AI group – status & plans

Wouter & Sascha

Goals of the AI of group - 1

**1 - Connect and coordinate AI/ML activities
of PP/APP scientists within the Nikhef portfolio**

- Support Nikhef science programs **over the full range** (LHC, APP, GW, Theory)

- Maintain **in-house expertise** on 'AI for Science' techniques that are of importance for Nikhef science

- **Work with scientists** on physics groups to work on concrete AI issues in their physics application

- Define and organize **AI education/training programs** for PhD/PD as well as staff

- Pursue **own research program on AI techniques** with potential impact on PP/APP,
in collaboration with experts in the field (national & international / physics & computer science & math)

   ✓ **Theme 1: How can we use AI's power for fundamental physics?**
   *Efficiently deployment of AI-models to 'learn the physics and the detector'
   from the full scope of available data, instead of processed, reduced data.*

   ✓ **Theme 2: How do we make AI scientifically trustworthy?**
   *How to make AI-models interpretable and aware of uncertainties, unknowns, and
   imperfectly specified domain knowledge that are essential for producing scientifically rigorous results.*

Goals of the AI of group - 2

2 - Liaison role with the broader national AI/ML research community outside (A)PP

Status:

- AI-in-science/physics activities in the NL not connected so far

- Good connection of Nikhef and national supercomputer center SURF, connections to AI departments

- No dedicated funding for AI in science

Opportunities:

- Help to build the national AI-in- science landscape

- Position for future national AI funding (e.g. sector plan for physics)

- National AI factory

Goals of the AI of group - 3

**3 – Be active participant in (future) European AI4Science coalitions for large-scale AI applications.**
"organize visibility/influence"

Status:

- **EuCAIF** (*European Coalition for AI in fundamental Physics*) de facto organization body for AI in fundamental physics
  (S.C. Management board/PI of original proposal)

- **CERN** has announced an AI strategy, but is just starting

- **EU** is starting a pilot for 100-1000 Million Euro "AI-in-science" funding with RAISE
  (Nikhef/S.C. coordinator of physics of the support and coordination action SCIANCE)

Opportunities:

- Help to build the European AI-in- science landscape

- Position for future European AI funding (e.g. RAISE, EU)

- Collaborate in European AI-in-physics R+D actions (e.g. EuCAIF)

- Collaborate with international partners
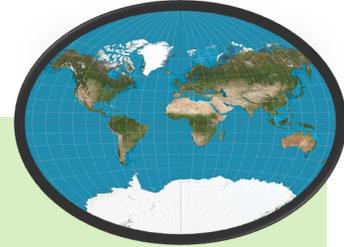
Group plans - before summer

- **Connect to the Nikhef programs**
  - **Visit all programs** (e.g. in their weekly meeting) for a brief presentation followed by an **interactive discussion** on areas of interest in AI/ML
  - Collect ideas and partners for collaboration, preferred ways for modes of cooperation needs for education and training

- **Define focus areas of AI/ML research of the core group for the medium term**
  - Based on input of groups **define a few key research themes** where core group will focus on (examples 'Simulation-based inference', 'AI track reconstruction' – but actual list of topics to be defined after consultation round with the groups)

- **Define initial modus operandi of group**
  - Internal organization of AI/ML research work
  - Scope and topics of regular meetings with core team and interested scientists

- **Kick of AI/ML training program**
  - Brief course 'AI/ML for supervisors' - high level introduction to AI/ML concepts focusing on 'what are the various ideas and methods is about' rather than hands on-training

Group plans – next

- **Strengthen relations with university (AI) groups**
  - Ties with non-HEP AI research groups in physics and computer science departments now thin and largely following personal ties of selected Nikhef staff
  - Aim to strengthen this into something more structure and more encompassing

- **Identify strategic international collaboration partners**
  - E.g. through ongoing Nikhef bilateral discussions with other institutes (so far TRIUMF,IN2P3,DESY)
  - Collaborations with other international groups on themes of common interest

- **Positioning in national and international funding landscape**
  - At present no 'AI for science' funding scheme in the Netherlands
    - Largely flurry of reports and position papers recently on AI in the Netherlands ('Delta Plan', 'Wennink rapport')
    - Significant focus on AI for industry and society and 'science for AI', much less so on 'AI for science'
    - Government coalition agreements also mention AI plenty, but no dedicated funding (yet)
  - If funding and/or resources become available, how can we best position Nikhef to be part of it?
  - *(More on this in Sascha talk)*

