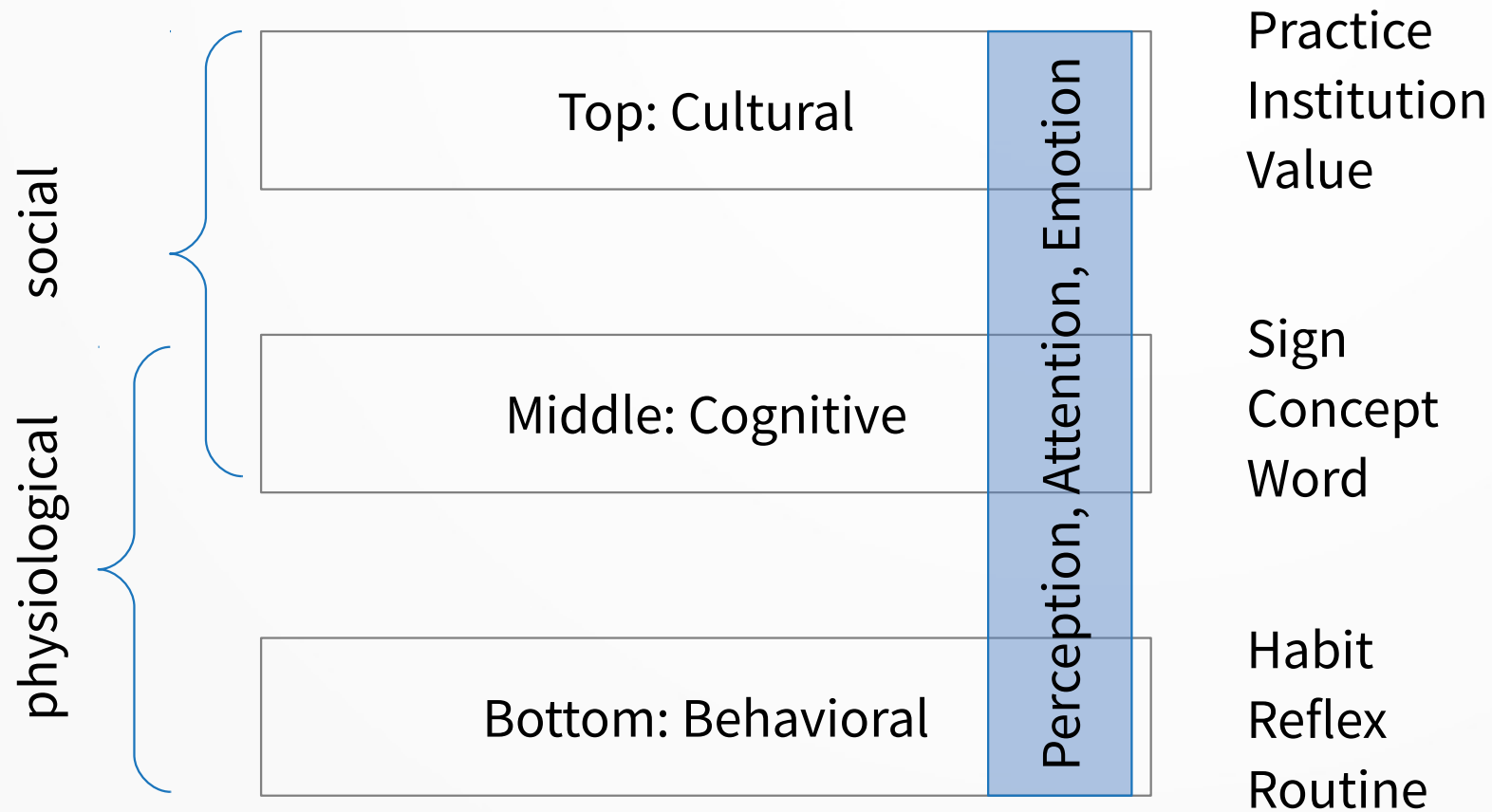


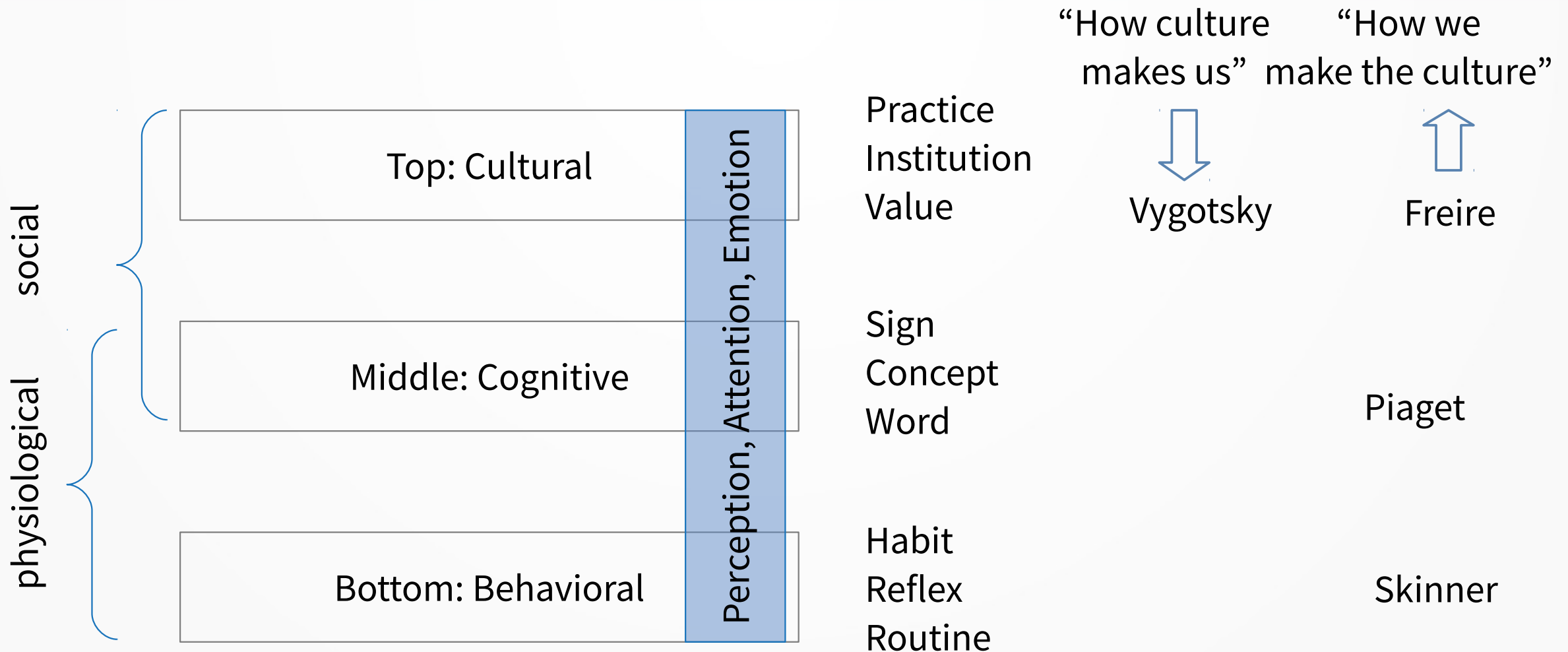
Skills and Education in an AI-enabled world

