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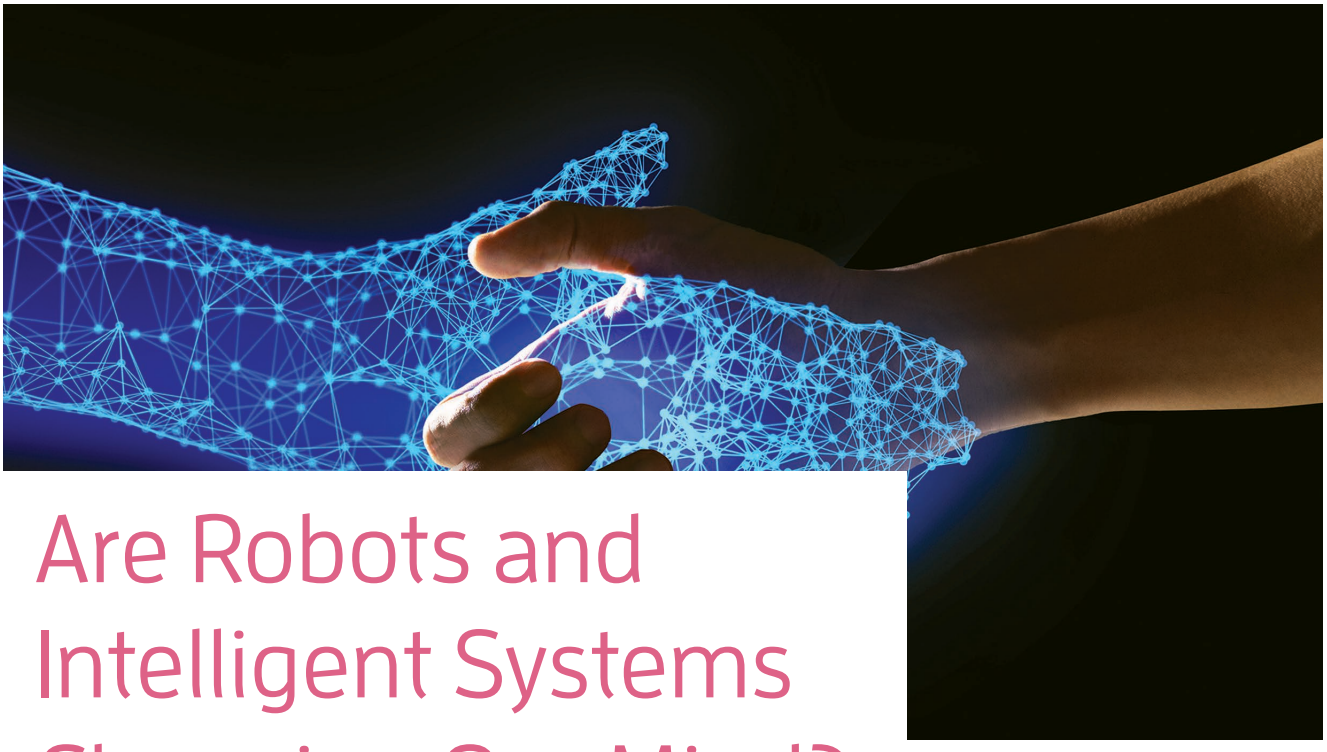

Are Robots and Intelligent Systems Changing Our Mind?

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Digital systems raise serious concerns in individuals regarding their role in human society. This scenario asks for human-centric development and use of computing systems, avoiding making humans inadequate in a deeply automated society.

The deep techno-social transformation generated by digital systems, including robots and artificial intelligence (AI) tools, poses significant challenges and raise questions about their influence and novel risks for humanity. Recently Elon Musk featured the Tesla Optimus humanoid robots and announced their production in 2025. Using his usual optimistic mood, Musk declared "I think everyone among the 8 billion people on Earth will want an Optimus buddy. ... Optimus robot will revolutionize the world more than ever!" The plans are to use Optimus in the Tesla factory; however, it can be used by people in daily life for walking their dog, babysitting their kids, fetching groceries, and so on. Although robots like Optimus can increase productivity and enhance human well-being, serious concerns are raised in human beings regarding their role in our society, the way they will change our life, and also our way of thinking about life and work.

MACHINES SHAPE OUR TIME

About ten years ago Michel Serres discussed some useful and "new" ideas in an essay.[1] He, who was an Academic of France and a professor emeritus at Stanford University, in that book reflected on how digital machinery, the Internet, and social media, have changed the space and time

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where we live (and not just the feeling we have of them). Serres explained how in the different epochs the space of men has shrunk until almost nullifying and recalled the comparison between the Internet, the horse, and the plane. Old and new transportation means and communication that have changed the distances between people in different ways.

