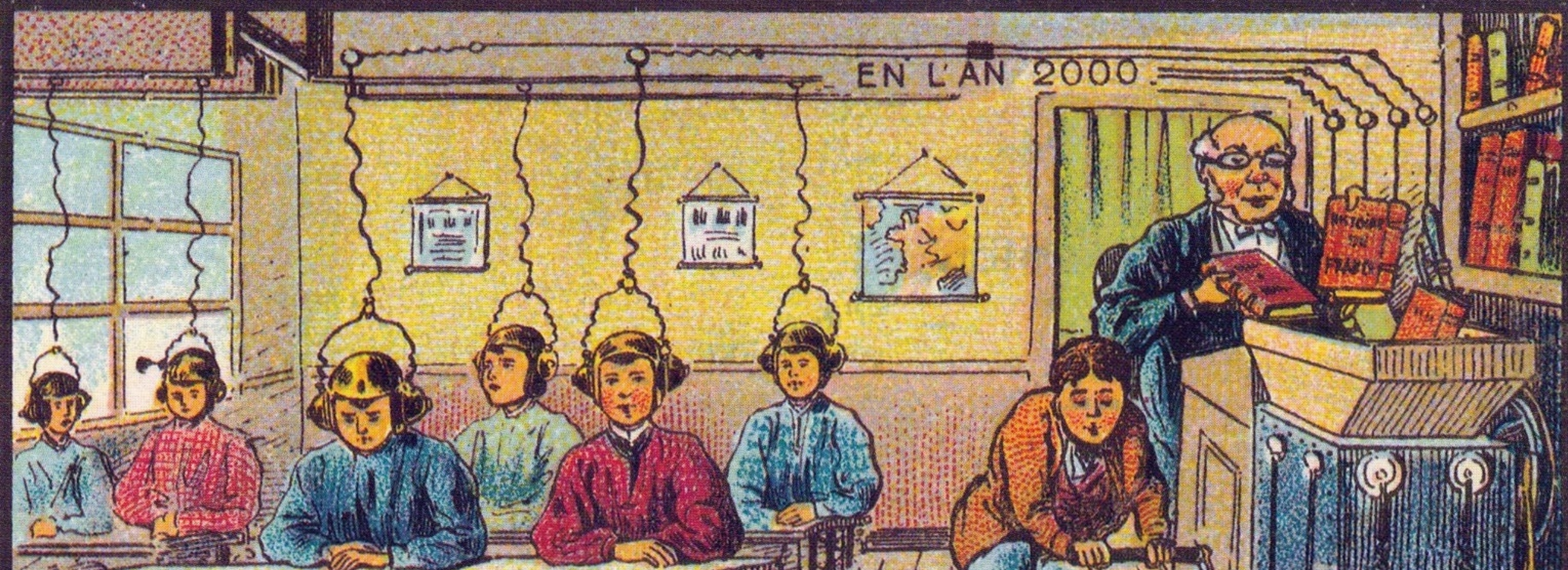




Artificial Intelligence and Education?

Powering the European digital transition: What can we learn from Cedefop's Second European skills and jobs survey?
12 December 2022

Dr Wayne Holmes

University College London, IRCAI (Senior Researcher), Council of Europe (Lead Expert AI&ED), UNESCO (Consultant)



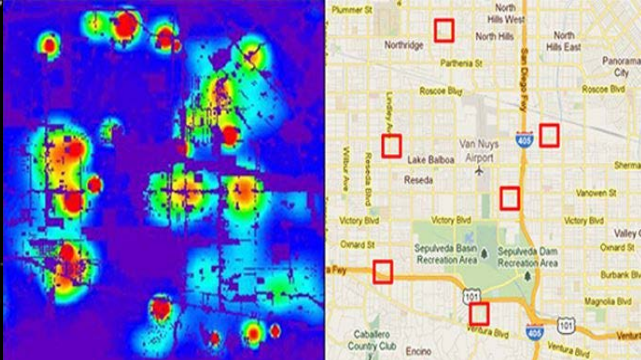
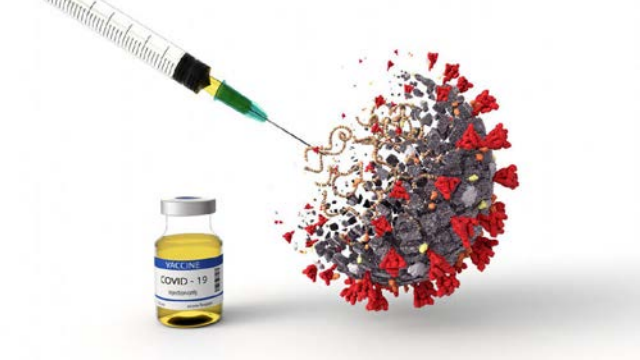
The background is a vibrant, futuristic digital scene. It features a dark blue and black color palette with glowing orange and red lines that crisscross the frame, suggesting a network or data flow. Binary code (0s and 1s) is scattered throughout, some appearing as if they are floating or falling. The overall aesthetic is high-tech and digital.

**1 AI is
impressive**

“Artificial Intelligence
has the potential to
revolutionize the way we
work. It can automate
tasks, increase
efficiency, and lead to
job displacement”

Written by ChatGPT, an AI system developed by OpenAI.





The background of the image is a vibrant, futuristic digital scene. It features a dark blue and black space filled with glowing binary code (0s and 1s) in a light blue color. Interwoven with the binary are several bright red laser lines that crisscross the frame, creating a sense of dynamic movement and high-tech connectivity. The overall aesthetic is reminiscent of a digital data center or a virtual reality environment.

