

FCAI

Finnish
Center for
Artificial
Intelligence

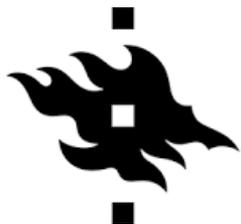
REAL AI FOR REAL PEOPLE IN THE REAL WORLD



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UNIVERSITY OF HELSINKI



Aalto University



Artificial Intelligence and Machine Learning

Recent breakthroughs in AI largely due to advances in **machine learning**, methods that learn from data, made possible by

- Increased computation capacity (GPU etc.)
- Larger data sets (ImageNet, web-scale text data etc.)
- Easy-to-use software, backed up by web-scale companies (TensorFlow etc.)
- Algorithmic improvements (especially in deep neural networks)

AI as Technology

- *Disruptive transformations* in all areas of societies in a very short-term future, opening both new opportunities for growth and a need for solutions for societal changes
- *Short gap* between AI research and products, compared to most other sciences, and fundamental and applied research often overlap
- *Tough global competition* of the new economy: the division to leaders and followers is taking place now
- **AI is not ready**: currently popular AI methods have severe shortcomings that need to be solved before more wide-spread utilization

The Finnish AI Strategy



- **Finland one of the first countries to establish a national AI strategy,** with the aim of turning Finland into a leading country in the application of artificial intelligence.
- The work was launched in May 2017, commissioned by the Minister of Economic Affairs Mika Lintilä.
- A steering group was set up to implement the work, chaired by Pekka Ala-Pietilä.
- The group's interim report with 8 key steps published in October 2017 (see www.tekoalyaika.fi/en)
- Action point in key step 4: **create a national center of excellence in AI**
- Final report in March 2019

1. Enhancement of business competitiveness through the use of AI
2. Effective utilisation of data in all sectors
3. Ensure AI can be adopted more quickly and easily
4. Ensure top-level expertise and attract top experts
5. Make bold decisions and investments
6. Build the world's best public services
7. Establish new models for collaboration
8. Make Finland a frontrunner in AI

Flagship Programme of the Academy of Finland

- *“The Flagship Programme is an instrument that promotes excellent research and versatile impact arising therefrom. The programme supports future knowledge and know-how and sustainable solutions to societal challenges and advances economic growth by developing new business opportunities.”*
- Through this one-time instrument, the Academy of Finland has decided to fund six Flagships in the period 2019-2027
- One of the six Flagships is **the Finnish Center for Artificial Intelligence (FCAI)**
- The total budget of FCAI is 250 M€ for the next 8 years.

FCAI as an AI competence hub

Helsinki the **leading AI hub in the Nordics**

- long tradition in ML research since 1980s
- producing almost 90% of top-level AI output in Finland
- **on par with many global top-20 universities** known for their AI output:

	H-index	Citations	AI output	Ranking
FCAI	32	5800	164	56 (UH)
UCL (UK)	31	6100	117	16
Cornell (US)	38	8200	140	14
Stanford (US)	47	7000	337	2

