WASP ED

WALLENBERG AI AND TRANSFORMATIVE TECHNOLOGIES EDUCATION DEVELOPMENT PROGRAM

THE NEXT FIVE YEARS

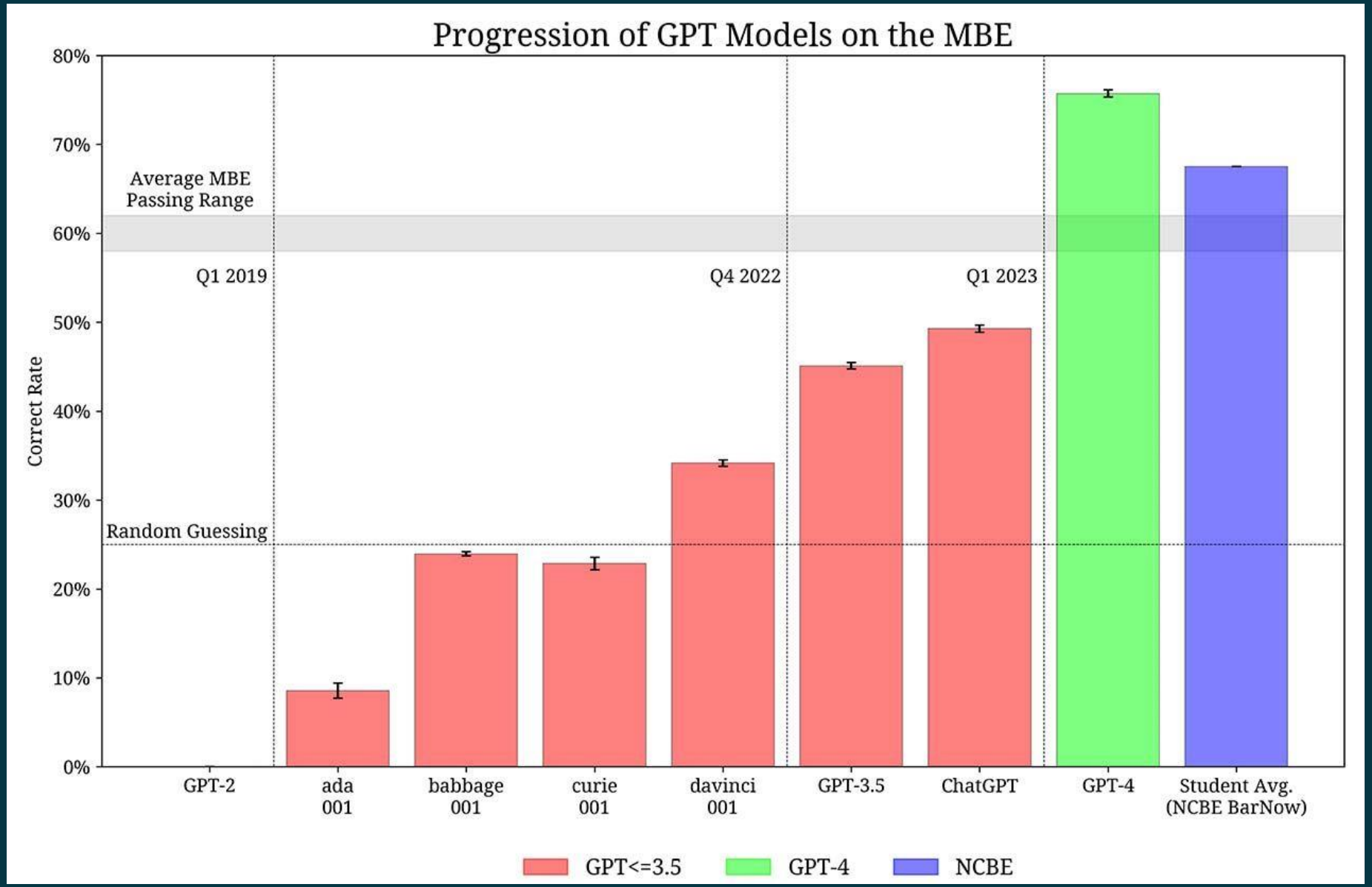
Fredrik Heintz, Linköping University, Sweden

