PANEL #5

NICE
June 2023

ComputationWorld 2023 & DataSys 2023

Theme:
Cognition Challenges in Digital Society

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Themes

- Digitization impact
- Smart environments
- Digital illiteracy
- Digital life
- Digital stress and anxiety
- AI awareness and cognitive impact

Chair Position

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Lodewijk Arntzen

Cognition Support AI Crucial in Pivotal Societal Positions (Law, Medicine, Universities)
Crucial while implementing AI is Deep Understanding Uniqueness of Human Cognition

What will the role of Human Cognition then be?
Human Judgment Skills may have to be reestablished at central Pivoting Societal Positions
Training of Human Judgment Skills preferably Central Academic Development at Universities

What will the role of new Digital Developments be?
Aid for Access knowledge and Aid in making Connections in Knowledge Web
Diagnostic Aid in Medicine (Deep Learning as a Tool, database search, finding differential diagnosis, and more)
Aid for Judges and Lawyer (Deep Learning as a Tool, finding jurisprudence, and more)
Aid for Teaching (Humans to Humans)

New Developments Quantum Technology lead to new Challenges
Quantum Technology leads to new emerging ethical issues
Quantum Supremacy in Computing

CONTRIBUTORS

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Moderator

Pr. Lect. Dr. Lodewijk Arntzen, The Hague University of Applied Sciences, The Netherlands

Panelists

- Prof. Dr. Robert Laurini, KSI Fellow and Professor Emeritus INSA Lyon, University of Lyon, France
- Dr. Christoph Knieke, Technische Universität Clausthal, Germany
- Pr. Lect. Dr. Lodewijk Arntzen, The Hague University of Applied Sciences, The Netherlands
- Prof. Dr. Ahmed Kamel, Concordia College - Moorhead, USA
- Prof. Dr. Isaac Caicedo-Castro, University of Córdoba, Colombia

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Robert Laurini

- **Cognition and Reasoning in Urban Planning**
  - *"Cognition provides the foundation for reasoning by acquiring knowledge and understanding"*
- **Question: Can AI assist urban planning and how?**
- **Two ways:**
  - Management of knowledge acquired by experts, from big data, etc.
    - Knowledge bases built on rules and spatial inference engines (2D and 3D geometric reasoning)
  - Deep learning with training based on previous experiences
    - For instance, designing ground plans
- **Origin of the intervention**
  - Many works in computing for urban and environmental planning (GIS, etc.)

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Robert Laurini

- **Urban design**
  - Usually integrating
    - new concepts for organizing space
    - new social problems to solve
    - new environmental approaches
    - economic constraints (costs, etc.)
  - Urban project: collaborative effort (urban planners, elected officials, participating citizens, building contractors, etc.)
    - Usually with multiple steps and different modalities of decisions made at each step
  - How to boost cross-fertilization between multiple stakeholders?
  - How to stimulate creativity?
- **Orientation**
  - Mixing artificial, human and collective intelligence
  - What if each actor has his/her own AI-tool?

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Christoph Knieke

- Word "cognition" comes from the Latin word "cognoscere," which means "discover, know, learn"
- Cognition: includes, among others, the processes of perception, attention, thinking, problem-solving, memory, mental imagery, and language processing.*

- **Many gadgets** like smart e-assistants available to support us in various way, e.g., translation, booking, route planning, programming, etc.

- **Problem:** Over-reliance on these gadgets
  - People lose the ability to problem-solve and think critically when faced with unexpected situations
  - Leads to a lack of creativity and innovation
  - Loss of personal touch

- **Solution**: Using these gadgets in a balanced way

*see: Eysenck, M. W., Keane, M. T. (2020). *Cognitive Psychology: A Student's Handbook, 8th Edn*. London: Psychology Press Ltd. doi: 10.4324/9781351058513

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Isaac Caicedo-Castro

- **Cognition health consequences of digital technology use**
  - Pros
    - Activate mental circuitry
    - Improve cognitive functioning and memory
    - Reduce anxiety
    - Might enhance the quality of sleep
    - Might improve the mood and behavior of people
  - Cons
    - Attention deficit symptoms
    - Addictive behaviors
    - Social isolation
    - Might affect brain development and sleep
  - Challenge: How to enjoy the healthy benefits of using digital technology and minimizing any potential negative consequences?
    - Developing applications to stimulate the memory and cognition
    - Studying the effects of digital technology and alternatives to cope its shortcomings regarding the cognition