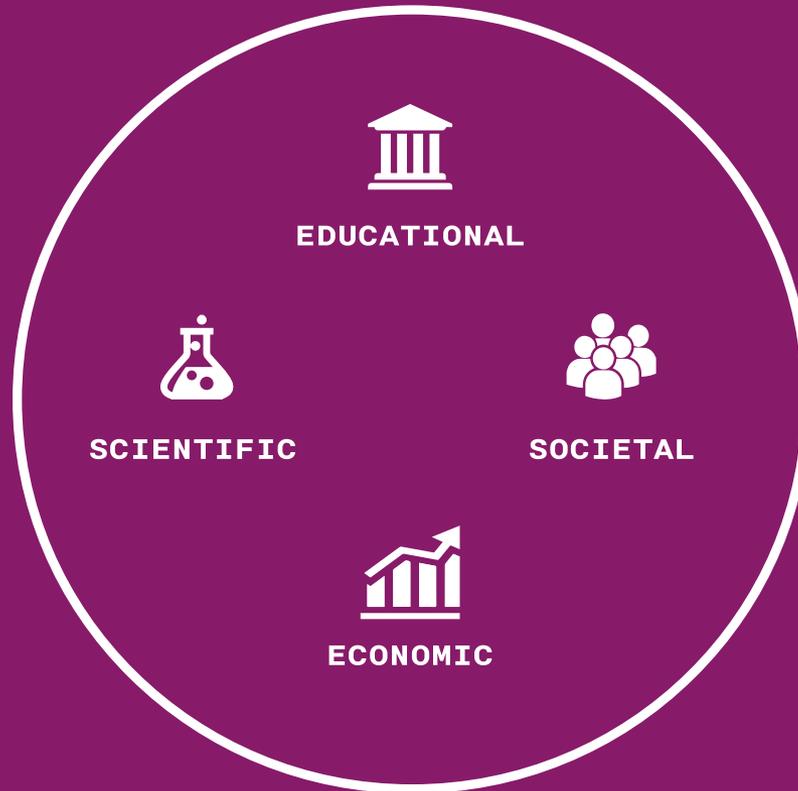
H-index/citations: Median for AI faculty

AI output: Publications in top-level AI forums in 2014-2017

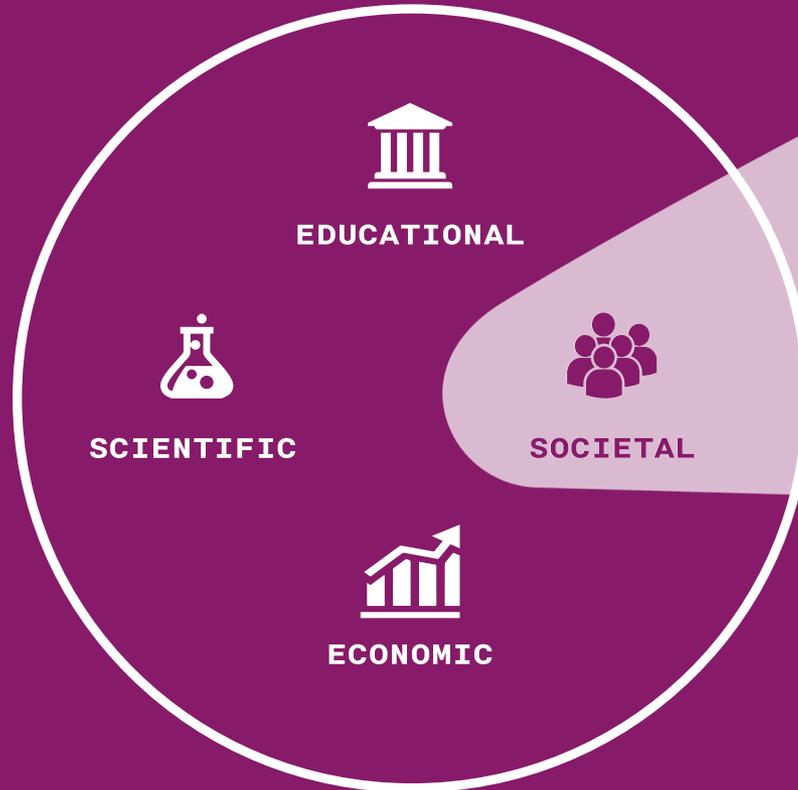
Ranking: Shanghai University Ranking 2017

Independent bibliometric study (Ailisto et al., 2018): Total AI output volume of FCAI (as determined by Scopus, based on years 2008-2017), is around 75% of the output of the country of Finland, is **among the top 10 in Europe, and is growing faster than the competition.**

