



KEYNOTE K4

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April 2025



UNIVERSITÉ
DE LORRAINE



AI and VR for People with Specific Needs

ComputationWorld 2025 & DataSys 2025, April 6-10, Valencia, Spain



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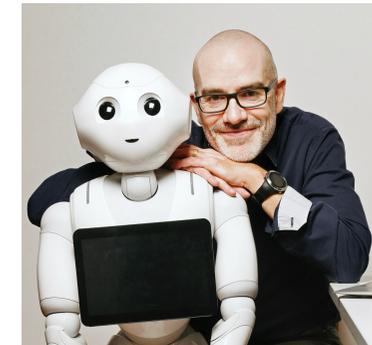
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Jérôme Dinet is the "Intelligence Artificielle" (AI) Mission Officer at the University of Lorraine. In this role, he is responsible for developing and overseeing the university's AI strategy, ensuring that AI initiatives align with ethical standards and societal responsibilities. In addition to his mission as AI Officer, Professor Dinet co-directs the BEHAVIOUR Industrial Chair, established in 2020, and created the 2LPN laboratory (a Lab of psychology and neurosciences) at the University of Lorraine in 2018. Throughout his career, he has been a visiting professor at several prestigious institutions, such as New York University, Uppsala University, Nagaoka University of Technology, Nagasaki University, and Tohoku University.c

Main scientific topics:

- Interaction between technology such as robots, artificial intelligence, tablets, virtual reality, and augmented reality and users with specific needs
- Développemental psychology from « life-span »
- Ergonomics and Human factors

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Jerome Dinet (on the right side ...)
Professor and Scientific director of the Chair
"BEHAVIOUR"
University of Lorraine

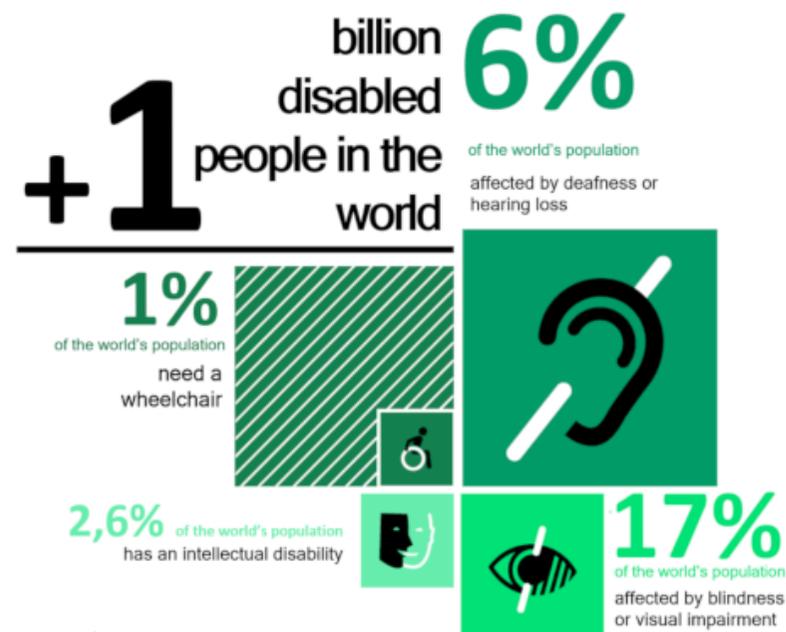
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- ✓ More than 1 billion people currently experience significant disability ..
- ✓ ... including nearly 240 million children.
- ✓ In Europe → 27% of the population over the age of 16, had some form of disability
- ✓ The share of women with disabilities was higher than that of men in all EU member states.



According to the World Health Organization (WHO), a disabled person is anyone who has “**a problem in body function or structure, an activity limitation, has a difficulty in executing a task or action; with a participation restriction**”.



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- ✓ Innovation and technology such as **AI** and **VR** can be powerful tools for **inclusion** and **quality of life** (enhancing access to information, education or the job market, to create a more inclusive and accessible world for all, ...)

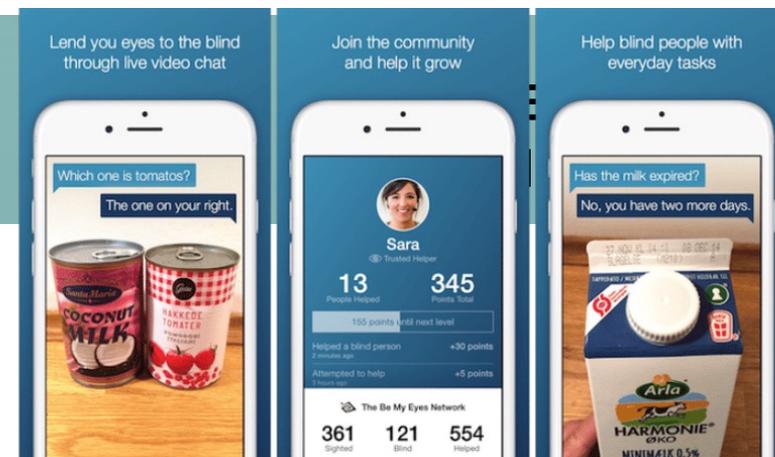


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(1) Assistive Technologies for Disabilities

- **Visual Impairment** → JAWS, Be My Eyes, ... reading aloud content, or identifying objects and surroundings.
- **Hearing Impairment** → Google Live Transcribe, Ava, ... help convert spoken words into text in real-time
- **Motor Disabilities** → Alexa, Siri, or Google Assistant, and eye-tracking technology to help interaction with devices without needing to physically touch them.
- **Speech Impairments** → assistive communication devices help individuals with speech disabilities communicate more effectively.



