

AI in physics: National and European structures

Sascha Caron (Radboud University and Nikhef)

National

European

Institutional

Motivation

- AI is becoming core infrastructure for physics (HEP, APP, GW, theory).
- Not just method development important → but **organization, coordination, and strategy**.

Questions

- *How can we fund AI in physics via national + EU ?*
- *How do we structure AI in physics at European levels ?*
- *How do we connect to and develop national AI initiatives ?*

European: EuCAIF

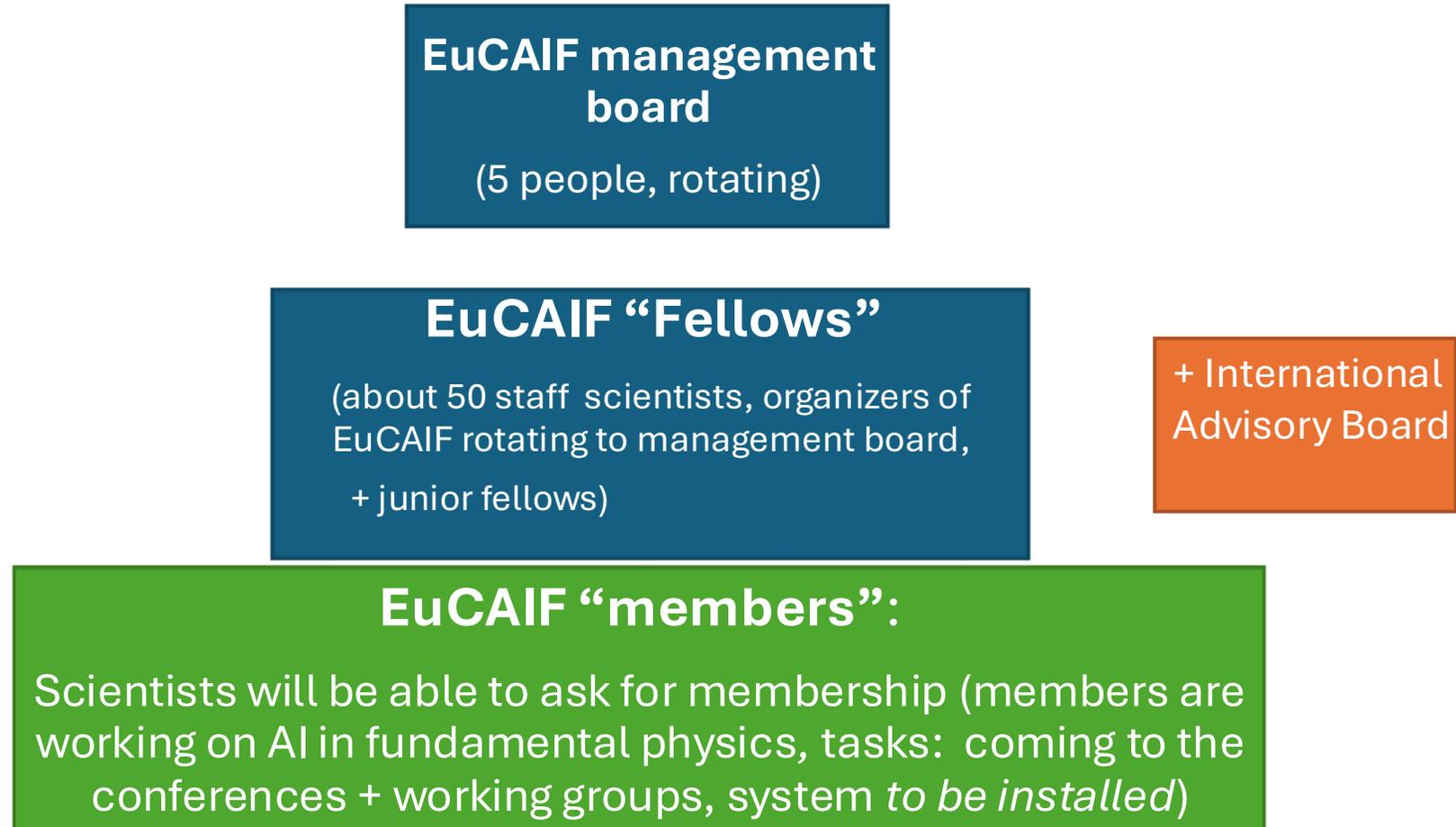
European Coalition for AI in Fundamental Physics *(ECFA, APPEC, NuPECC endorsed)*

- ~60 Fellows + Junior Fellows
- De facto coordinating body for AI in fundamental physics in Europe

Objectives

- EuCAIFCon (European AI-in-Physics conference)
- Strategic engagement (EU strategy & funding)
- Large-scale joint proposals
- Scientific working groups
- ...

