Key digital and information literacy competencies for AI

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Artificial intelligence and the next generation of competences :
How Digital – and Artificial Intelligence will impact jobs and competences profiles?

The World Conference on Intellectual Capital for Communities

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AI and Education, the issue of teaching for AI

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http://cdlh7.free.fr/UNESCO/TeachingAIreport09072019.pdf

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The message in just one slide

- It may be premature to « teach AI » to everyone
- A key issue resides in understanding the differences between the physical world and the digital world
- We propose 5 pillars for the future:
  - Data
  - Randomness
  - Coding and computational thinking
  - Critical thinking
  - Post AI Humanism

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The limits of a physical interpretation

- Algorithms do things differently (not just faster)
- But we cannot always expect to understand them only from a physical point of view
- A timeline
  1. Good old fashioned Computing
     An algorithm just does what a human does, but faster
  2. Algorithms which do not work the way we do
     Baum-Welch, Viterbi, Floyd-Fulkerson, Dijkstra…
  3. Algorithms which we don't even understand
     Code that writes code

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Discussion point

- We are expecting an algorithm which has been created by another algorithm to be understandable (ethical AI).
- But is that reasonable?
- If there is an algorithm A which can explain what the algorithm B is doing, then A is more powerful than B

- Do we understand 100 terabytes of data?
- Or are we just relying on another algorithm to « explain » ?

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What should we try to teach?

- Data
- Randomness
- Coding and computational thinking
- Critical thinking
- Post AI Humanism

- *Notice that this is about teaching concepts to understand AI, not AI itself!*

1 Data

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An example

(Just one issue here)

Data is not consistent!

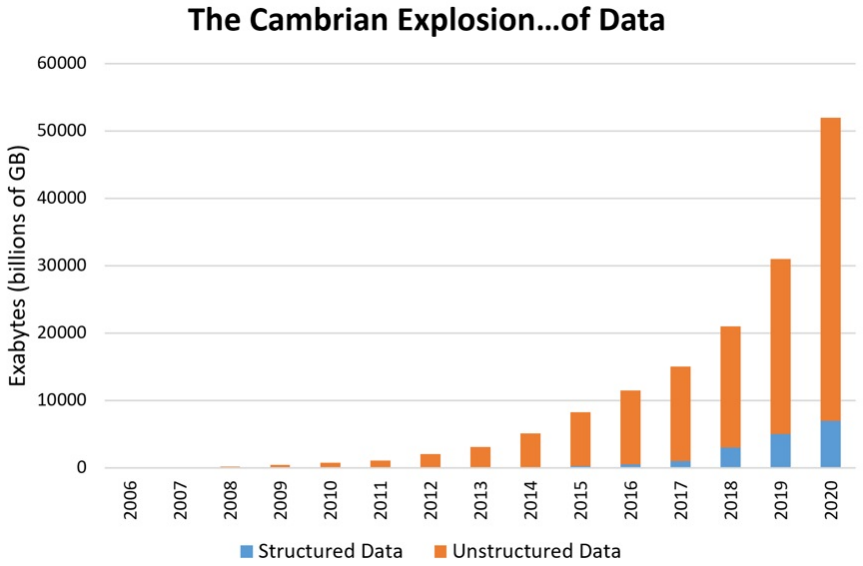
- If we study a dataset expressing #hours studied against obtaining an exam, we will get things like
  - Joe studied 2 hours and failed
  - Emily studied 3 hours and passed
  - Fred studied 4 hours and failed
  - Hamid studied 4 hours and passed

- So Data is a source of uncertainty

Intellectual Capital
for Communities
In the Knowledge
Economy

Why does data matter so much?

- Because data is « really » what is making the decisions
- Because it will matter to be or not to be inside the « right » population
- Because our decision making of tomorrow is going to be based on our capacity to build and use data



2 Randomness

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Understanding randomness

- The Inuits have 50 words for snow and ice
- In our educative system, we have one word expressing randomness, stochasticity, probability, uncertainty, nondeterminism…

Luck

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Why does randomness matter so much?

