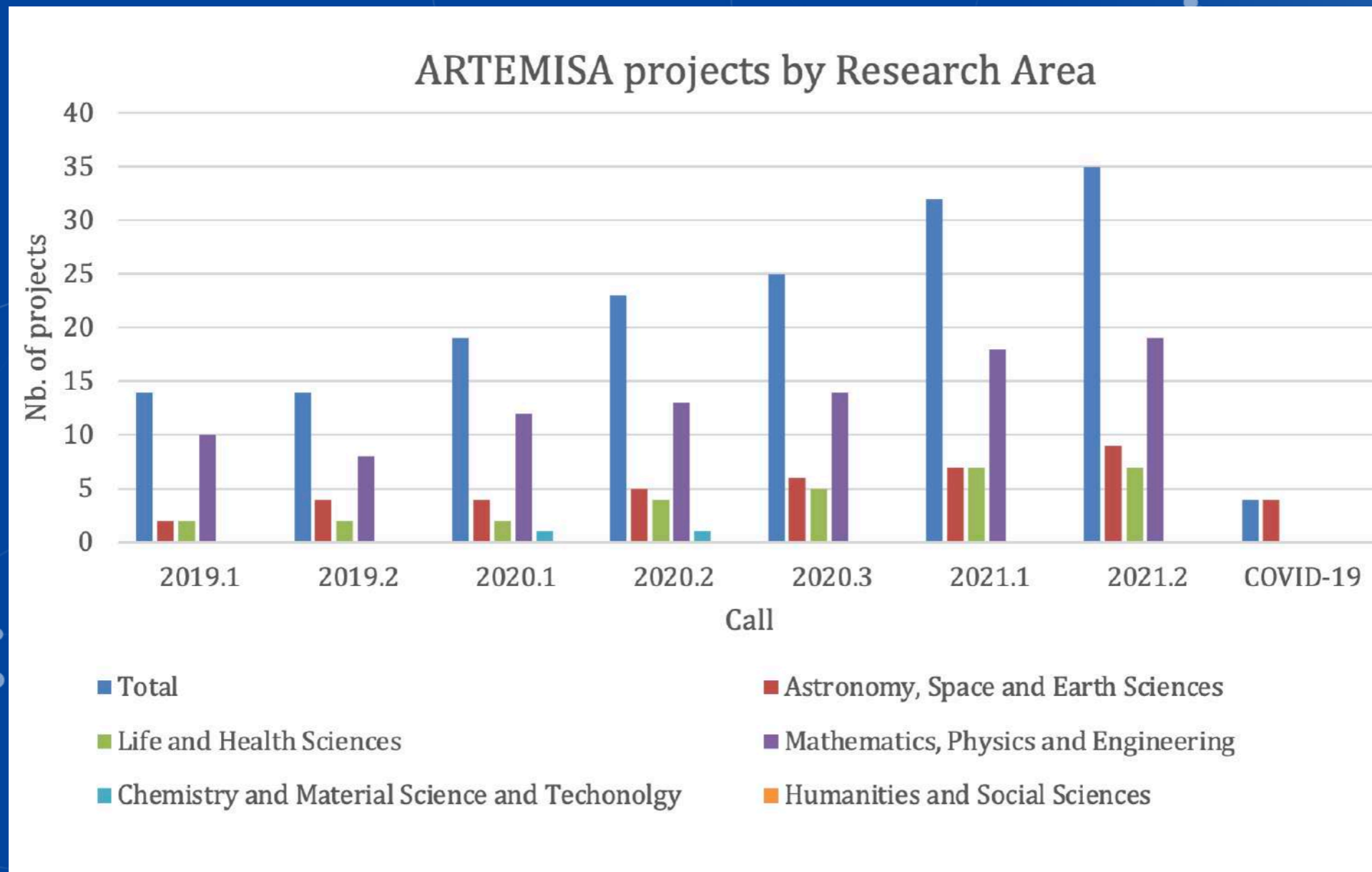


# Artemisa



Users per call for the last years in **Artemisa**. The increase of projects has a correspondence with users numbers.