EuCAIF organizational structure



EuCAIF Working groups

WG 1: Foundation models & discovery

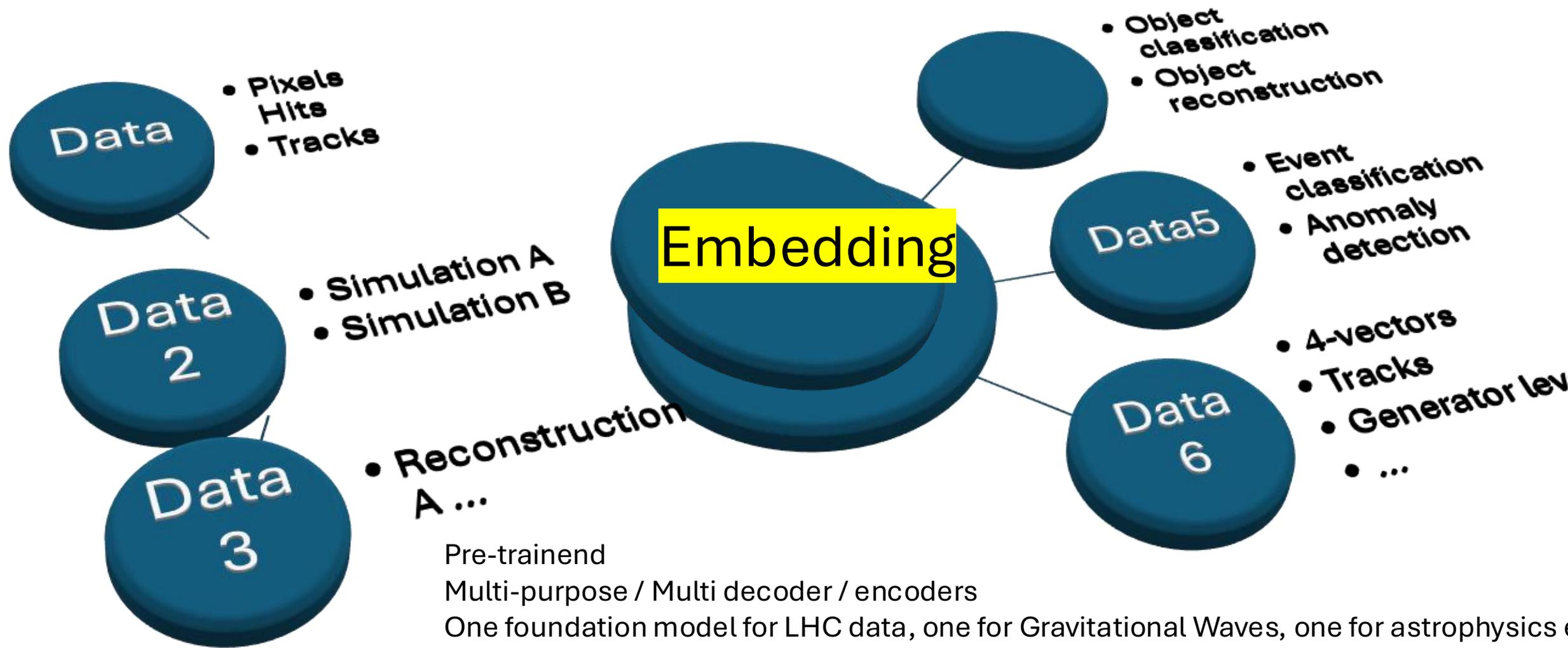
WG 2: AI-assisted co-design of future ground- and space-based detectors

WG 3: FAIR-ness & Sustainability

WG 4: Machine Learning and Artificial Intelligence Infrastructure (JENA WP4)