- In France, a system randomly selecting candidates to enter in specific studies was called “unfair”
- A human doctor can make a mistake. A robot doctor can’t
- Will we accept to use a system which may be contradictory?
- All machine learning systems rely on randomness

- Sunny tomorrow
- We expect sun tomorrow
- Sun tomorrow: 93%
- Sun tomorrow: 93% with high confidence

JMA

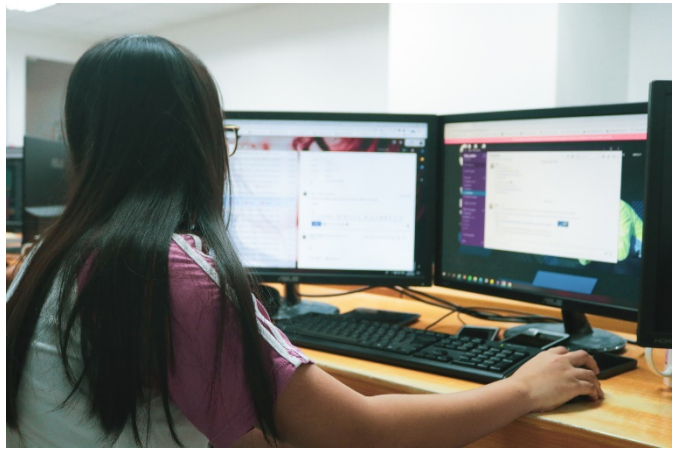
	/	/	B	C	B	C	C
SAPPORO One-week Forecast	13 /25 0/0/0/0	16 /23 40	13 /19 80	12 /19 40	12 /21 30	13 /22 30	14 /23 30
	/	/	B	C	B	B	C

Figures shown in parentheses in the low and high temperature rows indicate the ranges of error in degrees Celsius. The reliability for the day is represented as A, B or C in descending order of expected accuracy. The results of precipitation forecast accuracy verification for the period from 1 April 2002 to 31 March 2007 indicate an

More or less deterministic

Tomorrow's world may be more deterministic: *this child (age 1) will be good at science later*

- Another argument is that if we understand the randomness issues we will be living in a less deterministic world



3 Coding

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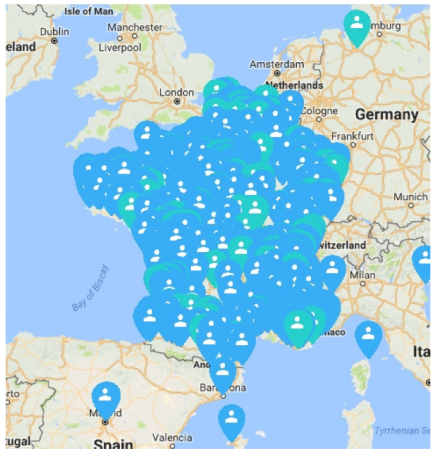
The importance of coding and computational thinking

- You can’t visualize data.
- Any tool for that is going to be (heavily) biased
- You need to be able to manipulate it
- Through coding
- Why does coding matter so much?
  - It doesn’t matter as much as computational thinking
  - This is problem solving
  - This is being able to implement your ideas

Class'Code

Informatics Europe Best Practice 2017



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4 Critical thinking

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Relying on common sense ?

- Nobody can offer you $100000 just like that!
- You can see that this webpage doesn’t have a proper address

- What is a fake?
- How do I recognize a fake?

- Are common sense and critical thinking sufficient?

(Wo)Man+Machine > Machine

- We should learn to use a machine in order to *beat* the machine!
- We want to accept that we cannot alone « beat the machine »
- Man+Machine vs. Machine is a better option

- Learn to use search engines, to use tools to help us navigate safely

5 Post AI Humanism

Our own understanding of the world

- Intelligence
  - Our definition of what is intelligence is being modified by the progress of AI
- Experience
  - David Silver, (DeepMind about alpha zero): *It's more powerful than previous approaches because by not using human data, or human expertise in any fashion, we've removed the constraints of human knowledge and it is able to create knowledge itself.*
- Creativity
  - The moves by Alphazero impress the best players
  - *Creation of music, stories, publicity by AI…*
- The truth
  - Libratus beat top poker players by learning. It was not explicitly taught to bluff. But it did learn to bluff/lie. Without any consciousness of this.

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