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# THE NON-HUMAN FACTOR

## GENERATIVE ARTIFICIAL INTELLIGENCE AND ITS IMPACT ON JOBS

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1

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What is it? This is a scientific dissemination website that studies the impact of new technologies on the world of work. Changes today are very fast and exponential. Professions are not static but very dynamic, so the ongoing evolutions can make them obsolete, transform them, or create entirely new ones. What skills will be necessary to face all this? Upskilling and reskilling, but not only.

Why? After 25 years of research, I have realized that to go beyond the boundaries, numbers are not enough. Traditional approaches are obsolete and tied to the old way of doing research. Today, we need to study the weak signals that are right before our eyes but that we see without really noticing. Stopping to consider these signals and imagining multiple possible futures will be the task of Frontiere. Traditional sources respond in real-time but only photograph the present. Today, however, there is a need to make predictions at least five years ahead, without neglecting the past and without forgetting that every topic addressed has a history to consider.

Who is it for? It's easy to make long-term predictions that cannot be verified. I am convinced that the research world needs an immediate confrontation with the world of education and orientation, and with young people who risk studying for professions that may not exist in a few years. They will be here to exchange opinions with the undecided, the disoriented, and those who intend to start over. Young people need to understand that there is a world above and a world below in the job market. A world of those who program algorithms (few and well-paid) and those who work for algorithms (many and poorly paid). We need to understand what to do to escape a job market that risks condemning young people to €1,000 per month salaries for life.

How will it be? Each topic will be addressed with light publications, with a strong emphasis on temporal depth. The publications will be accompanied by short videos (elivri) that get straight to the point. There will be an open chat for young people on the future scenarios of work, the profiles required, and the necessary skills.

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# THE NON-HUMAN FACTOR

The future holds a world where technology will play an increasingly predominant role in human life. The rapid changes in modern life are imposing new challenges on society and creating new opportunities; it can be said that we are in the midst of powerful accelerations (1). Among the most authoritative figures in this field is Raymond Kurzweil, Google's chief engineer and a proponent of transhumanism, the philosophical movement that believes in the possibility of improving humanity through the use of advanced technologies (2). Kurzweil's career has been marked by numerous inventions (3). In his fascinating and provocative book *The Singularity is Near*, he predicts the advent of a future where technology will become so advanced that it surpasses human intelligence. Published in 2005, the book remains highly relevant and stimulating, as its predictions about technology, AI (Artificial Intelligence), and the future of society are gradually coming true. Kurzweil foresees a "technological singularity," the moment when AI surpasses human intelligence and becomes capable of self-improvement.

**Will the "non-human factor" surpass the "human factor"?**

Today, with the advancement of AI, many of Kurzweil's predictions seem even more realistic. With ChatGPT, we have a concrete example of AI capable of emulating human conversation. However, it is important to note that this and other similar AIs are still limited in their ability to understand irony, context, and human emotions. This shows that, although AI is rapidly evolving, there is still much work to be done to achieve Kurzweil's vision of singularity. Daniel C. Dennett, director of the Center for Cognitive Studies at Tufts University in Medford, Massachusetts, considered one of the greatest living philosophers and a guru for Silicon Valley computer scientists, argues that our very consciousness is not a mysterious and incomprehensible reality but functions like complex software. It is therefore not excluded that one day, AI programs could become conscious entities, thanks to their growing ability to learn, like us, through the linguistic analysis of conversations (4). We are talking about so-called generative AI, which made a noisy appearance on the world stage in November 2022 with ChatGPT and its oracular wonders: you query the system and get detailed and in-

depth answers. But Yann LeCun (5) is there to dismantle everything and, above all, to make us feel shamefully unprepared. Yann LeCun is part of that trio of brains, along with Geoffrey Hinton and Joshua Bengio, who gave rise to neural networks, which today, in a semi-dark zone, make decisions for us and may soon acquire disproportionate power; we are talking about "synthetic minds." Synthetic intelligence is the ability to gather information from various sources, understand it, synthesize it, and transmit it to others. Accustomed to navigating the dimensions of the future, LeCun explains that ChatGPT is not the future but the past. Its technology is the result of the research of many scientists, but it is far from intelligent. While a boy takes a few hours to learn how to drive a car, the neural network needs a disproportionate amount of data to do much less. To recognize and distinguish, for example, the image of a cat from that of a dog, the AI needs to analyze and compare thousands of pieces of information to distinguish them and, once labeled, it will never achieve the abstraction and real awareness of them. Less intelligent than it appears in the collective perception, the AI is, at the same time, by its own admission, "magical and powerful." It evolves so rapidly that it surprises anyone who tries to confine it to a rigid scheme and fit it into a pre-established philosophical theory. One should not be distracted by ChatGPT, so as to shift attention to I-Jepa, the acronym for "Image Joint for Embedding Predictive Architecture." This tool, by developing a coherent model of the external world, does not limit itself to the meticulous recording of every detail, pixel by pixel, but is capable of learning by observing and monitoring the context in which information is embedded. It has an approach similar to the human brain, tending to consider the big picture and, in doing so, approaches the sublime capacity we instinctively possess for abstract representation (6). LeCun has always proposed and thought that deep learning AI models can learn about the surrounding environment without the need for human intervention. He compares the functioning of the model to that of humans who accumulate basic knowledge about the world simply by passively observing it (7).