WG 5: Building bridges - Community, connections and funding

EuCAIF WG : foundation models (Detector -> Physics)



EuCAIF “core group”

Management board

- Sascha Caron (Radboud University and Nikhef, Netherlands)
- Elena Cuoco (European Gravitational Observatory and Scuola Normale Superiore, Italy)
- Johan Messchendorp (GSI/FAIR, Germany)
- Tilman Plehn (Heidelberg University, Germany)
- Christoph Weniger (University of Amsterdam, Netherlands)

uCAIF International Advisory Board: Amber S. Boehnlein (Jefferson Lab), Kyle Cranmer (University of Wisconsin-Madison), Michael Kagan (SLAC, Stanford University)

EuCAIF Fellows: Gert Aarts (Swansea University) Helena Albers (GSI/FAIR, Germany), Lucio Anderlini (INFN Firenze, Italy), Anastasios Belias (GSI/FAIR, Germany)

Valerio Bertone (IRFU, CEA, Université Paris-Saclay, France), Miranda Cheng (University of Amsterdam and Academia Sinica, Taiwan), Elena Cuoco (DIFA- Alma Mater Studiorum University of Bologna and INFN Bologna, Italy), Sascha Caron (Radboud University and Nikhef, Netherlands), Stefano Carrazza (Milan University & INFN, Italy), Caterina Doglioni (University of Manchester, endorser, United Kingdom), Tommaso Dorigo (INFN Padova and University of Padova, Italy), Thomas Eberl (ECAP / FAU Erlangen-Nürnberg, Germany), Martin Erdmann (RWTH Aachen University, Germany), Stefano Forte (Milan University, Italy), Julian Garcia Pardinias (CERN), Stefano Giagu (Sapienza University of Rome), Tobias Golling (University of Geneva, Switzerland), Stephen Green (University of Nottingham, United Kingdom), Eilam Gross (Weizmann Institute, Israel), Will Handley (University of Cambridge, United Kingdom), Lukas Alexander Heinrich (CERN, Iik Siong Heng (University of Glasgow, United Kingdom), Verena Kain (CERN), Gregor Kasieczka (University of Hamburg, Germany), Michael Krämer (RWTH Aachen), Sven Krippendorf (LMU Munich), Andreas Ipp (TU Wien, Austria), Johan Messchendorp (GSI/FAIR, Germany), Lorenzo Moneta (CERN), Daniel Nieto (IPARCOS, Universidad Complutense de Madrid, Spain), Adrian Oeftiger (University of Oxford, United Kingdom), Hiranya Peiris (University of Cambridge, United Kingdom), Maurizio Pierini (CERN), Annalisa Pillepich (MPI, Heidelberg, Germany), Tilman Plehn (Heidelberg University, Germany), David Rousseau (IJCLab, CNRS/IN2P3, U Paris-Saclay, France), Roberto Ruiz de Austri (IFIC/CSIC and University of Valencia, Spain), Veronica Sanz (Sussex&Valencia, United Kingdom & Spain), Steven Schramm (University of Geneva, Switzerland), Steffen Schumann (University of Göttingen, Germany), Nicola Serra (University of Zürich, Switzerland), Nikolaos Stergioulas (Aristotle University of Thessaloniki), Roberto Trotta (SISSA and Imperial College London, Italy & United Kingdom), Sofia Vallecorsa (CERN), Pietro Vischia (Universidad de Oviedo and ICTEA, Spain), Benjamin Wandelt (Institut d'Astrophysique de Paris, Sorbonne Université, France), Christoph Weniger (University of Amsterdam, Netherlands), Gabrijela Zaharijas (Center for Astrophysics and Cosmology (CAC), University of Nova Gorica, Slovenia)

If you like to follow the activities of EuCAIF please join the following e-group: eucaif-info@cern.ch

