AISSAI : AI for Science, Science for AI

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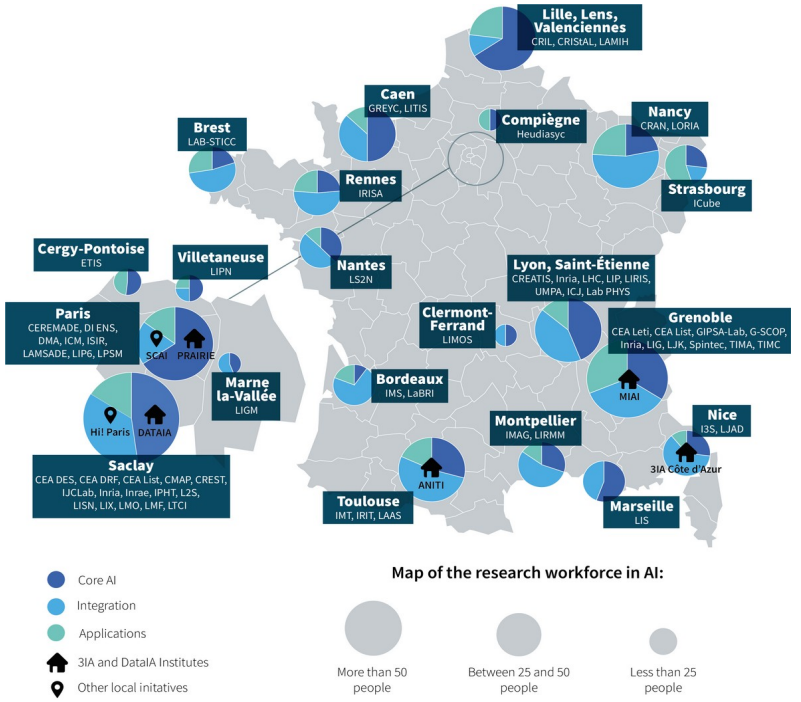
AI @ CNRS

- For CNRS, it is key to address AI from an **holistic standpoint**: all **sciences** are either being **impacted** if not reshaped by **AI**.
- Scientific organizations like the CNRS have responsibility to **help policy makers and public opinion** understand the implications, benefits and possible risks of AI.
- Within the National strategy in AI, CNRS has been actively involved in several AI programs:
  - **9 AI clusters**
  - **Choose France** – CNRS AI Rising talents.
  - CNRS operates the **Jean Zay** national supercomputer for AI and **engineers network.**
  - Co-coordination of the **PEPR AI** oriented towards trustworthy, embedded and decentralized AI.
  - Creation of **AISSAI center**.



AI for Science, science for AI

AI center launched by CNRS in 2021 https://aissai.cnrs.fr/aissai/

Foster dialogue between scientific disciplines in interaction with AI.

Establish new modes of collaboration between scientific fields far beyond the simple assimilation of AI methods.

Address domain-specific strategic questions such as interpretability, explainability, expert knowledge, robustness, ethics, frugality, etc.

Address new scientific questions and accelerate scientific discovery in all CNRS spectrum of science (physics, chemistry, materials, biology, ecology, humanities, etc.).

Build ties with other similar **centers abroad**.