**2 AI is not that
impressive**



+



=

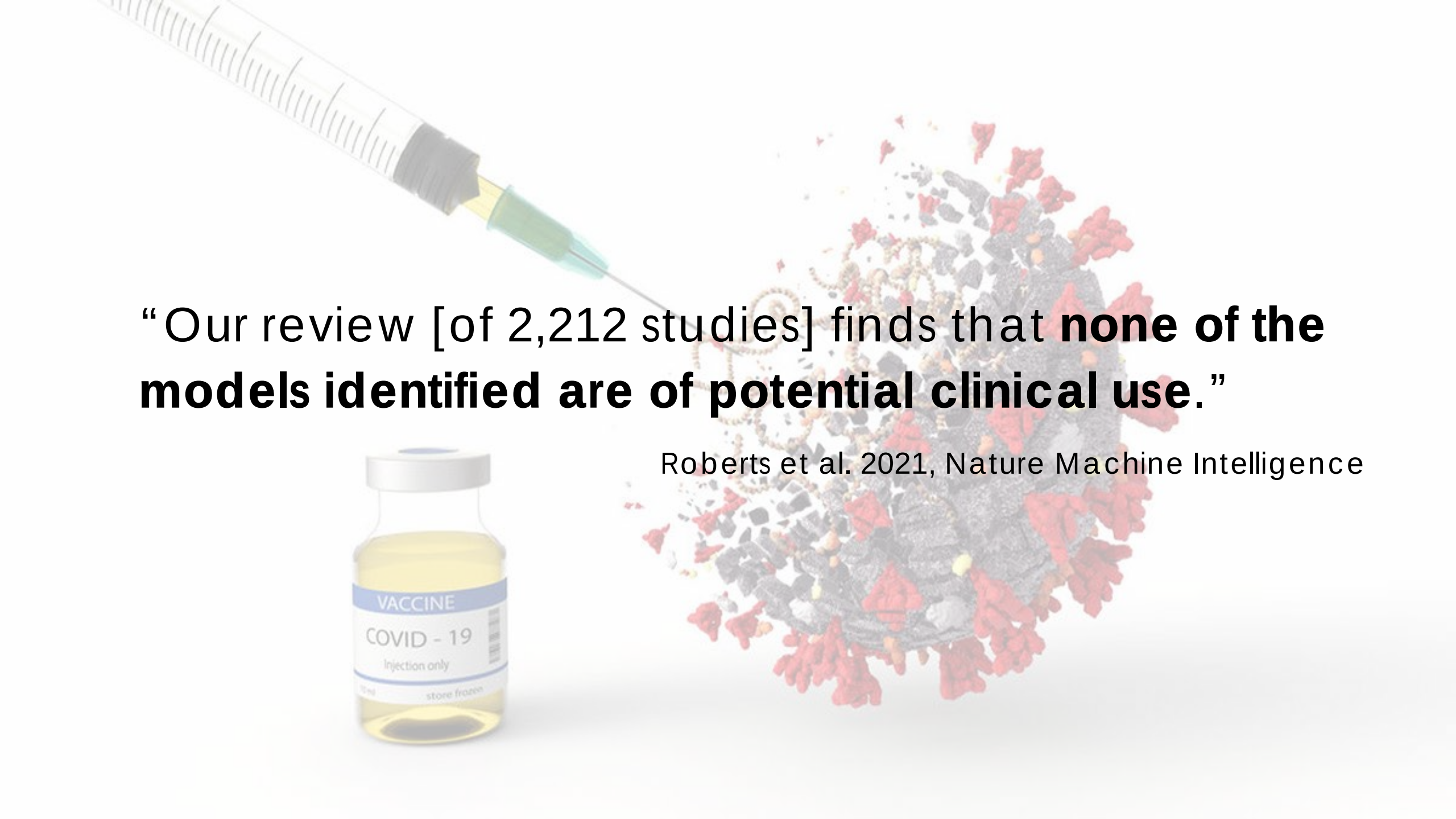


Panda

57.7% confidence

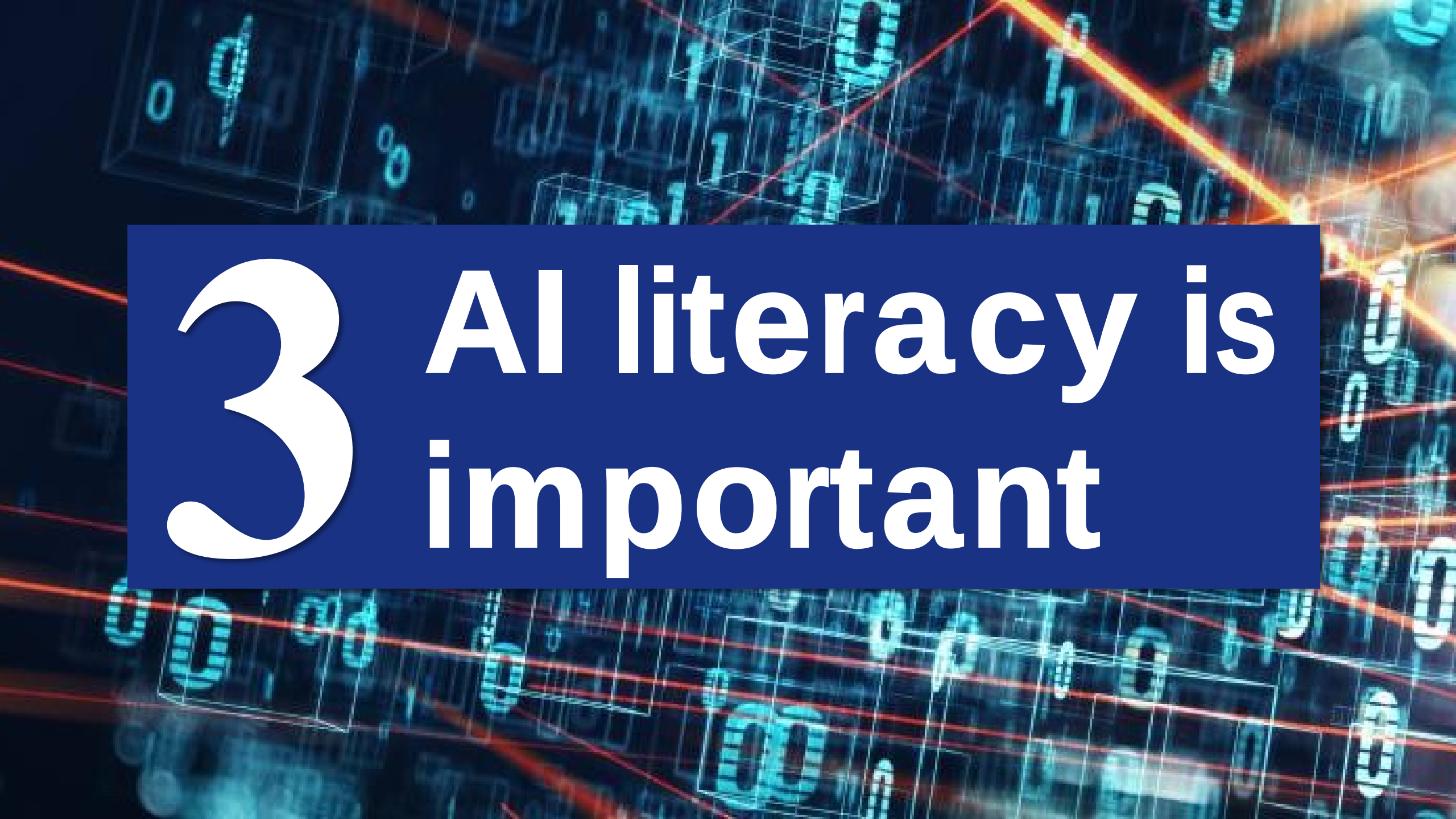
Gibbon

99.3% confidence



“Our review [of 2,212 studies] finds that **none of the models identified are of potential clinical use.**”