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(University of Glasgow, United Kingdom), Verena Kain (CERN), Gregor Kasieczka (University of Hamburg, Germany), Michael Kramer (RWTH Aachen), Sven Krippendorff (LMU Munich), Andreas Ipp (TU Wien, Austria), Johan Messchendorp (GSI/FAIR, Germany), Lorenzo Moneta (CERN), Daniel Nieto (IPARCOS, Universidad Complutense de Madrid, Spain), Adrian Oeftiger (University of Oxford, United Kingdom), Hiranya Peiris (University of Cambridge, United Kingdom), Maurizio Pierini (CERN), Annalisa Pillepich (MPI, Heidelberg, Germany), Tilman Plehn (Heidelberg University, Germany), David Rousseau (IJCLab, CNRS/IN2P3, U Paris-Saclay, France), Roberto Ruiz de Austri (IFIC/CSIC and University of Valencia, Spain), Veronica Sanz (Sussex&Valencia, United Kingdom & Spain), Steven Schramm (University of Geneva, Switzerland), Steffen Schumann (University of Göttingen, Germany), Nicola Serra (University of Zürich, Switzerland), Nikolaos Stergioulas (Aristotle University of Thessaloniki), Roberto Trotta (SISSA and Imperial College London, Italy & United Kingdom), Sofia Vallecorsa (CERN), Pietro Vischia (Universidad de Oviedo and ICTEA, Spain), Benjamin Wandelt (Institut d'Astrophysique de Paris, Sorbonne Université, France), Christoph Weniger (University of Amsterdam, Netherlands), Gabrijela Zaharijas (Center for Astrophysics and Cosmology (CAC), University of Nova Gorica, Slovenia)

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EuCAIF guidelines and procedures

Sascha Caron, Elena Cuoco, Johan Messchendorp, Tilman Plehn, Christoph Weniger

EuCAIF management board 2025

Abstract

This document describes the EuCAIF guidelines and procedures. EuCAIF strengthens European research in fundamental physics by fostering cooperation and scientific exchange on machine learning and AI, connecting experts across physics and computational sciences, and training the next generation of researchers. It provides a community framework that stimulates new collaborations, supports coherent long-term planning, and helps develop a shared vision and direction.

Contents

1 Introduction	1	<i>research with computational experts and AI/ML researchers.</i>
2 Membership and fellowships	2	This document defines the guidelines, rules, and procedures of EuCAIF, with the aim of ensuring stability while maintaining agility, inclusiveness, and a bottom-up, community-driven structure that serves the needs of the community. Their implementation is overseen by the EuCAIF Management Board. Amendments may be proposed by the Management Board and require approval by a simple majority vote of all EuCAIF fellows.
3 Management Board	3	
4 Advisory Board	4	
5 EuCAIFCon	4	
6 EuCAIF School	5	
7 EuCAIF Working Groups	6	For long-term sustainability and effectiveness, a formal legal status may be beneficial. The Management Board may explore possible legal models, including an association, a not-for-profit foundation, or integration within existing European research infrastructures, in coordination with JENAA. No specific structure is proposed at this stage. Amendments concerning the legal sta-
8 Funding and Community Support	6	
9 Outreach and Web Presence	7	
1 Introduction		

European RAISE

“RAISE – the Resource for Artificial Intelligence Science in Europe”

- Flagship European initiative
- Pillars:
 - **AI in Science**
 - **Science for AI → This is us !** ~€100M per year (various funding calls)
 - Computing infrastructure
- Funding instruments:
 - Small-scale projects
 - ~€15M network initiatives
- **Next major opportunity: 2027 network call, end of 2026 for synergy grant scale**

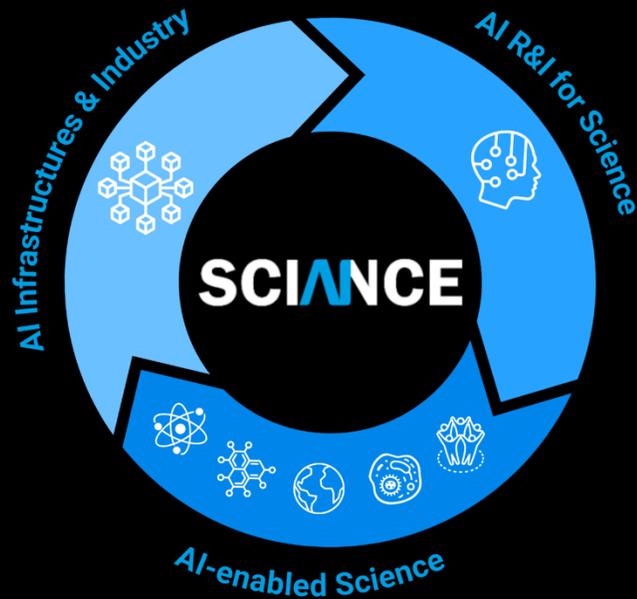
European: RAISE – networks of excellence