Be My Eyes©

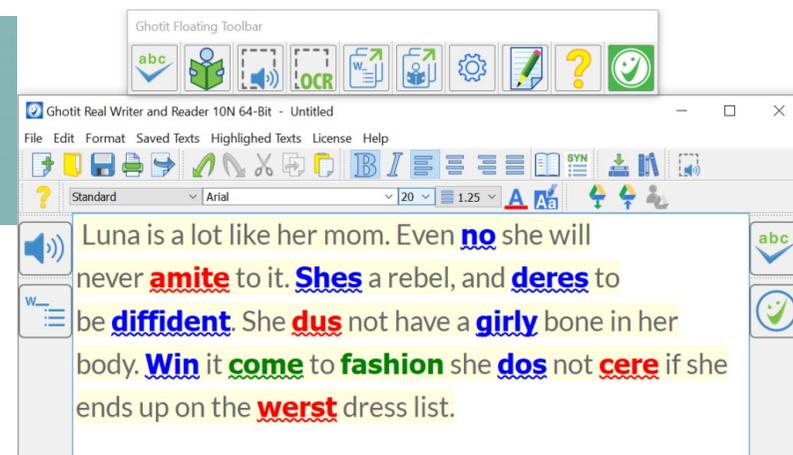


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(2) Cognitive and Learning Disabilities

- **Personalized Learning Tools** → Kurzweil 3000 or Ghotit Real Writer can help improve reading, writing, and language skills.
- **Memory Aids** → provide step-by-step instructions to help individuals with cognitive impairments, such as Alzheimer's or other types of dementia.
- **Interactive Learning Apps** → Proloquo2Go can facilitate communication and learning in a personalized way for children with ASD.

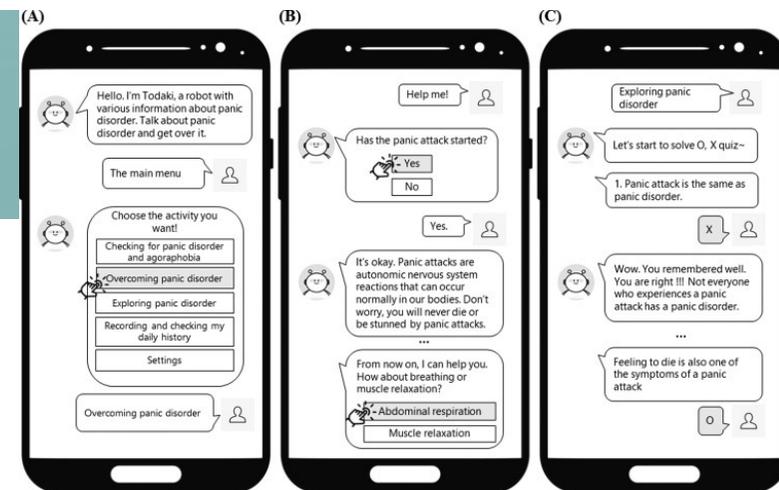


Ghotit Real Writer©



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For Phobia©

(3) Mental Health and Emotional Support

- **AI Chatbots for Therapy** → to offer conversational support and cognitive behavioral therapy (CBT) techniques
- **Mood Tracking** → apps can analyze emotional states through speech or writing patterns and offer insights or coping strategies.
- **AI for Personalized Healthcare** → to assist in diagnosis, treatment recommendations, and continuous monitoring of mental health conditions
- **Virtual Companions**



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One example of exoskeleton

(4) Health and Mobility Assistance and for Daily life

- **AI-powered Prosthetics and Exoskeletons**
- **Smart Home Technology**
- **Health Monitoring Systems** → AI is used in wearable devices that track vital signs like heart rate, glucose levels, and blood pressure (to alert users or healthcare providers to any abnormalities).



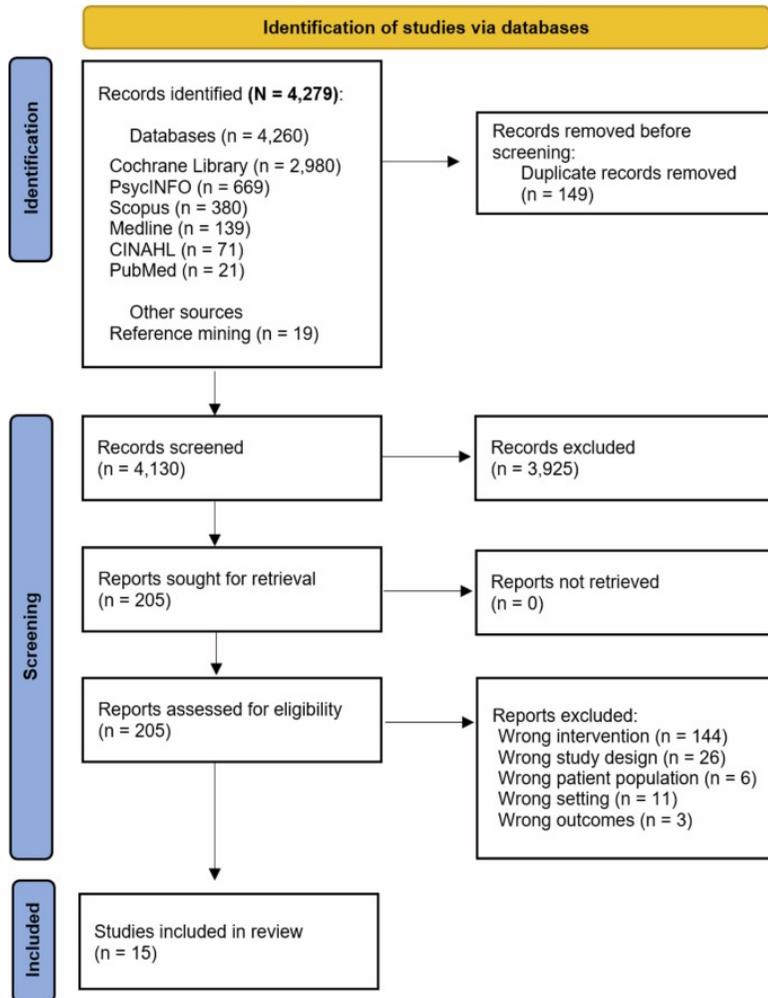
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- ✓ Innovation and technology such as **AI** and **VR** can be powerful tools for **inclusion** and **quality of life** (enhancing access to information, education or the job market, to create a more inclusive and accessible world for all, ...)
- ➔ However, this potential is still unmet for many
 - WHO and UNICEF noted that more than 2.5 billion people need one or more assistive products (wheelchairs, hearing aids, or apps that support communication and cognition)
 - Nearly **one billion are denied access**, particularly in low- and middle-income countries.