In recent years, it must be acknowledged that AI has made a leap forward and has profoundly changed (8). Deep Learning (DL) has entered the scene, a method that gives machines the ability to learn with or without supervision. But we have not yet reached the point where AI can feel emotions, although, so to speak, it knows the words to express them: the machine's intelligence will never be comparable to that of humans. We now know for certain that the human brain performs

functions so peculiar that they cannot be replicated by applying the model of the Turing machine, whose architecture is the basis of the computers we know, including quantum computers. We will never be able to create artifacts that faithfully simulate the brain, unless perhaps we use technologies that exploit living material. Therefore, we should not be afraid of being overwhelmed by AI (9).

**ChatGPT-3**

In the last months of 2022, this new software appeared, capable of doing quite impressive things: its name is ChatGPT-3, and it is produced by OpenAI. "Generative Pre-trained Transformer 3" (ChatGPT-3) is among the most important innovations in the field of generative AI, probably the most advanced natural language AI in the world. ChatGPT-3 is indeed a DL model; it consists of algorithms not only capable of recognizing data patterns but also able to learn. For this reason, it is considered a true artificial neural network with long-term memory. You can interact with a bot that responds to written questions, engaging in a plausible conversation on even complex topics, giving it orders, and obtaining written texts, compositions, poems, screenplays, and short essays, complete with bibliographies. This language processing model uses a powerful machine learning algorithm. This bot is capable of "conversing" with anyone. Moreover, it produces responses that resemble human ones and, by interacting with more and more interlocutors, it improves over time. These are certainly technologies that will bring about a great transformation. However, delving a bit into past economic history, AI does not herald an apocalypse. Transformations bring upheavals, and it is likely that some may suffer the consequences, but the question that arises is: "In the end, will the balance be positive?" It is right to ask questions because upheaval is certainly underway. Everything will depend on us. Not on the machines, but on us and the data with which we train them (10).

**Different percentages but the same concerns**

The mantra, however, remains the same. Technology has always created more jobs than it has destroyed. How many times have we heard this repeated? Even more so recently, with the advancement of AI. Well, this statement is an ideological falsehood! The evidence is numerous: it is a pious illusion that technology, in this case AI, can automatically create advantages for everyone (11). The only period in

which technology truly contributed to improving conditions for everyone in the West was during the "miraculous thirty years" between the post-war period and the end of the 1970s. The first industrial revolution, on the other hand, was a disaster: most people saw living conditions in cities worsen, starting with sanitary conditions. AI, however, can bring great benefits to humanity, for example in medical research, in the study of DNA and proteins to eradicate incurable diseases. The problem is different, and it is precisely the current propensity for different uses that can be made of it: it is increasingly sold by tech companies as a tool for cheap automation, i.e., cost-cutting and job cuts. This concern is also shared in the OECD (Organisation for Economic Co-operation and Development) report on work published this year. This is the first study investigating the impact of AI on the world of businesses and workers. On one hand, it emerges that for now the impact is limited and positive (it improves productivity and worker well-being, and there have been no layoffs), but on the other hand, there is concern, especially in the USA, about how generative AI is increasingly being used to automate office work for people with little experience or low qualifications (12). In particular, the OECD report highlights how the rapid project implementation of generative AI could lead to a short-term job loss of up to 27% of current jobs. Recently, a study was published on the impact of AI on the labor market. Its authors examined the so-called "pre-trained models" of the ChatGPT family. These software learn from a large amount of data to perform tasks that they then adapt to new contexts. Three of the four authors of this study are OpenAI employees. This company, after creating ChatGPT-3, has dedicated itself to syntography, i.e., it has created Dall-E 2, an effective AI algorithm capable of generating digital images through ML. The study is more important for its ambition than for its results. There is no doubt that the article wants to emulate the "Frey & Osborne Report" (13), named after the two Oxford researchers. These researchers published a catastrophic analysis in 2013, predicting the destruction of 47% of jobs by 2030. This was a much-cited and much-criticized work, given that, despite a pandemic, a geopolitical crisis, and a climate emergency, their predictions, to date, are far from being realized. This new and very recent study investigates the potential implications for the US labor market derived from the use of large language models (LLMs) in ChatGPT-4, the new and improved version of ChatGPT-3. OpenAI found that 80% of the American workforce has a job in which at least 10% of tasks can be performed (or assisted) by AI. The work activities of one-fifth of the workforce will be affected by at least 50% (14). Both the 2013 article and the one just published by OpenAI reduce

human work to a series of "tasks" (tasks and procedures). Like all reductionist analyses, this one should also be approached with healthy skepticism. Taking, for example, the operations and tasks that a nurse usually performs (assisting patients, filling out forms, etc.) and stating that some of them could be exposed to the use of ChatGPT does not mean that the nurse will be fired, but that her work will probably change (15). The concern arises because, despite very different percentages, the OECD also estimates that 30.1% of jobs in Italy (27% in OECD countries) are at risk of automation (16). And if the recent annual OECD labor market report has dedicated six out of seven chapters to AI, the concern increases. There is, however, no evidence that AI has had a negative impact on the world of work. Certainly, with the abrupt acceleration that technology has experienced with the introduction of ChatGPT and other generative platforms, it is clear that we need to multiply our attention because the qualitative leap will be truly remarkable (17).