Roberts et al. 2021, Nature Machine Intelligence



**3 AI literacy is
important**

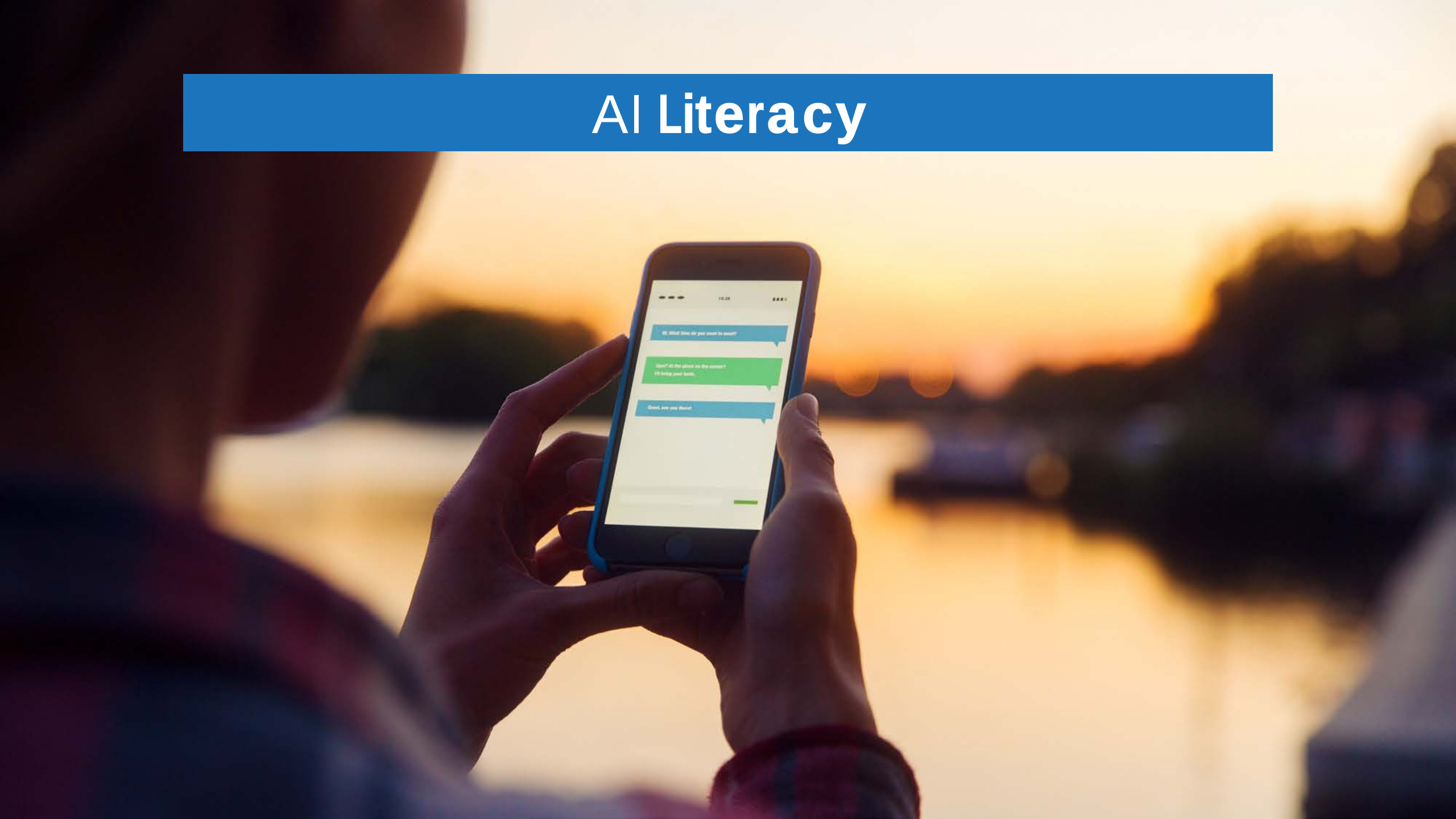
AI Literacy

Total EU workforce



Workforce who are coding AI

AI Literacy



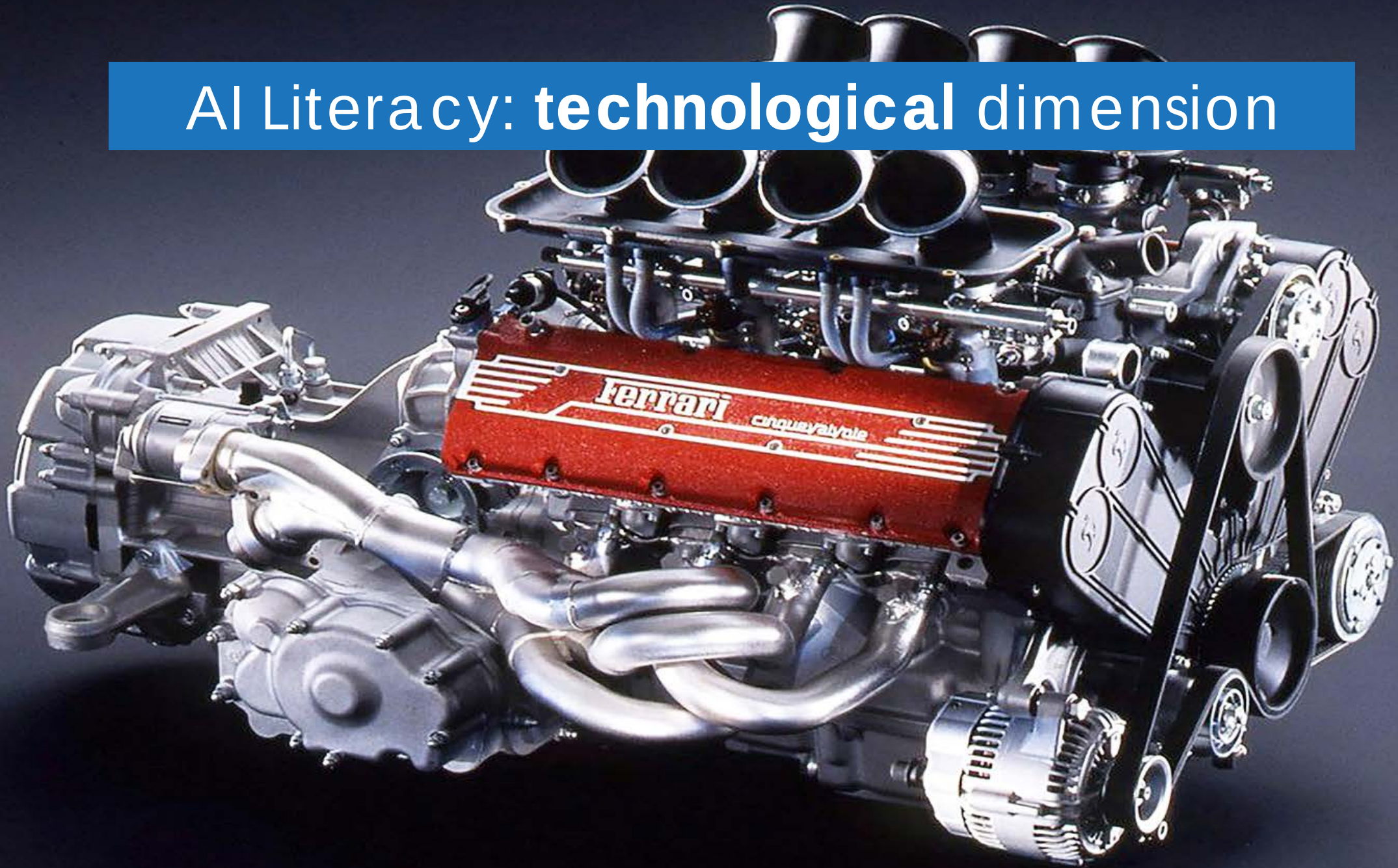
AI Literacy



The background is a complex digital visualization. It features a dark blue to black gradient. Overlaid on this are numerous glowing blue and white binary digits (0s and 1s) of varying sizes, some appearing to float or move. A network of thin, glowing red lines crisscrosses the scene, creating a sense of depth and connectivity. The overall aesthetic is high-tech and futuristic, typical of digital art or data visualization.