Program Director WASP-ED

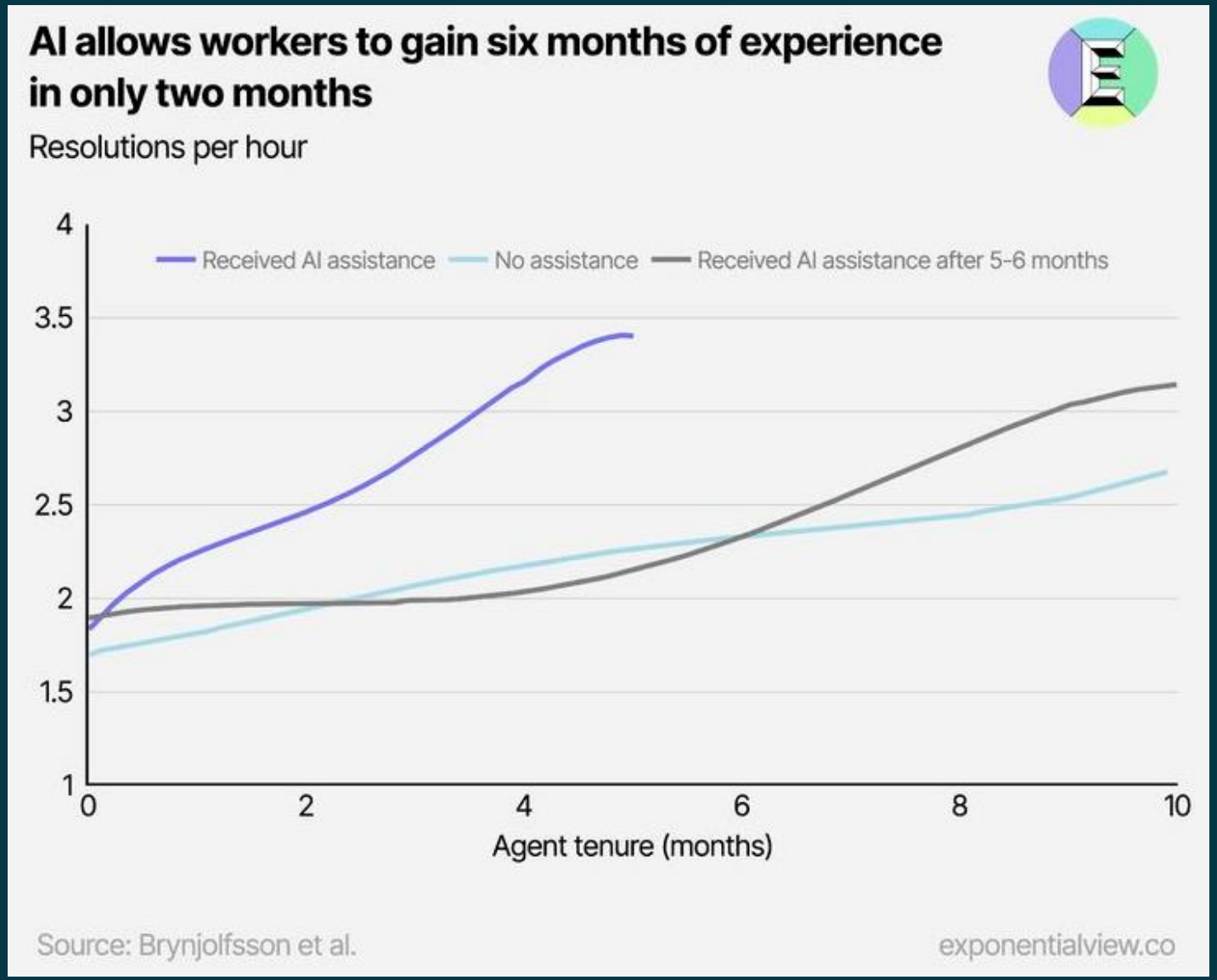
LINKÖPING UNIVERSITY · UNIVERSITY OF GOTHENBURG · UMEÅ UNIVERSITET · KTH VETENSKAP OCH KONST · ÖREBRO UNIVERSITET · UPPSALA UNIVERSITET

WASP-ED PURPOSE AND EXPECTED IMPACT

- The purpose of WASP-ED is to **significantly increase** the **capability** and **capacity** of Swedish universities in providing **timely, relevant, and scalable education in AI** and other transformative technologies.
- The expected impact is a **national step-change** in the **quality** and **quantity** of available **competence in AI** and the capability of addressing the need for such professional competence in coming transformative technologies.
- The focus is on **higher education** and **professional development**.