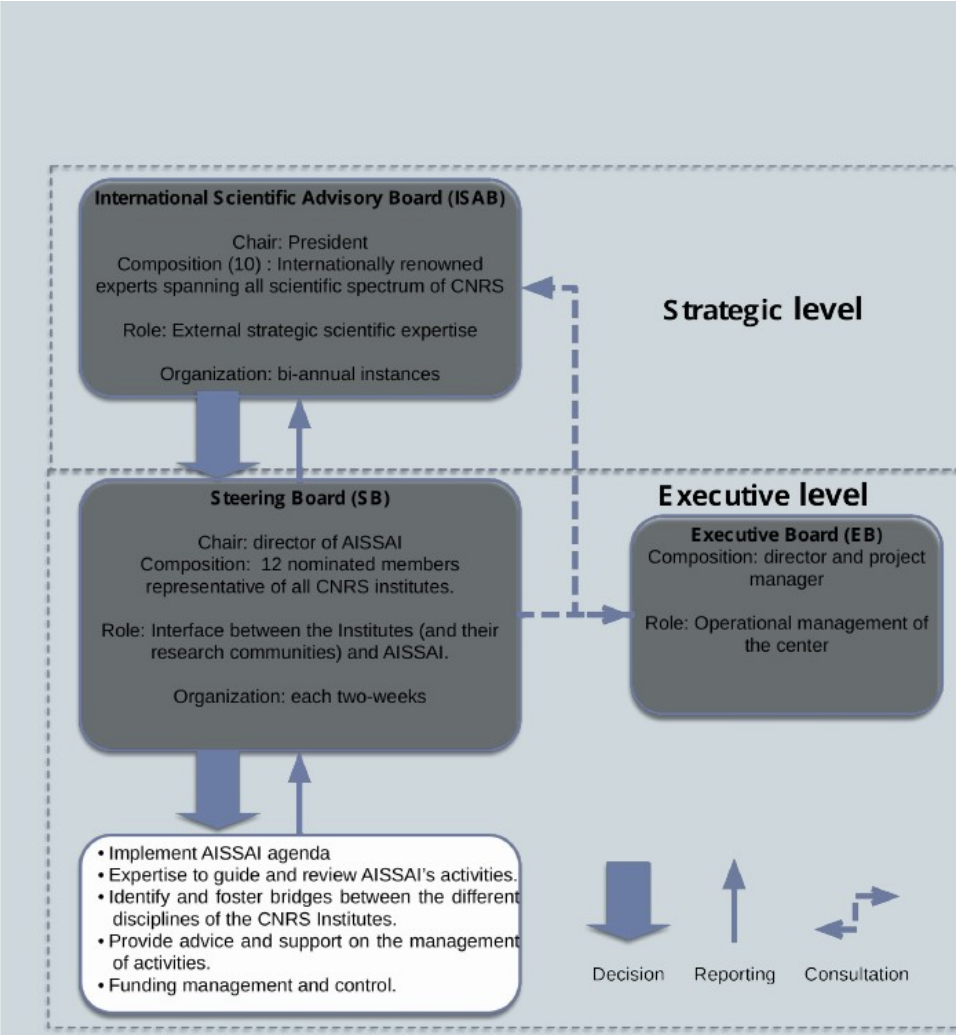
AI for Science, science for AI

Governance

ISAB:
- Tanya Berger-Wolf (Ohio State University)
- Stephen Cave (Cambridge)
- Claudia Draxl (Humboldt-U. zu Berlin)
- Antoine Georges (Flatiron & Collège de France)
- Alfred Hero (NSF)
- George Karniadakis (Brown)
- Emma Lundberg (Stanford)
- Brice Ménard (John Hopkins)
- Jesse Thaler (MIT)
- Rebecca Willett (U. Chicago)

Executive Committee:
- Director: Jalal Fadili.
- Project manager: Vincent Folliard.

Steering Committee: members representative of each CNRS department.



AI for science, science for AI

Thematic trimesters

- Develop over a period of **3-6 months** an **in-depth scientific program** on an existing or future research topic at the interface between AI and one or more other scientific disciplines.
- **Conferences**, workshops, tutorials, seminars, round-table meetings, visiting professors, etc..
- Training **schools** related to AI for researchers from different communities (e.g., Les Houches Summer School of Physics, 2022 and 2023).
- Program must be linked to the center's other scientific activities, in particular the **fellows and their teams**.
- **5 thematic programs** have been organized since 2022, are underway or will be by the end of 2024: Phystat-AI, Causality in AI, Astro-ML, **AI and Particle physics**, Computational humanities.
- Other programs are in discussion (Exascale and AI, material sciences, genomics, biodiversity, etc.).
- Top-down and bottom-up open calls