“One of the urgent matters is how artificial intelligence will change our world. The world for everybody. When computers came in and then the Internet, people did not notice that having computers and the Internet instead of creating a haven for everybody has built lots of obstacles and unbeatable barriers for many disabilities. It took us at least from 10 to 15 years to combat this. The problem is to convince people who are providing such programs to make them accessible.”

Heba Hagrass, 2025
(UN Special Rapporteur on the rights of persons with disabilities)



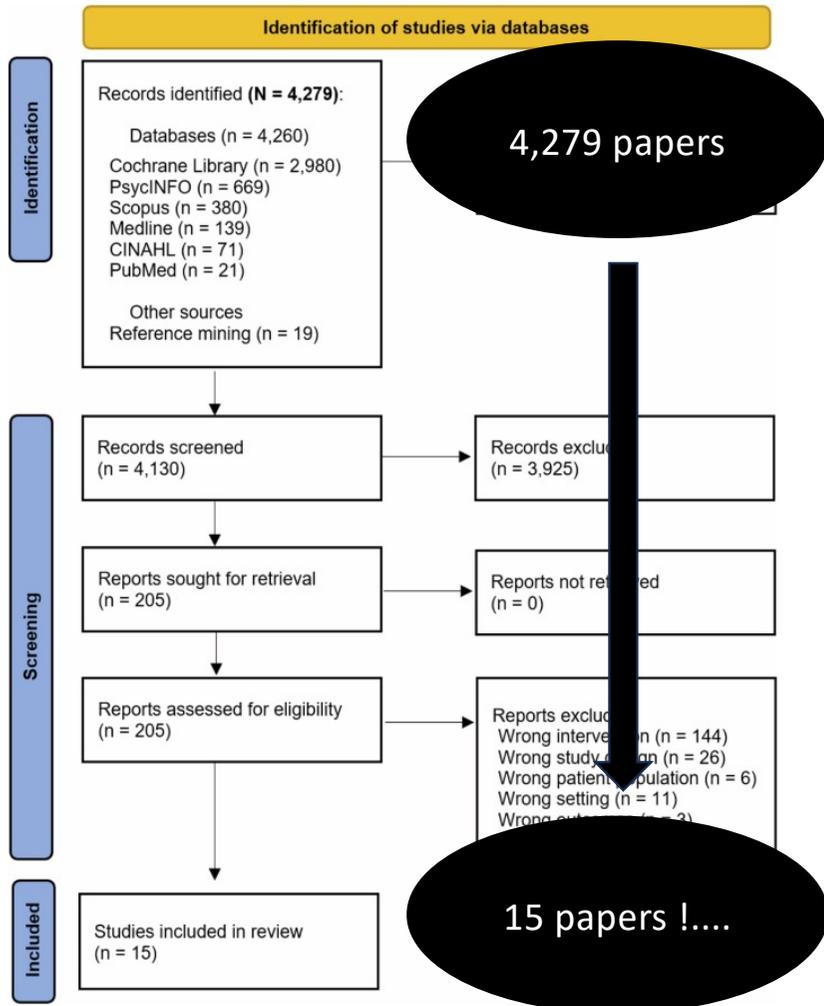
For instance → healthcare for **patients** with neurodevelopmental conditions (NDCs)



Perry, N., Sun, C., Munro, M., Boulton, K. A., & Guastella, A. J. (2024). AI technology to support adaptive functioning in neurodevelopmental conditions in everyday environments: a systematic review. *NPJ Digital Medicine*, 7(1), 370



- From 2005 to 2022 :
- ✓ What technology ?
 - ✓ For whom ?
 - ✓ For what ?
 - ✓ In what context ?
 - ✓ *Etc.*