# Artemisa

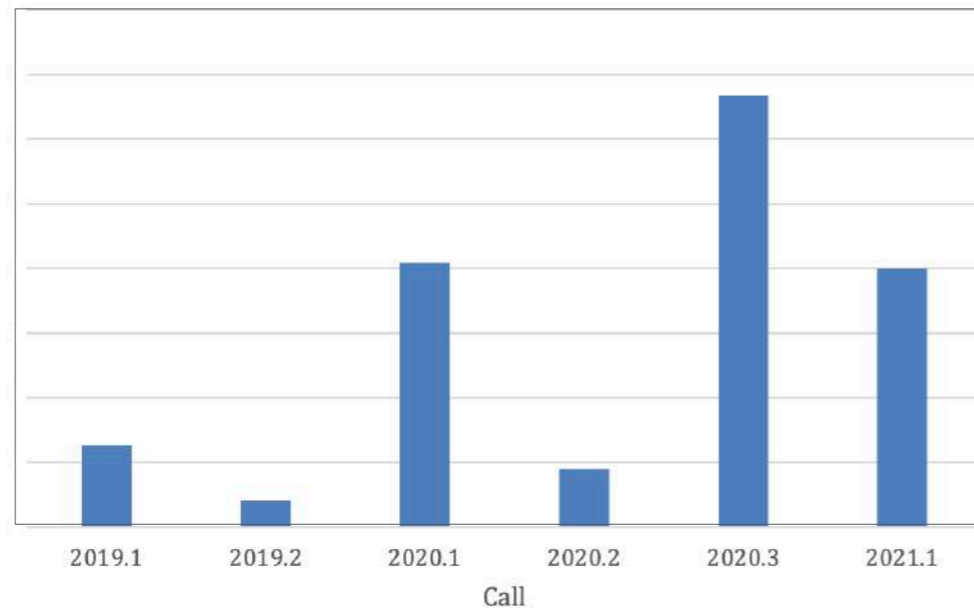


Breakdown of the research areas for the projects in **Artemisa**. Most of the projects are "Mathematics, Physics and Engineering" but other fields growing.

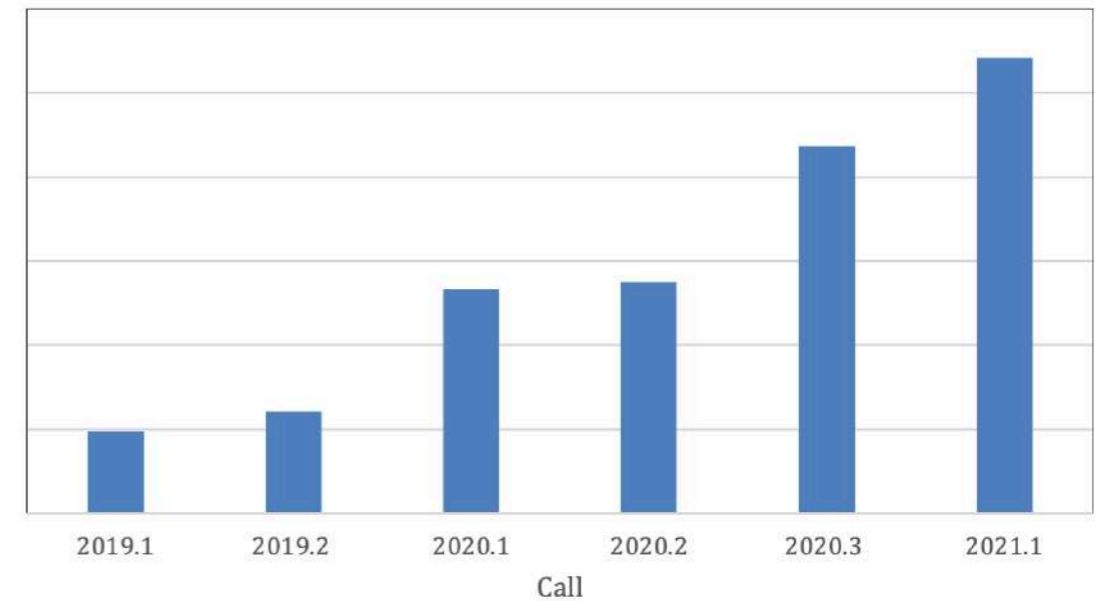


# Artemisa

CPU x hours per call



GPU x hours per call



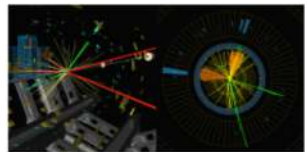
Positive evolution of the usage of the infrastructure, CPU depending on the call, but GPU usage increases with time.

## CHEST SCREENING EVALUATION FOR COVID-19 PATIENTS



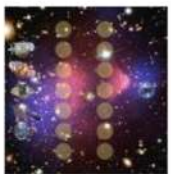
A project funded by Instituto de Salud Carlos III and led by IFIC researchers is carrying out radiological imaging analysis using machine learning techniques with the aim of enhancing patient diagnose and evolution assessment.

