

# **AI@CERN**

## **Efficiency, Science, Trust**

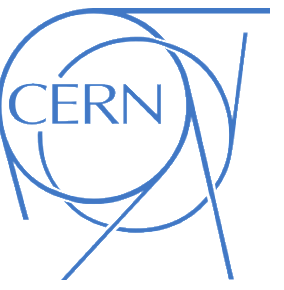
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# A “CERN for AI”



President von Der Leyen called for a European AI Research Council

Draghi EU Competitiveness report points to CERN as a model for effective EU-level coordination on AI

EU Group of Chief Scientific Advisors proposes a European Distributed Institute for AI in Science (EDIRAS)

“A CERN for AI” is part of the CAIRNE (prev. CLAIRE) network vision for European excellence in AI, since 2018

EU based think-thanks (eg. ICFG in Brussels) foster similar ideas



What do we do on AI at CERN?

# Artificial Intelligence at CERN in Research

Machine Learning has been used at CERN since the 1990s

Since early 2000s Deep Learning provides powerful techniques, applicable to a wide range of use cases

Data processing for LHC experiments :

- Anomaly detection and real time data selection
- Data analysis and pattern recognition
- Synthetic data generation and simulation

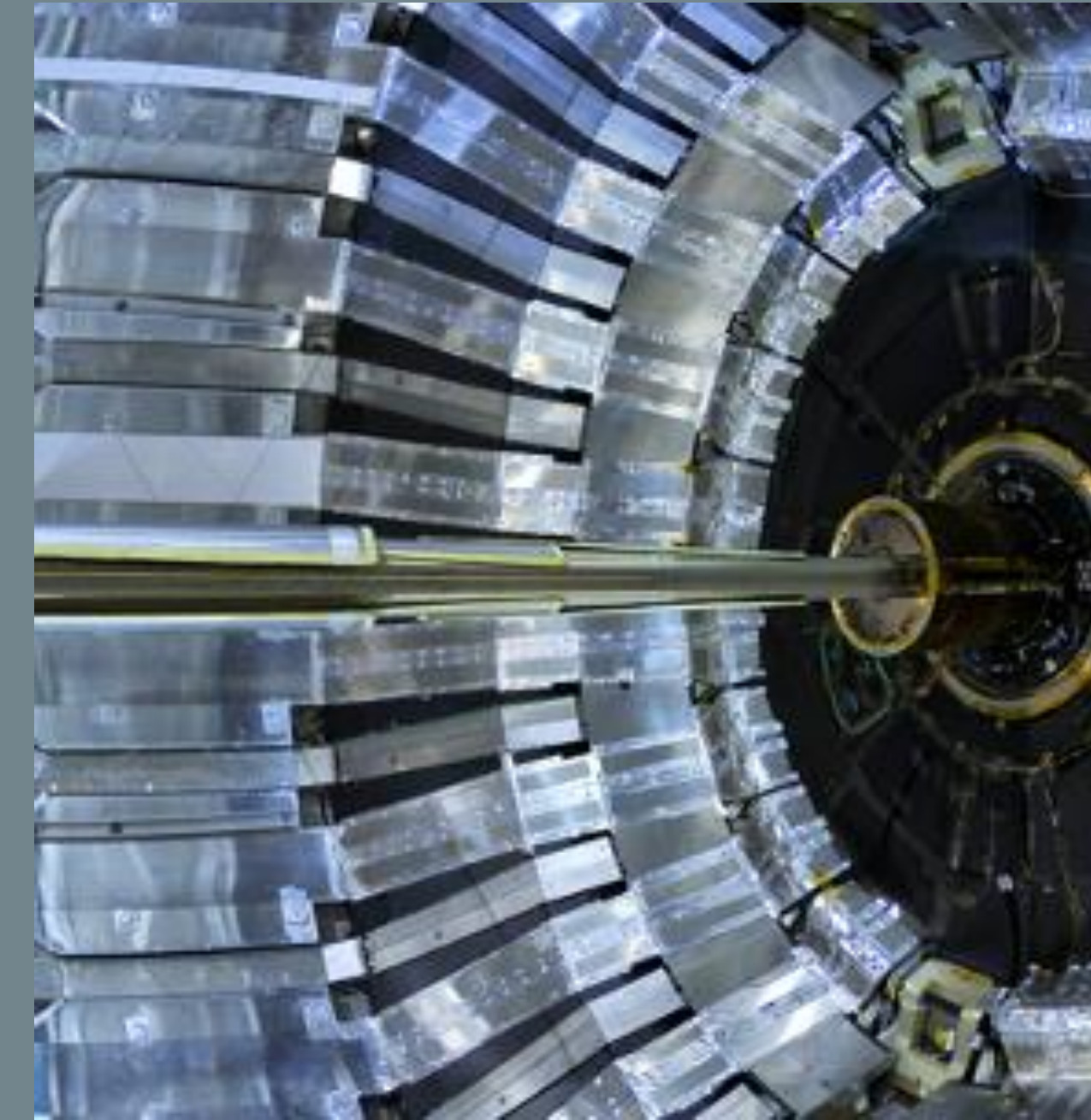
Operations and research in the field of particle accelerators