AISSAI
AI for science, science for AI

Fellowship Program

- An **international call** for researchers from **foreign academic** institutions.
- Individual **12 or 24-month research projects** in a CNRS laboratory and within the framework of AISSAI.
- Serve as opportunities to sow the seeds of interdisciplinary scientific collaborations.
- Fellows must **commit to participating** fully in the scientific life of **AISSAI**.
- Fellows will benefit from an **environment package** including post-doctoral fellows, doctoral students, visitors, travels, etc.

A new call is in preparation for 2025

Call for postdocs (2024)

Call for **5 multidisciplinary post-docs**:

- At the interface of AI and other sciences.
- (At least) 2 labs-2 disciplines.

Appel à candidatures
Bourses post-doctorales IA et Sciences
« Centre AISSAI »

Le Centre AISSAI lance un appel à candidatures pour des bourses post-doctorales afin de financer des projets interdisciplinaires aux interfaces Intelligence Artificielle (IA) et sciences et dont la mise en œuvre nécessite la collaboration entre équipes de recherche dans des laboratoires issus d'au moins deux Instituts du CNRS. L'IA est à comprendre ici au sens large couvrant les méthodes d'apprentissage automatique, le traitement et la préparation des données, etc.
Cinq projets seront financés en 2024/2025 pour une période de 18 à 24 mois.

Call launched in September 2024 (closed): results expected in December

Encountered a very large interest : **55 projects** deposited (4 from IN2P3)

AI for science, science for AI

International Coopération

- Build strong ties with **similar centers abroad ➡ international network**.
- We have been approached by several centers abroad to forge links and collaborations: IVADO (Québec), U. of Chicago, U. of Oxford, IRC U. Tokyo.
- **IVADO**:
  - A roadmap has been drawn up and is currently under implementation.
  - **Working groups** on specific subjects: **neuroscience, materials and molecule discovery, environmental sciences, AI human in the loop**.
- **U. Tokyo**:
  - Ongoing working group with U. Tokyo on IA and Science (extreme events, climate).
- Other entities: Google, Kyutai, ELLIS, Singapore, etc.

AISSAI IN2P3 Program

Series of events planned from July 2023 to October 2024

- Initiated by David Rousseau (IJCLab) and Alexandre Boucaud (APC)
- With support from Jalal Fadili and Vincent Folliard (AISSAI)

Bring together scientist from astro, particle physics, computer science, statistics, industry, instrumentation, medicine, ...