The technological dimension of AI

AI Literacy: technological dimension

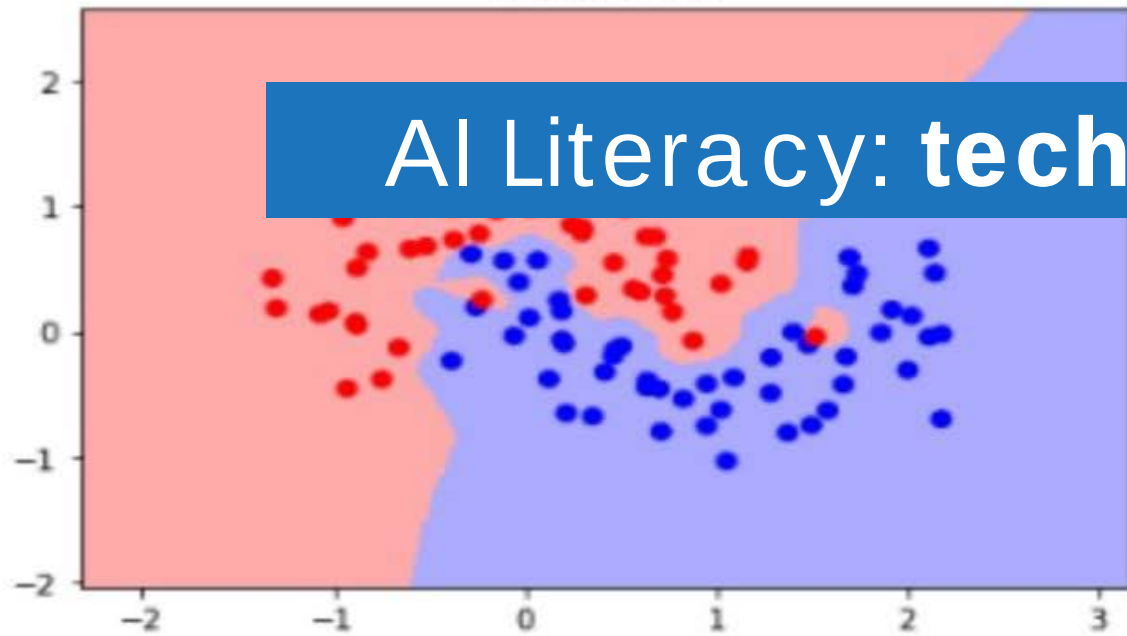


AI Literacy: **technological** dimension

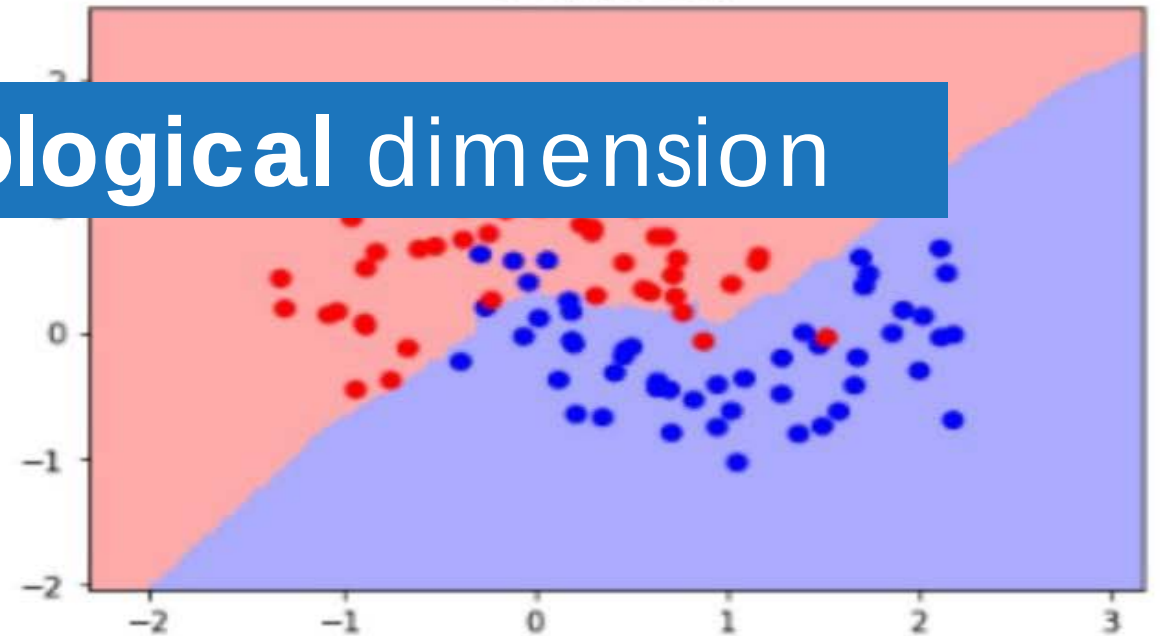


AI Literacy: technological dimension

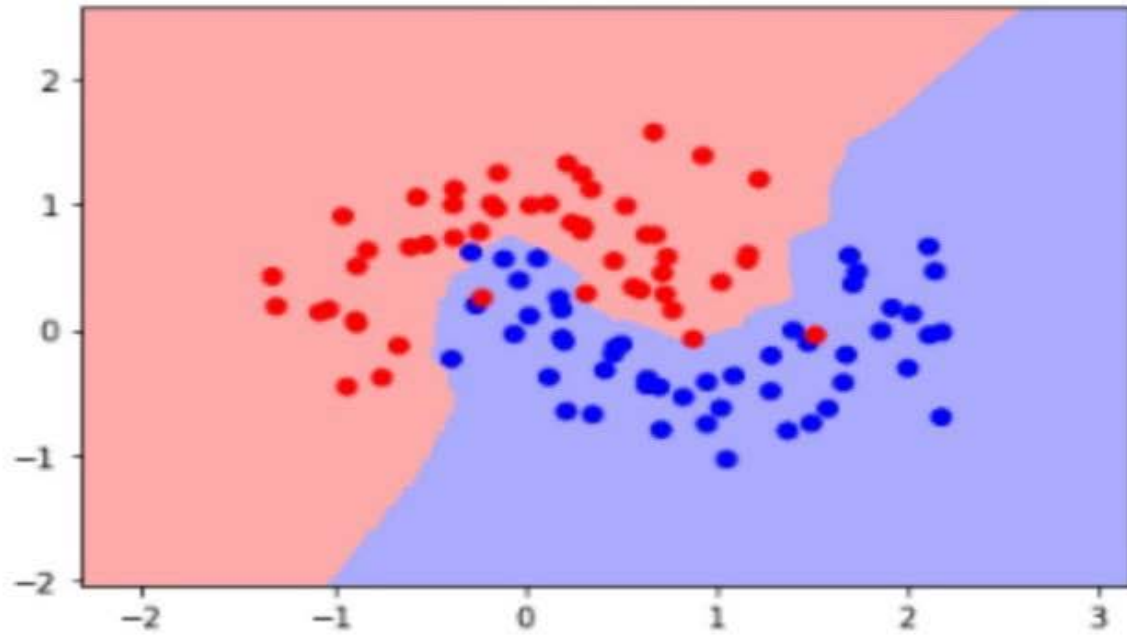
K value = 1



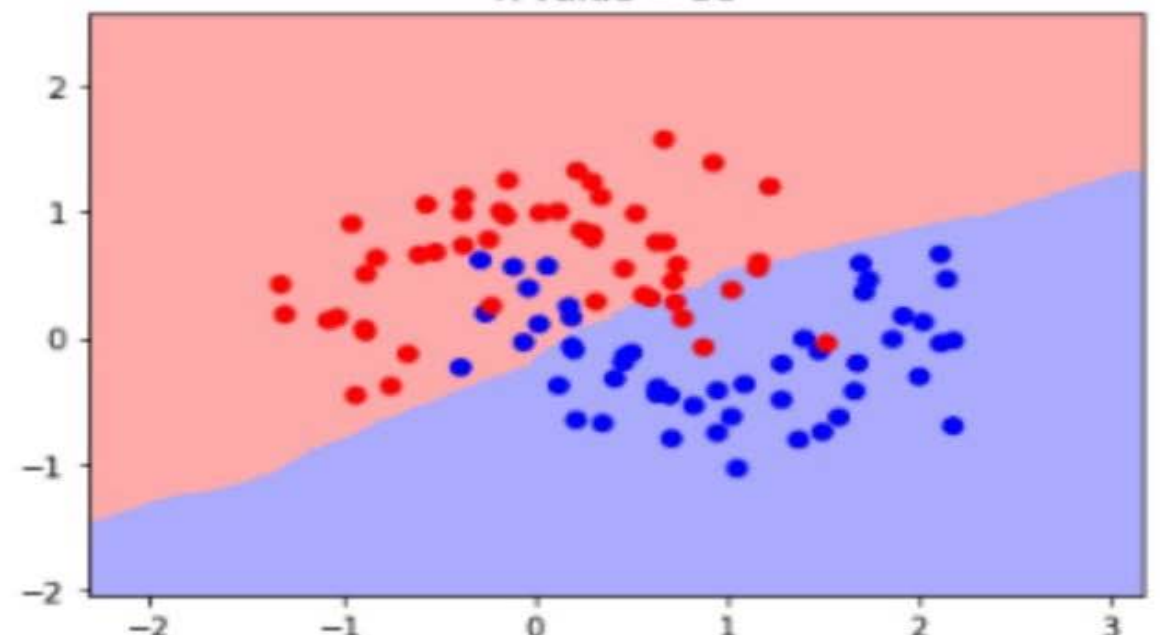
K value = 30



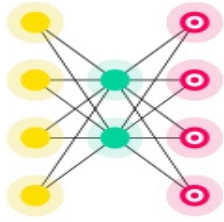
K value = 5



