**Roland Jakab**
CEO

**GPU Day 2024**

Budapest, 2024.05.30

Kutatás.
Innováció.
Hatás.

HUN-REN
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# AI ACTION PLAN
# From identifying needs to delivering on a roadmap

https://hun-ren.hu

# AI in Science - Policy brief - What we could achieve

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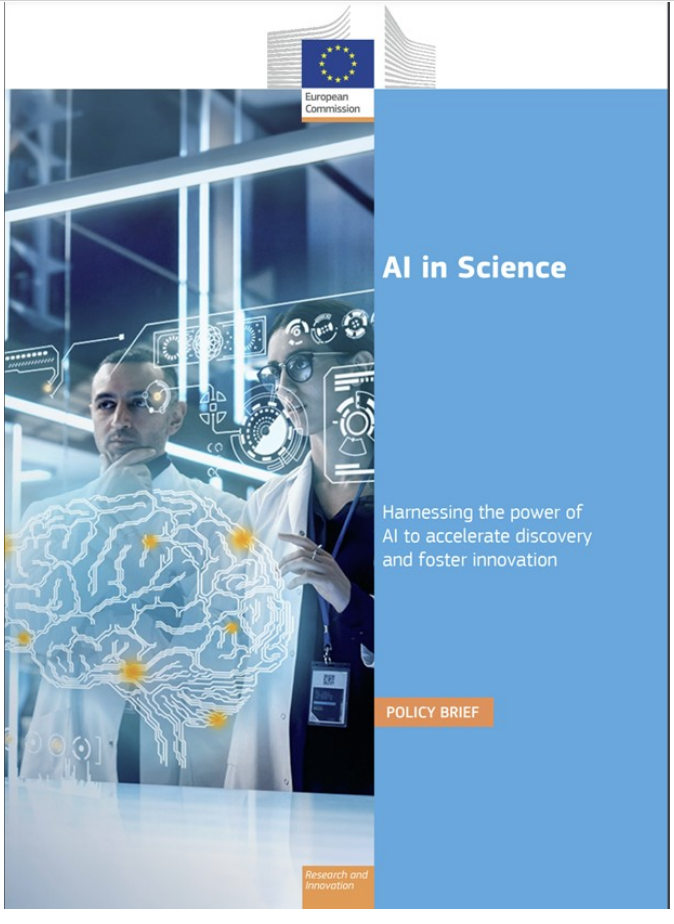


*"The power of collective AI-human intelligence could usher in a new era of problem-solving, accelerating discoveries and driving revolutionary advancements."*

"Integrating AI in scientific discovery is crucial for enhancing the EU's competitive edge in the global scientific arena. Leadership in AI-powered science will translate into leadership in discovery and innovation, essential for economic and social prosperity and strategic autonomy."

https://apre.it/wp-content/uploads/2023/12/ec_rtd_ai-in-science-pb.pdf

# AI in Science - Policy brief - What we could achieve

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## AI in science: a tool for accelerated discovery

- Research Assistant: Writing code, brainstorming, and manuscript preparation.
- Literature Review: Summarizing papers, identifying relevant studies.
- Making Predictions: Predicting protein structures with deep learning.
- Data Transformation: Sharpening first black hole image.
- Optimising Experiments: Configuring nuclear fusion tokamaks.
- Mining Literature: Uncovering connections for new hypotheses.
- Laboratory Automation: Running experiments with precision and speed.
- Scientific Communication: Automating generation of scientific reports.

## AI helping science solve global challenges

- Climate Change: Enhancing climate models, predicting extreme weather
- AMR: Discovering new antibiotics, fighting bacteria
- Personalised Medicine: Analysing MRI, predicting cancer risks
- Drug Development:
- Tailoring treatments, understanding brains
- Materials Science: Designing novel materials, predicting properties
- Crisis Preparedness: Anticipating natural disasters, saving lives
- Planetary Exploration: Autonomous robotic missions, exploring caves
- Serendipitous Discoveries: Identifying patterns, discovering free-floating planets

