



WALLENBERG AI AND TRANSFORMATIVE TECHNOLOGIES
EDUCATION DEVELOPMENT PROGRAM

WA1 - THE WASP-ED AI CURRICULUM: A HOLISTIC CURRICULUM FOR ARTIFICIAL INTELLIGENCE

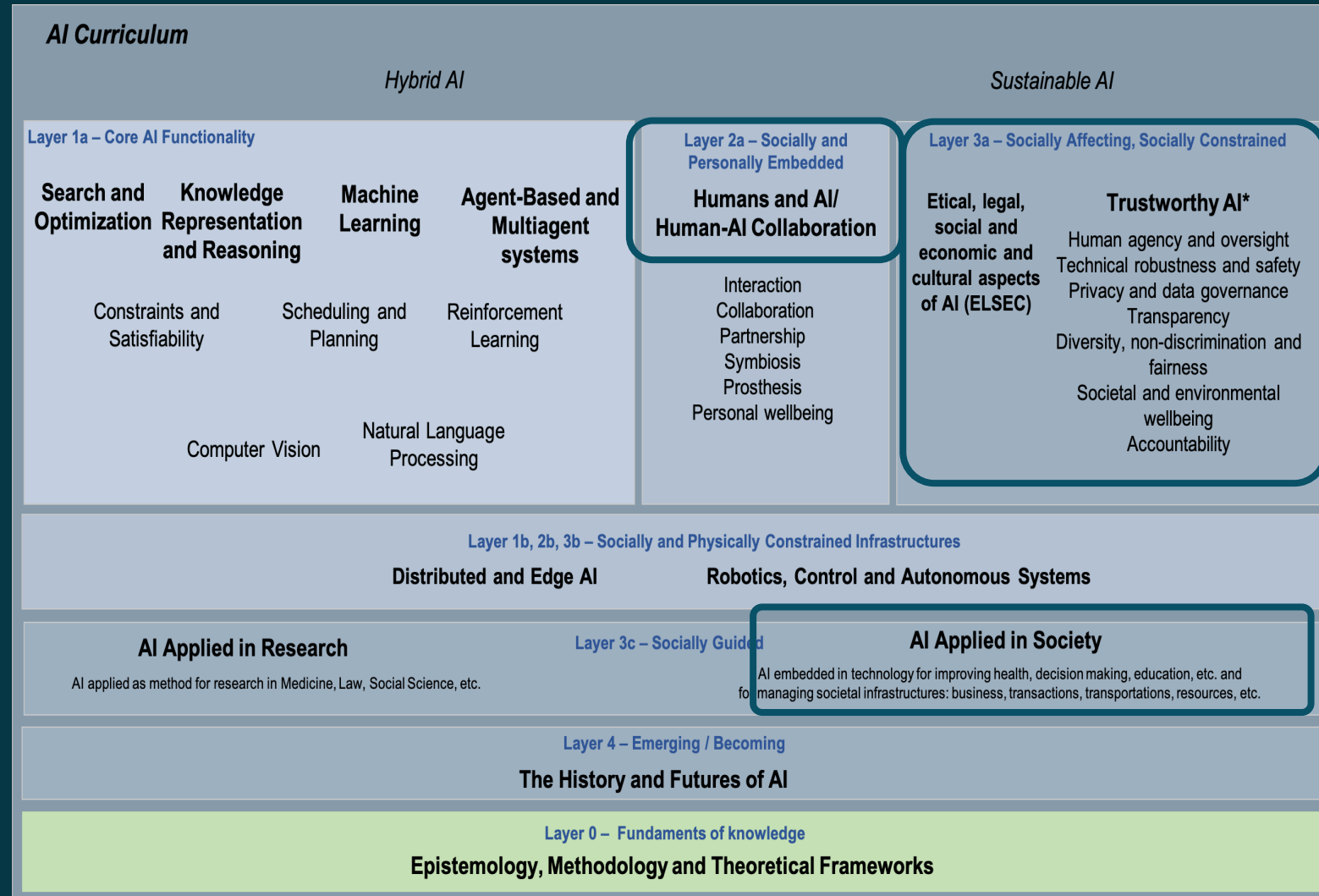
Helena Lindgren, Umeå University, Co-Director WASP-HS