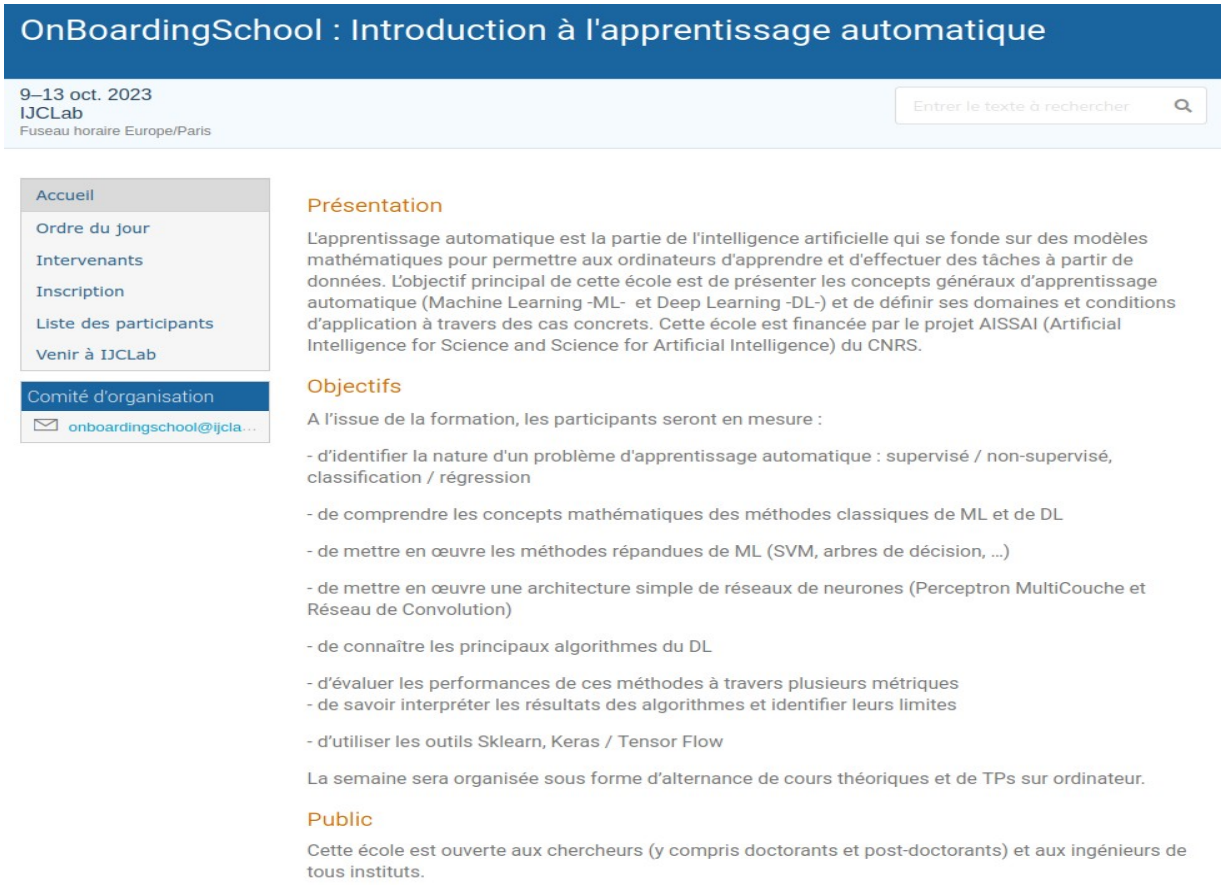
Share knowledge & experience

Create **collaborative environment**

AISSAI IN2P3 Semester

July 3-7 2023, Fréjus, https://aissai-hackathon.astroinfo.in2p3.fr/

Dedicated **AISSAI Hackathon** after Astroinfo 2023 school ⇒ Outcome: **3 ML projects**



OnBoardingSchool : Introduction à l'apprentissage automatique

9–13 oct. 2023
IJCLab
Fuseau horaire Europe/Paris

Entrer le texte à rechercher

Accueil
Ordre du jour
Intervenants
Inscription
Liste des participants
Venir à IJCLab

Comité d'organisation
onboardingschool@ijcla...

Présentation

L'apprentissage automatique est la partie de l'intelligence artificielle qui se fonde sur des modèles mathématiques pour permettre aux ordinateurs d'apprendre et d'effectuer des tâches à partir de données. L'objectif principal de cette école est de présenter les concepts généraux d'apprentissage automatique (Machine Learning -ML- et Deep Learning -DL-) et de définir ses domaines et conditions d'application à travers des cas concrets. Cette école est financée par le projet AISSAI (Artificial Intelligence for Science and Science for Artificial Intelligence) du CNRS.

Objectifs

A l'issue de la formation, les participants seront en mesure :

- d'identifier la nature d'un problème d'apprentissage automatique : supervisé / non-supervisé, classification / régression

- de comprendre les concepts mathématiques des méthodes classiques de ML et de DL

- de mettre en œuvre les méthodes répandues de ML (SVM, arbres de décision, ...)