**Impact on service jobs**

ChatGPT-3, like many other advanced language models based on AI, has the potential to positively influence various sectors and jobs, but it also introduces some risks and challenges. For a long time, it was believed that the disruptive impacts of automation and globalization would remain confined to the productive sectors (mining, manufacturing, and agriculture). The service sector had remained untouched by automation and globalization, as computers were not yet able to "think" and, in general, because it was very difficult to relocate services abroad. Until the rise of the Digital Revolution and machine learning in particular, most professional jobs and service sector jobs had remained "protected" from automation competition, as industrial robots could not speak, listen, read, write, and thus be of any use in the office. Many of these jobs, once "protected" in the service sector, are now at the epicenter of the ongoing transformation, and the effects of this change will be unstoppable. The disruptive pace of digital technology is making white-collar robots extremely skilled in collaborating on office work and capable of performing many tasks of knowledge workers. It is more than evident that this new reality, which is advancing inexorably, will increasingly affect this sector. Let's try to identify some of the jobs that could be at risk due to ChatGPT-3 and all similar technologies. ChatGPT-3 is capable of

generating high-quality texts on a wide range of topics. In short, it is "simple writing jobs" that will be increasingly compromised (18). This could reduce the demand for writers who produce basic content, such as informational articles, product reviews, or press releases. ChatGPT-3 can also be trained to perform automatic translation tasks (19), thus threatening the role of human translators, especially for more common languages and less technical content. These models can improve the quality of automatic translations, making communication between people who speak different languages easier. ChatGPT-3 can be used to create advanced chatbots and virtual assistants that can understand and respond to customer queries naturally and effectively, thus providing excellent support, at least for the most common questions (20). This could reduce the demand for call center staff. ChatGPT-3 is also perfectly capable of generating code in various programming languages (21), so it will have a strong impact on basic and repetitive programming. It can certainly perform tasks related to "generic content creation," such as email templates, drafts of standardized documents, or social media posts. The ability of chatbots to understand and generate text can be used to simplify some software development activities or to write comments in simple code. From this overview of ChatGPT-3's activities and subsequent versions up to ChatGPT-4, the largest neural network of AI ever created to date, it is clear that the entire service sector, and particularly the clerical area, will be disrupted by the automation of all repetitive tasks previously performed by employees. This will reduce the need for human labor for specific tasks, such as creating reports or responding to standardized emails. Therefore, all low-level, more executive and repetitive profiles, such as bank tellers, front desk staff, or data entry clerks, will rapidly decline. At the same time, it must be added that the bot directly enters people's daily activities by providing information, suggestions, or assistance in problem-solving. This can increase the efficiency and productivity of employees. Certainly, new job opportunities will be created, related to the design and maintenance of AI-based systems. This may require specialized skills in the implementation and use of these technologies. In short, these technologies can be used to improve the quality of human work by automating boring tasks and allowing employees to focus on more creative and strategic activities. However, it is important that workers adapt to new technologies and acquire the necessary skills to make the most of them through continuous training.

**High-level professional profiles most exposed to AI**

Certainly, the evolution of ChatGPT will lead to the automation of complex tasks. AI models could be used to automate highly specialized tasks that require advanced skills and specific training. This could affect professions with higher qualifications, such as scientific research, legal or financial consulting, and journalism. Generative AI is emerging as a catalyst for change in the intellectual work sector, particularly for activities that require decision-making and collaboration that until now could not be thought of as automatable. A wide variety of activities involving communication, supervision, documentation, and interaction with people now have the potential to be automated. Researchers therefore argue that generative AI will have the greatest impact on knowledge jobs, particularly on activities involving "decision making" and collaboration. Generative AI increases the potential for automation in occupations that require higher levels of education, which were previously excluded (22). In financial analysis, for example, it can be used to process financial reports and analyze large market datasets (23). It can also be used to automate legal research, document drafting, and especially to respond to common legal questions (24). And especially in telemedicine, ChatGPT-3 can be used to analyze clinical data, assist doctors in diagnoses, and indicate the most appropriate treatment for patients (25). AI is already changing work in the world of journalism (26). AI will change journalism in the next three years more than journalism has changed in the last 30 (27). It could even influence the creation of creative content. It could challenge creative professions such as fiction writers, directors, and composers. In general, jobs that require repetitive tasks, a certain level of data analysis, and routine decision-making are at the highest risk. Perhaps it is not surprising that "information processing industries," which require high-level writing, calculation, and analysis, are most exposed to AI based on LLMs (28).