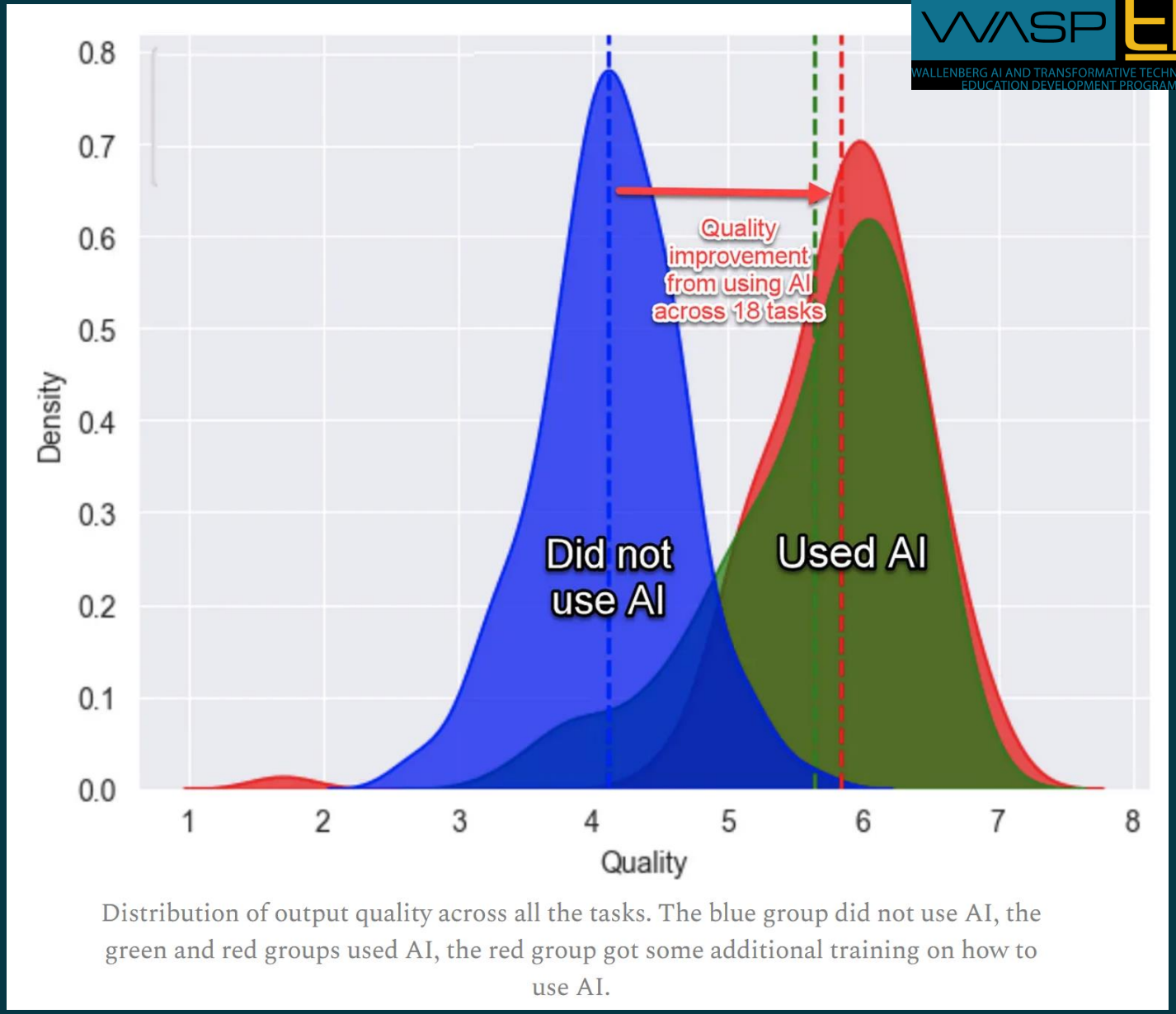
Katz, D., Bommarito, M., Gao, S. and Arredondo, P. *GPT-4 Passes the Bar Exam* (March 15, 2023). https://ssrn.com/abstract=4389233



https://www.exponentialview.co/p/generative-intelligence-can-propel#details
Generative AI at Work, E. Brynjolfsson, D. Li & L. Raymond, 2023, DOI 10.3386/w31161

AI AND FUTURE OF WORK

- **12% more tasks**
- **25% quicker**
- **40% higher quality**



Distribution of output quality across all the tasks. The blue group did not use AI, the green and red groups used AI, the red group got some additional training on how to use AI.

https://www.oneusefulthing.org/p/centaurs-and-cyborgs-on-the-jagged

HBS Working Paper 24-013 "Navigating the Jagged Technological Frontier: Field Experimental Evidence of the Effects of AI on Knowledge Worker Productivity and Quality" by F. Dell'Acqua et al.