- **Prepare for future funding calls in existing schemes**
  - E.g. lay the groundwork for future ENW-M2 and ENW-XL grants in collaboration with programs

Group evolution – this year

- **Rapid expansion of group of foreseen this year**

- **Planned *core* group by end of 2026**
  - Wouter (leadership) → current member, ramping up involvement
  - Sascha (leadership) → current member, ramping up involvement
  - New staff member on AI algorithm development → recruitment before summer
  - New staff member on AI infrastructure (joint with PDP) → recruitment before summer
  - Postdoc on AI algorithm development (topic 1) → recruitment after summer
  - Postdoc on AI algorithm development (topic 2) → recruitment after summer

- **Plans for *associate* group members (under development)**
  - Nikhef staff/PD/PhD active in AI/ML deployment in programs that are interested in collaborating on AI/ML methodology development can join AI group as '**associate members**'
  - Aim to make agreement to (initially) work on a defined topic of common interest
  - Some minimum fraction of time required to work on AI in science, time commitments to be also agreed with relevant program leaders
  - Can also be extended to 'associate members of Nikhef' (i.e. scientists currently outside the regular scope of the Nikhef collaboration)
  - Aim to roll out this scheme around summer.

Profile staff position – AI algorithms

The AI and ML research group
Starting in 2026, a new Nikhef AI and ML group will establish a scientific research agenda to develop AI/ML technology with broad applicability across Nikhef's particle and astroparticle physics programs. The growing group will coordinate AI/ML activities at Nikhef, collaborate with leading national and international AI/ML communities, and participate in European AI-in-science initiatives. Nikhef is initially recruiting two dedicated staff scientists as well as postdoctoral researchers for this group.

The position
The successful candidate will contribute to and lead research efforts in AI and ML for particle and astro-particle physics, and will play an important role in defining the research agenda of the group. The candidate is expected to supervise PhD candidates and postdoctoral researchers within the AI/ML group, to deepen the impact of AI/ML in the Nikhef science programs through collaborative R&D efforts, and to advance the frontier of AI/ML in particle and astroparticle physics through participation in international collaborative efforts and policy initiatives. The candidate is expected to be proactive in the procurement of science funding on AI/ML related topics and to participate in the organization of AI/ML education and training for Nikhef scientists.

Requirements
Applicants are expected to have a PhD degree in physics, computer science or a closely related field, a demonstrated multi-year record of outstanding and impactful research in AI/ML for (astro)particle physics, and a track record of successful supervision of PhD candidates and postdocs. Applicants are expected to have proficient communication and presentation skills, both verbal and written.

Profile staff position – AI infrastructure

(by David Groep)

The position

The successful candidate will perform research on data processing infrastructures for high-throughput computing, accelerated computing, and dedicated computing infrastructures for AI/ML. In addition to developing the long-term strategic vision, this position will benefit from direct engagement with the physics research programmes and a hands-on approach to systems engineering.

The successful candidate will play a leading role in shaping computing to enable future particle- and astro-particle physics research. Key elements of the position include collaborating with our national and international partners at a strategic level, the acquisition of funding and management of projects, and developing the computing systems for the AI/ML activities at Nikhef.

Requirements

The candidate has a PhD in sub-atomic physics, computer science, or a very closely related field, and extensive experience in the organization of data-intensive computing in large physics experiments. Systems operation experience in high-throughput computing, data management systems, or networking, as well as knowledge of machine learning frameworks or infrastructure for AI and machine learning is expected.

The candidate should also be a skilled communicator, excelling at presentation, negotiation, and information sharing; be a team player, capable of motivating and inspiring colleagues and collaborators; and be effective in policy-oriented and planning discussions. These qualities will be necessary for the candidate to operate effectively in the communities of national and international projects in which Nikhef plays a significant role.

Prior experience in international particle and astro-particle collaborations is strongly preferred, and interest in or affinity with other data-intensive sciences, and especially active experience with them, is also advantageous. Willingness to learn (if necessary) the Dutch language to communicate effectively in the national context is expected.