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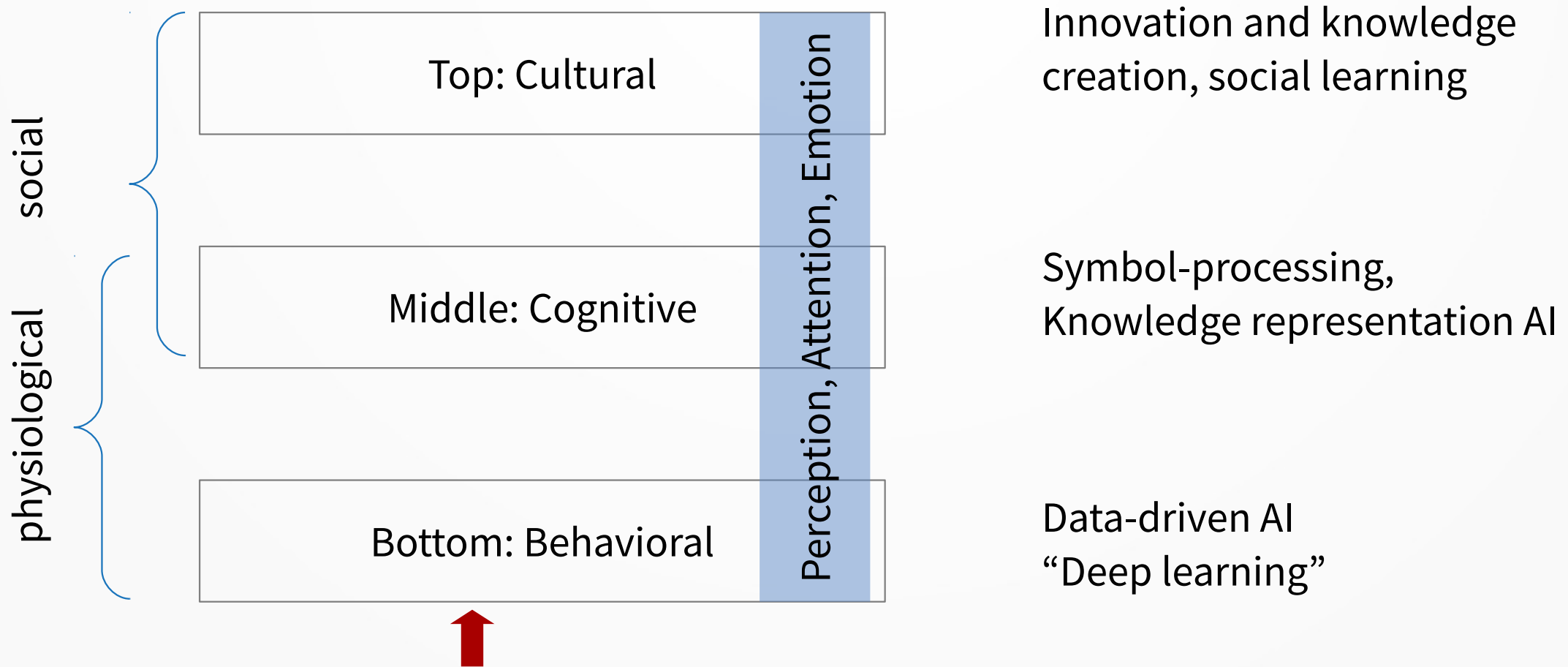
What, exactly, is machine learning?