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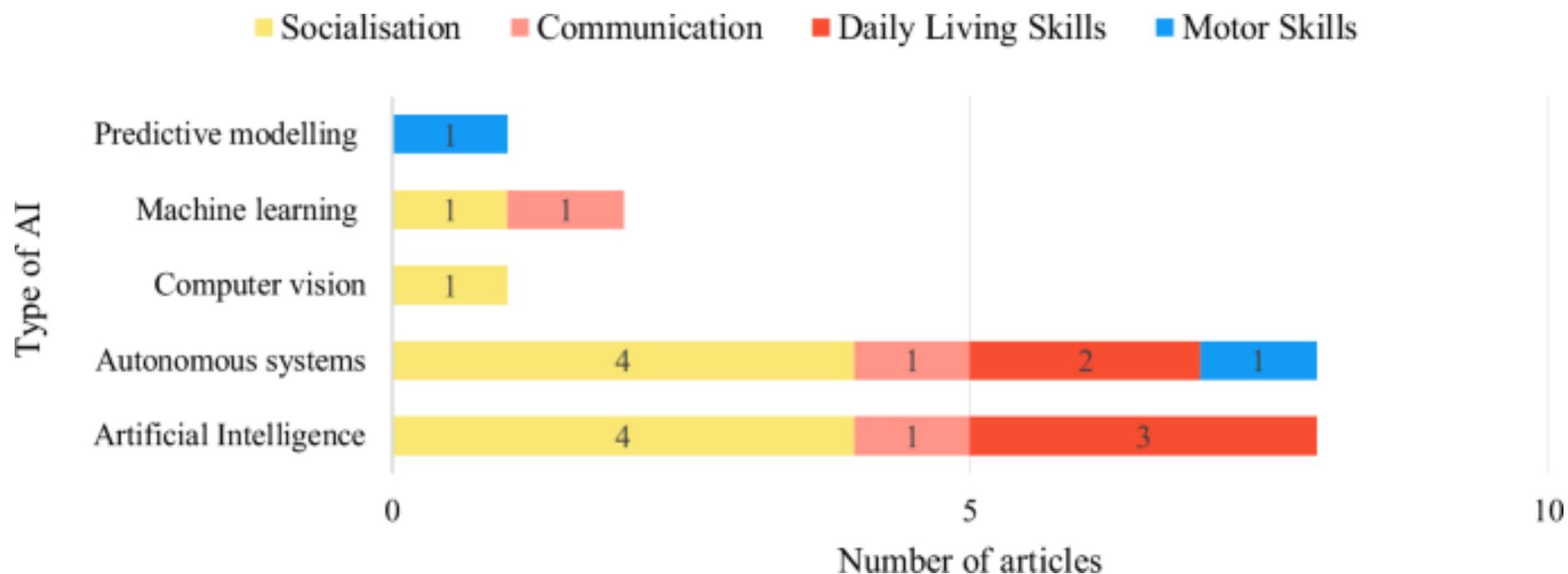


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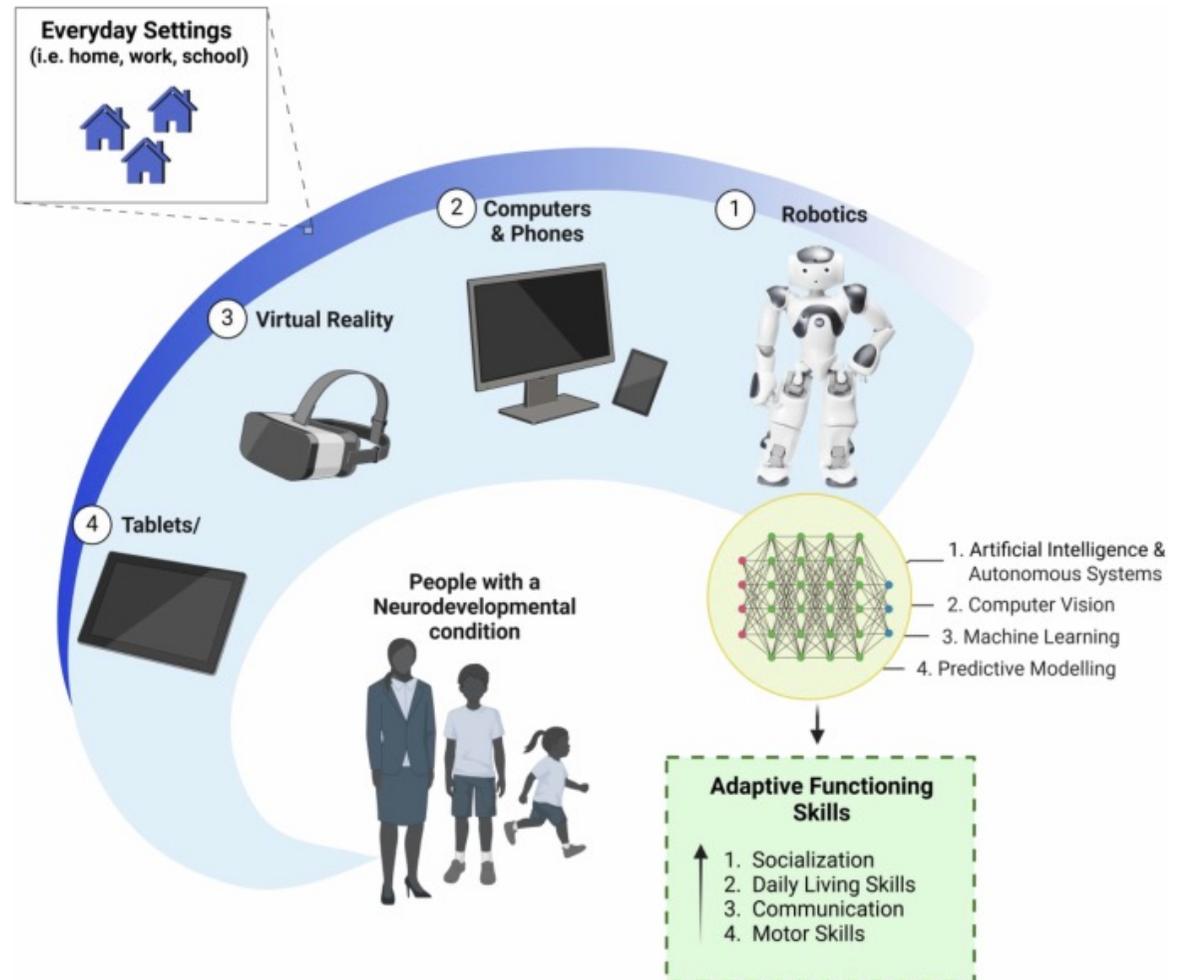
Representation of AI and its subtypes applied to different functioning outcomes in the included studies. Note that one type of AI may be used to support more than one functioning outcome.