Like space, even our daily time is deeply influenced by the continuous use of new technologies. Because of them, time flows in a different way from the one that our grandparents and parents met and experienced. The web, email, social media, AI, and the several digital devices we use continuously shape our daily time, sometimes more than traditional commitments and relationships. Mobile phones are pervasive in our lives; we interact with them more than our family members or friends. Very often we read Facebook and LinkedIn profiles of people to know in a few seconds information about friends, colleagues, or strangers. There, we get information that in the past was obtained with difficulty and much more slowly.

Despite the public plans linked to digital identity services that governments and public administrations put in place, there is no doubt that today, Facebook, Instagram, and Twitter profiles are used very easily and more concretely in place of paper or electronic identity cards. Social media users include a percentage of bot accounts with which people interact without knowing their artificial nature. In a near future, robots may also have their social profiles and communicate and share opinions and actions with people.

In the hundred pages of his book, Serres, in addition to the precious thoughts on how computers and the Internet have changed the space and time in which we live, devotes other considerations that are even more important. The issue of primary importance that Serres poses is linked to the fact that computers and the software systems they run are changing people's minds and their way of thinking. The Internet, AI, and mobile apps are changing the human mind as did the writing that, over two thousand years ago, worried Plato. The same occurred with the Gutenberg press that allowed the spread of books, instruments able of transmitting knowledge like no other another instrument had done before. Plato, in his *Phaedrus*, claimed that the written text is poor because it does not contain the richness of orality and in particular dialectical orality. Also, for this reason, in his life Plato has written dialogues, which are approaching the search for the meaning of things like dialectic orality, but not essays that are forms of expression distant from the dialectical discourse that he preferred. Nowadays, hundreds of millions of people talk to AI chatbots, and this new interaction modality is again changing the way knowledge is acquired and transferred.

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As in the past with the printing press, today with the computer (whatever are the forms in which it is implemented) and with the network, the object and the subject of thought are changing. Digital machines, robots, and their algorithms become almost infinite auxiliary brains and memories. Indeed, they constitute new connective and processing elements for the information we use. This is done by allowing or forcing the birth of new ways of thinking that surpass and integrate those used so far because, as Serres argues, "many of the old functions of thought are replaced by the computer." Therefore, for example, when we use Instagram or TikTok to know about our friends or when we interact with ChatGPT or Gemini asking them to help us in our tasks, our mind generates neuronal processes that serve to learn how to use these tools without wishing to replace them for working out by ourselves what they already do provide.

When we are performing those operations, our mind is dedicated to those functions that computers and robots do not make for us and only those. A new way of thinking is generated every time we use a new software tool in our daily tasks. This is occurring massively in our mind. Every day we dismiss some method of solving routine problems if computers solve them for us and, at the same time, we develop new ways of approaching life's problems if we know that digital machines can do it for us.

DIGITAL DEVICES TRANSFORM THE WAY WE THINK

In our daily activities, we incessantly look for data and information. Often we find that info in the storage of our digital devices or in those of millions of servers composing cloud platforms. Our communications are mediated and implemented by the network and its services. All this affects our brain that must be able to react by adapting elastically to these new scenarios. Therefore, billions of people and their minds change every day, in an unstoppable and irreversible process of silent mass adaptation. A collective and personal process that takes place rapidly and naturally in the minds of the digital native, but it occurs also in those of adults, albeit in different and slower forms.

As we highlighted, it is worth keeping in mind that what is happening

and will happen is not related to a new appliance or to a flaming modern instrument that simplifies one or some functions of our days. Computers, robots, the Internet, and generative AI chatbots are creating new individuals who are transformed, for better or for worse, by a revolution of historical significance that in a few years will bring humanity to be something different from what it was. What is happening in these decades is a sort of acceleration of genetic evolution that could discard people less suitable and will select the most right (suitable) for "digital adaptation."

This issue is clearly stated, for example, in the title of the book edited by John Brockman: *Is the Internet Changing the Way You Think?*.[2] Brockman is the author of popular science books, and he founded the Edge Foundation to support scientific and humanistic thinking on the meaning of life and to understand, as he says, "the profound meaning of our existence, redefining who and what we are."

John Brockman has posed the question that gives the title to the book to 160 scientists, philosophers, artists, writers, teachers, and journalists. The response of each of Brockman's interlocutors is condensed in a few pages, and the collection of contributions provides a series of very interesting and original points of view. The introduction to the book is edited by Daniel Hillis, American scientist and former brilliant MIT graduate. In the book introduction, Hillis wrote: "We have incorporated our intelligence into machines and we have delegated many of our actions and choices to them, so we have created a world that goes beyond our understanding. … We have linked our destinies not only with all people on Earth, but also with our technology. … Now we are all connected, men and machines."