## MACHINE LEARNING @ ATLAS EXPERIMENT



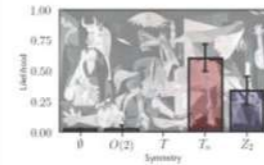
The ATLAS experiment at the Large Hadron Collider (LHC) is looking beyond the Standard Model of particle physics, searching for signs of unknown new physics. An important aspect to be able to find this new physics is the identification of the interesting events within all the events available. Interesting 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



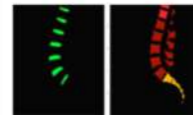
Dark Machines ([www.darkmachines.org](http://www.darkmachines.org)) is an initiative to develop and apply machine learning methods to accelerate dark matter searches. It is composed of more than 300 high-energy physicists, astroparticle physicists and astrophysicists, from theory and experiment, as well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

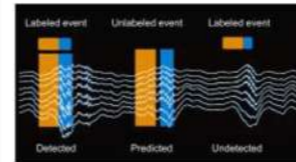
## IDENTIFYING WEED SPECIES IN CROP FIELDS



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.

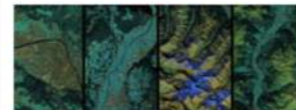
In the Artificial Perception Group of the Centre for Automation and Robotics (CAR) we are interested in identifying and classifying weed species within crop fields, which is a very specific problem, as the system will only need to process images of soil and plants.

## NEUROCONVO: BRAIN WAVES WITH NEURAL NETWORKS



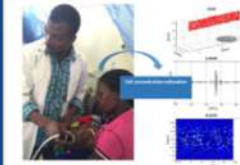
The brain generates activity in the form of oscillations. Brain waves span from very slow rhythms, typical of sleep, to faster oscillations during attention and cognitive processing. Moreover, changes of brain oscillations are markers of some neurological diseases. Given the dynamism of brain activity,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

## SENTIFLEX



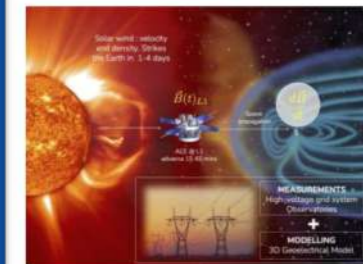
Machine learning is one of the keys in the development of modern Earth Observation satellite missions. Model training requires precise Earth simulation as basis of applications such as vegetation monitoring, prospecting for minerals, soil use and climate change studies, among others.

## 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.

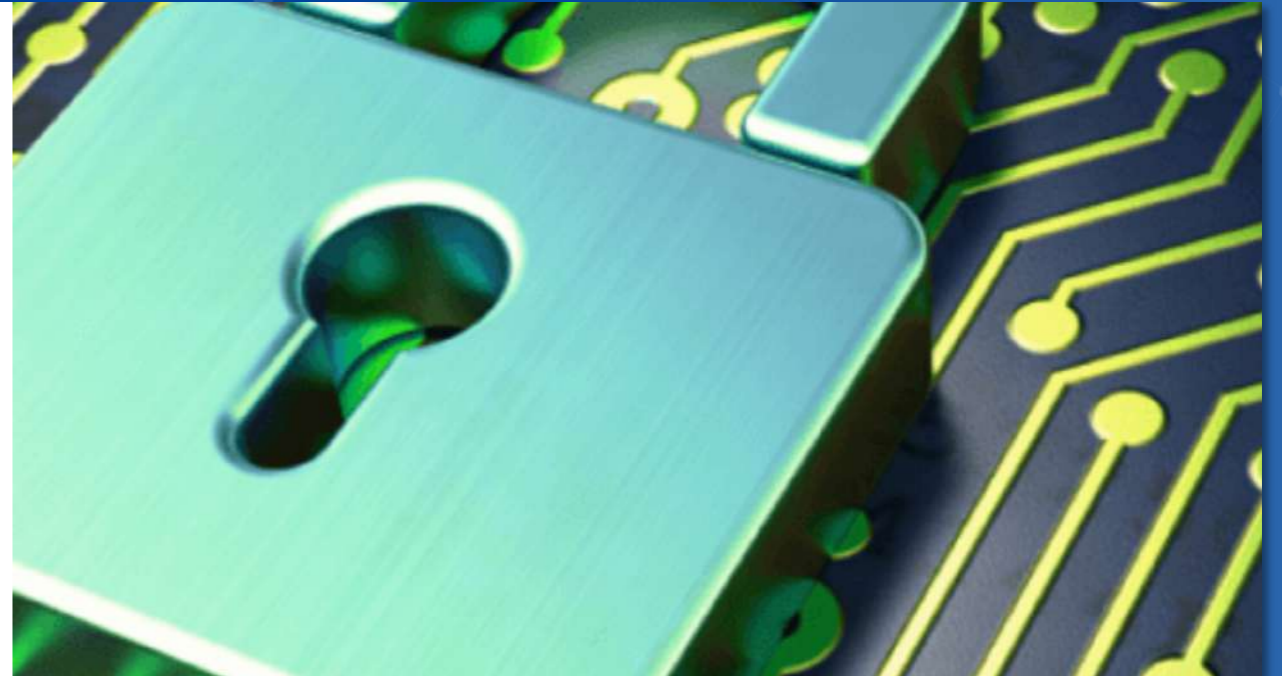
## SOLAR STORMS AND THE SPANISH CRITICAL INFRASTRUCTURES



