

The artificial intelligence: a solution to the limited rationality of economic actors?

الذكاء الاصطناعي : هل هو حل للعقلانية المحدودة للجهات الاقتصادية؟ الفاعلة

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Received on:03/04/2024

Accepted on:24/07/2024

published on: 29/10/2024

Abstract:

This exploratory work on the effects of artificial intelligence (AI) on human rationality, in particular the rationality of economic actors, revealed a notable complexity. The results highlight significant ambivalence and nuance. The use of AI can, in some situations, compensate for the limits of human rationality as mentioned by Herbert Simon. However, in other cases it could weaken this rationality. These findings highlight the need for a balanced and contextual approach to the application of AI in economic decisions, taking into account both its potential benefits and implications for human rationality.

Keys words: Artificial intelligence, bounded rationality, decision optimization, machine learning.

JEL classification codes: D8, D83, L1, L15.

ملخص:

كشف هذا العمل الاستكشافي حول تأثيرات الذكاء الاصطناعي على العقلانية البشرية، ولا سيما عقلانية الجهات الفاعلة الاقتصادية، عن تعقيد ملحوظ. وتسلط النتائج الضوء على تناقض كبير وفروق دقيقة. إن استخدام الذكاء الاصطناعي يمكن، في مواقف معينة، أن يعوض حدود العقلانية البشرية كما ذكره هربرت سيمون. ومع ذلك، في حالات أخرى يمكن أن يضعف هذه العقلانية. تسلط هذه النتائج الضوء على الحاجة إلى اتباع نهج متوازن وسياقي لتطبيق الذكاء الاصطناعي في القرارات الاقتصادية، مع الأخذ في الاعتبار فوائده المحتملة وآثاره على العقلانية البشرية.

الكلمات المفتاحية: الذكاء الاصطناعي، العقلانية المحدودة، تحسين القرار، التعلم الآلي

تصنيف JEL: D8, D83, L1, L15..

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1-Introduction

In the global economic context, the rationality of economic actors remains a primary concern, both for theorists and for practitioners. At the heart of this analysis lies the problem of “bounded rationality”, conceptualized by Herbert Simon, which exposes the cognitive and informational constraints that individuals face during their economic decision-making processes. In this context, there is growing interest in the emergence of AI, as a potential means of compensating for these shortcomings and improving the rationality of economic actors.

With this in mind, our investigation focuses on the extent to which artificial intelligence can constitute a viable solution to overcome the limited rationality of economic actors. To do this, we begin the research process with a fundamental question: to what extent can AI be considered an effective solution to transcend the limited rationality of economic actors? Through this issue, we will try to explore the impact of artificial intelligence on the rationality of economic decision-makers. We plan to carefully examine its ability to provide in-depth analysis, accurate predictions and improved management of complex information, with the aim of better understanding its potential to improve economic decision-making.

The objective of this research is to analyze the interactions between AI and economic rationality, highlighting the challenges and opportunities related to the increasing integration of AI into economic decision-making processes. It is also part of an interdisciplinary approach, combining concepts from behavioral economics, AI and data management. By exploring the implications of AI for economic rationality, it aims to enrich our understanding of the challenges associated with technological evolution in the economic domain.

Our initial postulate suggests that the integration of AI into economic decision-making processes opens promising prospects for improving the rationality of economic actors. We anticipate that AI, by leveraging sophisticated algorithms and unparalleled data processing capacity, will enable more informed and efficient decision-making. Furthermore, by reducing cognitive biases and human errors, it could contribute to better risk management and more strategic decisions. By integrating predictive models and advanced analytics, AI could also provide a deeper understanding of market trends and emerging opportunities, enabling economic actors to better anticipate and respond to changes in the economic environment. In sum, our hypothesis suggests that AI has the potential to radically transform the way economic decisions are made, providing significant benefits in terms of efficiency, accuracy and rationality in the decision-making process.