The machines Hillis talks about are computers, robots, Internet of Things devices in their most varied forms ranging from implantable sensors and smart labels to large language models, GPUs, and supercomputers made up of hundreds of thousands of processors. Hillis's thesis, like many others interviewed by Brockman, is that we are transferring our intelligence into digital machines, and this can be a point of no return that is in fact changing not only the way we operate, but also our way of interacting with the world in which we live, our reality, and therefore also the ways by which we generate our thoughts.

On this issue there is evidently a strong agreement with what Michel Serres wrote in his book. The opinion of an authoritative computer scientist like Hillis is also linked to the theories of another well-known scientist such as Raymond Kurzweil, another brilliant graduate of MIT, inventor of technologies for the automatic recognition of text and speech and awarded some tens of honorary degrees. In his *Singularity*, Kurzweil hypothesized that around the middle of this century there will be a date after which computers will have equal intellectual abilities and even higher than human ones.[3] "The key idea underlying the impending Singularity is that the pace of change of our human-created technology is accelerating, and its powers are expanding at an exponential pace."

There is nothing definitive and certain in the Kurzweil's conjectures concerning the future AI developments. However, it would be a serious mistake to consider them as simple wanderings from futurologists. In fact, we need to clarify that the mentioned declarations come from scholars and researchers with great expertise and creators of innovations of enormous value. If the background of enormous experience of these people was not enough, it is sufficient to read some results of the accurate research work made by the scholars who investigate the effects of information technology and, in particular of generative AI, in the learning processes of young people, the digital natives, who grew up the in digital age.

In human history, the use of new and different methods and tools (language, printing press, telegraph, television) have been used to modify and improve ways of acting, to share knowledge, and then, after all, to think. More than these, the Internet and all computing devices connected to it, with their huge amount of information, services, and ability to process algorithms and data are formidable tools with transformational power of human processes. An apparatus that far surpasses the previous ones, also because the network it is able to connect and amplify its effects enormously, which often are of great benefit to people and organizations, but which risk overcoming limits never considered before.

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COMPUTING MACHINERY AND HUMAN PERCEPTION

We are therefore faced with a machinery of collective knowledge that is unprecedented, which allows us to generate and disseminate knowledge as never before in terms of speed, size, and complexity. The daily use and therefore the habit, allows us to take for granted using the car to move faster or the phone to talk with very distant people, or even generative AI tools for getting information and knowledge in a very fast way. For induction it should not seem strange

to use computing devices to think and reason better. If we still happen to be amazed by this, it is because today it is not quite so, although there are now many situations where computers connected through digital networks find solutions for us when we cannot find them or sparing us to think of them looking for solutions that are hard to find. This extraordinary new situation could also become a huge trap for human beings or for the part of them that will cede cognitive abilities to digital machines, losing functions, autonomy, social role, work skills, and individual freedoms.

In its various functional forms, computing technologies changed the perception we have of reality by canceling geographical distances, allowing people to make experiences previously impossible, and virtualizing both the relationships among people and the relationships of people with the whole world. The Irish philosopher George Berkeley closely linked the perception to the knowledge of reality (*"Esse est percipi"*): if the perception that man has of reality changes, also his way of knowing it changes. Digital devices and advanced software systems are certainly modifying the way human beings perceive the world and therefore the modes of production and fruition of knowledge are changing. They are transforming the forms of knowledge and are also causing a change in the modes of creation and accumulation of human thought. A change that could be irreversible.

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ADVICE PROFESSIONALS ON TECHNOLOGY'S IMPACT

During the 11th Heidelberg Laureate Forum, which took place in Heidelberg in late September 2024, Vinton Cerf was asked whether he had questioned himself, early in his computer science career, about the ethical and philosophical questions that arise today with the development of the Internet, social networks, and artificial intelligence. Cerf replied that today many experts should advise computer professionals on technology's impact on human society. He recognized that the lesson he has learned from the fast development of technology, such as smartphones, is that people should want to learn new things; otherwise, they will become ever more inadequate for their time. However, the large use of digital technologies calls for solving ethical and ontological problems related to the correct and moral development and use of those technologies and, at the same time, to the role they may play to empower or weaken humans. For example, to address some of those issues generated by the development in artificial intelligence systems, researchers and professionals have to design and implement systems that assist and cooperate with humans, instead of developing systems aiming to substitute people in their working and social roles.

Without a careful attention to these key issues, many individuals may lose their role and rights, and a social separation will arise between a talented elite able of interpreting information and transforming it into effective knowledge and a mass that, incapable of the necessary interpretation, risks to become only a conglomeration of passive consumers of new technologies. Schools, universities, professional, and educational bodies are challenged by the digital revolution that asks for new skills, new ethics for professionals,[4] and new processes in science, industry, and business that are respectful of people and their cognitive abilities[5] and which contribute to improving social well-being.

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