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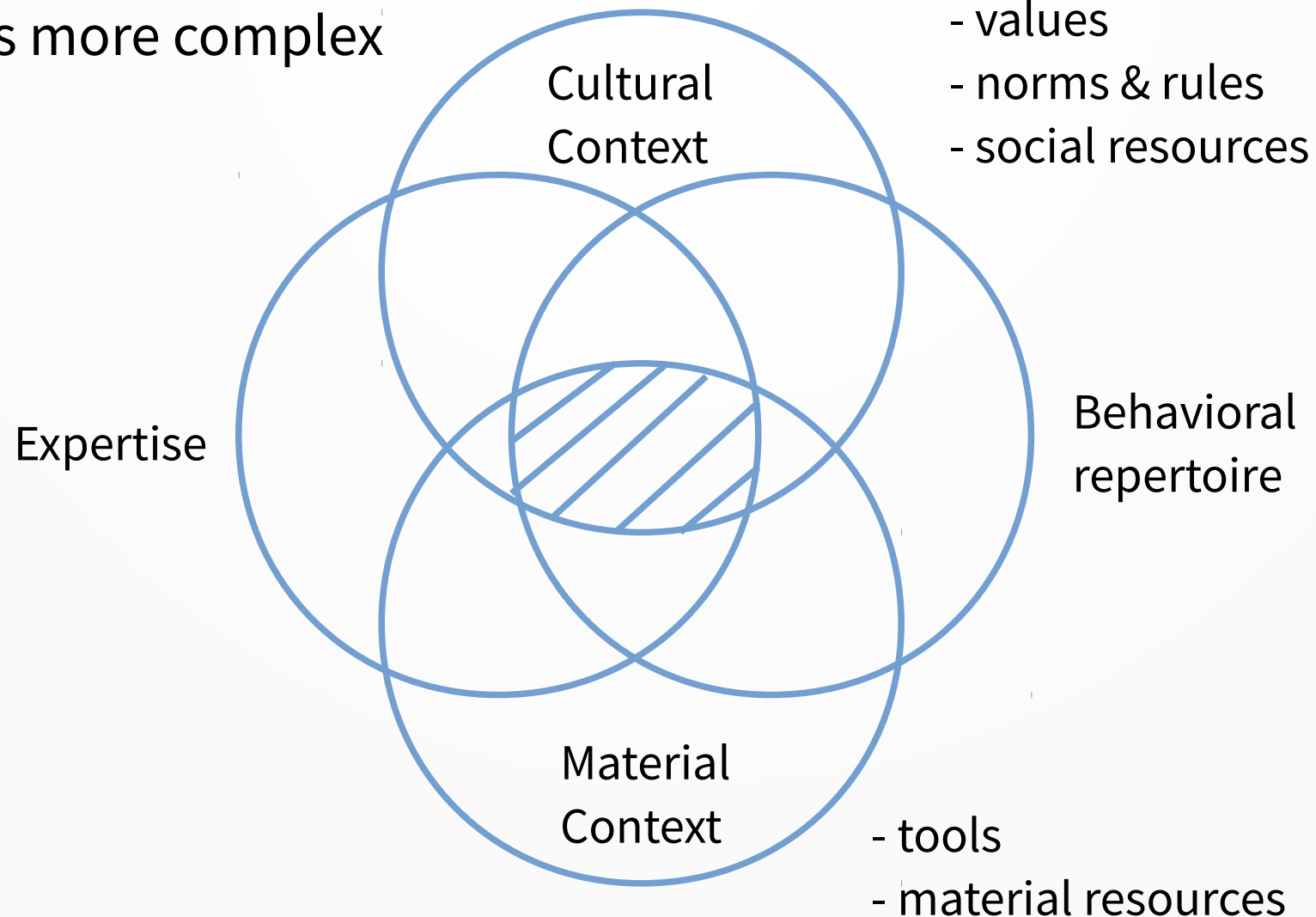
Anything here can be done with less than one second of thinking.

Learning for AI

- Know about, follow the debate, have an informed opinion
 - study one week full-time equivalent
- Use (know how)
 - study about one fte week for each application
- Modify existing AI systems for new uses
 - study one week (for one application and for a person with basic CS skills) to two years (full AI portfolio)
- Create new models and technologies
 - study 3-5+ years, fte

VET needs a broader view

Competence is more complex



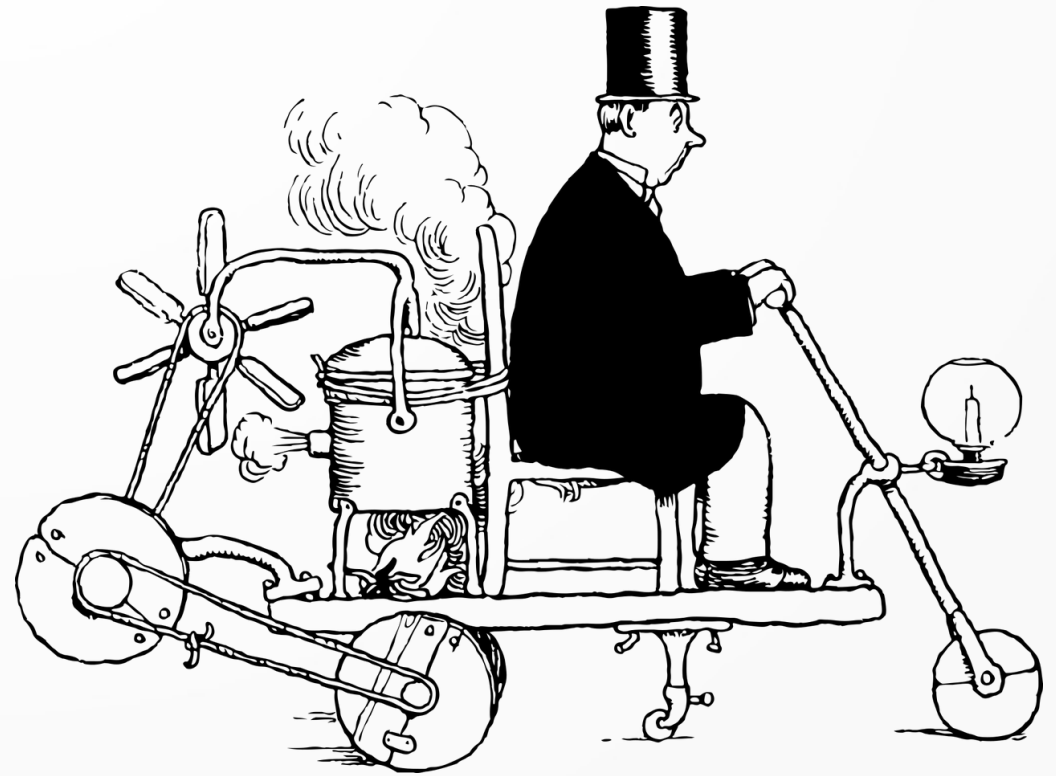
Industry 4.0 as a cultural and material context