2-The concept of limited rationality: Origins, definition and implications

The concept of bounded rationality, introduced by Herbert Simon in the 1950s, represents an alternative approach to the perfect rationality traditionally assumed in classical and neoclassical economic models. The author challenges the idea that individuals act rationally by maximizing their interests in an environment of perfect information. Instead, it argues that human beings face cognitive, temporal, financial, and informational limitations that prevent them from processing all available information and making optimal decisions.

- **Informational constraints:** they designate the limits that are encountered by individuals in the acquisition, access and processing of data relevant to decision-making. In the financial context for example, these constraints may include gaps in the availability of information on financial assets, delays in the disclosure of financial data, as well as costs associated with the collection and analysis of the

information. These informational constraints hinder the ability of individuals to make fully informed investment decisions. Due to these limitations, investors may be required to make decisions based on incomplete or incorrect information, which may compromise their rationality in the financial decision-making process.

- **Financial constraints:** they indicate restrictions linked to the monetary resources available to individuals. This may include budgetary limitations, restrictions on access to credit, or liquidity requirements that limit individuals' ability to invest or diversify their portfolio optimally. In this way, they can force individuals to make sub-optimal investment decisions due to their inability to access certain financial assets or diversify their portfolio appropriately. This may result in sub-optimization of returns or increased exposure to risk.

- **Cognitive constraints:** they refer to the limitations linked to the cognitive abilities of individuals to process information and make rational decisions. This may include cognitive biases, information processing limitations, or errors in judgment that can influence individuals' financial decisions. Cognitive constraints can also lead actors to make irrational or suboptimal decisions due to influence. cognitive biases in the decision-making process. For example, overconfidence in financial markets can produce an overestimation of expected returns, while loss aversion can result in excessively conservative decisions.

- **Temporal constraints:** These describe the time limits that individuals face when making decisions. These limitations may be due to strict deadlines, schedule pressures, or deadline constraints in a dynamic environment. Faced with strict deadlines and schedule pressures, individuals must often make do with partial information, adopting heuristics and cognitive shortcuts to reach a decision within the allotted time frame. This haste can increase the risk of impulsive decisions or decisions based on hunches rather than full rational analysis. Thus, time constraints force individuals to find a compromise between the completeness of the analysis and the need to act quickly, which can have implications for the quality and rationality of the decisions made.

From this perspective, bounded rationality can be defined as a decision-making process in which individuals adopt simple heuristics to solve complex problems, rather than actively seeking the optimal solution. For (Simon, 1956) Simon H (1956): "Bounded rationality is the notion that individuals, when making decisions, operate under constraints of knowledge, cognitive capacity and time. They use heuristics rather than optimal procedures to achieve a satisfactory, but not necessarily optimal, result within a limited time frame." This approach recognizes the constraints faced by individuals in their decision-making environment and highlights the notion of satisfactory approximation rather than perfect optimization. In other words, individuals seek solutions that are "good enough" given their limited resources.

The concept of bounded rationality has profoundly influenced various fields, including economics, psychology, sociology, and organizational theory.

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In economics, this concept challenges the foundations of neoclassical theory by highlighting the limits of human rationality in economic decision-making. Unlike the neoclassical assumption that individuals act perfectly rationally to maximize their utility, bounded rationality recognizes that individuals face cognitive and informational constraints that limit their ability to process all available information and make decisions optimal. Thus, this concept highlights the importance of heuristic behaviors, that is, cognitive shortcuts and simple rules, in the economic decision-making process.

In psychology, the recognition of bounded rationality has led to the development of behavioral models that take into account cognitive biases and information processing limitations in individuals. These models recognize that individuals are subject to biases such as overconfidence, loss aversion, and anchoring, which can influence their decisions. Therefore, economic and behavioral psychology is interested in understanding how these biases affect individual and collective choices and how they can be mitigated or exploited in different contexts.