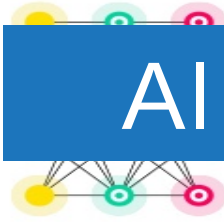
K value = 50



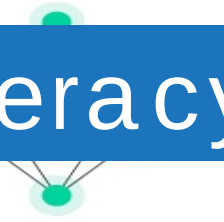
Auto
Encoder (AE)



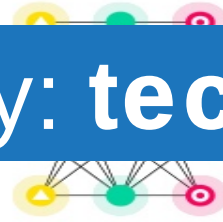
Variational
AE (VAE)



Sparse
AE (SAE)



Denoising
AE (DAE)



Markov
Chain (MC)



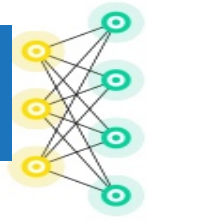
Hopfield
Network (HN)



Boltzman
Machine (BM)

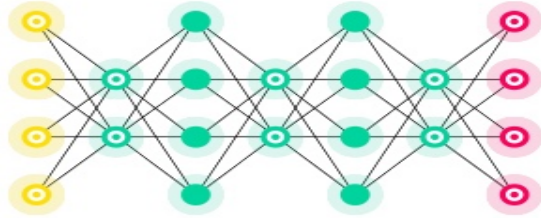


Restricted
BM (RBM)