**Exposure of basic professional profiles**

The surprise, in part, comes from low-level profiles. In fact, despite concerns about job destruction, new digital platforms also return another type of work, at the heart of the most extreme automation. Thousands of "click workers" are engaged in these new activities. With an investigation into the new capitalism of digital

platforms, Antonio Casilli shows that, in reality, AI increasingly needs a workforce, which is recruited in Asia, Africa, and Latin America. These people read and filter comments on digital platforms, classify information, and help algorithms learn. What is happening is a profound revolution that concerns us closely, because it transforms work into a simple, fragmented gesture, paid less and less or even nothing, when we are even the consumers. We are creating a technology that in this case needs human labor and will need it more and more. A job that will never be replaced by automation. Recent history is that of poorly paid workers, engaged, on behalf of OpenAI, in labeling hate speech, expressions of sexual violence, and other explicit material to teach the machine not to reproduce certain phrases, with the aim of achieving a true sentimental education of the machine. These are exploited and poorly paid workers, an integral part, unfortunately, of the complex industrial system that has contributed to automating the service (29). Systems like ChatGPT will not completely replace the workers we know today, but they will force the hiring of many new click slaves, paid very little, to train the algorithms. But we are not talking about so-called "Data Labeling" (30), we are talking about much less qualified professions. A few months after the launch of ChatGPT, an investigation by Time magazine revealed that these workers were paid less than $2 an hour (31). In other documents discovered shortly after, the American company stated that it had also trained its algorithms with workers in the Philippines, Latin America, and the Middle East (32). One of OpenAI's largest partners is Sama, which labels data for many Silicon Valley clients such as Meta, Google, and Microsoft. Sama presents itself as an "Ethical Artificial Intelligence" company and claims to have helped lift more than 50,000 people out of poverty. All this stems from the need to make GPT-3's language less "toxic." This is because initially, the AI had been trained with a vast number of words, hundreds of billions, processed without filters. That huge training dataset was the reason for GPT-3's impressive linguistic capabilities, but it was also its greatest curse, as it sometimes led to wrong conclusions and obvious errors. Here is revealed the true impact on work of ChatGPT software. AI even automates the process of selection, hiring, and firing of precarious workers. It is not the usual science fiction scenario where robots replace humans. It is the permanent employees who are replaced with underpaid pieceworkers hired and fired by digital platforms (33). This trend is already underway, and companies like OpenAI are intensifying it. These are micro-jobs with starvation wages, largely performed by workers on platforms located in developing countries.

**Impact on the production and logistics sector**

But today, the influence of machines has expanded from the service sector to the production sector, as AI and advanced robotics are becoming increasingly sophisticated. In particular, AI-based automation could affect jobs such as assembly line production or logistics. ChatGPT-3 can be used to improve the monitoring and control of industrial processes, making automation more flexible and adaptable. This can reduce the need for human labor in certain stages of the production process. Low-level profiles, therefore, the more executive and repetitive ones, could be compromised. It must be recognized that GPT-3 will not necessarily replace operators in these professions, but it could collaborate with them to automate repetitive tasks and allow operators to focus on high-value-added activities. In eight Case Studies (34) related to work experiences in various activities, it emerges that the companies studied, which offered workers training paths and allowed them to deal with the monitoring and maintenance of cobots (35), achieved production optimization. From interviews with workers, positive feedback emerges. The automation of manual workstations, especially in relation to the reduction of monotonous and low-engagement tasks, has been well received. At the same time, in some cases, there is a growing concern that these robotic systems may cause, in the long term, the loss of one's job (36). But also logistics, the only service sector to automate first, benefits greatly from GPT-3. It can be used to analyze transport data, monitor stocks, and optimize distribution operations (37). AI will be able to analyze large amounts of data from the supply chain and logistics to identify trends, problems, and opportunities for improvement. The full conviction is increasingly emerging that virtual assistants based on AI will help logistics professionals make more informed and faster decisions thanks to real-time information on the operational situation. They will function as true decision-making and technical supports in problem-solving.

**Required profiles**

It is important to note that the adoption of AI-based technologies can lead to changes in skill requirements and occupational roles within companies. On the other hand, the demand for highly specialized figures becomes fundamental in

manufacturing. In particular, the "Automation Engineer" becomes particularly suitable, relying on electrical, electronic, computer, and purely mechanical skills (38). Similarly, the "Management Engineer," who deals with logistics and particularly with the management of the "supply chain," production planning, warehousing, transportation, and distribution. ChatGPT-3 and similar technologies can automate or simplify some activities, but they are not yet able to completely replace human work in many sectors (39). Certainly, there will always be work, especially for high-level profiles, but it will be very different from before (40).

**New professions**

This change will bring new specializations and profiles. Let's start to get to know them:

- Data Scientists are professionals who collect, analyze, and interpret data to develop and train AI models like GPT-3.
- Machine Learning Engineers are responsible for designing, implementing, and optimizing the algorithms underlying models like GPT-3.
- Software Engineers create the technical infrastructure and platforms on which GPT-3 runs, ensuring the reliability, scalability, and security of the system.
- Computational Linguists contribute to the analysis and understanding of natural language, ensuring that the model understands and generates texts accurately and coherently.
- User Interface Designers create interfaces and applications that allow users to interact with GPT-3 in an intuitive and fruitful way.
- AI Researchers conduct research to improve the performance and capabilities of language models like GPT-3.