On a practical level, taking the concept into account implies important consequences for the design of public policies, the management of organizations and strategic decision-making. By integrating an understanding of bounded rationality into these areas, it is possible to promote more effective and equitable outcomes. This involves simplifying choices to make decisions more accessible, providing clear information to help individuals make informed decisions, and developing decision-making mechanisms that account for heuristics and cognitive biases.

3-Working methodology:

To collect the data that is necessary for our research, we adopted a methodical approach by undertaking an exhaustive literature search. This took place in several renowned academic and professional databases, as well as in specialized journals, thus guaranteeing broad and in-depth coverage of the field. We have taken care to select recent and relevant articles that focus specifically on the role and impact of artificial intelligence in economic decision-making. These articles were subjected to careful review and methodical synthesis to identify emerging trends, critical challenges, and promising opportunities associated with the use of AI in this specific context. By consolidating this information, our goal was to gain a deep and nuanced understanding of the implications of AI in economic decision-making, providing a solid foundation for our analysis and conclusions.

In the meantime, we have undertaken the identification and selection of recent empirical studies focusing specifically on the impacts of artificial intelligence on decisions that are made by individuals and organizations in a variety of contexts. This approach allowed us to collect concrete data from the field, thus providing additional insight to the theoretical information obtained in the academic literature. Having identified these studies, we conducted a

meticulous analysis of their results, highlighting the nuances and implications of AI's effects on decision-making processes. We took a detailed look at the methodologies that are used in these studies, including the data analysis techniques and statistical models employed, as well as the performance metrics and success indicators used to assess the impact of AI. This rigorous approach allowed us to complement and validate the information that is collected in the academic literature, thus strengthening the robustness of our analysis and the reliability of our conclusions.

Concerning the data quality control protocol, our approach was rigorous in order to guarantee the reliability and validity of our results. First, we paid particular attention to the selection of recognized and reliable data sources in the field of artificial intelligence and economic decision-making. This allowed us to rely on quality academic work and professional research, supporting the credibility of our analyses. Furthermore, we established strict criteria for the selection of articles and empirical studies, giving preference to works presenting robust methodologies and verifiable results. This approach ensured the relevance and robustness of the data used in our research. Finally, we carried out an in-depth analysis of the collected data, employing advanced statistical techniques and qualitative analysis tools to identify significant trends and patterns. This rigorous analytical approach ensured the precision and reliability of our conclusions, necessary for the validity of our study in the field of artificial intelligence and economic decision-making.

4-Complex Duality of Artificial Intelligence: between rational and ethical

Artificial intelligence (AI) is sparking a heated debate between its rational possibilities and the ethical concerns it raises. This complex duality challenges both scientists and philosophers, and it is at the heart of contemporary discussions on the future of technology and society. By closely examining the advancements in AI and the ethical questions that accompany it, it becomes clear that these two aspects are deeply intertwined and require careful consideration.

AI represents an interdisciplinary field that combines advances in computer science, statistics and machine learning to create systems that are able of solving tasks traditionally associated with human intelligence. From natural language processing to computer vision through planning and decision-making, AI offers endless possibilities to automate and streamline various processes.

An artificial intelligence agent is in fact: “a computer system that is capable of perceiving its environment using sensors, analyzing these perceptions using algorithms and machine learning models, and acting autonomously to achieve specific objectives in this environment” (Negnevitsky, 2011).

Although the definition of an artificial intelligence agent may vary depending on the specific context in which it is used, but generally speaking, it can be described as a computing system designed to act autonomously in order to accomplish specific tasks depending on its environment and the objectives

assigned to it. In this, the distinction with human intelligence lies mainly in their functioning and their capacities:

- Cognitive abilities: AI agents are typically designed to excel at specific tasks using algorithms and machine learning models. Their performance often depends on the quality and quantity of the data on which they are trained. In contrast, human intelligence is often characterized by its ability to generalize, learn new information flexibly, and adapt to varied situations with contextual understanding.
- Consciousness and subjectivity: AI agents do not possess consciousness or subjectivity like human beings. They do not feel emotions, desires or intrinsic motivations. Their behavior is determined by programmed rules and predefined goals, and they are not capable of making decisions based on their own subjective understanding of the situation.
- Limitations and task specificity: AI agents are typically designed to perform specific and limited tasks for which they are trained. Their performance may be exceptional in their area of expertise, but they may be ineffective or even incompetent in areas in which they have not been trained. In contrast, human intelligence is often characterized by its ability to adapt to a variety of tasks and situations, and to leverage experience and knowledge to solve new problems.