CHARACTERISTICS OF TRANSFORMATIVE TECHNOLOGIES

- Rapidly increasing demand for technical competence
- Broadening the demand and scope to other subjects and professions
- The previously agreed content significantly changes

WASP-ED: CHALLENGES

The fundamental challenge that WASP-ED is designed to address is how the Swedish educational system can deliver the necessary competence when the demand for competence in new technologies explodes and vastly broadens.

Three particular challenges are to:

1. **Reach a commonly agreed subject matter content** as the subject is being actively and rapidly developed.
2. **Introduce AI in education beyond only the specialized education programs** for technical experts, as the need for competence spreads from the experts developing the technology to much broader ranges of professions and disciplines.
3. **Increase teaching capacity** both to scale-up technical education to broader audiences and to scale-out AI education into other professions and disciplines.

WASP-ED: OBJECTIVES

1. **Provide the educational foundations** for AI and related transformative technologies.
2. **Scale-up the national educational capacity** in AI and transformative technologies including educating and maturing the teaching staff to make use of and be innovative in the application of AI and transformative technologies in education.
3. **Scale-out education** in AI and transformative technologies **to disciplines and professions beyond the technical core.**
4. **Develop data-driven education and pedagogical transformation** using learning analytics.

WASP-ED: WORK AREAS

WA3 Course Development
Develop modular course content

WA6 Teaching Competence Development
Provide professional development support for teachers

WA2 Program Development
Develop flexible and adaptable course packages for different roles

WA5 Technical Platform and Education Data
Provide a technical platform for delivering courses and course content

WA1 Curriculum Development
Provide a comprehensive overview of the subject matter content

WA4 Pedagogical Development and Learning analytics
Provide support for pedagogical experimentation and development

- Program Director: **Fredrik Heintz, LiU**
- Program Coordinator: **Catharina Karlsson Foo, LiU**
- Leader WA1 (Curriculum): **Helena Lindgren, UmU**; co-lead Fredrik Heintz, LiU
- Leader WA2 (Program): **Amy Loutfi, ÖrU**; co-lead Alan Said, GU
- Leader WA3 (Course): **Mikael Sundström, LU**; co-lead Anna Foka, UU
- Leader WA4 (Pedagogy): **Teresa Cerrato-Pargman, SU,** co-lead Olga Viberg, KTH
- Leader WA5 (Platform): **Jan Gulliksen, KTH**; co-lead Joakim Lilliesköld, KTH
- Leader WA6 (Competence): **Thomas Hillman, GU**; co-lead Kristin Ewins, ÖrU