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Representation of the most reported types of AI utilized across the most common types of technologies, as well as adaptive functioning outcomes in the included studies. AI-assistive devices, AI, and adaptive functioning outcomes ordered by frequency

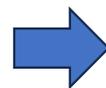




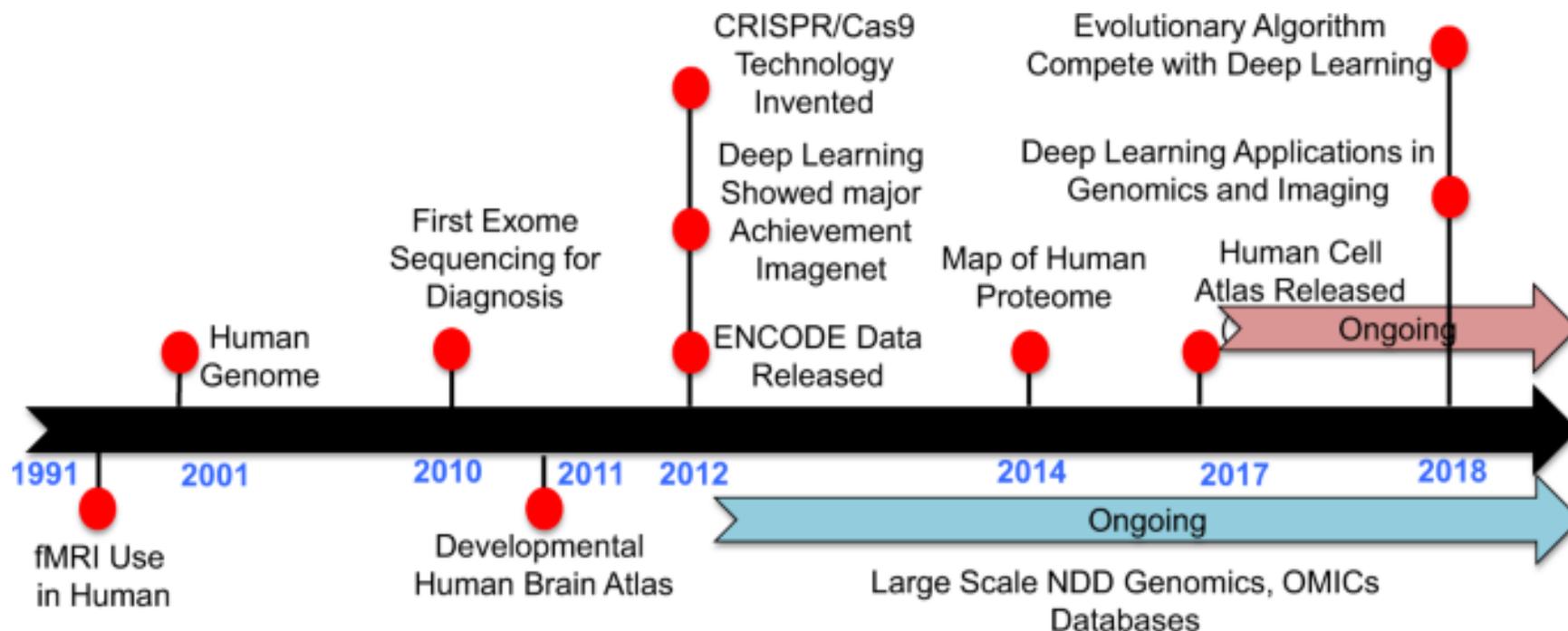
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For instance → healthcare for
professionals interested in NDCs



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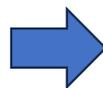




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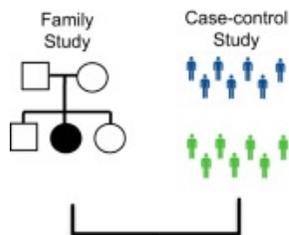
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Identifying Causal Genes

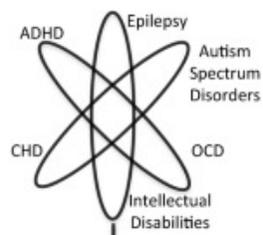


Genome Sequencing

Machine Intelligence Prediction or Classification Model

Detection of Causal or Associated Genes

Phenotypic and Genetic Heterogeneity

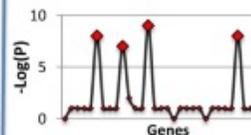


- Pleiotropy
- Incomplete penetrance
- Environmental factor
- Dosage Imbalance

Machine Intelligence Clustering or Classification Model

Identifying Genotype-Phenotype Correlation

Polygenic Risk Score and Gene-Gene Interactions

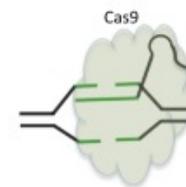


- Gene Expression
- Regulatory OMIC Databases
- Population Scale Mutational Databases

Machine Intelligence Algorithm Inferring Polygenic Risk Score and Gene-Gene Interactions

Quantifying Polygenic Risk Score and Gene-Gene Interactions

Drug Discovery



- *in vitro* (Cell Line, Brain Organoid) and *in vivo* (animal model) model to characterize genetic mutations