# HPC (GPU) is a key success factor for AI applications

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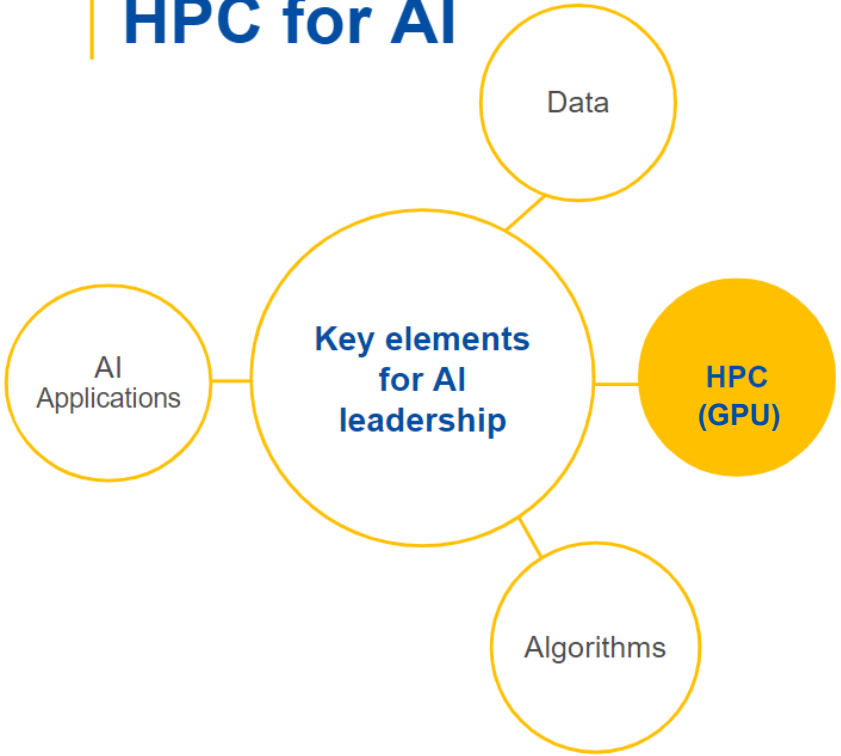


- **HPC** plays a key role in the development of AI, as it provides the massive amounts of computing power required for the development and training of GPAI large-scale models.
- As GPAI large scale models become bigger and more ambitious and larger complexity, a significant increase in the use of HPC for their training is expected.
- Advanced **AI-based applications** (e.g., robotics, automotive, personalised medicine) are only possible by combining comprehensive data and powerful supercomputing ecosystems.

European Commission

[source: EC & EuroHPC]

# Infrastructure building is a key component of the Hungarian AI Strategy* as well

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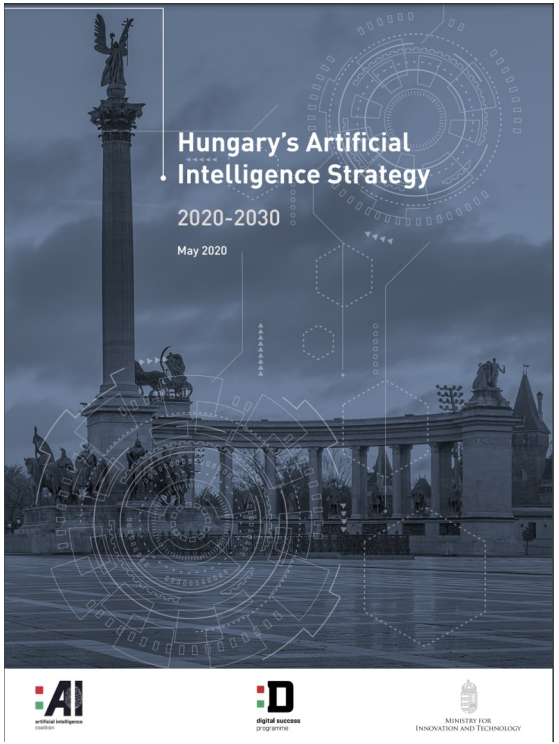



### 4.1.5 Infrastructure development – "Stable and Accessible Infrastructure"

Creating the digital infrastructure of the future as a suitable basis for efforts in research and development.