Topic	↑	Budget year : 2026	↓↑	Stages	↓↑	Opening date	↓↑	Deadline	↓↑	Contributions	↓↑
HORIZON-RAISE-2026-01-01 - HORIZON-RIA HORIZON Research and Innovation Actions		€15,000,000.00		Single-stage		6 January 2026		21 April 2026		around €15,000,000.00	

“2026 call: proposes applications from material science”

SCIENCE Overview

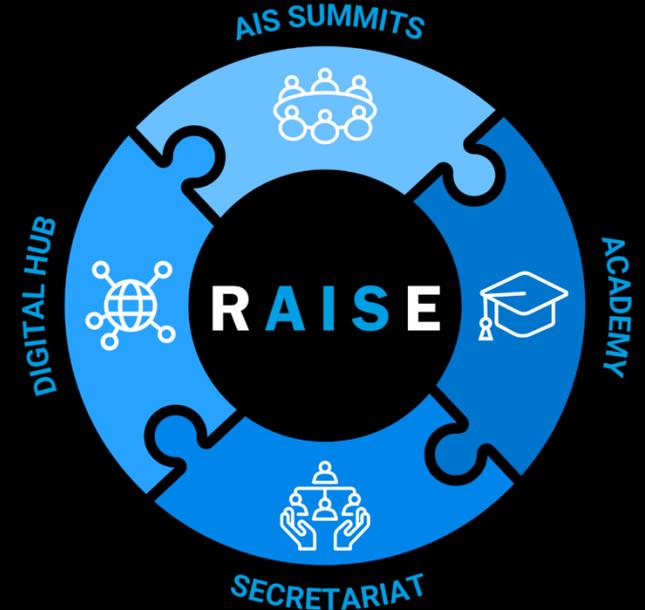
SCIENTIFICALLY
CREDIBLE



AI in Science & AI for Science



STRATEGICALLY
ALIGNED



SCIANCE and RAISE

SCIANCE is coordinating an support action for RAISE
Nikhef responsible for fundamental physics

Activities:

- Set up AI in physics expert panel for europe
- Set up Strategic adviosory board
- Define / summarize scientific priorities
- Organize AI in science summits
- Others (see backup slides)

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We / Nikhef need to assign
a deputy for physics

European - CERN

- AI strategy / plan under construction, however this will arrive soon

National Level (Netherlands)

AI Coalition for the Netherlands (AIC4NL)

Since 2025: merger of

NL AIC (largest AI community in NL)

AiNed (largest Dutch AI programme; National Growth Fund)

Strategic Agenda 2025–2027

No explicit mention of **AI in Science / Fundamental Physics**

No visible structural involvement of physics

→ **gap at the national level**

→ **Opportunity to position AI in Science nationally**

Strategic agenda:

https://aic4nl.nl/wp-content/uploads/2024/12/AIC4NL-Agenda-2025-2027_def.pdf

National Level -- Funding

There is **no dedicated national AI-for-science initiative in the Netherlands**. Physics groups have to compete under:

- broad science funding calls (e.g., through NWO),
- general AI or data infrastructure programmes,
- or EU programmes (like Horizon Europe / RAISE / ERC).

--- Extra slides ---

Why SCIENCE?



Bottom-up approach for AI-enabled scientific research across Europe, involving the scientific community directly



Facilitate cross-domain collaborations between scientific disciplines, AI research, industry and EU infrastructures



Improve data access, infrastructure capabilities, and skills, through feasible upgrades scenarios