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. Their later has its origin in solar activity and their associated events, such as solar flares or

## 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.**”*



**Artemisa** completely certified. Infrastructure dedicated to general AI learning.

**ISO 27001** is an international security certification. At IFIC includes the full computing facility, personnel and the scientific committee, and a large number of IFIC components dedicated to perform daily operations. It takes care of 114 controls in 14 groups of interest:

**A.5: Information security policies (2 controls)**

**A.6: Organization of information security (7 controls)**

**A.7: Human resource security - 6 controls that are applied before, during, or after employment**

**A.8: Asset management (10 controls)**

**A.9: Access control (14 controls)**

**A.10: Cryptography (2 controls)**

**A.11: Physical and environmental security (15 controls)**

**A.12: Operations security (14 controls)**

**A.13: Communications security (7 controls)**

**A.14: System acquisition, development and maintenance (13 controls)**

**A.15: Supplier relationships (5 controls)**

**A.16: Information security incident management (7 controls)**

**A.17: Information security aspects of business continuity management (4 controls)**

**A.18: Compliance; with internal requirements, such as policies, and with external requirements, such as laws (8 controls)**

# ISO 27001

**Huge** work by the IT department and committee to document and audit all the system. Official audit happened last week by the certification institute (IVAC).

Name	Last commit	Last update
ANEXO-A	Documento Zonas Carga y Descarga	1 day ago
CLAUSULAS	Update OBJETIVOS-INDICADORES_IFIC-A...	1 day ago
ISO-27001-PUBLICO	Firma dirección 20211111	2 weeks ago
media	Estructura ACTAS y primera entrada: Acta...	2 weeks ago
tools	Incluir hiperlinks autog...	
.gitignore	Organización según IS...	
Makefile	Estructura ACTAS y pr...	

Name	Last commit	Last update
..		
A.05_Politica_seguridad_informacion	Update Politica_de_seguridad_de_la_informacion_ES...	1 month ago
A.06_Organizacion_de_la_seguridad_de...	Clasificación según Uso PUBLICO (sin restricciones), I...	1 month ago
...	Clasificación según Uso PUBLICO (sin restricciones), I...	1 month ago
...	Clasificación según Uso PUBLICO (sin restricciones), I...	1 month ago
...	Clasificación según Uso PUBLICO (sin restricciones), I...	1 month ago
...	Clasificación según Uso PUBLICO (sin restricciones), I...	1 month ago
...	Clasificación según Uso PUBLICO (sin restricciones), I...	1 month ago
...	Clasificación según Uso PUBLICO (sin restricciones), I...	1 month ago
...	Documento Zonas Carga y Descarga	1 day ago
...	Clasificación según Uso PUBLICO (sin restricciones), I...	1 month ago
...	Updated desarrollo seguro	2 weeks ago
...	Update Apendice_Listado_de_provedores_ES.md	2 weeks ago
...	Clasificación según Uso PUBLICO (sin restricciones), I...	1 month ago
...	Clasificación según Uso PUBLICO (sin restricciones), I...	1 month ago
...	Modificado aplicabilidad y ENS	1 day ago

Name	Last commit	Last update
..		
ACTAS	Update Acta_revision_direccion_20211202.md	2 weeks ago
ANALISIS_RIESGOS	Organización según ISO27001 Anexo A.	7 months ago
INVENTARIO_ACTIVOS	Updarte Inventario Activos	2 days ago
OTROS	Update OBJETIVOS-INDICADORES_IFIC-ARTEMISA	1 day ago
.gitignore	Organización según ISO27001 Anexo A.	7 months ago

Name	Last commit
..	
Apendice_Clausulas_de_seguridad_para_prov...	
Apendice_Listado_de_provedores_ES.md	
Politica_de_seguridad_de_los_provedores_y...	





# Artemisa

- Deep Learning studies and **Artemisa** usage at **IFIC** keeps growing. Committee and IT department goal is to support the work. Human resources are limited but always open to comments and suggestions.
- Further upgrades are expected for **Artemisa** facility during the next years. Looking for new resources to improve and enhance the infrastructure (Plan de recuperación, transformación y resiliencia, Horizonte Europa,...)

<http://artemisa.ific.uv.es>