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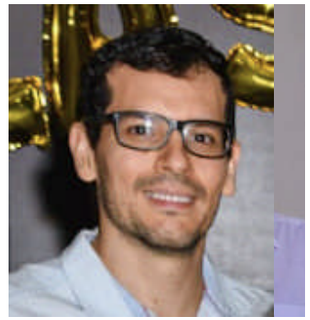

Isaac Caicedo-Castro

- **Challenge: How can we effectively leverage digital technology to enhance cognitive experiences, optimize cognitive processes, and create a conducive cognitive environment?**
  - Applying AI (machine learning) -> curriculum development, progression, student admissions, vocational guidance, and so forth.
  - Harnessing NLP -> communication skills, proficiency in multiple tongues (healthy for human brains)
  - Exploiting the potential social networks -> boost cognition development in students' communities.
  - Conducting research about video games -> cognition development.

Facts: prior research has revealed that surgeons who usually play videogames exhibit higher levels of accuracy and improved reaction times compared to surgeons who don't play videogames (Rosser et al., 2007)

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Marc Kurz

Cognition challenges in the digital society arise due to the ***increasing reliance on digital technologies*** and the ***rapid flow of information*** in modern society.

Various aspects of cognitive processes affected: (i) attention, (ii) memory capabilities, (iii) critical thinking, (iv) decision-making, and (v) overall mental well-being

Key points:

- ***Information Overload***: overwhelming amount of information, often leading to information overload. Difficult for individuals to filter, process, and prioritize information effectively
- ***Digital Distractions***: with smartphones, social media, and other digital platforms, distractions are readily available. Notifications, pop-up messages, and the constant urge to check social media feeds can interrupt cognitive processes, disrupt workflow, and hinder deep thinking and problem-solving abilities
- ***Shallow information processing***: digital society often promotes quick and superficial information consumption, with emphasis on skimming, scanning, and browsing rather than in-depth reading and analysis → decline in critical thinking skills, as well as a reduced capacity for deep comprehension and synthesis of complex information
- ***Online disinformation and misinformation***: digitalisation has also given rise to the spread of disinformation and misinformation, which can have detrimental effects on cognition. False or misleading information can confuse individuals, distort their understanding of reality, and lead to cognitive biases and faulty decision-making

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Marc Kurz

Addressing these cognition challenges in the digital society requires a ***multi-faceted approach***

Possible approaches could be:

- promoting ***digital literacy*** and ***critical thinking skills***
- encouraging ***mindful technology*** use
- cultivating ***healthy online habits***
- providing ***education on media literacy*** and ***fact-checking***
- developing tools and platforms that support ***cognitive well-being***

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Ahmed Kamel

- **Some Cognitive Skills Lost**
  - Example: writing skills (happened before, e.g., with Math skills)
  - Would enable focusing on other skills and provide cognitive relief
- **Quality of Life Improvements**
  - Examples: smart homes, remote control
  - At what cost?
- **Increase in Digital Divide**
  - Not having the digital skills can have a wider impact on quality of life, access to education, etc.
- **Everyday stress**
  - Increase in use of digital world for everyday life (social media, e-friends, vs live friends) has the potential for increasing isolation, and stress.

Pessimistic: In terms of cognition, humankind is on the brink of facing challenges related to digital technology which might lead to the evolution of our species. Those who can overcome the adverse effects of digital technology on human cognition might develop superior skills and aptitudes. Whilst it's uncertain, these individuals may potentially be better equipped than us to navigate extreme circumstances, such as, e.g., the potential extinction of our planet, galaxy, or even the universe.

Optimistic: Humanity will not disappear and will not be replaced by artificial entities as an artificial tool lacks some human specifics:

There is no personalized memory(ies)

There is no instant personalized thinking

There is no visibility on any personal past activity (no gene transmission, either)

There are no feeling, no fear, no genuine emotions (eventually mimicking by instructions/learning)

Stage for the Audience