Machine Intelligence Algorithm Inferring Biomarker

Multi-stage Clinical Trials

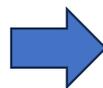




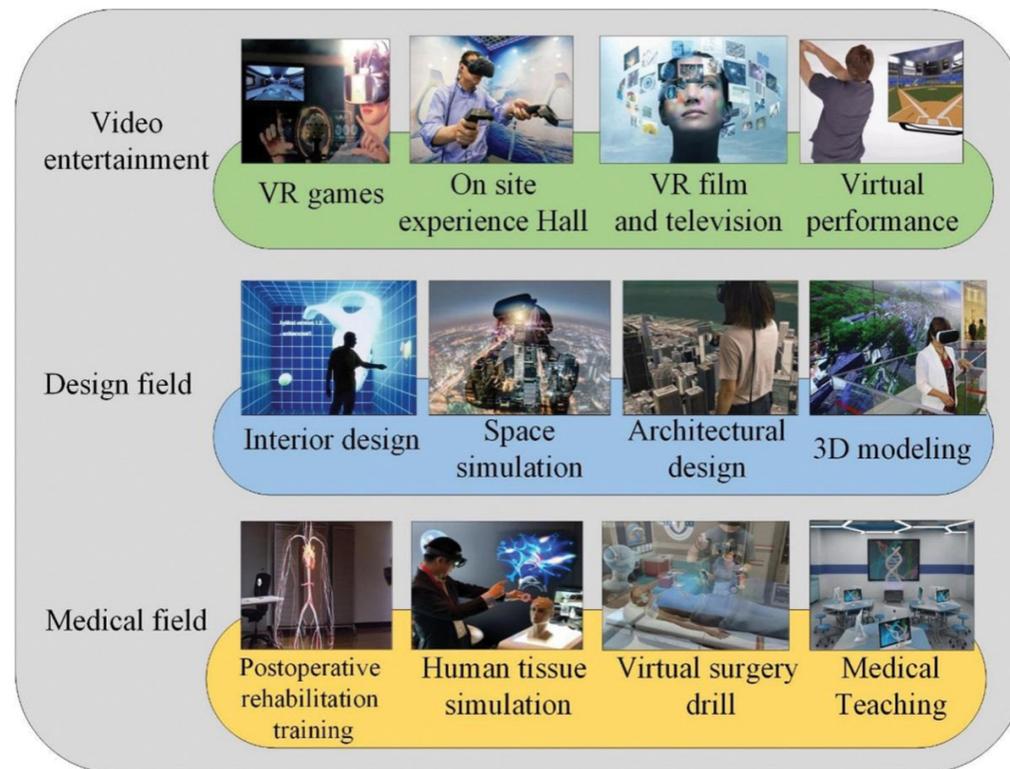
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Georgiev, D. D., Georgieva, I., Gong, Z., Nanjappan, V., & Georgiev, G. V. (2021). Virtual reality for neurorehabilitation and cognitive enhancement. *Brain sciences*, 11(2), 221.