AI Innovation, Competence and Research Ecosystem

Utveckling och användning av AI

Myndigheter, regioner, kommuner || Näringslivet

Stödja Innovation och tillämpning

AI SWEDEN

RI.SE

VINNOVA Sweden's Innovation Agency

Avancerad Digitalisering

Utbildning och kompetensutveckling

AI Competence of Sweden

elementsofai.se

Forskning

WASP | WALLENBERG AI, AUTONOMOUS SYSTEMS AND SOFTWARE PROGRAM

WASP-ED

WASP—HS

CHALMERS UNIVERSITY OF TECHNOLOGY

KTH VETENSKAP OCH KONST

LINKÖPINGS UNIVERSITET

LUNDS UNIVERSITET

UMEÅ UNIVERSITET

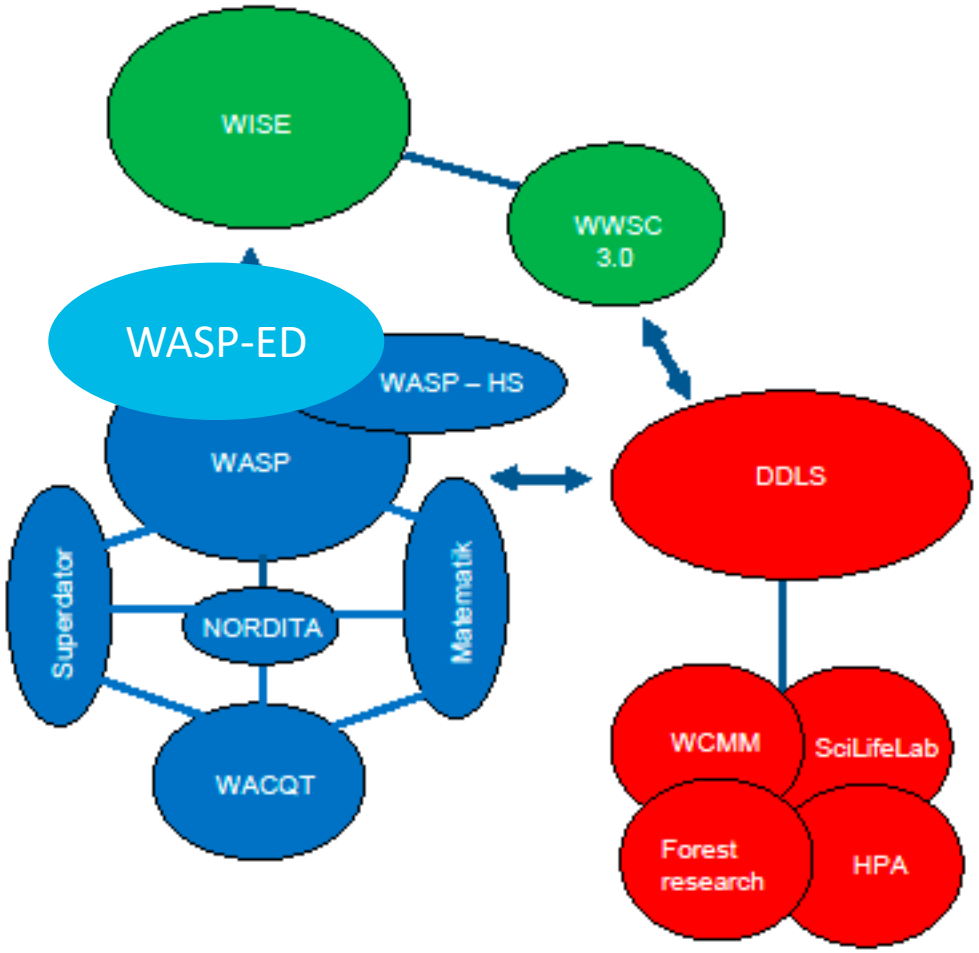
UPPSALA UNIVERSITET

ÖREBRO UNIVERSITY

Övriga högskolor & universitet

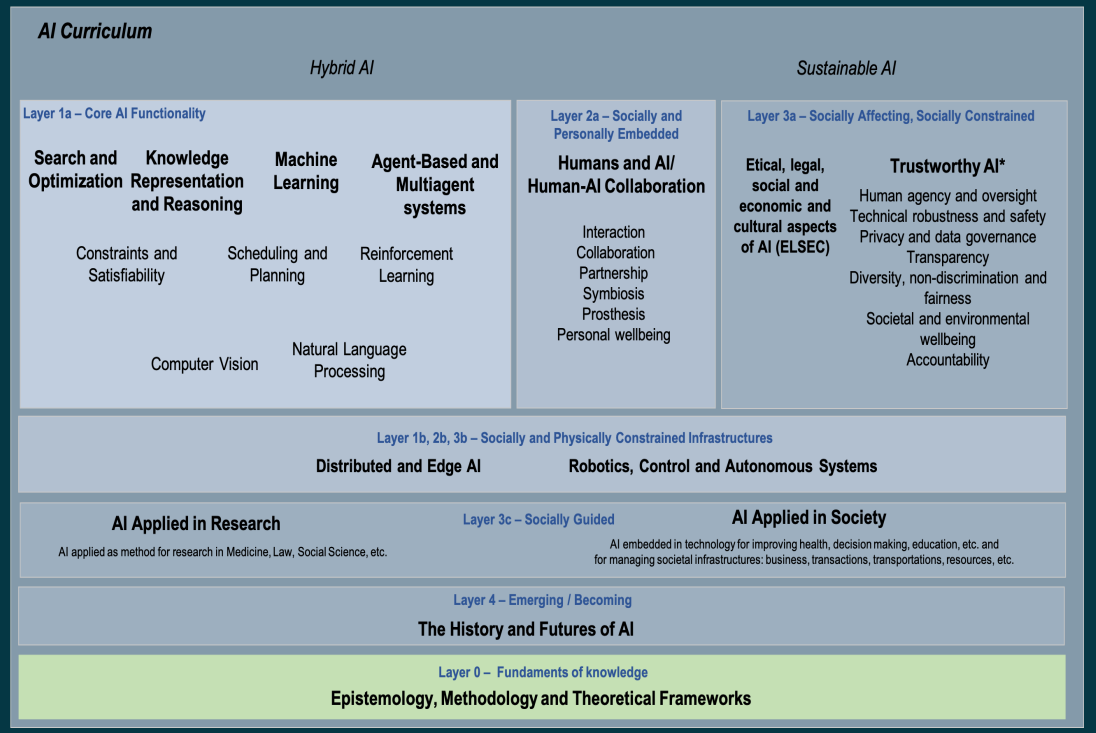
COMPETENCE FOR SWEDEN – STRATEGIC GRANTS