- de mettre en œuvre une architecture simple de réseaux de neurones (Perceptron MultiCouche et Réseau de Convolution)

- de connaître les principaux algorithmes du DL

- d'évaluer les performances de ces méthodes à travers plusieurs métriques
- de savoir interpréter les résultats des algorithmes et identifier leurs limites

- d'utiliser les outils Sklearn, Keras / Tensor Flow

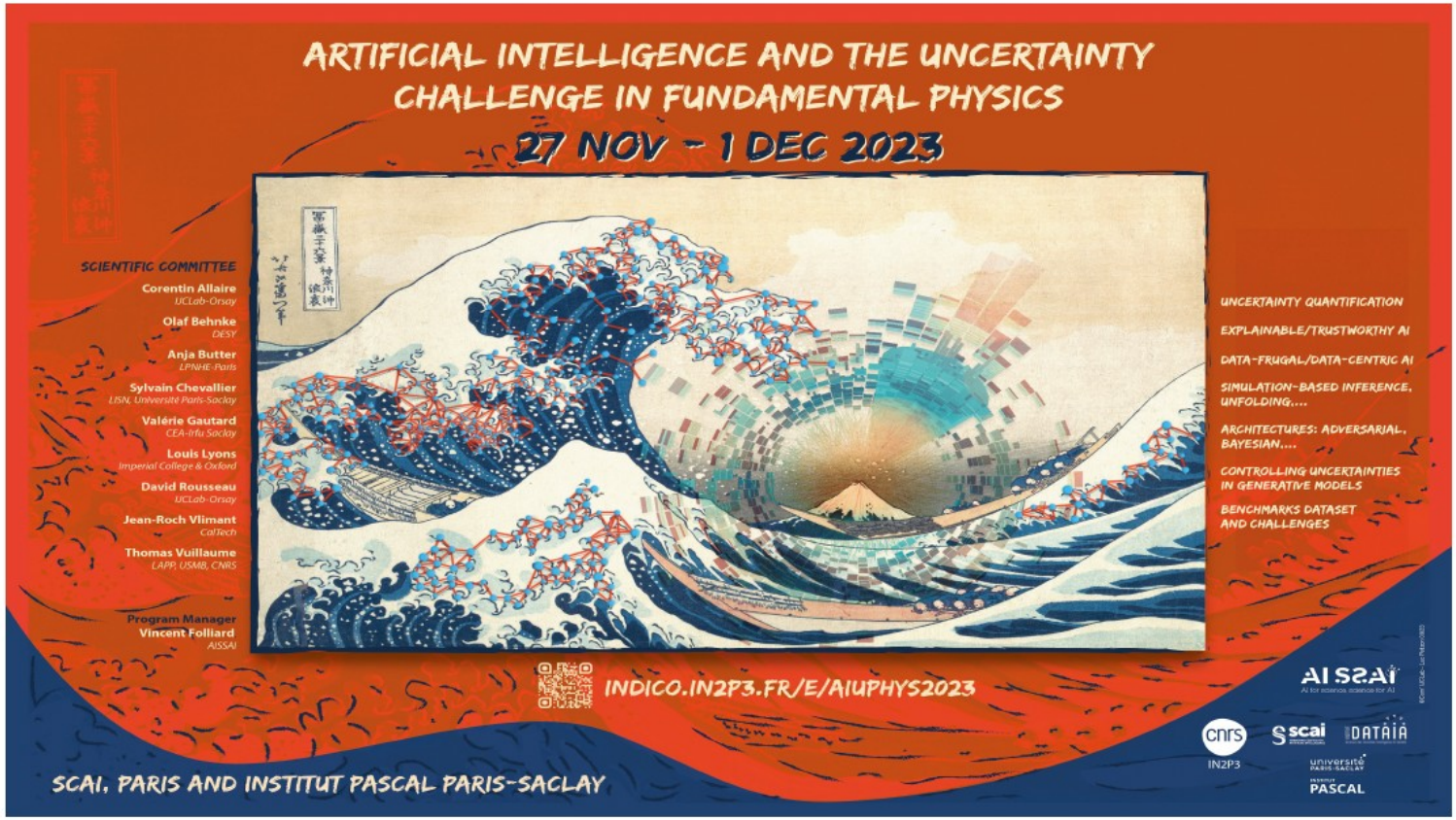
La semaine sera organisée sous forme d'alternance de cours théoriques et de TPs sur ordinateur.