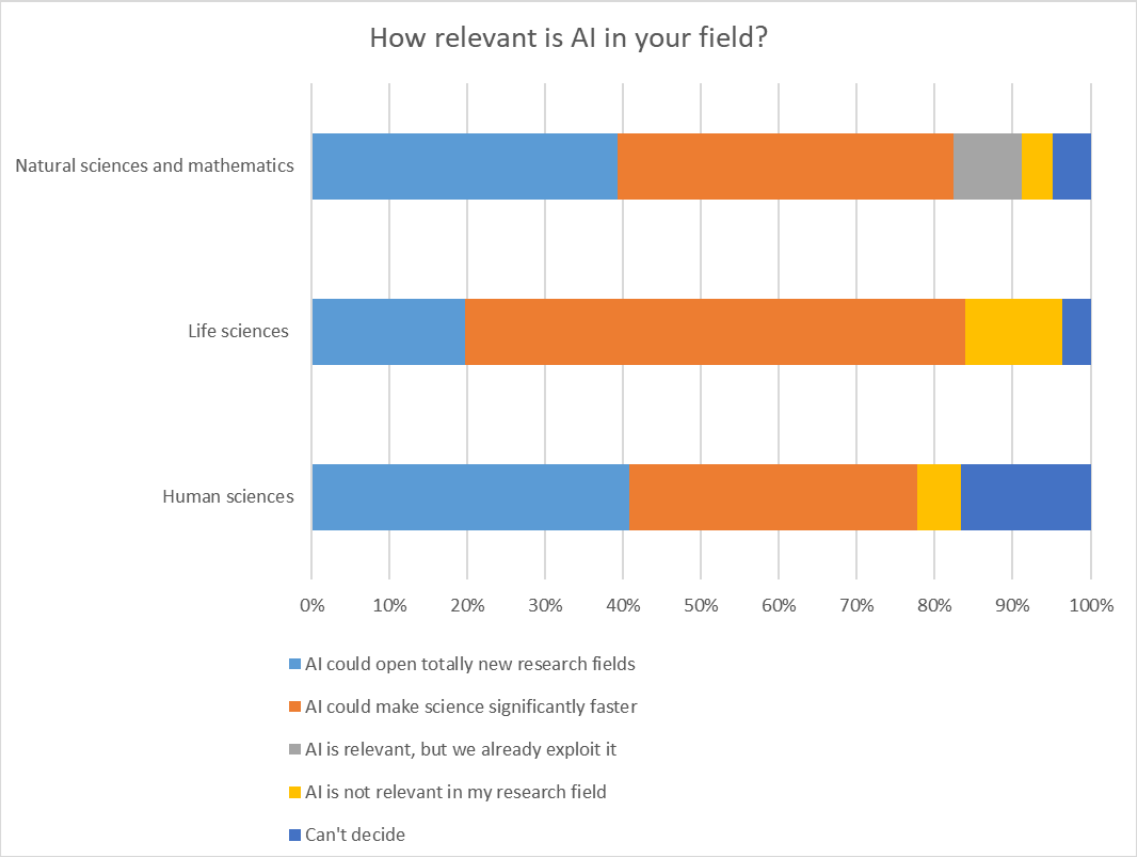
- Providing businesses and institutions with whatever hardware resources they require for their research and development activities, such as specific purpose-built hardware, supercomputers, cloud-based software and/or service systems.

1. ***2023: Komondor release with significant* GPU clusters**
2. ***2025: Expected HUN-REN Cloud* GPU extensions**
3. ***2026: Expected release of with extended GPU capacity***

***Currently being rewised**

[source: ai-hungary.com]

# We asked our researchers as well




Most of our scientists agree, that AI will be very significant or transformative

# Some clustered AI enabled breakout points from OUR researchers

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## 1. Genomics and Proteomics

- Genomic Imputation: Use in population genetics models.
- Marker-Based Prediction: Genome analysis, 3D genome analysis.
- Protein Modeling: Application in vaccine research, protein-ligand interaction prediction.