- The objective is to support excellent basic research but also to build competence in critical areas for Sweden and Swedish industry.
- The strategic programs have graduate schools with 1300 PhD students including 325 industrial PhDs.
- Financing over 600 postdocs and at least 120 industrial postdocs.
- Several research arenas



WA1: ACHIEVEMENTS

- Inventory of AI topics, programs and courses across fields
- Mapping of programs and courses into a holistic AI Curriculum
- Eliciting aspects in multidisciplinary workshops
- Engaging assistant professors recruited by WASP-HS and other in development of syllabuses connecting to the curriculum (jointly with WA3)
- First version published, extended version to be completed



AI Curriculum

Hybrid AI

Sustainable AI

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WALLENBERG AI AND TRANSFORMATIVE TECHNOLOGIES EDUCATION DEVELOPMENT PROGRAM

Layer 1a – Core AI Functionality

Search and Optimization | **Knowledge Representation and Reasoning** | **Machine Learning** | **Agent-Based and Multiagent systems**

Constraints and Satisfiability | Scheduling and Planning | Reinforcement Learning

Computer Vision | Natural Language Processing

Layer 2a – Socially and Personally Embedded

Humans and AI/ Human-AI Collaboration

Interaction
Collaboration
Partnership
Symbiosis
Prosthesis
Personal wellbeing

Layer 3a – Socially Affecting, Socially Constrained

Etical, legal, social and economic and cultural aspects of AI (ELSEC)

Trustworthy AI*

Human agency and oversight
Technical robustness and safety
Privacy and data governance
Transparency
Diversity, non-discrimination and fairness
Societal and environmental wellbeing
Accountability

Layer 1b, 2b, 3b – Socially and Physically Constrained Infrastructures

Distributed and Edge AI | **Robotics, Control and Autonomous Systems**

AI Applied in Research

AI applied as method for research in Medicine, Law, Social Science, etc.

Layer 3c – Socially Guided

AI Applied in Society

AI embedded in technology for improving health, decision making, education, etc. and for managing societal infrastructures: business, transactions, transportations, resources, etc.

Layer 4 – Emerging / Becoming

The History and Futures of AI

Layer 0 – Fundaments of knowledge

Epistemology, Methodology and Theoretical Frameworks

AI Curriculum

Hybrid AI

Sustainable AI

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Mapping to WASP expertise areas

Mapping to WASP-HS expertise areas

Layer 1b, 2b, 3b – Socially and Physically Constrained Infrastructures

Distributed and Edge AI | **Robotics, Control and Autonomous Systems**

Mapping to DDLS, WISE & WACQT expertise areas

AI Applied in Research

AI applied as method for research in Medicine, Law, Social Science, etc.

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AI Applied in Society

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Mapping to WASP-HS expertise areas

Layer 4 – Emerging / Becoming

The History and Futures of AI

Layer 0 – Fundaments of knowledge

Epistemology, Methodology and Theoretical Frameworks

WA2: ACHIEVEMENTS

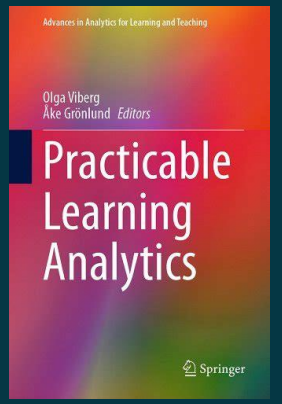
- Blueprint for a generic masters - examples of such at GU, and UMU.
- An open call for integrating AI in Medicine. Four proposals accepted and EVERY proposal has collaboration between several universities.
- Student follow-up: How disciplinary background affects AI learning in higher education. GU.

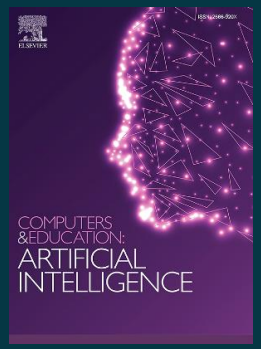
WA3: ACHIEVEMENTS

- Established a new way to link universities on the course level in the Python initiative, offering linked courses in Python across 4 unis (LU, UU, UmU, LTU).
  - The initiative has attracted massive interest from a wide pool of talent and is now a platform to which more and/or more advanced AI-related courses can be attached (LiU is actively shadowing the project, MAU has expressed interest, and international partners are in talks with us).
- Working on up to 5 AI-related MOOCs with partner universities.
- Collaborating with WA1 on courses with WASP-HS lecturers.