- Computational Ethologists contribute to the design of machine learning models inspired by human cognitive processes.
- Cybersecurity Experts ensure that the model is secure and that its outputs do not pose a threat or risk.
- Data Engineers collect, clean, and organize the data necessary for the training and operation of the model.
- Ethical AI Researchers deal with the ethical and social implications of language models, seeking to mitigate possible "biases" and negative consequences.
- Marketing and Sales Experts promote and market GPT-3-based services to businesses and users.
- Content Designers create and curate training data, defining the input and responses of the model to improve its performance and usefulness.
- Model Teachers and Trainers supervise the initial training of the model and guide its growth and development.
- Project Managers coordinate the efforts of various teams and professionals to ensure that the GPT-3 development project proceeds efficiently and in line with established objectives.
- User Interface Designers create intuitive and usable interfaces that allow users to interact with GPT-3 effectively and productively.
- Cognitive Scientists contribute to understanding how people interact with GPT-3 and how the model can best adapt to human needs.

These technologies can create new job opportunities, such as the design and supervision of the models themselves, the adaptation of AI solutions to the specific needs of companies, and much more. The transformation of the labor market due to AI will require a balance between automation and the integration of human capabilities in a creative and strategic way.

**How to design the future**

The rapid development of generative AI, which is capable of performing complex written work at ever-lower costs, combined with the ease of adopting these new technologies, suggests that OECD economies are on the verge of a revolution that will radically change the workplace (41). In this context, it is legitimate to ask how to design the future. Should we focus on strengthening human capabilities in which AI or RI (Remote Intelligence) (42) excel, or should we think about strengthening those in which they do not excel, such as general intelligence and the ability to deal with new situations? The first reflection is that the old rule, which made sense before the digital revolution: "become more competent, more educated, more trained, and more experienced" probably no longer makes sense today. The digital revolution has erased the reality on which the old rule was based. Many jobs, once "protected," in the service sector are now at the epicenter of the transformation of work and jobs. And this means that the advice "acquire more skills" is too simplistic for today's world, because simply having more skills and university degrees will not avoid competition from AI and RI, true disruptors of work as classically understood. This is why the old rules will no longer work. The jobs threatened are precisely those in services, where 3 out of 4 workers operate. We need to change the way we think, and quite quickly.

**New AI models**

Today, it is increasingly difficult to navigate the internet without encountering names like ChatGPT, Bing Chat, Google Bard (43), Midjourney, Dall-E 2, etc., which, starting from the second half of 2022, have marked a revolution that has changed not only our relationship with the web but will, over time, profoundly change our society and our work. Moreover, recognizing a text written by generative AI is not at all easy. For an inexperienced eye, it can be extremely difficult to distinguish whether content has been written by a person or by generative AI. And certainly, the goal of these companies is to make the machine's text as close as possible to human text (44). Generative AI is therefore "risky"? Exactly like ChatGPT, because any of its texts could be mistaken for those generated by a human. A risk that would become a certainty according to leaks from developer Sigi Chen about version 5 of AI, expected next winter, and which the US Federal Trade Commission is beginning to investigate (45). We must not think that the current situation regarding GPT remains static, but it is in full evolution. Subsequent interactions of

models like GPT could have an even greater capacity to generate coherent and convincing text on a wide range of topics. Not only that, but future models could be able to understand the meaning of text more accurately, thus improving their ability to respond coherently and relevantly to questions, offering more personalized experiences. Future models could be designed to be more aware of ethical, social, and cultural issues in their output, potentially reducing the generation of inappropriate or offensive content. Certainly, conversations between humans and AI will become more natural and meaningful. This obviously exposes most people, who will not be trained to grasp the "differences" if the writer is a human or a machine.

**Will soft skills be enough?**

Will soft skills (46) be enough to save us from intelligent machines? Will we need superpowers, and which ones? And above all, will we all be indiscriminately prepared? It seems necessary to ask ourselves what the short- and long-term consequences might be and, above all, how to face them. ChatGPT and DALL-E are tools that leverage generative AI: they take input from humans and autonomously create new content. They have revolutionized the habits of thousands, if not millions, of people. This type of intelligence is capable of taking user instructions and using them to create completely new products: texts, images, sounds, or videos. Generative AI combines two different intelligence technologies: on one hand, machine learning, which allows recognizing patterns or trends in existing data and user input; on the other, the ability to create new content, which clearly always depends on the dataset it draws from, also known as the training set. In a world of deepfakes, it will soon be impossible to tell what is real and what is not. This crisis of misinformation we are facing now has been dubbed the "Infocalypse." AI technology is now capable of creating videos of people doing things they have never done, in places they have never been, saying things they have never said (47). At this point, we must ask ourselves the following question: what happens, for example, when you can no longer believe your eyes? (48). ChatGPT is built on the so-called Large Language Model, i.e., on vast databases of texts that allow the program to understand instructions given in human language, rather than in computer languages mastered by very few (49). When an LLM produces an output, is it generating a new product, the result of creativity as a