Fredrik Heintz, Linköping University, GS Director WASP



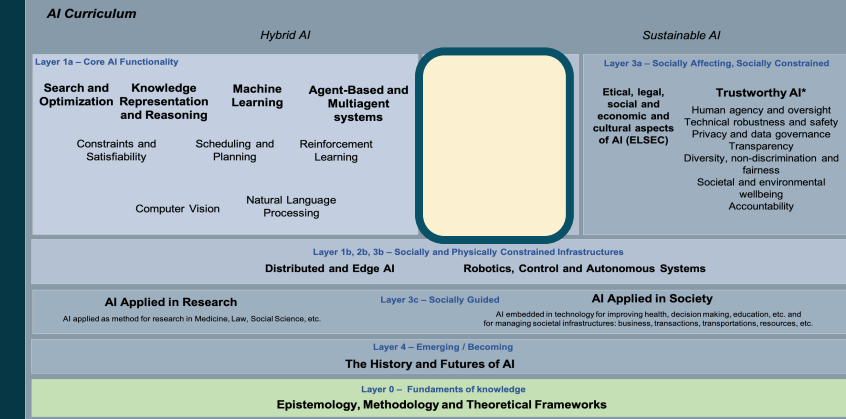
CURRENT FOCUS

- Describe the content of the topics, the dependencies and progression between the topics
- Identify entry points and subsets of topics providing suitable educational pathways for different practitioners and professions
- Fackspråk: Terminology matters!

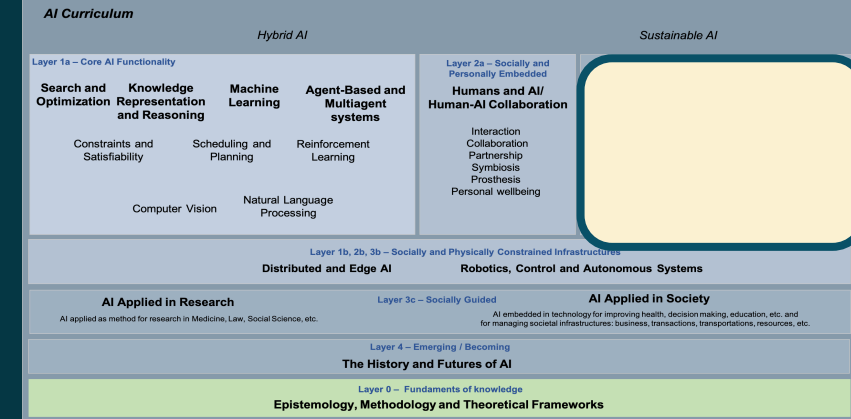


SOCIALLY AND PERSONALLY EMBEDDED AI: HUMANS AND AI/ HUMAN-AI COLLABORATION

- The human in the HCAI context
 - Example: Critically evaluate person-tailored AI technology and its impact on the individual on a cognitive, personal, emotional, physical, social level in a short-term as well as long-term perspective.
- Theory and methodology
 - Example: Critically evaluate and discuss how theories and methodology facilitate or limit the understanding of the consequences of AI technology on the human's cognitive, personal, emotional, physical, social level in a short-term as well as long-term perspective.
- HCAI technology
 - Example: Hybrid AI: Computational frameworks in tandem with the human for sliding autonomy, agency, user modelling, Theory of Mind, pro-active vs. adaptive behaviour, multi-agent systems including humans, collaborative grounding, negotiation and agreement.