IMPACT

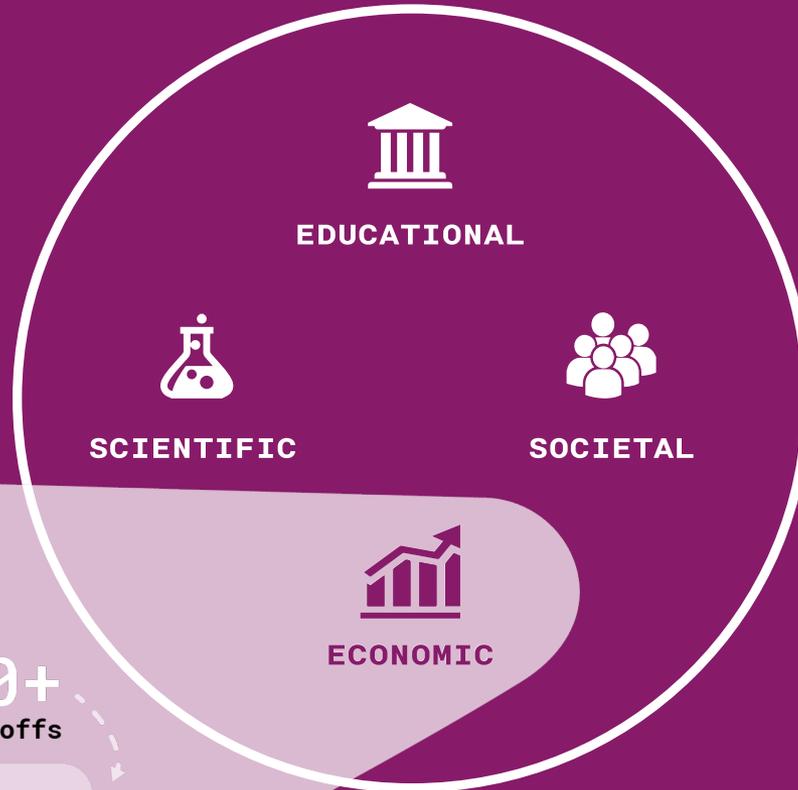


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**FINLAND WANTS
TO BE A LEADING
COUNTRY IN AI**

IMPACT



First 4 years

work with

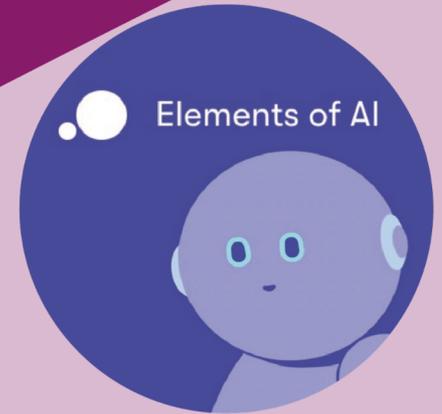
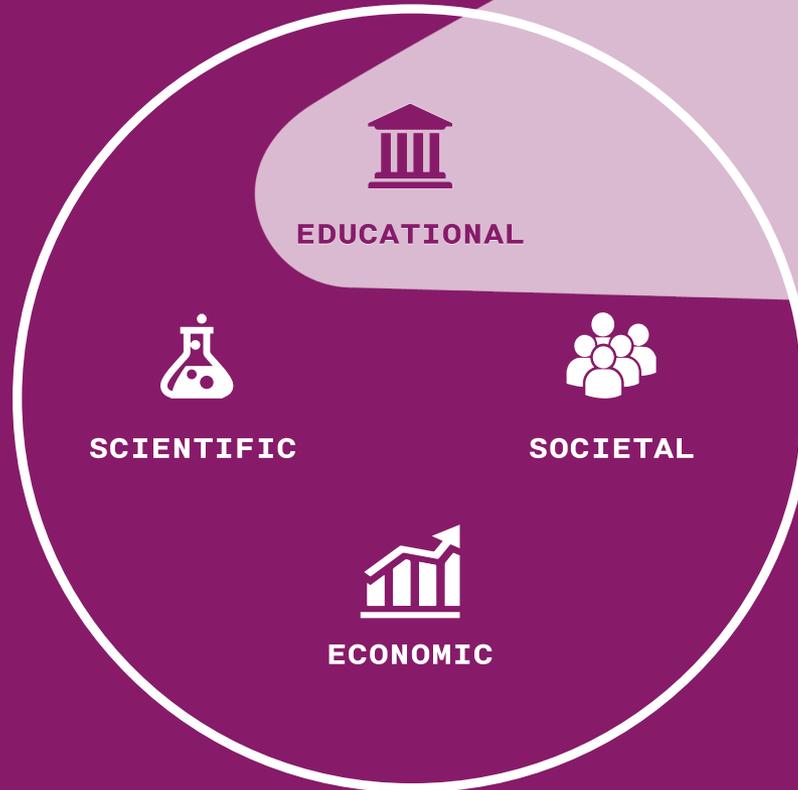
30+
leader
companies