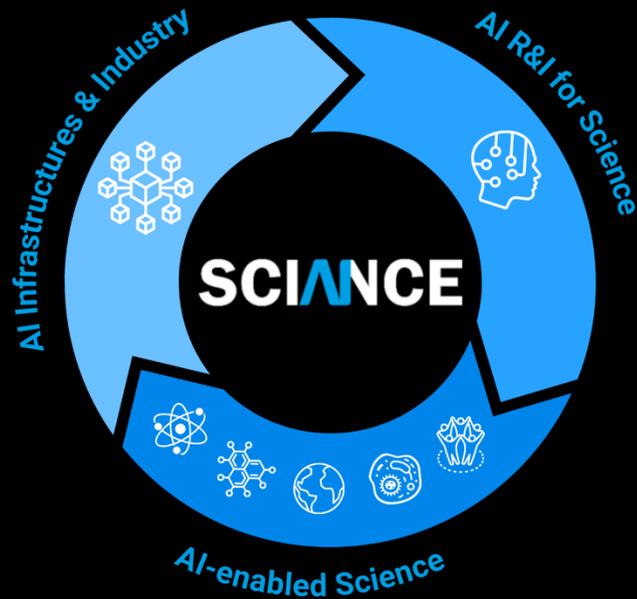
Provide structured guidance, cooperation mechanisms and strategic priorities, via a SRIA and implementation roadmap



Increase visibility and integration of AI research and innovations for scientific research

SCIENCE Overview

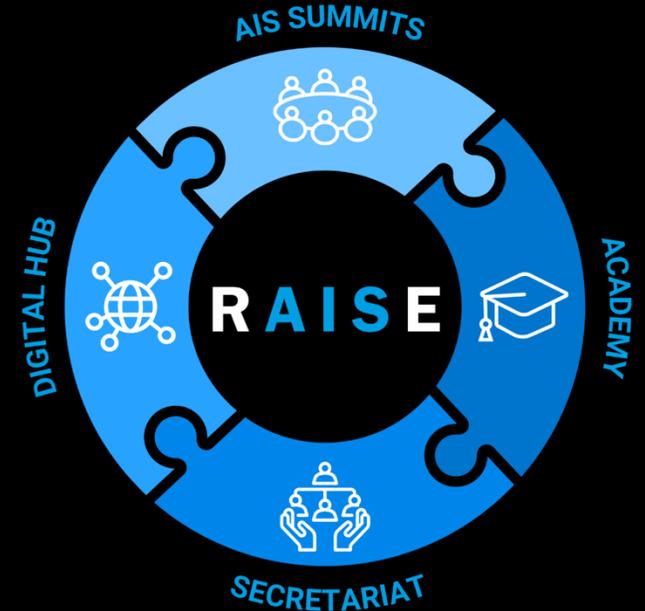
SCIENTIFICALLY
CREDIBLE



AI in Science & AI for Science

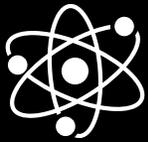


STRATEGICALLY
ALIGNED



AI in Science Priorities

Scientific Pilot Areas



Physics &
Astronomy

Nikhef &
University of
Manchester



Materials
Science

Constructor
University



Earth
Sciences

Twente
University ITC



Life
Sciences

Euro-
BioImaging



Social Sciences
& Humanities

CNR-ISTI
(SoBigData)



Evidence
Base



SRIA

Co-creation and Alignment with EU priorities



AI in Science Working Groups

Co-creation process involving AI in Science Working Groups to identify SRIA priorities, infrastructure upgrade requirements and cooperation mechanisms, supported by the [RAISE Secretariat](#)



Community Consultations

Validation through broader consultations via [RAISE Digital Hub](#), partner networks and dedicated events at AIS summits



Strategic Advisory Board

Continuous feedback with key European actors including research infrastructure, AI networks and infrastructures, EC & member states (ERA action) and industry.



Policy Alignment

Coordination with European policymakers, including European Commission, Member States, and relevant European initiatives

AI in Science Community Building and Sustainability



RAISE Secretariat pilot for AI in Science

- Support RAISE AI in science coordination activities and SCIANCE AI in Science Working Groups
- Facilitate cooperation and community building within the AI in Science Ecosystem
- Explore operational scenarios and potential funding models to support AI-enabled science beyond the project
- Ensure continuity and sustainability of SCIANCE key exploitable results and project assets for RAISE



RAISE Digital Hub

- Online platform for project resources, best practices, consultation tools, outputs from domain-specific pilots, and training resources
- Long-term access portal for RAISE AI in Science, interface with broader scientific communities and infrastructures



RAISE Academy pilot and Bootcamp

Targeted capacity-building to equip decision-makers with knowledge and tools needed to implement the SRIA



AIS Summits Events

Co-organised sessions, community events, roundtables and consultations at AIS summits.