Public

Cette école est ouverte aux chercheurs (y compris doctorants et post-doctorants) et aux ingénieurs de tous instituts.

Oct 9-13 2023, IJCLab, https://indico.ijclab.in2p3.fr/event/9597/

1-week **introductory ML school** for students, engineers and physicists



27 Nov-1 Dec 2023, Paris, Paris-Saclay, https://indico.in2p3.fr/event/30589/

Quantifying uncertainty in ML: uncertainty prediction, controlling impact of uncertainties

AISSAI IN2P3 Semester

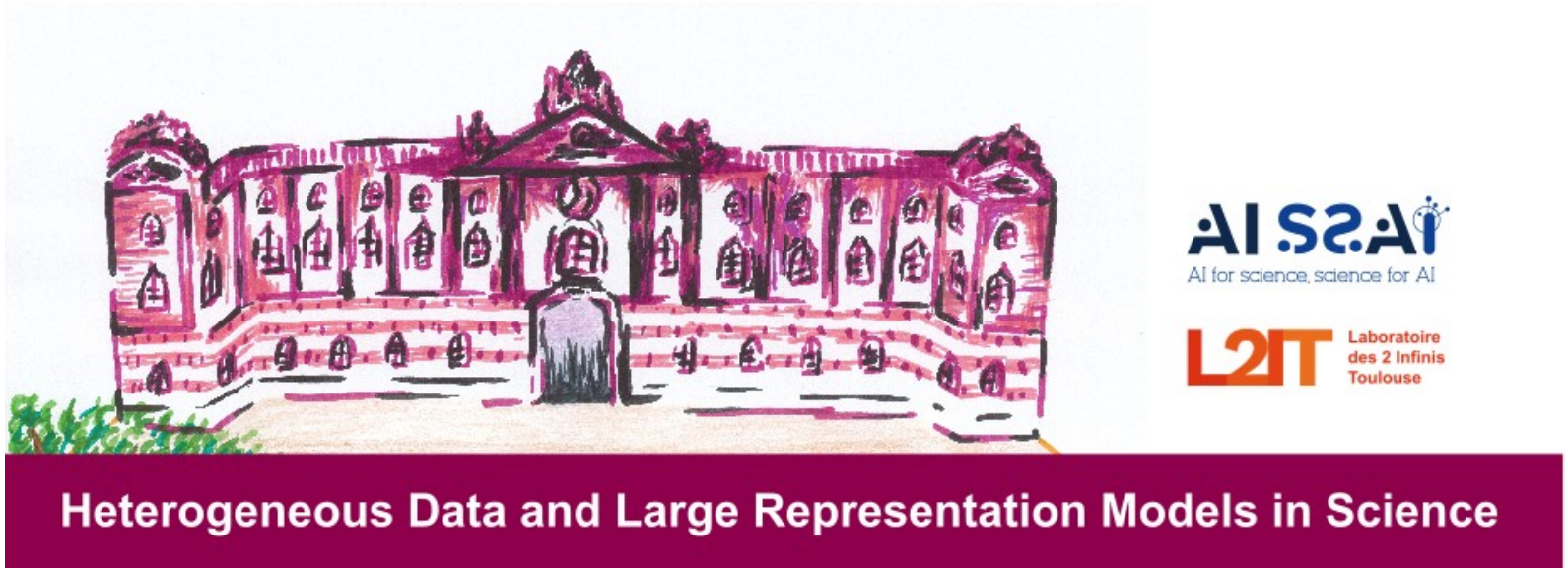
ML for anomaly detection (HEP, Cosmology), real-time anomaly detection

Transverse applications : Industry, medicine, biology

4-7 Mars 2024, Royat,https://indico.in2p3.fr/e/AISSAI2024

Workshop AISSAI at Toulouse: Sept. 30 – October 4

Heterogeneous Data and Large Representation Models in Science



https://indico.in2p3.fr/event/33412/

Proposing another Trimester ?