1000+
benefit

20+
spinoffs

20B€ *AI-based
growth*

IMPACT

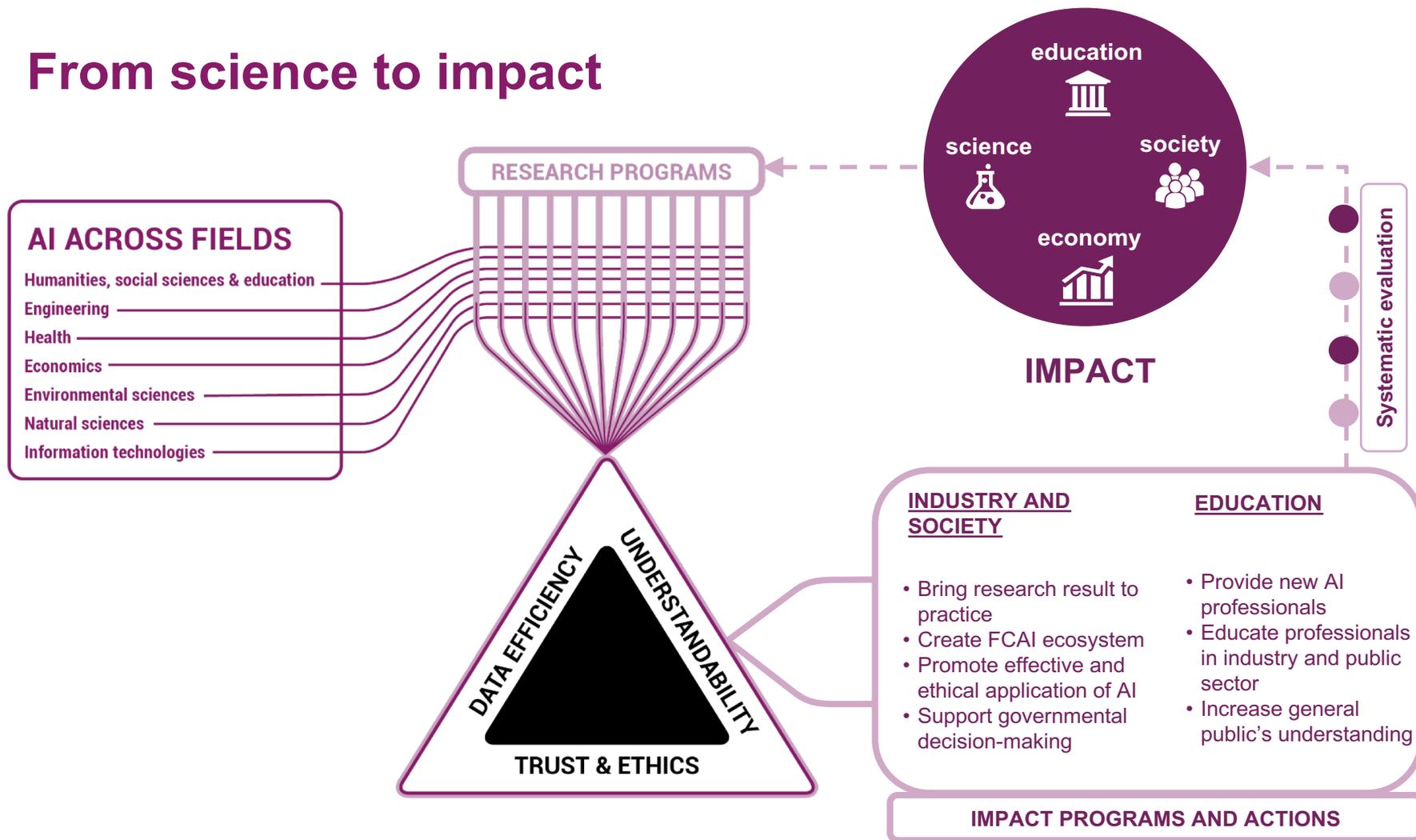


Educate 1% of Finnish citizens in basics of AI

RESEARCH FOCUS: SOLVE 3 AI BOTTLENECKS

1. **Data efficiency**. Most of the value in big data is in the enormous number of small questions it could answer. At this resolution **data becomes small and a scarce resource**.
 - ✓ We will **make AI applicable to a significantly wider scope of questions** by several means: data-efficiency, prior knowledge, (privacy-preserving) sharing and fusion of data.
2. **Trust and ethics**. Many AI techniques cannot be trusted because they are vulnerable to manipulation and information stealing, and reliability is not known.
 - ✓ We will develop the required privacy-preserving, secure and resilient AI. **Societal trust** stemming from dependable AI **enables wide applicability**.
3. **Understanding**.
 - ✓ We will give AI the capability to understand the user, which enables for making AI understandable. Outcome: AIs that are able to **augment human capabilities**.

From science to impact