WA4: ACHIEVEMENTS

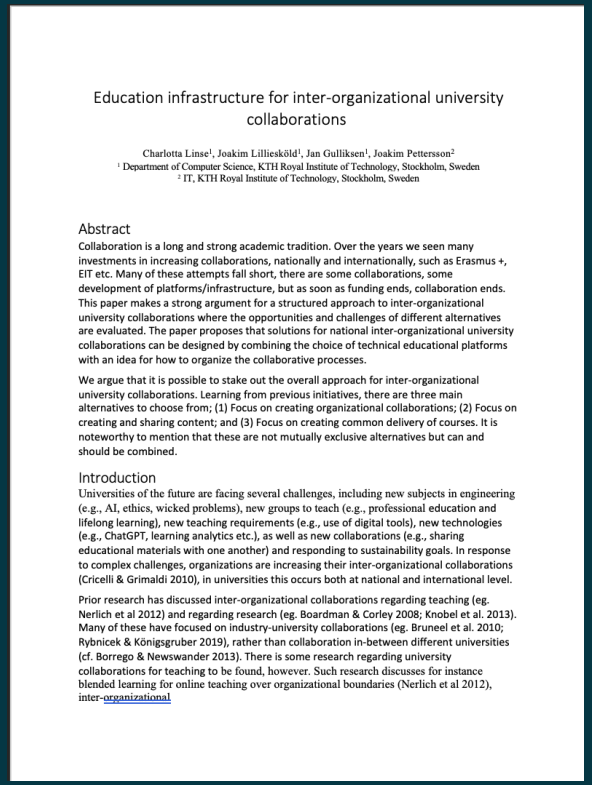
- 1a) Demonstrating the use of learning analytics (LA) for better learning and scaling up on at least one pilot course
  - Viberg, O., & Grönlund, Å. (Eds.). (2023). Practicable Learning Analytics. Springer Nature.
- 1b) How can we enable the adoption of LA/Generative AI in Swedish higher education? and Why?
  - McGrath, C., Cerratto Pargman, T, Juth, N., & Palmgren, P. J. (2023). University teachers' perceptions of responsibility and artificial intelligence in higher education-An experimental philosophical study. Computers and Education: Artificial Intelligence, 4, 100139.
  - Viberg, O., Kizilcec, R., Jivet, I., Martinez-Mones, A., Hrastinski, S., Mutimukwe, C. & Scheffel, M (2024). Cultural differences in students' privacy concerns in learning analytics across Germany, South Korea, Spain, Sweden, and the United States. Computers in Human Behaviors Reports (in press).
  - Cerratto Pargman, T. C., McGrath, C., Viberg, O., & Knight, S. (2023). New vistas on responsible learning analytics: A data feminist perspective. Journal of Learning Analytics, 10(1), 133-148.
- 2) Guiding Framework
  - Viberg, O., Mutimukwe, C., Hrastinski, S., Cerratto-Pargman, T., & Lilliesköld, J. (2024). Exploring teachers'(future) digital assessment practices in higher education: Instrument and model development. British Journal of Educational Technology. https://doi.org/10.1111/bjet.13462
  - Mutimukwe, C., Han, S., Viberg, O., & Cerratto-Pargman, T. (2023). Privacy as Contextual Integrity in Online Proctoring Systems in Higher Education: A scoping review.





WA5: ACHIEVEMENTS

- Study of prior attempts to collaborate
  - For instance EIT, European University Alliances, SSES, and many more
  - Result: identified three main alternatives from where to initiate teaching collaborations that has an effect on the platforms used:
    - creating organizational collaborations
    - creating & sharing content
    - creating common delivery of courses
- Supporting pilot on cross university programming education - WP3
- Test of platform support in (at least one) of the courses in WP3
- Research paper ” Education infrastructure for inter-organizational university collaborations” under review



Education infrastructure for inter-organizational university collaborations

Charlotta Linse[1], Joakim Lilliesköld[1], Jan Gulliksen[1], Joakim Pettersson[2]
[1] Department of Computer Science, KTH Royal Institute of Technology, Stockholm, Sweden
[2] IT, KTH Royal Institute of Technology, Stockholm, Sweden

Abstract

Collaboration is a long and strong academic tradition. Over the years we seen many investments in increasing collaborations, nationally and internationally, such as Erasmus +, EIT etc. Many of these attempts fall short, there are some collaborations, some development of platforms/infrastructure, but as soon as funding ends, collaboration ends. This paper makes a strong argument for a structured approach to inter-organizational university collaborations where the opportunities and challenges of different alternatives are evaluated. The paper proposes that solutions for national inter-organizational university collaborations can be designed by combining the choice of technical educational platforms with an idea for how to organize the collaborative processes.