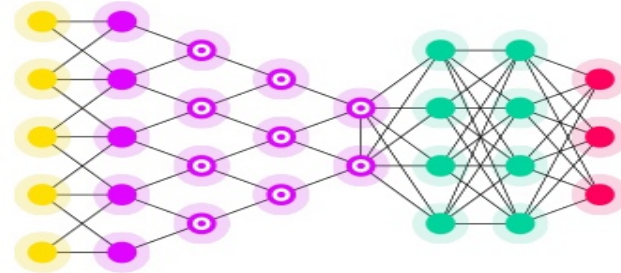


AI Literacy: technological dimension

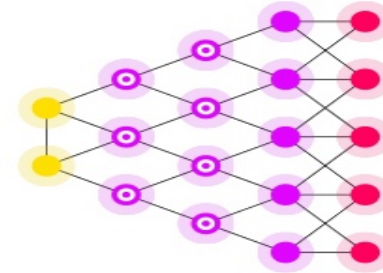
Deep Believe
Network (DBN)



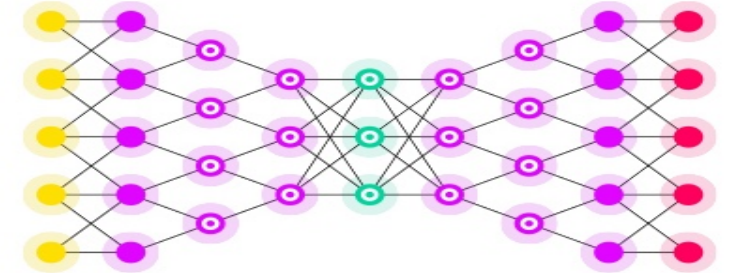
Deep Convolutional
Network (DCN)



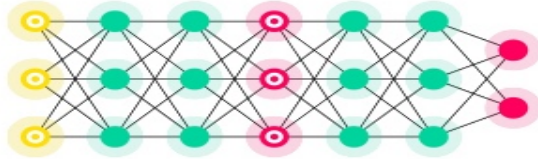
Deep
Network (DN)



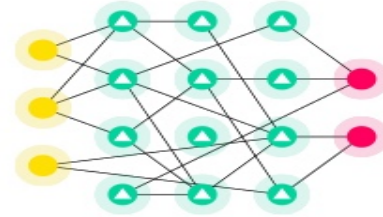
Deep Convolutional
Inverse Graphics Network (DCIGN)



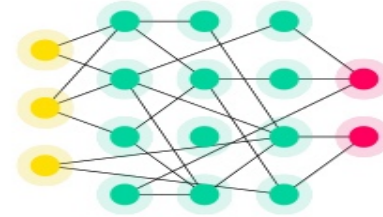
Generative Adversial
Network (GAN)



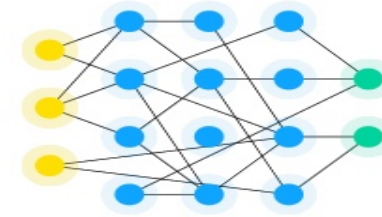
Liquid State
Machine (LSM)



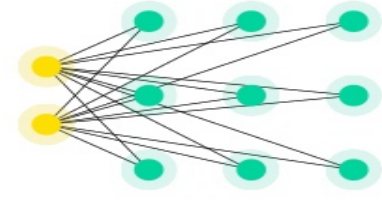
Extreme Learning
Machine (ELM)



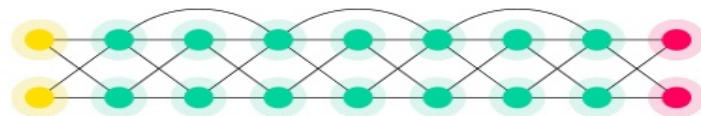
Echo Network
Machine (ENM)



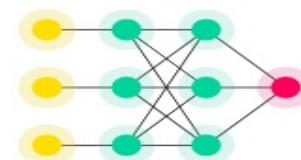
Kohonen
Network (KN)



Deep Residual Network (DRN)



Support Vector Machine (SVM)



Neural Turing Machine (SVM)



AI Literacy: technological dimension



The background is a complex digital visualization. It features a dark blue field filled with glowing blue and white binary digits (0s and 1s) that appear to be floating or falling. Overlaid on this are several thin, bright red lines that crisscross the frame, creating a sense of depth and connectivity. Some of these lines are thicker and more prominent, while others are fainter. The overall effect is one of high-tech, data-driven complexity.