Initial FCAI Research Programs

- **Agile probabilistic AI**, *Coord: Prof. Aki Vehtari*

Goal to develop an interactive and AI-assisted process for building new AI models with practical probabilistic programming. The models will work as explainable, verifiable, uncertainty-aware, reliable tools to build and check the behavior of AIs.

- **Simulator based inference**, *Coord: Prof. Jukka Corander*

Goal to develop new methods needed for real AIs to have efficient and interpretable reasoning capabilities. This requires cross-breeding modern machine learning and simulator-based inference.

- **Deep learning**, *Coord: CEO Harri Valpola, Curious AI*

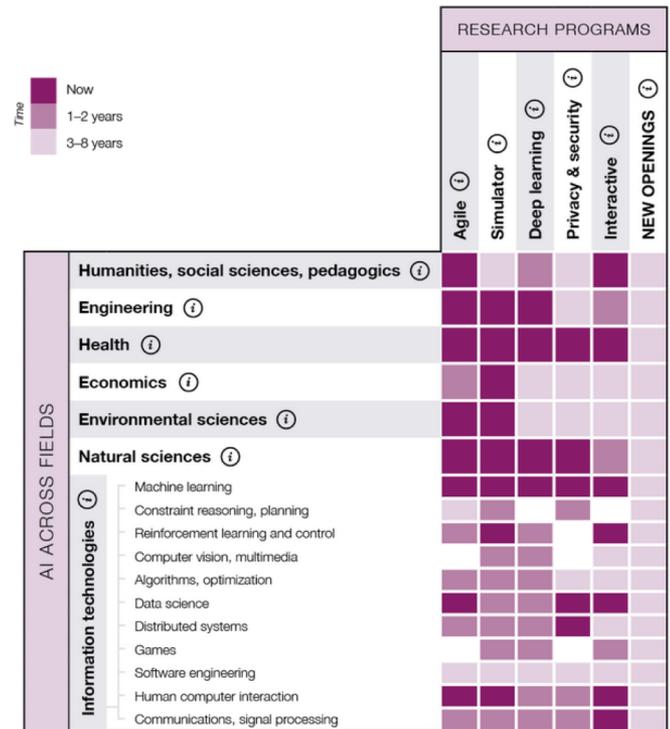
Goal is to develop methods which harness the power of deep learning while achieving good results with less training data and in particular less human supervision.

- **Privacy & Security**, *Co-Coord: Prof. Antti Honkela and Prof. N. Asokan*

Goal is to develop realistic adversary models to build effective tools and techniques that practitioners can use to build trustworthy and secure AI systems.