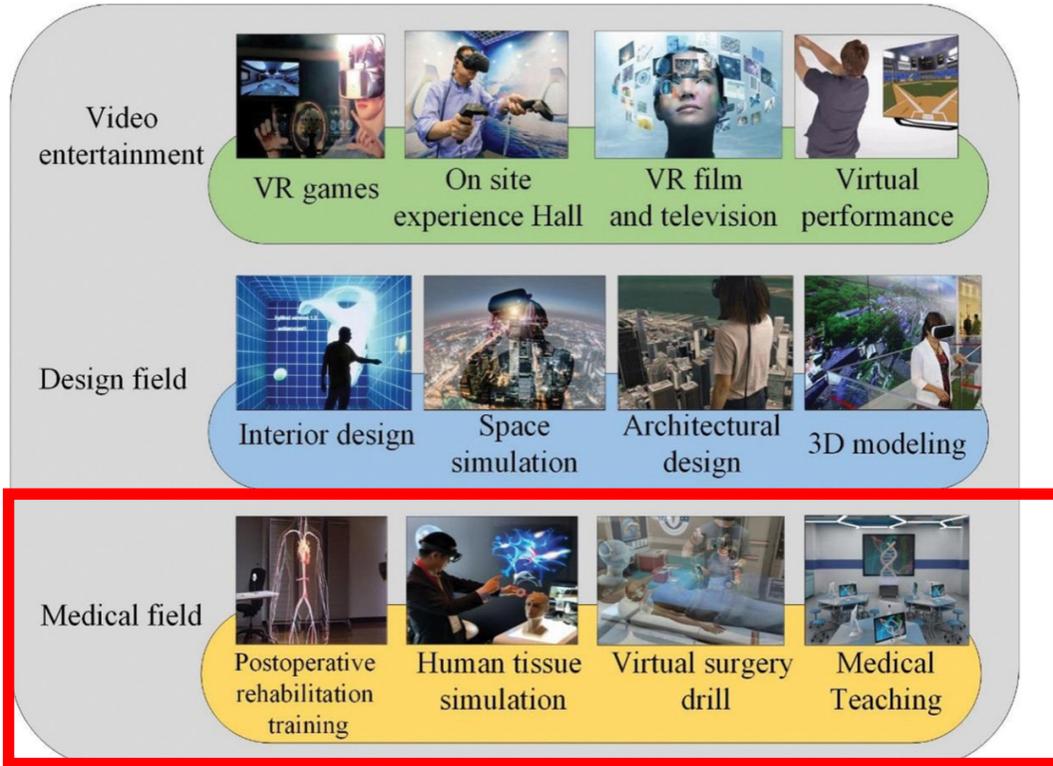
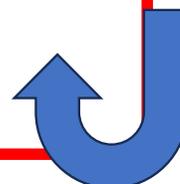
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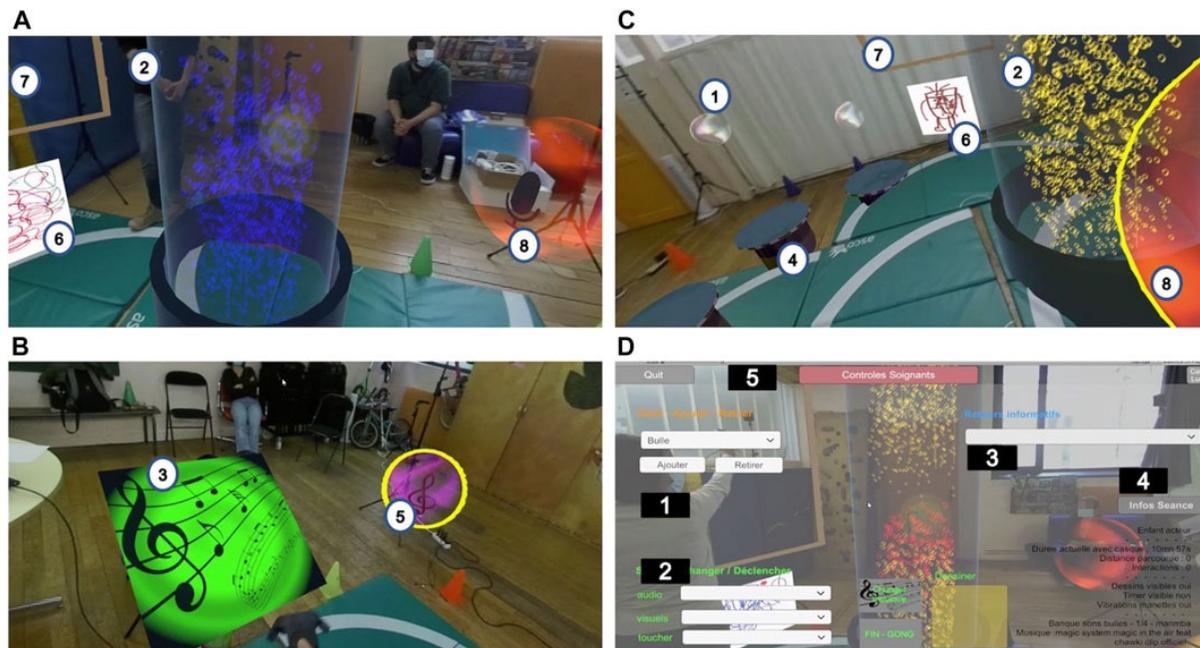
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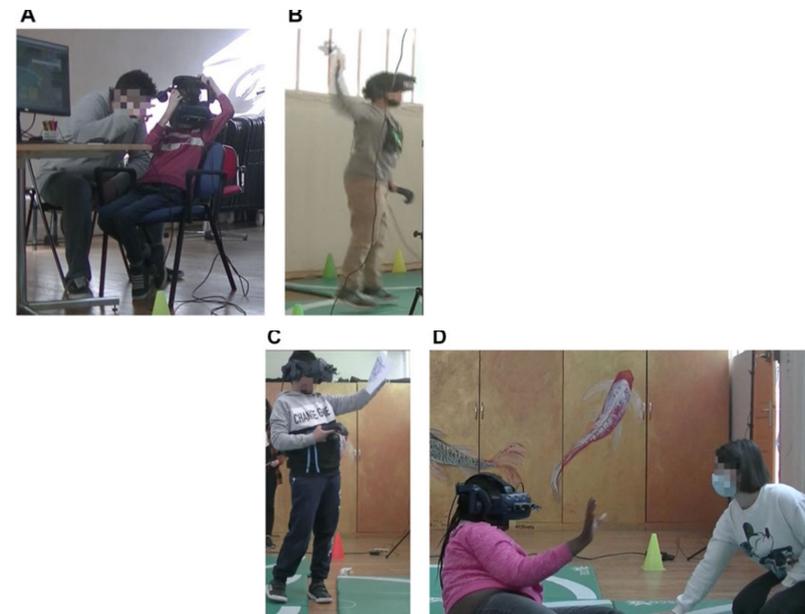
For instance → AR for children with Autism Spectrum Disorder (ASD)



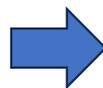
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« Magic Bubbles »



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« Magic Bubbles »



- ✓ To create a climate of trust
- ✓ To establish relationships with the psych.
- ✓ To decrease the stress
- ✓ To improve interaction

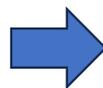
← Evolution of children's drawings over time. The abscissa axis refers to the session number, and the ordinate axis to children's identifiers.