Engineering and Infrastructure

- Robotics and computer vision

**NB:**

**None of the above applications triggers (Personal) Data  
Protection issues**



AI-based real time data selection:

In just a few microseconds, the complex system can determine whether the information about a given collision event is

worth keeping or not

# Ex. Generative Models in HEP

**Generative AI today «translates to LLMs»** but it is actually a much broader class:

Boltzmann Machines exist since the 1980s **and in HEP we have used them since 2014!**


Ex. CaloGAN (2017), 3DGAN (2017)...

PHYSICAL REVIEW D **97**, 014021 (2018)

**CALOGAN: Simulating 3D high energy particle showers in multilayer electromagnetic calorimeters with generative adversarial networks**

Michela Paganini,<sup>1,2,\*</sup> Luke de Oliveira,<sup>2,†</sup> and Benjamin Nachman<sup>2,‡</sup>

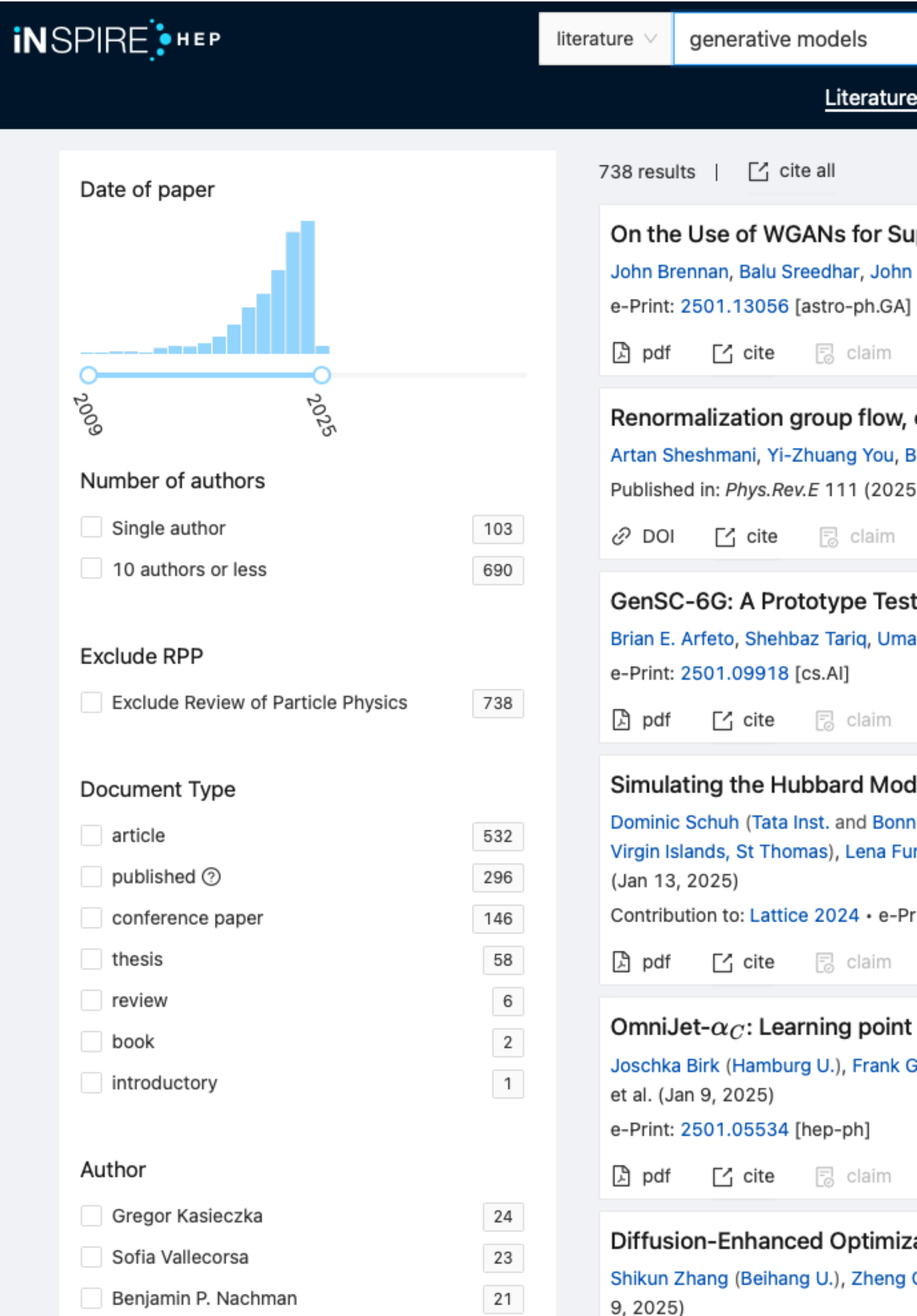
<sup>1</sup>*Yale University, New Haven, Connecticut 06520, USA*  
<sup>2</sup>*Lawrence Berkeley National Laboratory, Berkeley, California 94720, USA*