- Skills become obsolete when the cultural and material contexts change.
- We are at present in a transition point.
- But what, exactly, the transition is about? Digitalization? Globalization? Innovation? AI?

Industry 0.0: Work by biological energy



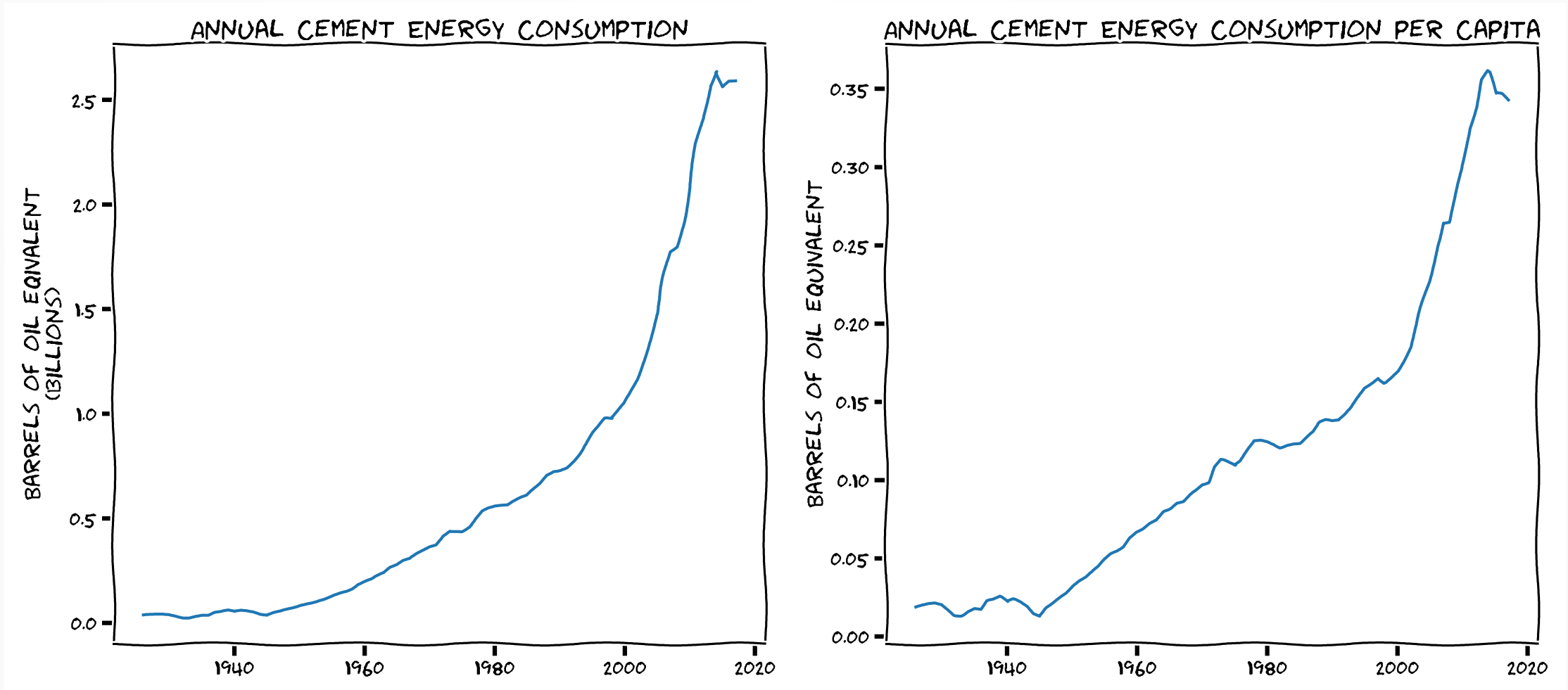
1.0: Mechanisation of work by renewable energy