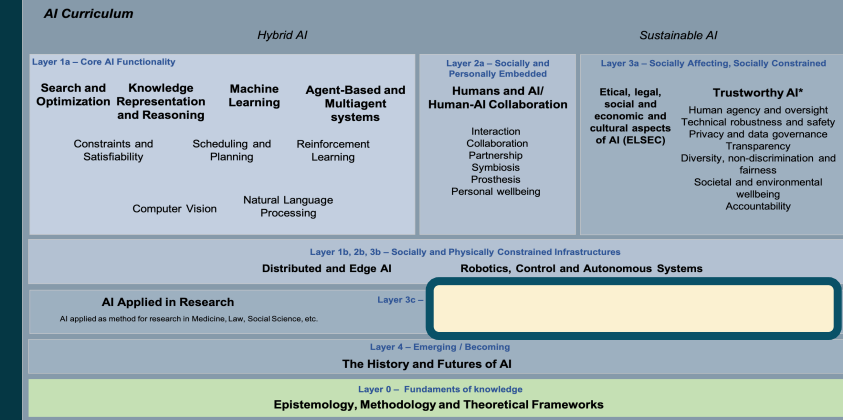


SOCIALLY AFFECTING, SOCIALLY CONSTRAINED AI



- **Appreciation:** Identifying the applicability of the requirement in different contexts and its different dimensions for different stakeholders.
- **Analysis:** Deliberating about possible implementations of the requirement, how they relate to ethical guidelines and codes of conduct, and their possible consequences.
- **Application:** Selecting and technically implementing a solution in response to analysis in terms of the requirement.

AI APPLIED IN SOCIETY (AI FOR X)



- Data curation and management
- Knowledge elicitation and development of computational models of domain-specific expertise
- Learning and prediction models for planning and resource distribution
- AI-supported workflows and business intelligence
- Simulation models
- AI-supported domain-specific knowledge and skill development
- AI-supported continued education and lifelong learning integrated in disciplinary work
- AI-supported teamwork
- Changes of disciplinary roles, expertise and work tasks as a consequence of AI
- The customer/client/citizen's perspective on AI-based tools, e.g., ethics, equality, equity, autonomy, self-management
- Adopt the principles of trustworthy AI.

UKÄ REPORT

- Specialist competence
- General AI competence
 - "Den generella AI-kompetensen handlar ytterst om tillräckliga tekniska kunskaper för att överbrygga gapet mellan teknik och tillämpningsdomän."
- Domain competence
 - "Vid sidan av generell AI-kompetens behövs alltså kompetenser i tillämpningsområdet som är oberoende av AI för att kunna avgöra om AI gör rätt."
- Interdisciplinary understanding in domain experts and specialists
 - "Dubbla examina, mer sannolikt behov av nya utbildningsprogram"
- Competences in the border where technology and society meet
 - Etik och juridik



Layer 1a – Core AI Functionality

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

Fundamentals of AI Generalists?
Specialists

Constraints and Satisfiability	Scheduling and 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

Mapping to WASP expertise areas

Mapping to WASP-HS expertise areas

Interdisciplinary Competence Domain-experts --- Specialists

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.

Mapping to DDLS, WACQT, WISE expertise areas

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

Hybrid AI

Sustainable AI

Layer 1a – Core AI Functionality

Layer 2a – Socially and Personally Embedded

Layer 3a – Socially Affecting, Socially Constrained

Search and Optimization
Knowledge Representation
Art Reasoning

Machine Learning
ML

Agent-Based and Multiagent systems

Humans and AI
Human-AI Collaboration

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

Trustworthy AI*
Human agency, autonomy, technical robustness and safety, data governance, Transparency

Constraints and Satisfiability

Scheduling and Planning

Reinforcement Learning

Interaction
Collaboration
Partnership
Symptoms
Prosthesis
Personal wellbeing

Responsible Design of Interactive AI Systems
(Human-AI Collaboration and Trustworthy AI-ELSEC)

for "Specialists"