 (Received 18 July 2017; published 30 January 2018)

ACAT2017  
 IOP Conf. Series: Journal of Physics: Conf. Series **1085** (2018) 022005 doi:10.1088/

**Generative models for fast simulation**

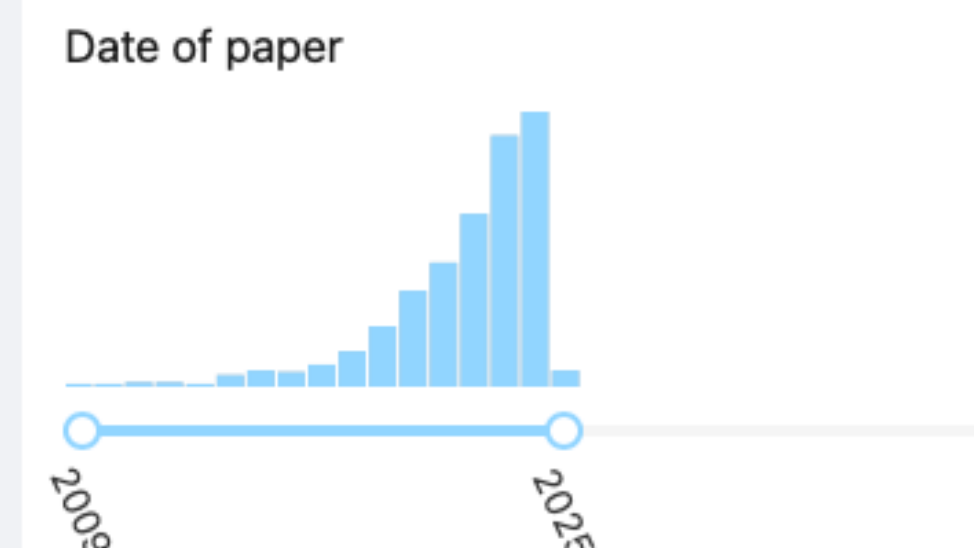
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**INSPIRE HEP** literature generative models

738 results | cite all

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**Author**

- Gregor Kasieczka 24
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 9, 2025)

# Artificial Intelligence at CERN for Productivity & Efficiency

Many commercial AI tools are in use at CERN today, largely unregulated

Notably being used for recruitment, finding and contacting suppliers, modernizing and creating code, content creation, summarizing and editing, translation, research and defect, data and risk analysis

A pilot project to use AI in administrative domains for productivity and efficiency is in progress, to identify quick wins, assess potential gains, and inform future strategy at CERN

Benefits include increased quality of content, time saving, increased engagement of personnel, empowerment for non-technical people

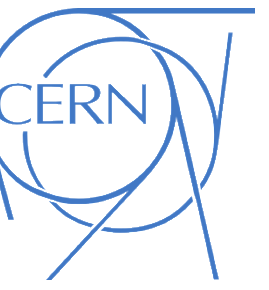
*“ Front end development went from 3 hours to 5 mins ”*

*“ The added value is so big that it’s not an option to not use it ”*

*“ I work in a pair with ChatGPT ”*



# What about AI risks?



Scientific applications at CERN do not suffer from the same kind of risks limiting application in other domains (e.g. AI for Human Right report)

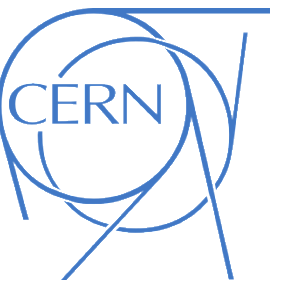
Biases, performance and systematic errors are fully evaluated and characterized during the R&D process by design

While there is an opportunity for CERN to embrace AI in non-scientific tasks for productivity and efficiency gains - here the risks are the same as in any other organization...