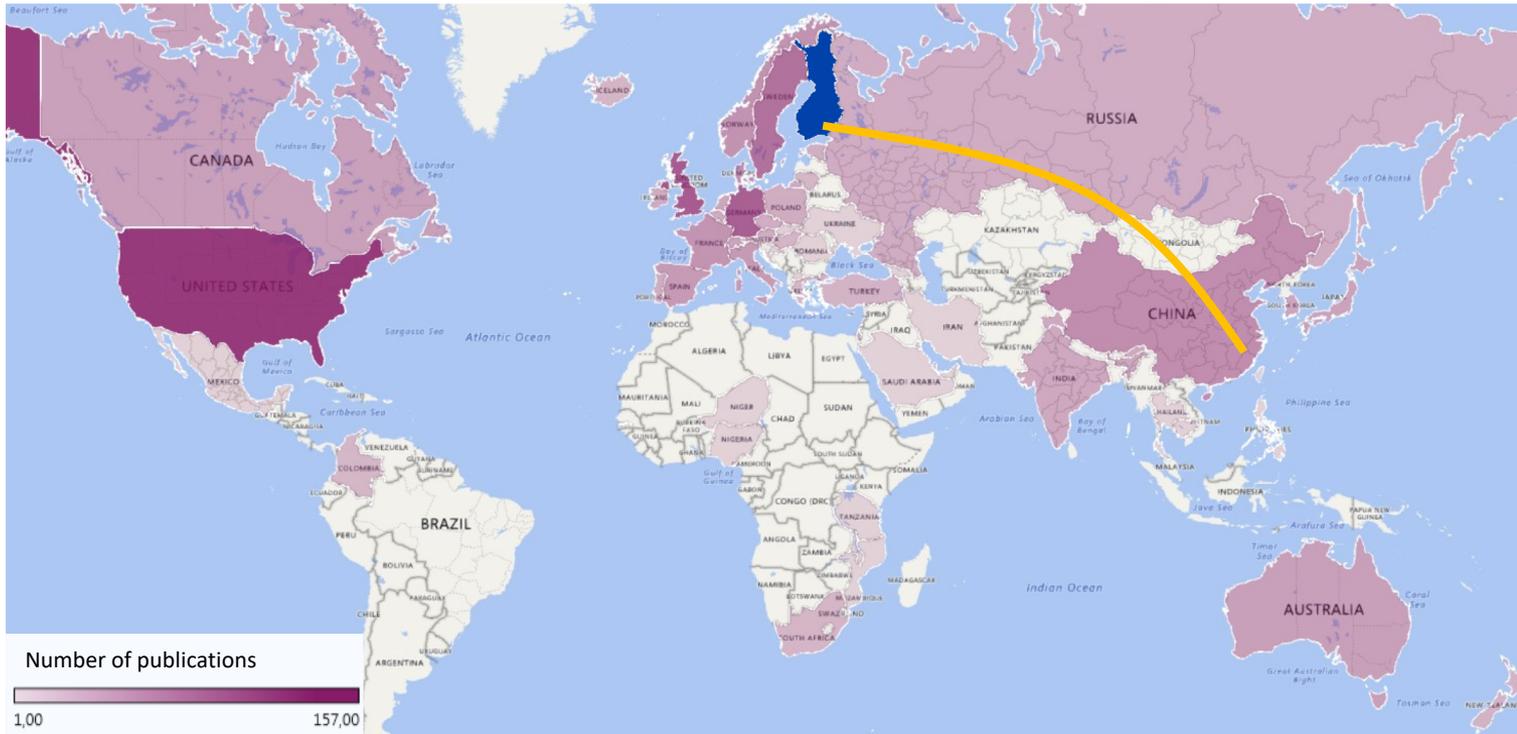
- **Interactive AI**, *Coord: Prof. Antti Oulasvirta*

Goal is to enable AI that people can naturally work and solve problems with, and which demonstrates the ability to better understand our goals and abilities, takes initiative more sensitively, aligns its objectives with us, and supports us.



AI research programs (columns) and the disciplines linked to them (AI Across Fields rows), with expansion plan in colors: currently in operation (dark purple), starting in 1-2 years (middle purple), and in planning (light purple). Examples of on-going work and initiatives are being linked to from the matrix (work in progress).

International collaboration (in AI)



15+ Company members

NOKIA Bell Labs

 **HUAWEI**

 **NVIDIA**