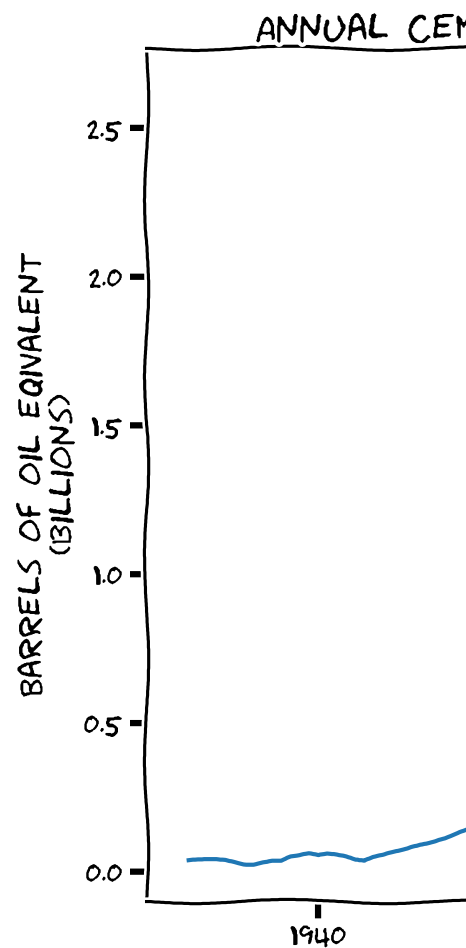
2.0: Mechanization of work by accumulated energy



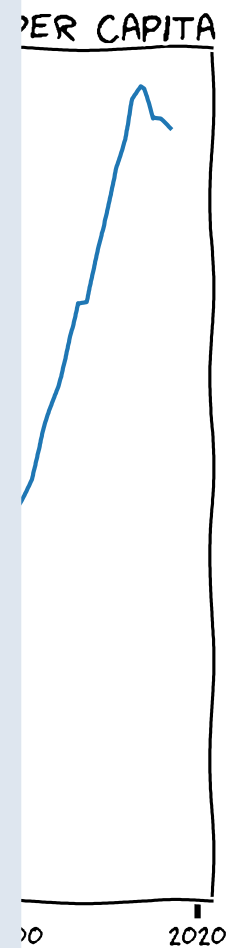
Industry 3.0: Factories, ports, bridges



Industry 3.0: Factories, ports, bridges



- Mining one bitcoin requires now 60 barrels of oil. If made of concrete, 1 ₿ would weight 650 tons.
- Compared to data-driven AI, Bitcoin is small change.
- Other things being equal, the energy consumption required to teach AI models has doubled every 3-4 months in the last decade.
- Teaching a state-of-the-art AI model now requires 1000 trillion computations.
- Training a data-driven NLP model now produces CO2 equivalent of 5 lifetimes of a car.
- Developing and tuning such a model takes several times more energy.



Industry 4.0 as a cultural and material context

- Explosion in the use of accumulated energy reservoirs \approx Industrial Age
- Visions of “Industry 4.0” look a bit like “Industry 3.0 on digital steroids”
 - More efficient automation and global production networks
 - Distributed decision-making by AI
 - But less space and time for human intervention and contribution
- The realization of i4 implies major socio-economic transformations, and requires rethinking the functions of education in the AI-enabled world.

How to make AI real

- In the EC-JRC “AI Handbook with and for Teachers” -project, we are aiming at co-creating meaningful uses of AI in education.
- A key starting point is that concrete educational contexts are very different in different countries. Teachers have critical knowledge about how AI can be made beneficial in their practices and institutional contexts.
- Another starting point is that digitalization and AI are changing the society and the economy. We need to stop extrapolating the past and design AI for the future of learning and education. AI should be viewed as a tool for change, not as a quick fix for existing problems.