human would, or is it generating a work derived from these texts? (50). In the second case, something is certainly happening. And it seems that this is exactly the case. The spread of neural networks is equivalent to the invention of the printing press in the 15th century. We must also understand that new generative models are trained through representations, rather than with data. There will still be a need for new skills and "upskilling" and "reskilling" paths (51) to withstand the impact of AI in general and generative AI in particular. But will they be enough? Will the fundamental soft skills to acquire, train, and master be enough? To face the future that is coming, it will be useful to look for jobs that are not in direct competition with white-collar robots or "telemigrants." Then it will be necessary to try to build skills that allow avoiding direct competition with new AI and RI applications. Finally, we must become aware that "being human" is an advantageous condition and not a handicap. In the future, having a good heart could be as important for economic success as having a good head was in the 20th century and two arms in the 19th century. Therefore, from what has just been stated, it would be better to leave aside the deepening of those skills that are based exclusively on models derived from experience, because AI is becoming very accurate in this kind of activity. If it is possible to collect a large amount of data on a specific task, it will soon be taken over by software robots "trained" by AI. Try to stay away from jobs where this, if it hasn't already happened, will happen soon. Similarly, we should refine those skills necessary to deal with those who are obliged to interface in person, precisely because "telemigrants" cannot do so. Digital technology is making it easier for talented and low-cost foreigners to perform many of our office tasks abroad. What kind of tasks are these? We must stay away from jobs for which it is not necessary to be physically present in a specific place with others. These are the tasks that will put educated foreigners, who can sustain a middle-class lifestyle with a job paid only $10 an hour, in competition with workers from advanced economies. As for training, we should invest in creating soft skills, such as the ability to work in a team and be creative, socially aware, empathetic, and ethical, because globots do not possess these skills. Of course, we should not only have such skills. We should all have a greater mastery of technical aspects, a characteristic that is already widespread among people under 30. An argument often overlooked in public debate is as simple as it is obvious: how many will really benefit from the digital transformation? Some AI experts, especially those who will design it, will become incredibly rich, but what about the others? Most people, if they do not want to be supplanted by AI

systems, will probably have to learn to use these new work tools very well. Flexibility and adaptability will certainly be important in the future world of work, which is continuously and rapidly evolving. Language skills, on the other hand, will be less advantageous than they were before automatic translation offered such incredibly effective results.

**Competing with AI**

There are still areas where humans have distinct advantages and can compete effectively. Let's examine some possibilities through which humanity can distinguish itself and compete with ChatGPT and similar technologies: creativity and originality. Humans are endowed with creativity and the ability for original thinking that can lead to unique ideas, solutions, and artistic works. The ability to combine elements in innovative ways is a human characteristic that is difficult for machines to replicate. Another factor is that ChatGPT lacks empathy and emotional understanding. Humans can recognize and interpret emotional nuances in texts, conversations, and human behaviors. This human understanding is essential in fields such as therapy, counseling, emotional support, and leadership. Ethical and moral reasoning. Humans can face ethical and moral dilemmas, evaluate contexts, and make decisions based on a complex range of considerations. ChatGPT does not have a true understanding of ethics and often generates responses based on statistical models rather than ethical principles. ChatGPT can learn from past data, but humans have the ability to adapt quickly to new situations and innovate. This mental flexibility allows humans to face unexpected challenges and find new ways of doing things. Human intuition and the ability to subjectively evaluate complex situations are difficult for machines to replicate. This is important in fields such as legal consulting, financial consulting, and leadership decisions. Human interactions involve complex elements such as social dynamics, non-verbal communication, and the building of meaningful relationships. GPT does not have personal experience or authentic social interactions. In summary, it certainly has significant impacts and advantages, but there are aspects of the human experience that remain unique and irreplaceable. Humans can capitalize on these qualities to continue to compete effectively in the world that is rapidly evolving due to technology. Something profound is certainly happening in today's enterprises, something that many define as "digital

subversion." With the acceleration of technological progress and competition, service sector enterprises are moving to more flexible organizational models, and this entails, in turn, more flexible agreements with workers. They are reorganizing some tasks, so as to combine robotic applications of AI and RI with human work, accustoming employees to be "agile." This allows them to compete with traditional enterprises, which continue to employ workers on-site to perform most of the work. In the not-too-distant future, it is conceivable that AI and RI will allow dedicated teams of intelligent workers, present on-site, located in the same building, to direct much larger teams of "telemigrants" and white-collar robots. Tasks involving routine information manipulation will be taken over by AI; this will no longer take over tasks for which humanity has an advantage or tasks for which it is essential to be in the same place; these tasks will be safe from automation and globalization in the future world of work. The consequent shift to those "protected" jobs will reward a very different set of skills than those that were favored by ICT (the Information Communication Technology revolution). Ultimately, AI will make everyone much "smarter" (smart), i.e., skilled in recognizing a pattern. The change will be revolutionary for ordinary people, but much less so for the few who are very intelligent. Using the term "head" in the sense of "brain," AI will give more head to those who have a lot of heart, but it will not give more heart to those who have a lot of head (52).