## 2. Image Processing and Remote Sensing

- Autonomous Vehicles: Image processing for the development of self-driving vehicles.
- Aerial Image Evaluation: Monitoring ecological processes.
- Satellite Data Analysis: Processing meteorological and climate data.

## 3. Numerical Modeling and Simulations

- Exoplanet Discovery: Use of numerical simulations in exoplanet discovery.
- Dynamical Stability Examination: Analysis of the stability of exoplanetary systems.
- Acceleration of Numerical Modeling: AI acceleration in applications such as fusion devices.

## 4. Healthcare and Biology

- Clinical Prediction Models: Disease prediction, clinical decision support.
- Vaccine Research: Protein modeling for mRNA development.
- Electrophysiological Data Analysis: Cleaning and analyzing large volumes of raw medical data.

## 5. Environmental Science and Ecology

- Modeling Ecological Processes: AI-based parameterization in numerical models.
- Monitoring Invasive Species: Based on drone aerial images.
- Bacterial Typing: Based on phenotypic properties, examination of antibiotic resistance.

## 6. Language Technologies and Text Mining

- Text Mining: Exploration of interdisciplinary issues, analysis of multilingual content.
- Questionnaire Content Analysis: Application of language technology to process open-ended questions.
- Corpus Analysis: Analysis and database organization of digital and printed texts.

## 7. Social Sciences and Humanities

- Analysis of Historical Data: 3D analysis and modeling of archaeological data.
- Demographic Models: Modeling changes in prehistoric societies.
- Analysis of Cultural and Social Impacts: AI-assisted social sciences, e.g., detection of manipulation and emotions.

# How can HUN-REN contribute: The AI Action Plan

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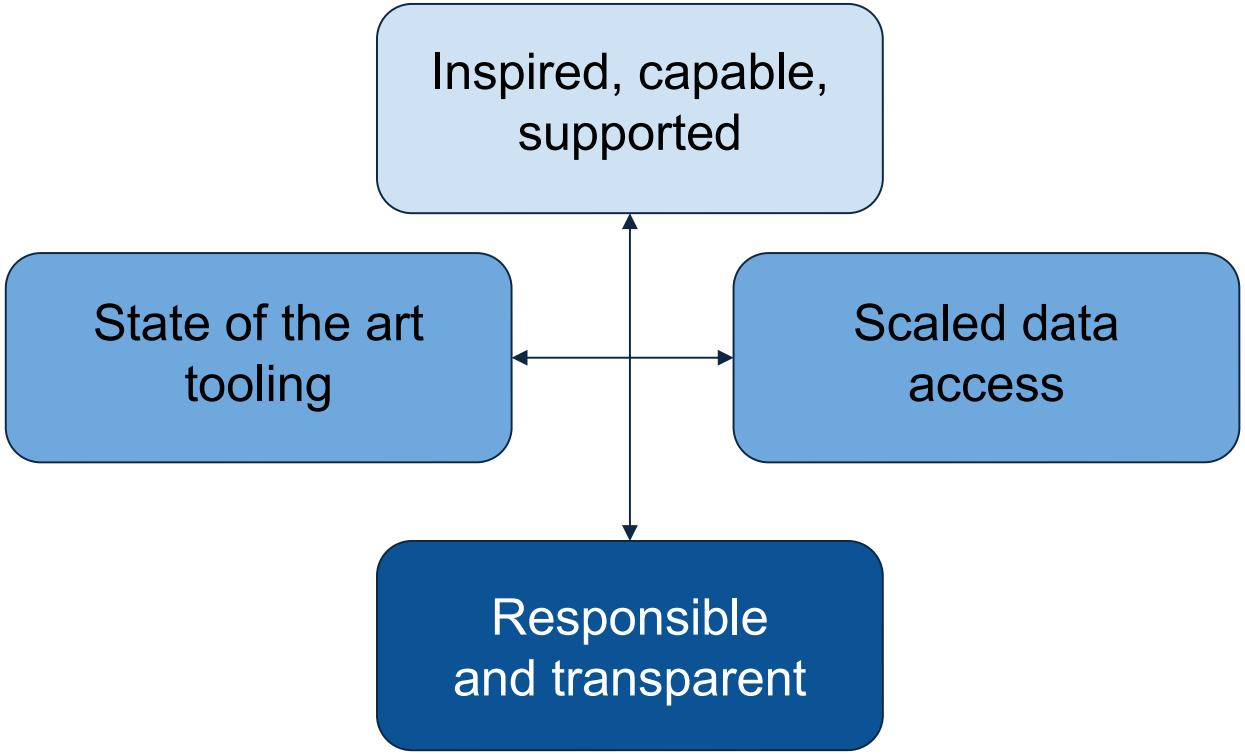
*Our goal is to support breakthrough research by empowering researchers with the capabilities of AI.*