The human dimension of AI

AI Literacy: **human** dimension



AI Literacy: **human** dimension



AI Literacy: **human** dimension



Lighter skin
males

100%



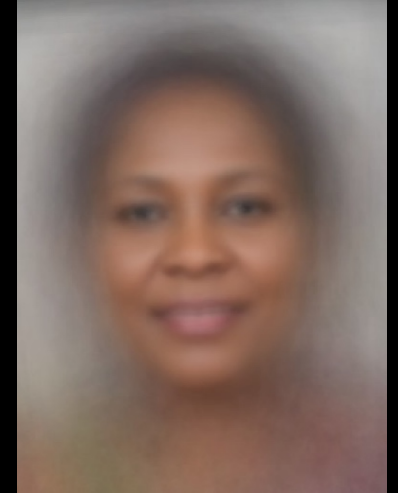
Darker skin
males

98.7%



Lighter skin
females

92.9%



Darker skin
females

68.6%

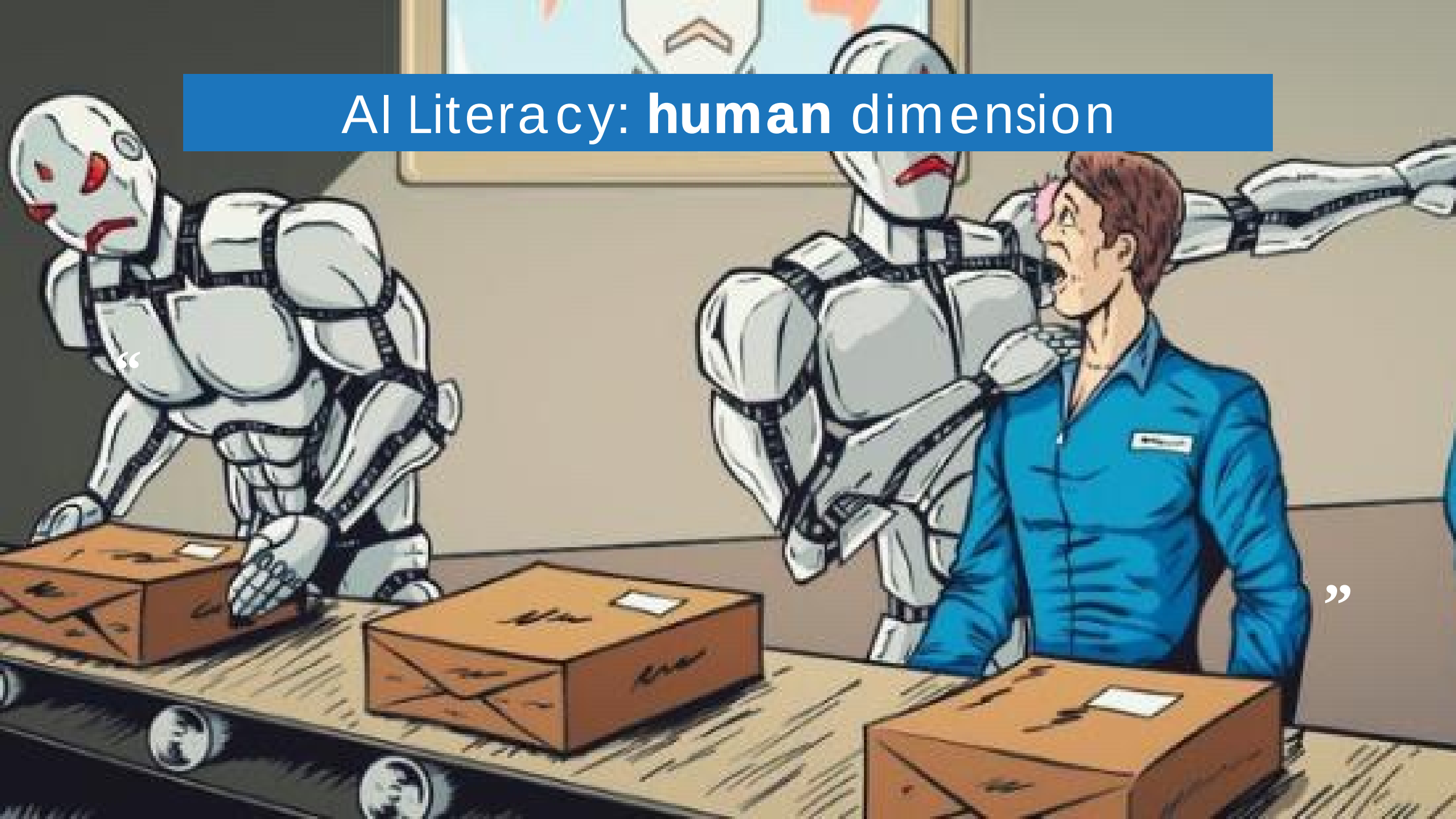
AI Literacy: **human** dimension



AI Literacy: **human** dimension



AI Literacy: **human** dimension



AI Literacy: **human** dimension

DigComp 2.2, Annex 2: Citizens Interacting with AI Systems

- A. What do AI systems do and what do they not do?
- B. How do AI systems work?
- C. When interacting with AI systems
- D. The challenges and ethics of AI
- E. Attitudes regarding human agency and control

EU JRC, 2022

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A2. CITIZENS INTERACTING WITH AI SYSTEMS

Main authors: Riina Vuorikari, Wayne Holmes

Today, for citizens to engage confidently, critically and safely with new and emerging technologies, including systems driven by artificial intelligence (AI), they need to acquire a basic understanding of such tools and technologies (DEAP2).

Greater awareness will also lead to improved sensibility towards potential issues related to data protection and privacy, ethics, children's rights and bias – including accessibility, gender bias and disabilities. The DigComp 2.2 update addresses the topic of citizens interacting with AI systems rather than focusing on the knowledge about Artificial Intelligence per se (see Box 6).

The co-creation process of the 2.2 update resulted in a list of more than 80 examples of knowledge, skills and attitudes related to citizens interacting with AI systems (see more about the process in FIG.9). 35 are included in Dimension 4 so that each DigComp competence area has a number of examples that illustrate various aspects to pay attention to when citizens interact with AI systems. The selection was guided by the feedback collected through public validation.

Additionally, a separate appendix on this new topic was created. It covers all 73 examples which have been revised according to comments received through the public validation. In this appendix, the examples are thematically grouped so as to facilitate the reading. After each example, the corresponding number to the competence is given. This can help curriculum developers and trainers to get inspired when updating their content regarding new and emerging technologies. The list of examples below should not be considered as a ready curriculum to teach about AI as such. Whereas these examples cover competences outlined in the DigComp conceptual reference model, they leave out some themes and topics that might be considered rudimentary when providing a curriculum outline or a training syllabus about AI and emerging technologies (e.g. what is AI, history of AI, different types of AI).

- A. What do AI systems do and what do they not do?
- B. How do AI systems work?
- C. When interacting with AI systems
- D. The challenges and ethics of AI
- E. Attitudes regarding human agency and control

BOX 6. Requirements for citizens interacting with AI systems

As part of the update process focusing on citizens interacting with AI systems, the requirements gathering captured the following:



KNOWLEDGE

- To be aware of what AI systems do and what they do not do
- To understand the benefits, limitations and challenges of AI systems



SKILLS

- To use, interact and give feedback to AI systems as an end-user
- To configure, supervise and adapt AI systems (e.g. overwrite, tweak)