**Beyond Googling**

At the dawn of the digital age, mastering the art of "Googling" (searching for information on the web) was considered an indispensable skill. Today, we find ourselves navigating the complex landscape of generative AI. It is a new and almost unexplored world, where the rules of engagement are being rewritten and the required skills are rapidly evolving. The days of simple "keyword" searches are behind us. Today, working effectively with AI requires a more sophisticated understanding. It is not just about what you know, but how you apply it in the context of empathy, culture, and social nuances. We are facing a seismic shift, highlighting the fundamental role that soft skills now play in AI. Skills must be accompanied by collaboration, communication, ethical decision-making, and UX design (53). It will be necessary to delve into how these human-centered skills are shaping the way we interact with and leverage this new technology. Our

relationship with AI is becoming less tied to codes and algorithms and more tied to understanding, adaptation, and connection in a rapidly changing world. In the rapidly advancing AI era, technical competence alone is no longer sufficient. Professionals must now embrace cross-cutting skills, vital to leveraging AI effectively and responsibly. Beyond programming experience, qualities such as empathy, communication, adaptability, and ethical reasoning are crucial. It is necessary to understand culture, context, the adoption of new technologies, and the prioritization of user needs. Mastering these skills is not only fundamental to shaping the future of AI but also to ensuring its alignment with human values and the well-being of society. Thus, it is precisely the navigation that makes us realize that the key to leveraging this transformative technology goes far beyond algorithmic competence or programming ability. The era of simple "Googling" has given way to a new dawn, where the skills required to work with generative AI extend into the realms of empathy, culture, and context. A successful AI professional is not just a technologist, but also a compassionate communicator, a discerning ethicist, an adaptable learner, and a creative problem solver. As AI continues to evolve, so must our approach to it. By cultivating these soft skills, we can ensure not only to keep pace with the rapid advancement of AI but also to harness its potential responsibly, ethically, and effectively for a future where technology and humanity coexist in harmony (54).

**Reskilling**

It is important to remember that generative AI is a field in constant evolution, so it is important to stay updated on the latest research and developments through reading academic articles, attending conferences, and engaging in the research community. Simply put, continuous training should play a big role in the near future. For those already working with computers, it is time to prepare for a new phase. A significant part of the investment will go into reskilling employees. Thanks to in-company courses, everyone will have to learn to use AI. It is not just the professions of journalists, doctors, lawyers, etc. that are being challenged, but also the "business intelligence" expert, who today, to write rather complex reports, must rely on very in-depth technical skills, will have to update themselves. Because when AI "understands" the supply chain of a product, it will be able to extract data with ease, previously unimaginable. At the national level, in the field

of research, the "FAIR" project has been launched, funded by the PNRR, which aims to study the various fields of application and the problems related to AI, academic studies, and their continuous updates. New master's degrees in AI Engineering are being inaugurated, with courses in law, ethics, and neuroscience. In these university programs, theories once reserved only for research doctorates are also studied, on how to create scalable systems to train artificial intelligences on infinitely large amounts of data. At the same time, degree programs with subjects like Philosophy of AI are already emerging in many universities(55).

**Algorithmic Invasion of the Labor Market**

We know that innovation cannot be stopped, but this is an exceptional case. What these technologies are capable of is not even clear to those who create them. Everything is happening too fast. As already mentioned, in a few months, ChatGPT-5 could be ready, which will be even more powerful. These technologies are destined to change everything. They will change the work of millions of people. They will also change intellectual jobs. We are facing an algorithmic invasion of the labor market. But it won't be AI that steals all the jobs; rather, each worker will have to adapt to the new demands and modalities of the working world. We are talking about tools that might give us superpowers, not something that will replace us. We must be cautious, but we should not be afraid, and therefore, we must understand them well to exploit them to our advantage. The fear that these tools could go out of control remains. The fact that the parameters and information are managed by a few companies, and moreover, private ones, fuels some concerns. It is essential to ask some questions. Who controls the answers? Who can prevent the spread of misinformation? At the core, what is most frightening is that ChatGPT and other chatbots interact directly with people, and they do so in a straightforward manner, without control and without ethical principles. The effects, when they have even greater potential, could be devastating. There are no good or bad machines; in reality, they are just objects that do what we tell them. However, we must not fall into the common misconception that technology is always neutral. When we design AI, we inevitably embed our own knowledge, ideologies, and biases. Another recurring question: what if we can't keep up? What if we can't compete with the machines? Are we destined to be overwhelmed? Will we see a planet dominated not so much

by carbon-based units but by silicon-based units? These are legitimate questions, and evidently, humanity must have a "Plan B" and not be unprepared for a future that is very different from what we might expect. All this presupposes that the human body has become obsolete and that the state of corporeality must be rethought in light of a radical hybridization with technology. This implies transformative interventions, such as integrated prosthetics. Recently, due to Elon Musk and his Neuralink, the discussion around interfaces and neural implants has reopened, not only to treat pathologies but also for human enhancement purposes. Computers and the human brain communicating through the use of a chip. Science fiction? Not anymore. Neuralink, a start-up owned by the controversial South African entrepreneur Elon Musk, is reportedly one step away from connecting the minds of a group of volunteers to its computers, allowing them to interact in real-time with AI. Neuralink's official Twitter account, in fact, announced on May 26 that it had received authorization from the Food and Drug Administration to test its technology on humans, while also emphasizing that it has not yet started the recruitment process for volunteers.