We argue that it is possible to stake out the overall approach for inter-organizational university collaborations. Learning from previous initiatives, there are three main alternatives to choose from; (1) Focus on creating organizational collaborations; (2) Focus on creating and sharing content; and (3) Focus on creating common delivery of courses. It is noteworthy to mention that these are not mutually exclusive alternatives but can and should be combined.

Introduction

Universities of the future are facing several challenges, including new subjects in engineering (e.g., AI, ethics, wicked problems), new groups to teach (e.g., professional education and lifelong learning), new teaching requirements (e.g., use of digital tools), new technologies (e.g., ChatGPT, learning analytics etc.), as well as new collaborations (e.g., sharing educational materials with one another) and responding to sustainability goals. In response to complex challenges, organizations are increasing their inter-organizational collaborations (Cricelli & Grimaldi 2010), in universities this occurs both at national and international level.

Prior research has discussed inter-organizational collaborations regarding teaching (eg. Nerlich et al 2012) and regarding research (eg. Boardman & Corley 2008; Knobel et al. 2013). Many of these have focused on industry-university collaborations (eg. Bruneel et al. 2010; Rybnicek & Königsgruber 2019), rather than collaboration in-between different universities (cf. Borrego & Newswander 2013). There is some research regarding university collaborations for teaching to be found, however. Such research discusses for instance blended learning for online teaching over organizational boundaries (Nerlich et al 2012), inter-organizational

WA6: TEACHER COMPETENCE DEVELOPMENT

- 5 modules with teaching material for AI and how it can be integrated in different subjects used by across Sweden
- Conferences with representatives of pedagogical development in higher education
  - About 30 different colleges and universities
  - About 60 participants each
  - Increase the awareness about the need to develop teacher competence and better understand the needs of the different organisations
- Active encouragement at several colleges and universties

WASP-ED SUMMARY

https://wasp-ed.org/

- Purpose: significantly increase the capability and capacity of Swedish universities in providing timely, relevant, and scalable education in AI and other transformative technologies
- 3-year program with a budget of 18.6 MSEK + co-funding
- Objectives: 1) Provide educational foundations
  2) Scale-up the national educational capacity
  3) Scale-out education to disciplines and professions beyond the technical core
  4) Develop data-driven education and pedagogical transformation
- Work areas:

WA3 Course Development Develop modular course content	**WA6 Teaching Competence Development** Provide professional development support for teachers
WA2 Program Development Develop flexible and adaptable course packages for different roles	**WA5 Technical Platform and Education Data** Provide a technical platform for delivering courses and course content
WA1 Curriculum Development Provide a comprehensive overview of the subject matter content	**WA4 Pedagogical Development and Learning analytics** Provide support for pedagogical experimentation and development

- **We strive to be open and inclusive!**

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THE NEXT FIVE YEARS

SEVERAL REPORTS ON AI AND EDUCATION

- UKÄ
- MYH
- AI Competence
- The common theme is
  - AI will have significant impact on education,
  - we need to increase flexibility, and
  - we need to take a systemic perspective.

HOW DOES AI IMPACT EDUCATION?

- AI can solve more tasks and will be a powerful tool for many professions.
- Every reasonably well defined tasks will be able to automate.
- It will be more important to **ask questions** and **verify answers** (than answer questions).
- What is left is **complex, imprecise, multi-fascetted, uncertain and wicked problems** (the rest will be solved).
- **AI-literacy** for everyone to achieve **reponsible** and **critical** use of **AI**.
- Requires knowledge about how **AI impact** different on **professions/subjects**.
- We need to prepare people for **AI+human.**

WHAT DO YOU NEED TO KNOW?

- Data-driven mindset
  - High quality data flow within and between organisations is foundational
- Computation-driven mindset
  - Enables automation and scaling
- Centaur-mindset
  - People solves problems together with powerful AI tools

WASP-ED – RESEARCH CHALLENGES

- What does everyone need to know about AI? How to teach it?
- What does profession X need to know about AI? How to teach it?
- How to integrate AI in existing education programs?
- How to teach AI to new groups of students?
- How do we combine learning and working?
- How ought the educational system look in an AI-powered world?
- Can we accelerate learning?

WASP-ED – THE NEXT STEP

- Systematically bring the research in the Wallenberg programs into Swedish higher education nationally
- Expand the national coverage and involve all higher education institutions
- Develop new course and program concepts
- Support the development of the infrastructure needed
- Support the professional development of teachers

INPUT TO THE ROADMAP

Today we will have four sessions to discuss some of these topics:

- Broadening and scaling-out AI education
- Data-driven pedagogical transformation in higher education
- AI Literacy
- AI and Professional Development