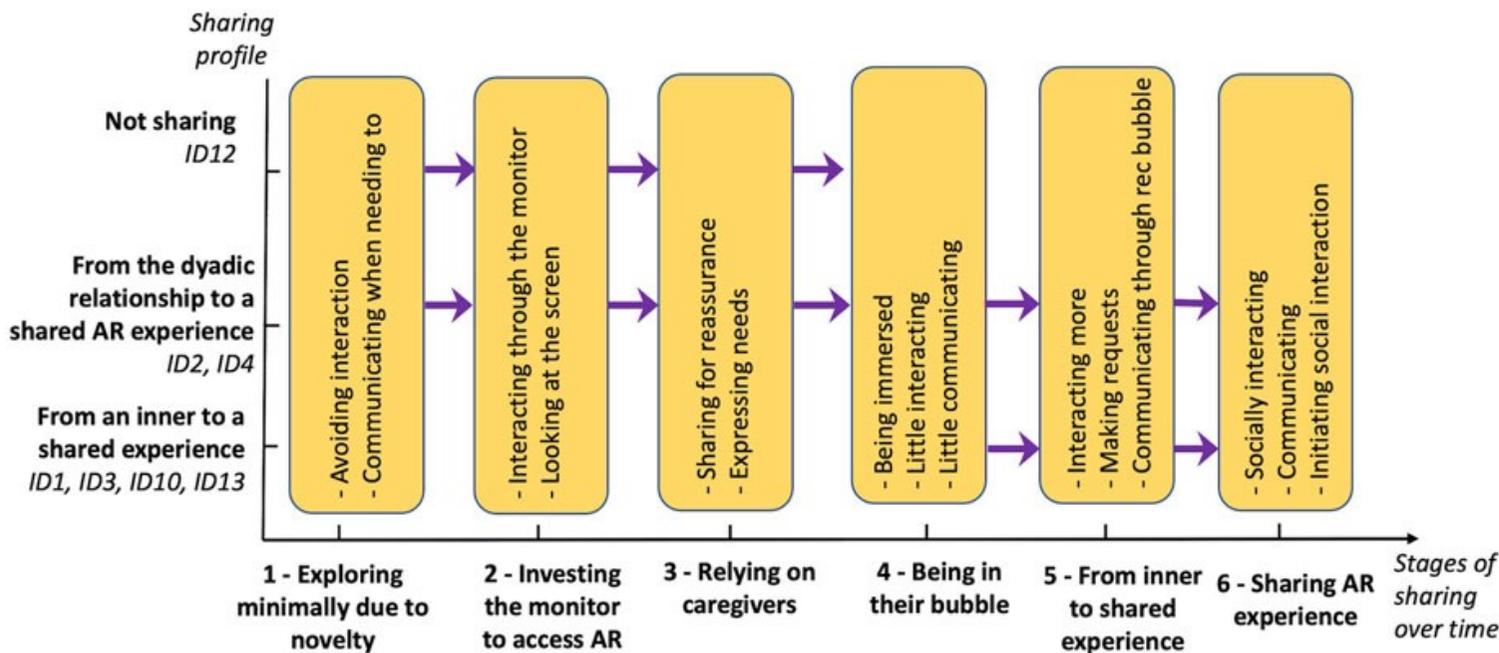
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Sharing experience over time
← Different profiles



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AI and VR **EMPOWERING INCLUSIVITY**

can enhance access to opportunities and enable a greater level of independence for people with various disabilities

- ✓ Dyslexic individuals may benefit from AI-driven applications that provide writing support
- ✓ AI can provide real-time translation in sign language or text during video calls, which may assist individuals with a hearing impairment.
- ✓ Individuals with mobility impairments can control their smart home appliances through AI virtual assistants, including automating routine tasks such as controlling the lights, door locks, and thermostats.
- ✓ Autistic people can develop communication and theory of mind by using VR
- ✓ *Etc.*





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INACCESSIBILITY CAUSED BY AI & VR

- ✓ Unrepresentative dataset ?
- ✓ Bias in algorithmic systems ?
- ✓ Inaccessibility to employment opportunities ?
- ✓ Financial costs ?
- ✓ Inadequate design and testing ?
- ✓ Ethical dimensions ?
- ✓ Cross-cultural dimensions ?
- ✓ *Etc.*



Inaccessible AI and VR systems can :

→ lock persons with disabilities out of social participation

→ reinforce existing barriers and create new ones.

Therefore, it is crucial to mitigate the risks of AI's negative impact on the rights of persons with disabilities.



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- ✓ *Etc.*

Weizenbaum, J. (1976). Computer power and human reason San Francisco: W H. H. Freeman.



Welcome to

```
EEEEEE LL IIII ZZZZZ AAAAA  
EE LL II ZZ AA AA  
EEEEEE LL II ZZZ AAAAAA  
EE LL II ZZ AA AA  
EEEEEE LLLLLL IIII ZZZZZZ AA AA
```

Eliza is a mock Rogerian psychotherapist.
The original program was described by Joseph Weizenbaum in 1966.
This implementation by Norbert Landsteiner 2005.

```
ELIZA: Is something troubling you ?  
YOU: Men are all alike.  
ELIZA: What is the connection, do you suppose ?  
YOU: They're always bugging us about something or other.  
ELIZA: Can you think of a specific example ?  
YOU: Well, my boyfriend made me come here.  
ELIZA: Is it important to you that your boyfriend made you come here ?  
YOU: He says I'm depressed much of the time.  
ELIZA: I am sorry to hear that you are depressed.  
YOU: It's true. I am unhappy.  
ELIZA: Can you explain what made you unhappy ?  
YOU:
```



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- ✓ *Etc.*

Coghlan, S., Leins, K., Sheldrick, S., Cheong, M., Gooding, P., & D'Alfonso, S. (2023). To chat or bot to chat: Ethical issues with using chatbots in mental health. *Digital health*, 9, 20552076231183542.

The four-principle framework for a chatbot:

1. Human involvement (= human supervision ?)
2. Evidence base
3. Data Collection, Storage and Use (e.g., commercial purposes or government intervention)
4. Unexpected Disclosure of Crime (e.g., child abuse or domestic violence)⁴

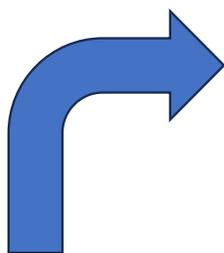


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Five key ethics principles for mental health chatbots. [46](#)

AI Ethics Principle	Ethical Requirements
Non-maleficence	Avoid causing physical, social or mental harm to users
Beneficence	Ensure that interventions do good or provide real benefit to users
Respect for autonomy	Respect users' values and choices
Justice	Treat users without unfair bias, discrimination or inequity
Explicability	Provide to users sufficient <i>transparency</i> about the nature and effects of the technology and be <i>accountable</i> for its design and deployment

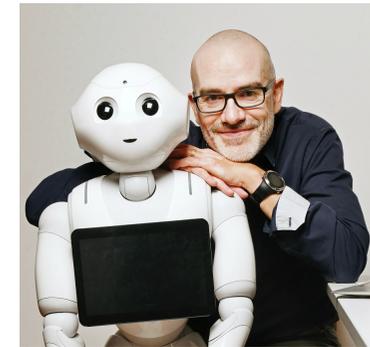


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