Risks include hidden bias, accuracy and transparency of AI outputs, non-alignment of AI with Organizational values, lack of framework for ethical use or proper training and non-democratization of AI use



# AI strategy at CERN ?



We have started an initiative studying the development of “in-house” LLMs

Full data and training pipeline control, full performance characterization for explainability and trust, continuous adjustments to CERN specificity

Expertise and tools to give back to the community?

Setup an AI Initiative addressing the different issues related to scientific AI applications development and AI use for productivity & efficiency

In particular addressing the need for policies, strategy and data privacy risks



**Thanks!**  
**Questions**



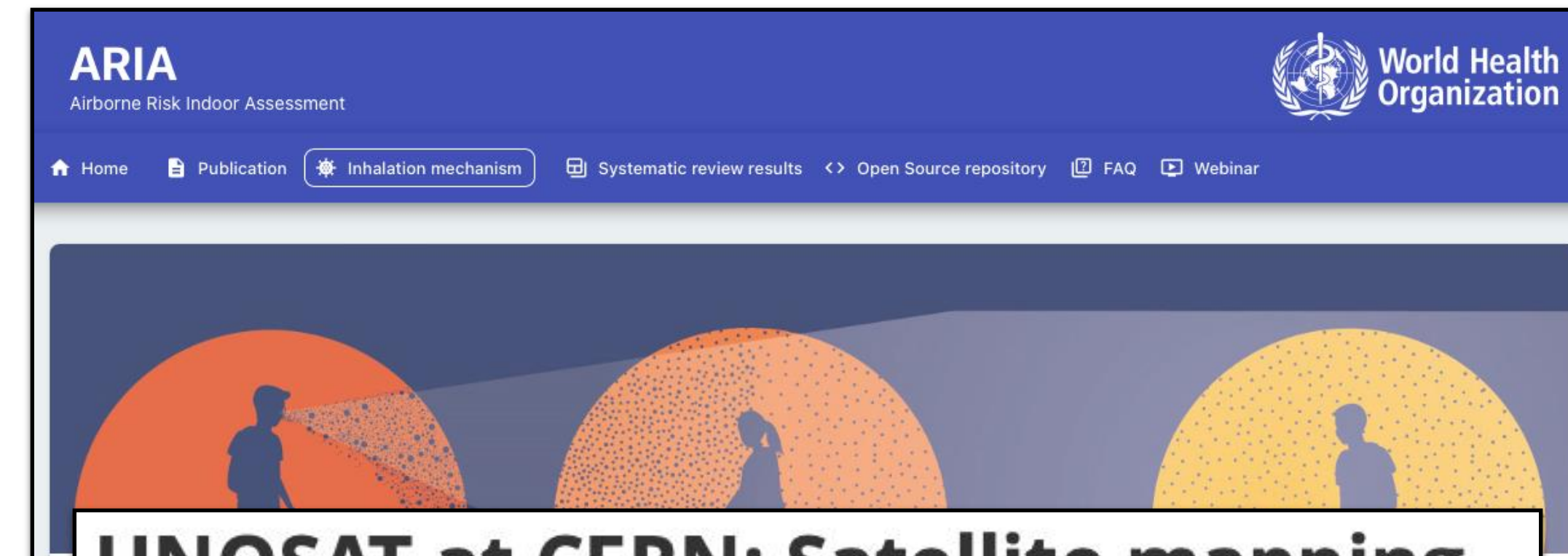
# AI for humanity at CERN

“Unite people from all over the world to push the frontiers of science and technology, for the benefit of all”

from the CERN mission statement

CERN builds collaboration with humanitarian agencies and takes concrete actions to support human rights

- ARIA project with WHO
- AI-based satellite image analysis with UNOSAT (UNITAR)
- Most recently, new collaboration with Luxembourg, LIST and WFP on a series of AI based tools to help improving WFP operations



## UNOSAT at CERN: Satellite mapping for the good of humanity

5 JULY, 2021 | By Cristina Agrigoroae