**Techno-Optimists or Techno-Pessimists?**

The primary goal would be to help paralyzed individuals or those with neurological diseases to move and communicate again. A noble purpose that intertwines with complicated ethical and moral questions, which also emerge from Elon Musk's words, according to which these chips should allow humanity to achieve a "symbiosis with Artificial Intelligence." In recent years, technology has made possible a series of innovations that are redefining our idea of humanity. AI, particularly generative AI, along with biotechnology and genetics, is opening new possibilities for improving our bodies and minds and could lead to a future where humans might be radically different from how we know them today. Humans could thus overcome their physical and mental limitations, reaching a level of power and capability unimaginable just a few years ago. Fortunately or unfortunately, no one can predict the future, and there are times when it is natural to regret it. Yet, the future is possible, and with much effort and data in hand, we can predict it: that is, not how it will be in detail, but at least what the most likely options are among those on the table. The posthuman option is certainly one of them. Emerging technologies could surpass our capacity for understanding, and it is inevitable that

we must prepare ourselves. Human enhancement, that is, any type of intervention and action that allows us to improve or enhance our abilities, our bodies, our minds, our well-being, will certainly be possible with new technologies. But to enhance or not to enhance? In the debate, two extreme positions emerge: some think that interventions of this kind are a threat to nature and human dignity, while others argue that these human interventions are a way to reach our true potential by going beyond our limits. Current dynamics seem to push not only for the development of technologies for human enhancement but also for the desire, in some cases, the need to use them. If it is true that the curtain is about to fall on the history of Homo Sapiens, we who belong to one of its final generations must dedicate some time to answering one last question: what do we want to become? This question, sometimes called the "question of human enhancement," downsizes the debates that currently concern politicians, philosophers, scholars, and ordinary people. Certainly, there could be something more dangerous than a mass of dissatisfied and irresponsible gods who do not even know what they want. For example, some argue that it is necessary to enhance ourselves, both to ensure our own survival and because we will have to leave the planet to explore other unknown future environments, and, this is precisely the case we are facing, because we might create technologies capable of representing a threat to our very existence. Navigating the bumpy path between techno-skeptics and techno-enthusiasts means addressing the problem of how to govern the transformation, that is, how to ensure that humans remain at the center of the digital revolution and are protagonists capable of adapting technological artifacts to their needs and not forced to adapt to them by an innovation for its own sake.

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# Massimo Tamiatti

I have always been involved in the study and dissemination of topics related to new technologies, new jobs, and new skills. I do this in a completely new and different way compared to traditional research approaches because, in addition to consulting traditional sources, I consult sources from major strategic consulting firms, which do not have a static but dynamic vision of reality, as they focus on the future. I systematically use the web to search for the most up-to-date content, perhaps through webinars with privileged witnesses on the subject of the investigation or through some important influencer specialized in the topic being addressed. Obviously, today, I use Generative Artificial Intelligence tools. I do not neglect the present; I try to interpret the signals that we have before our eyes, which we are often used to looking at and not seeing, and which suggest what could happen. I do not neglect the past, that is, history, but in reality, many disciplines are mixed: economics, statistics, sociology, psychology, anthropology, and above all, I use imagination anchored to the facts that happen every day in the world. I consider numbers very important, but they are not everything; at the center, there must always be a particular attention to the privileged witnesses of the things that happen and their personal stories. Frontiere does not have the gift of foresight, but our team can make hypotheses, and among these hypotheses, I have realized that it is very likely to encounter the future. Spreading the culture of anticipation helps people understand what is happening in the world, especially in the world of work, helps them prepare, elaborating strategies, and organizing themselves to make very important conscious and correct choices for the effect they will have on their lives.

**Institutional Profile**

I was Chief Research Officer of the Agenzia Piemonte Lavoro, where I coordinated groups of researchers in the field of labor and vocational training policies until June 30, 2023. Since July 1, I have become part of the staff of the "Laboratorio Riccardo Revelli" as an honorary member. I am an expert in public employment services. Currently, I am a member of the group that coordinated the organization of the "Settimana del lavoro 2024" and related events on behalf of the Istituto per la memoria e cultura del lavoro, dell'impresa e dei diritti sociali (ISMEL), of which I am a member of the scientific committee. I am a member of the scientific committee of Polis policy, Accademia di alta formazione. I am the founder and director of the online scientific dissemination site **http://www.frontieretecnologialavoro.com** since 2022 and a member of the Associazione dei Futuristi italiani di Roberto Poli. I am an expert in the use of forecasting techniques applied to local labor markets, in collaboration with the start-up Skopìa, specialized in future studies and anticipation, aimed at helping organizations develop anticipatory strategies to support complex decisions in areas of strong uncertainty. I have a degree in letters and philosophy, with a thesis in contemporary history and one in political science, both obtained from the University of Turin, and I am the author of numerous publications related to the labor market, and in particular to the new scenarios of the labor market, new professions, and new skills.

**The following collaborated with me on this project: Gabriele Lamberti, Benjamin Dafku, Ivan and Federico Giacobino.**