New Bridges
Mathematics $\leftrightarrow$ Data Science

A Scientific debate

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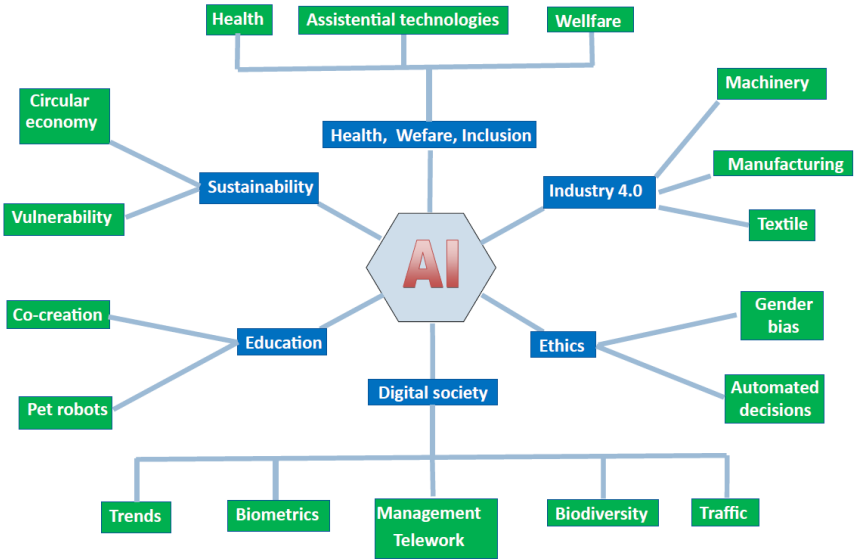
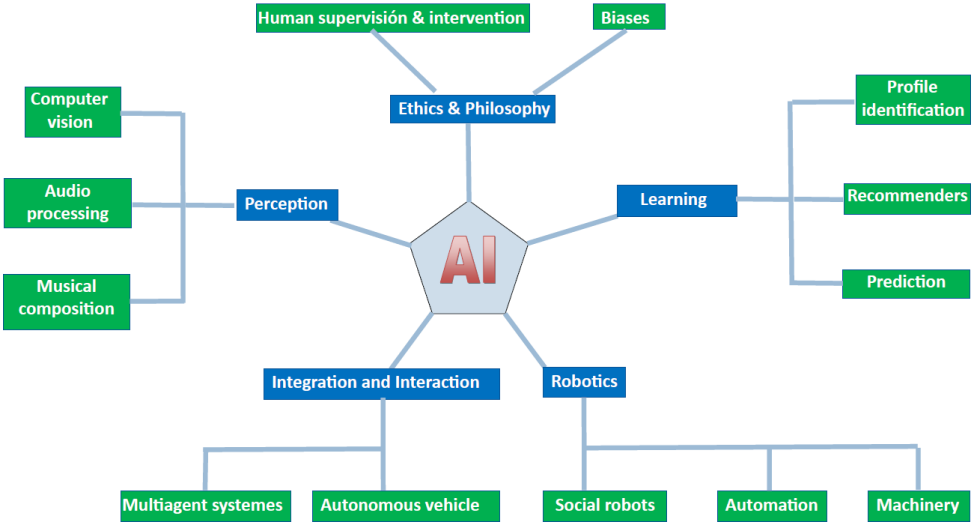
- Analyze the positioning of the international mathematical community with respect to the *data driven computational mathematics* by looking at the thematic evolution of the mathematical contributions oriented to the applications.
- To prospectively think and discuss about the *challenges, open problems and strategic lines* in which *mathematics can contribute to the foundations* of Computational Mathematics, Artificial Intelligence, and their algorithms.
- Collectively come up with *specific initiatives, policies and detailed actions' proposals* to help interested senior mathematicians and young researchers in contributing to the foundations of Artificial Intelligence and Data Driven Computational Mathematics.

	AI taxonomy	
	AI domain	**AI subdomain**
Core	**Reasoning**	Knowledge representation
		Automated reasoning
		Common sense reasoning
	Planning	Planning and Scheduling
		Searching
		Optimisation
	Learning	Machine learning
	Communication	Natural language processing
	Perception	Computer vision
		Audio processing
Transversal	**Integration and Interaction**	Multi-agent systems
		Robotics and Automation
		Connected and Automated vehicles
	Services	AI Services
	Ethics and Philosophy	AI Ethics
		Philosophy of AI

Classification of AI according to the application domain



Classification of AI according to techniques used



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Defining the skills citizens will need in the future world of work

To future-proof citizens' ability to work, they will require new skills—but which ones? A survey of 18,000 people in 15 countries suggests those that governments may wish to prioritize.

by Marco Dondi, Julia Klier, Frederic Panier, and Jörg Schubert

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Cognitive

Critical thinking
- Structured problem solving
- Logical reasoning
- Understanding biases
- Seeking relevant information

Planning and ways of working
- Work-plan development
- Time management and prioritization
- Agile thinking
- Ability to learn

Communication
- Storytelling and public speaking
- Asking the right questions
- Synthesizing messages
- Active listening

Mental flexibility
- Creativity and imagination
- Translating knowledge to different contexts
- Adopting a different perspective
- Adaptability

Interpersonal

Mobilizing systems
- Role modeling
- Win–win negotiations
- Crafting an inspiring vision
- Organizational awareness

Developing relationships
- Empathy
- Inspiring trust
- Humility
- Sociability

Teamwork effectiveness
- Fostering inclusiveness
- Motivating different personalities
- Resolving conflicts
- Collaboration
- Coaching
- Empowering

Self-leadership

Self-awareness and self-management

- Understanding own emotions and triggers
- Self-control and regulation
- Understanding own strengths
- Integrity
- Self-motivation and wellness
- Self-confidence

Entrepreneurship

- Courage and risk-taking
- Driving change and innovation
- Energy, passion, and optimism
- Breaking orthodoxies

Goals achievement

- Ownership and decisiveness
- Achievement orientation
- Grit and persistence
- Coping with uncertainty
- Self-development

Digital

Digital fluency and citizenship

- Digital literacy
- Digital learning
- Digital collaboration
- Digital ethics

Software use and development

- Programming literacy
- Data analysis and statistics
- Computational and algorithmic thinking

Understanding digital systems

- Data literacy
- Smart systems
- Cybersecurity literacy
- Tech translation and enablement

1. In what sense is Data Science a Science?

2. How do you see the relations between Data Science, Machine Learning and Artificial Intelligence?

3. And the relations between AI in general and the Neurosciences?

4. What mathematical techniques are used in the above disciplines?

5. Are we moving toward more interdisciplinarity, particularly within the research groups?

6. In what forms could research and teaching in Mathematics take advantage of the current and future developments in AI? Will it be like the advantages of using Computer Algebra Systems in the last five decades or something quite different?

7. I what fronts could research driven by Mathematics contribute to the advancement of AI?

8. Can we go on with the curricula as understood today or should we consider and anticipate whether it would be convenient to modify them? If so, what sorts of modifications should be undertaken?

9. What should be the role of Mathematical Research Institutes in defining a suitable strategy for a productive relation between Mathematics and AI?

10. What should be the role of Mathematical Societies, Academies, Faculties, etcetera, in driving the changes deemed necessary?

References I

[1] S. Samoili, M. López Cobo, E. Gómez, G. De Prato, F. Martínez-Plumed, and B. Delipetrev, "AI Watch. Defining Artificial Intelligence. Towards an operational definition and taxonomy of artificial intelligence," *Publications Office of the European Union*, 2020.