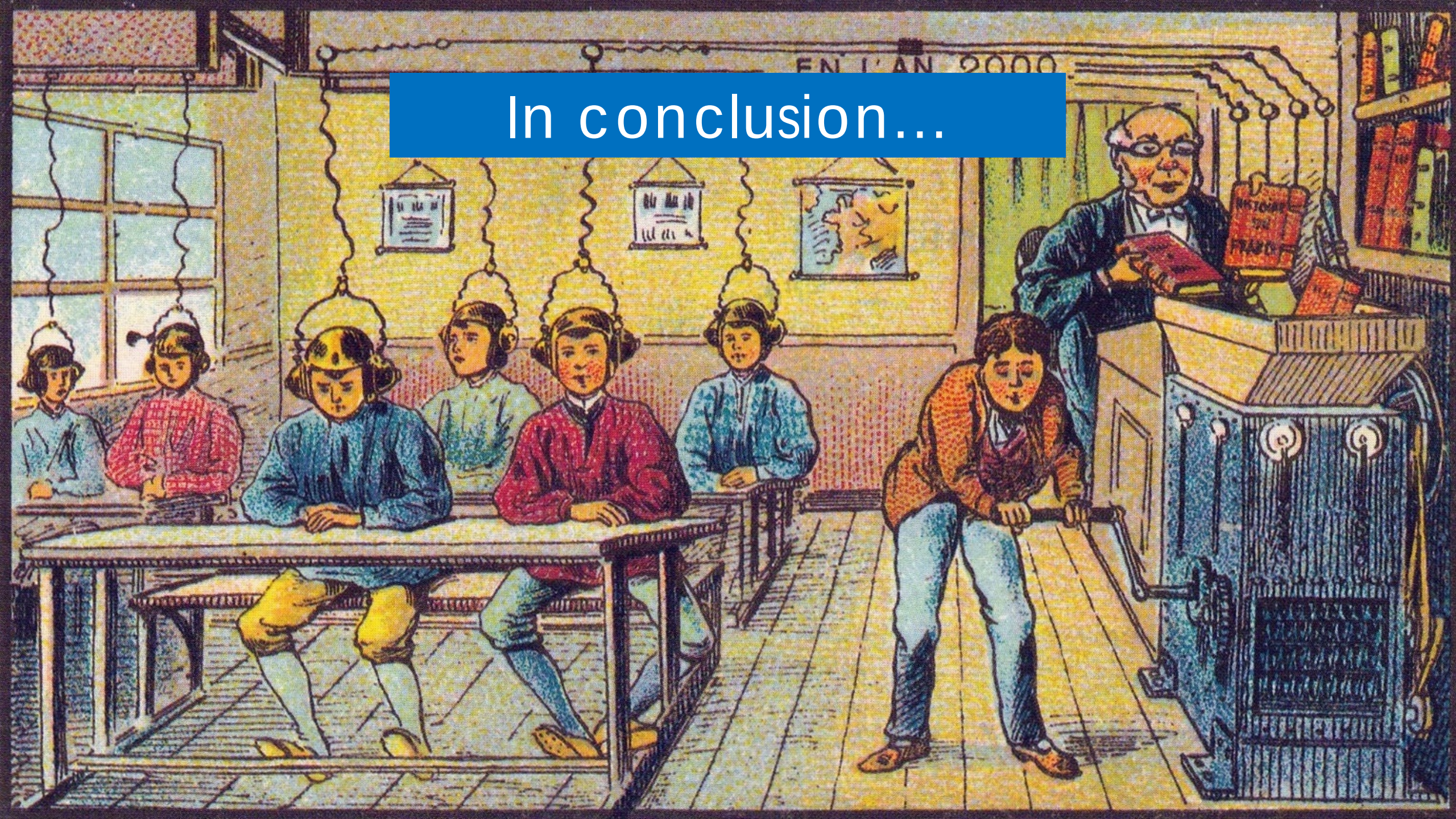


ATTITUDES

- Human agency and control
- Critical yet open attitude
- Ethical considerations of usage

A little red dot identifies the examples included in DigComp2.2

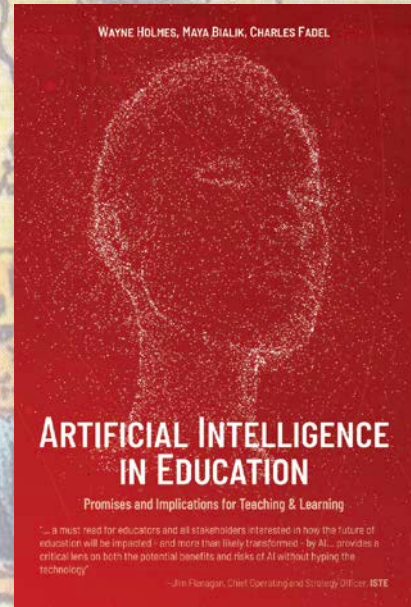
In conclusion...



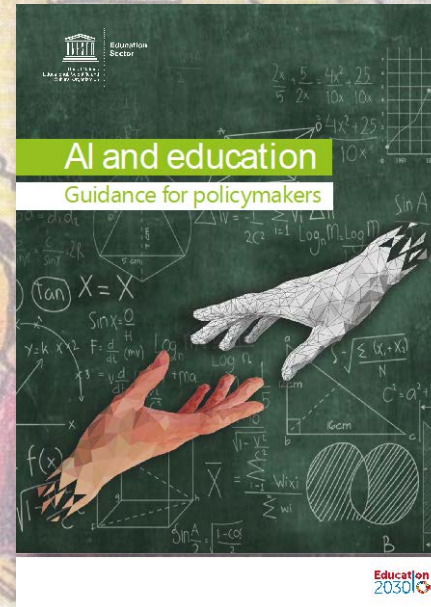
Thank you for listening.



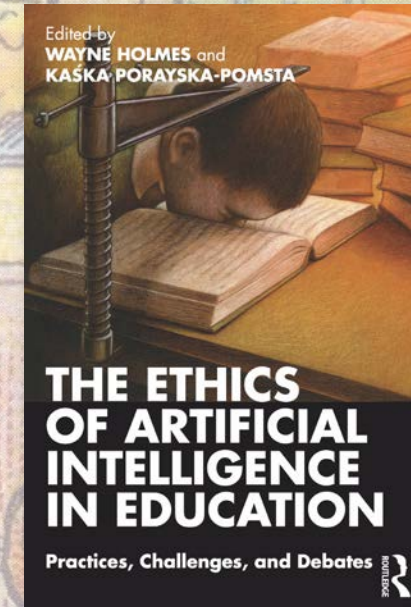
Intelligence
Unleashed.
An Argument for AI
in Education.



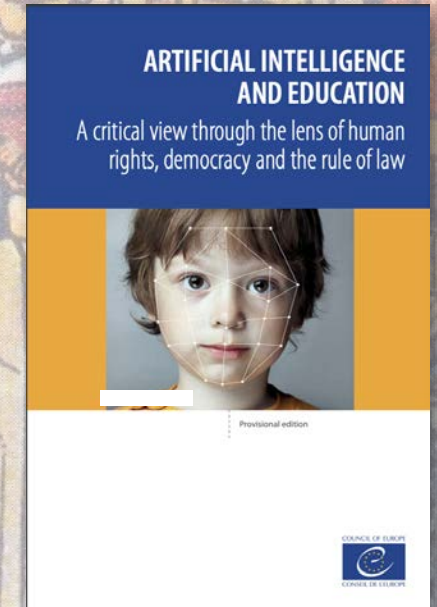
Artificial Intelligence
in Education.
Promises and
Implications
for Teaching and
Learning.



AI and Education.
Guidance for
Policymakers.
UNESCO



The Ethics of
Artificial
Intelligence in
Education
Practices,
Challenges, and
Debates



Artificial Intelligence
and Education a
Critical View
Through the Lens of
Human Rights,
Democracy and
the Rule of Law.
Council of Europe.

wayne.holmes@ucl.ac.uk