# Inspired, capable, supported




Researchers have to be comfortable with the technological capabilities and limitations of AI to find and pursue new ways to do research or new topics to research. They have to have access to quality upskilling and personal support in case of AI enabled research.

1. **Upskilling and inspiring:**
   a. From python AI library basics to GenAI usage
   b. From general trainings to specialist workshops
   c. From knowledge download to hackathons
2. **AI Ambassador program**
   a. Representing needs and ideas
   b. Supporting adaptation and spreading best practices
3. **Specialist support**
   a. Hired generalists to discover
   b. Contracted specialists to plan
   c. Long term collaboration with fellow scientists through match-making

# State of the art tooling

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Technology is advancing faster than ever. We have to be as close as possible to the frontier of support tools both in software and hardware while maintaining safety and sovereignty.

1. **Provide useful AI software:**
   a. Have channels to support licensing of paid tools
   b. Have funnels to provide open-source alternatives as applications
   c. Have people who can help navigate the apps
2. **On-demand flexible hardware**
   a. Map available hardware and access routes (Domestic, EU and global)
   b. Improve usability and support
   c. Improve local cloud booking flexibility and utilisation
   d. Map demand growth with hardware development growth

# Scaled, professional data access

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Accessing data redefines research opportunities, managing data indicates a new burden for researchers. We have to work together to support new data collaborations and eliminate friction in data management.

1. **Streamlining data collaborations**
   a. Standardising legal frameworks
   b. Giving legal support
   c. Setting up data governance processes (skills&technology)
2. **Accessing new data sources**
   a. Mapping available/potential data sources
   b. Setting up grants for data access
   c. Using centralised negotiation opportunities with big potential data partners
3. **Setting the stage for technology enabled private data collaboration**
   a. Examining and designing privacy preserving data collaboration technologies

# Responsible and transparent


More powerful AI and data management tools mean more responsibility. Researchers have to be clear on the “how”-s of ethical AI and data usage and be able to comply with them.

1. **Policy mapping:**
   a. Digest and circulate EU AI usage principles
   b. Help find principles from specific publishers/journals
2. **Policy development**
   a. Discuss policies on a country level
   b. Develop and circulate guidelines for Hungarian researchers
3. **Policy alignment**
   a. Set up provided technical frameworks (apps, compute) to be compliant by design
   b. Spread responsible AI practice attitudes

# Grounded internationally

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Research does not happen in a country, still countries have to support their researchers to be able to collaborate internationally.

1. **Aligning with the EU efforts:**
   a. Joining the AI usage measurement system
   b. Participating in international best practicing
   c. Engaging in cross-country collaborations
2. **Professional grant management**
   a. Watching and disseminating information about grants
   b. Supporting with international match-making
   c. Easing the burdens of grant admission administration

# AI Action Plan in Practice – AI Ambassador program

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## AI Ambassadors support the Institute's researchers in

- the use of AI
- navigating the available resources
- channelling emerging needs
- disseminating good practices, providing inspiration
- providing information on new updates or available resources

## AI Ambassadors are involved in

- providing feedback on central efforts
- testing new tools available, early access
- discussions on good practices in use