Submit a thematic trimester proposal:

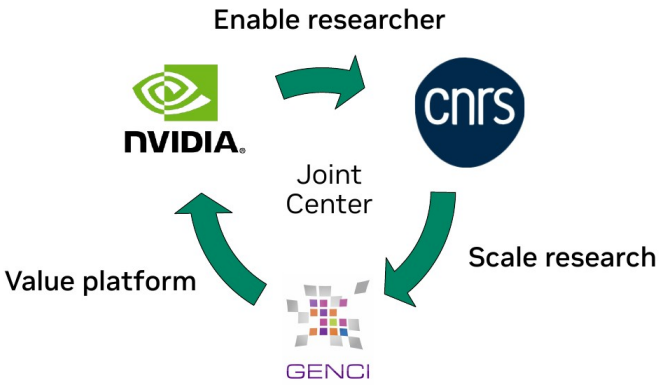
https://aissai.cnrs.fr/en/evenement/call-for-thematic-program/

Discussed several ideas during this workshop

- ANF school on LLM / RAG ?
- Workshop on AI for metasciences ?
- AI and accelerator monitoring ?
- Quantum Computing and Machine Learning ?

News / Events

- PNRIA : Réseau des ingénieurs CNRS du Programme national de recherche en intelligence artificielle



- MoU signed between NVIDIA and CNRS last July
  → Discussion with NVIDIA AI Technology Center (Expertise, training ?)

- AI Action Summit (10-11/02)
  → AI for Sciences (6-7/02)

- ANR TSIA (deadline 17/03)

- Workshop Helmholtz AI in July (Karlsruhe)
  Session dedicated to IN2P3 projects ?

AI-Clusters

9 IA-Clusters funded by France 2030 were announced last May

→ **Training, research and innovation in AI**

Within the perimeter of **several IN2P3 labs**:

- MIAI Cluster (UGA, UCA, USMB) – 70 M€: **LPCA, LPSC, LAPP**
- DATAIA-Cluster (Université Paris Saclay) – 20 M€: **IJCLab**
- Hi! PARIS Cluster 2030 (Polytechnique Paris) – 70 M€: **LLR**
- PR[AI]RIE – PSAI (Paris Sciences et Lettres) – 75 M€: **APC**
- PostGenAI@PARIS (Sorbonne) – 35 M€: **LPNHE**
- ANITI IA Cluster (Toulouse) – 20 M€: **L2IT**

It is important to find out more and contact people in charge of these

→ Opportunities for funding research, HR, teaching and training

Conclusion

Motivation of **AISSAI** is to structure and organise cross-disciplinary actions involving all CNRS institutes at the interfaces with AI

- Scientific actions: thematic trimesters, postdocs, fellowships, etc
- Several other opportunities for funding AI & Science topics
- Stay tuned !

Backup

CERN Openlab and IA

CERN Openlab: public-private partnership between CERN, research organisations and industry, with the aim of accelerating the development of cutting-edge computing technologies for research

R&D directions related to AI:

Sustainable infrastructures: AI algorithms, platforms and applications

- Distributed AI optimization, generative AI, foundation models, AI-based algorithms on modern computing architectures, real-time AI inference

Emerging Technologies

- Digital twins : InterTwin, CAD-based digital twins
- Quantum computing and networks

Interesting for IN2P3 to join this collaboration for IT R&D projects

An **information meeting** will be organized October 11th with Sabine