Formal and Cognitive Reasoning

Computer vision
Computer Vision

NLP
Natural Language Processing

Diversity, non-discrimination and fairness
Accountability

Various courses

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

Distributed and Embedded AI

Robotics, Control and Autonomous Systems

AI Applied in Research

Layer 3c – Socially Guided

AI Applied in Society

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

Project collaborations with external organisations

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

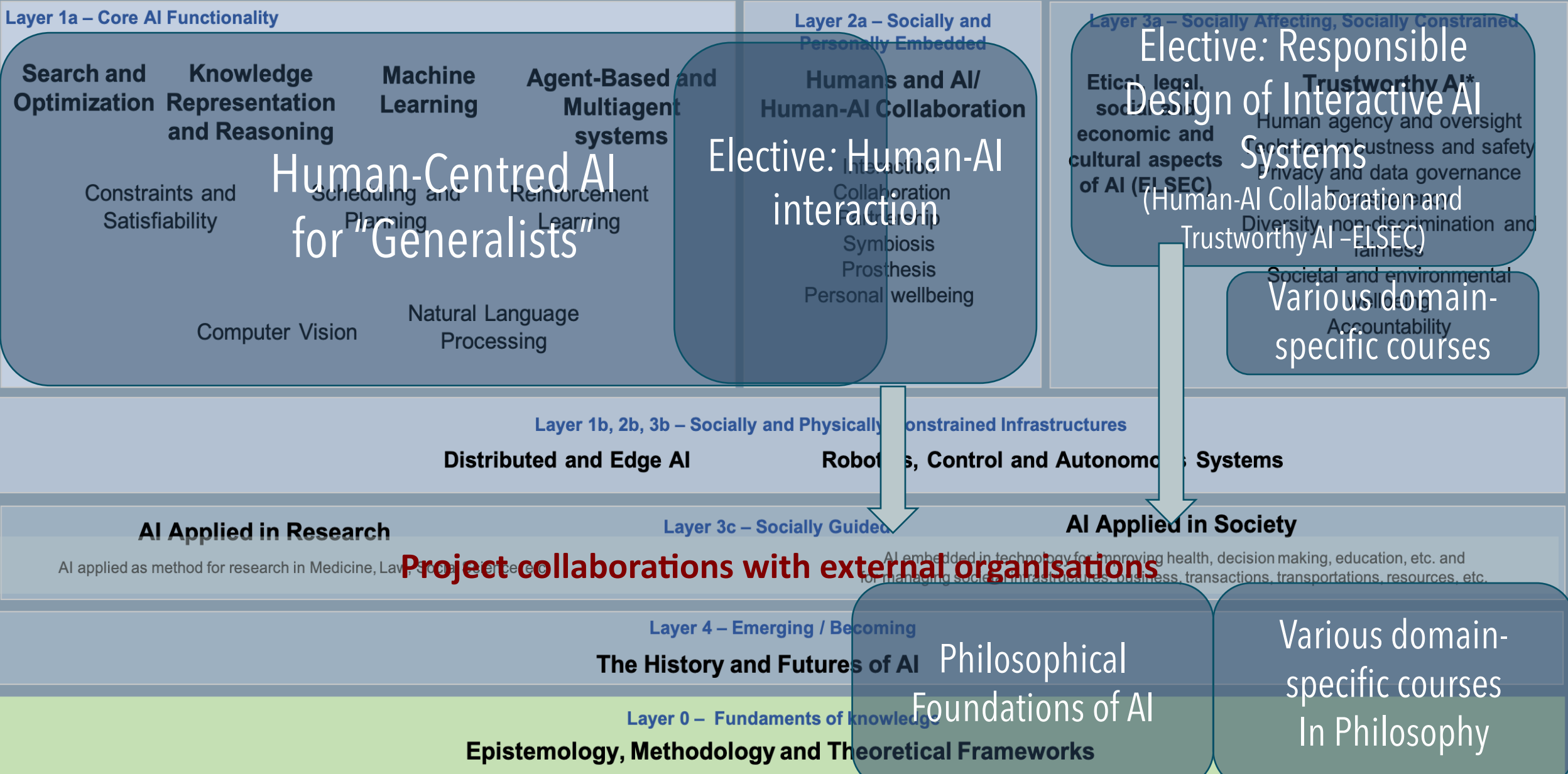
The History and Futures of AI

Layer 0 – Fundamentals of knowledge

Epistemology, Methodology and Theoretical Frameworks

Hybrid AI

Sustainable AI



QUESTIONS FOR DISCUSSION

1. Is there a level of competence that domain professionals can gain between an introduction to “anybody” and an AI course that requires programming as prerequisite?
2. Generalists “Using” vs. “participating in/driving” design and development?
3. Terminology: at which level does “fackspråk” (technical language) need to align across disciplines?
4. Transdisciplinary life-long learning?

H. Lindgren and F. Heintz. 2023. THE WASP-ED AI CURRICULUM: A HOLISTIC CURRICULUM FOR ARTIFICIAL INTELLIGENCE.

In INTED2023 Proceedings. IATED, 6496–6502.

<https://doi.org/10.21125/inted.2023.1727>