From the perspective of rationality, the ability of artificial intelligence to analyze and interpret large data sets evokes a significant advancement over traditional methods of information processing. Machine learning algorithms, particularly deep neural networks, are capable of learning to recognize complex patterns and making accurate predictions from raw data. Unlike humans, who may be limited by cognitive biases or information processing limitations, AI systems can analyze data objectively, leveraging every available piece of information to draw relevant results.

In the medical field, for example, artificial intelligence has revolutionized the way diagnoses are made and treatments are planned. AI systems can analyze thousands or even millions of medical images with unparalleled accuracy and speed, allowing doctors to detect early signs of diseases such as cancer or heart disease. This ability to identify subtle abnormalities that might escape the human eye leads to more accurate diagnoses and faster interventions, thereby improving patient outcomes. Additionally, it offers the ability to optimize medical processes and improve healthcare efficiency, by analyzing electronic medical records to spot trends and correlations between symptoms, treatments and patient outcomes, allowing healthcare professionals to tailor treatment protocols based on the individual needs of each patient, which can go a long way in reducing medical errors, minimizing healthcare costs and improving the overall patient experience.

However, this apparent rationality is not without flaws. The widespread and misuse of artificial intelligence in various fields raises significant concerns about algorithmic biases and the harmful consequences they can generate. For good

reason, AI models are often trained on historical data sets that can reflect and amplify existing social biases, thus perpetuating inequalities and discrimination in automated decision-making (Barocas. S, 2016). As some studies in the field of human resources management have demonstrated, candidate selection algorithms during the selection phase can, for example, be influenced by past recruitment patterns that have favored certain demographic groups over others. (Dastin, 2018), similar to the lending industry, other studies indicate that algorithms used to assess borrowers' creditworthiness may also unintentionally perpetuate discriminatory practices by granting loans unfairly based on creditworthiness race, gender, or other demographic characteristics (Mullainathan.S, 2017).

These examples highlight how biases in historical data can propagate into automated decisions made by AI algorithms. The emergence of these biases raises important ethical questions in addition to the risks of potential errors in decision-making. In other words, when critical decisions are automated by algorithms, it is essential to ensure that they do not unfairly favor or penalize certain groups of people. Algorithmic bias potentially introduces systemic injustice and discrimination, raising major ethical concerns about fairness and justice in our society. For these reasons, algorithmic fairness has become a major concern and already aims to ensure that AI systems make decisions that are fair and unbiased for all individuals, regardless of their origin or socio-economic status (Chouldechova, 2017). This could mean carefully examining training data to identify and correct existing biases, as well as designing algorithms that are transparent and explainable, allowing users to understand how decisions are made and remediating any discriminatory behavior (Diakopoulos, 2016).

In this sense, the need for transparency in artificial intelligence systems fits into the broader context of algorithmic fairness, which aims to ensure fair and impartial decisions for all individuals, despite concerns about bias algorithms and potential discrimination. Transparency about how AI systems work and the data used in their training not only builds public trust in these systems, but also encourages independent oversight and review to detect and correct potential problems or injustice (Goodman.B, 2016). By making the operation and data that is used by AI systems public, organizations enable external stakeholders, such as researchers, regulators and the general public, to better understand how these systems make decisions and what are the implications of these decisions.