# We connect researchers with AI enabling resources

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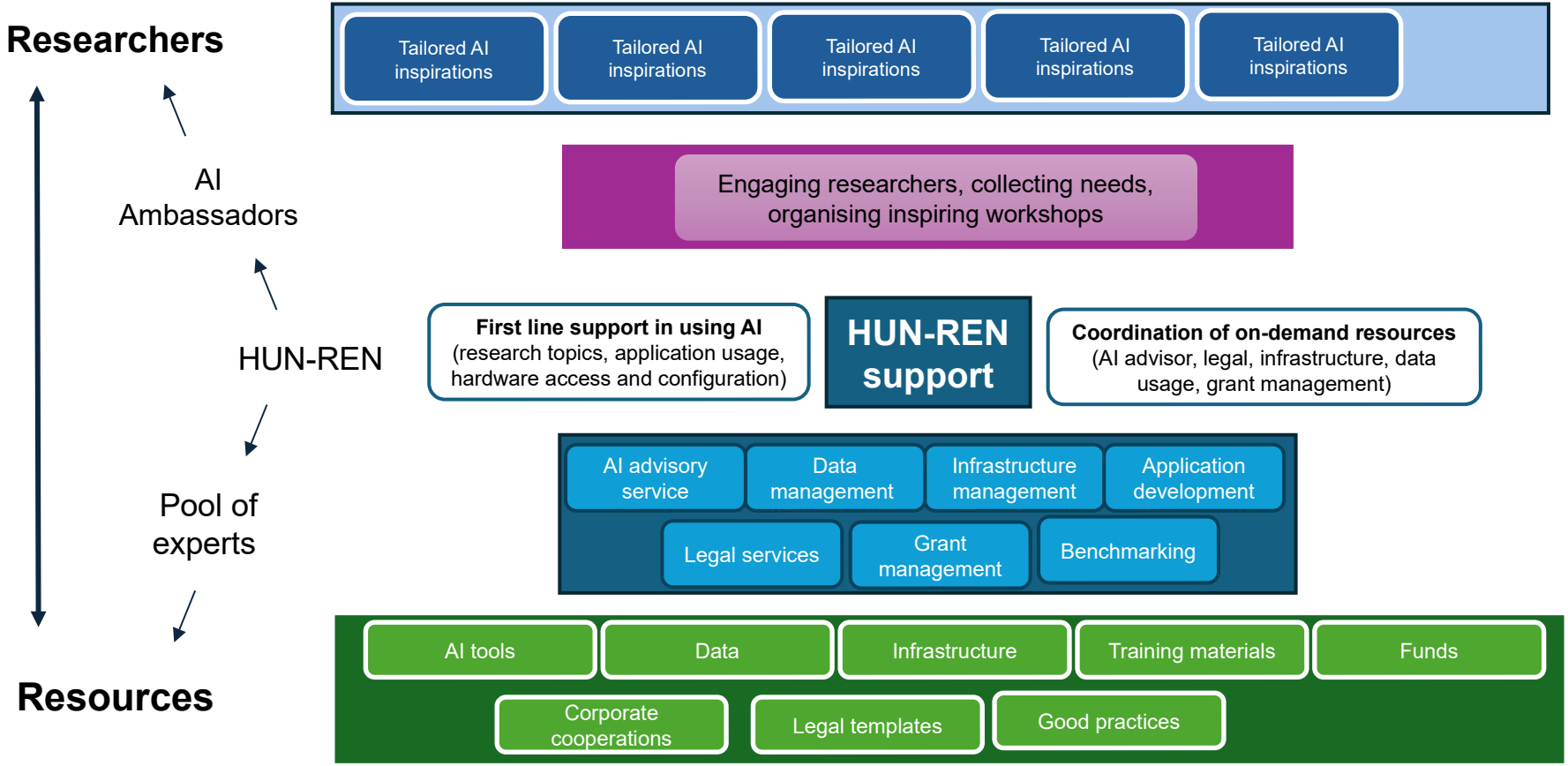

# Better AI infrastructure for every researcher!

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## How can we together…

### …improve usability and support?

- Ease of use
- Reference architectures
- Consulting resources

### …improve utilization and access?

- Easy access request
- Utilization monitoring
- Dynamic reallocation

### …improve state of the art computing capacity?

- Planning for technological change
- Invest in what *will* be needed
- Maintain and operate what we have built

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