This aspect firstly strengthens public trust in AI systems, particularly in sensitive areas such as health, finance and justice, where decisions made by algorithms can have a significant impact on the lives of individuals; secondly it facilitates independent monitoring and review of AI systems by making available data on which the algorithms are trained, as well as the characteristics and weights of those algorithms, to enable regulators to assess the fairness of the

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decisions made; and finally it encourages the responsibility of organizations that develop and deploy AI systems by encouraging them to adopt ethical and responsible practices, to invest in the detection and correction of bias, as well as to design recourse mechanisms for individuals affected by the decisions of AI systems.

These contradictory and nuanced effects lead to the following conclusion: although artificial intelligence offers enormous potential to solve complex problems and increase efficiency in various fields, its current development is marred by persistent ambiguities and challenges. At this stage, artificial intelligence does not necessarily guarantee indisputable effectiveness. In fact, human cognitive biases, which are inevitably built into the design and deployment of AI systems, can alter the accuracy and unbiasedness of the results that are produced. These cognitive biases, often unconscious, can manifest themselves through decisions made during data collection and processing, as well as in the design of algorithms.

As a result, even the most sophisticated AI systems can be imbued with bias, compromising their perceived effectiveness. Furthermore, algorithmic bias, which results from the use of often biased historical data to train AI models, constitutes a major challenge, in that it can perpetuate and even amplify existing injustices and discrimination, impacting negatively the decisions made by AI systems in critical areas such as recruitment, loans, or the justice and health systems.

In conclusion, the duality of artificial intelligence, combining promising capabilities and significant limits, raises complex questions about its role in contemporary societies: on the one hand, it offers exciting opportunities to improve decision-making processes, increase operational efficiency and solve complex problems on an unprecedented scale. On the other hand, it imposes considerable ethical and social challenges, particularly with regard to fairness, transparency and accountability in automated decision-making.

5- Ambivalent effects of artificial intelligence on human rationality: an exploration of documentary research

Artificial intelligence (AI) lies at the crossroads of two fundamental decision-making paradigms: bounded rationality, inherent to human cognition, and the ideal of perfect rationality, often underpinned by conventional models of decision-making. By amalgamating aspects of bounded rationality into computer systems that are capable of rapidly analyzing enormous volumes of data and providing recommendations supported by sophisticated algorithms, it still faces the constraints that are specific to human rationality, such as contextual understanding, consideration of ethical values and management of uncertainty.

Academic research was quick to highlight the ambivalent effects of the use of artificial intelligence on the functioning of societies, sometimes certain studies highlight its significant contributions to operational efficiency, technological innovation and the quality of services, sometimes others warn of

potential risks such as the loss of jobs, the dehumanization of interactions, and the accentuation of social inequalities.

5-1- Mechanisms for strengthening decision-making rationality:

sophisticated mechanisms to process massive amounts of data, identify complex patterns, and provide useful insights. By automating repetitive tasks and offering personalized recommendations based on predictive models, it optimizes decision-making processes, freeing decision-makers from time and resource constraints. It also offers the ability to learn and adapt continuously, improving the relevance and precision of the decisions made. These mechanisms position AI as an essential tool to strengthen decision-making rationality and meet the complex challenges of the modern world where uncertainty and inconstancy are imminent.

5-1-1 Cognitive complementarity:

Artificial intelligence (AI) plays a crucial role in promoting cognitive complementarity by providing information processing and data analysis capabilities that significantly enrich human cognitive capabilities. This complementarity arises directly from AI's unparalleled ability to quickly and efficiently process vast amounts of data, as well as identify complex patterns, providing a broader perspective and irreplaceable insights that often surpass human observation alone.

Research by (D.H, 2023) has clearly demonstrated how automation, largely facilitated by artificial intelligence, frees humans from repetitive tasks and directs them toward more cognitively demanding activities. This transition to more complex activities is beneficial in several ways. First, it allows individuals to devote their time and efforts to activities that require human expertise, such as creativity, innovation and complex problem solving. Second, it promotes the development of essential cognitive and socio-emotional skills, such as critical thinking, collaboration and empathy, which are inherently human and difficult to replicate by AI systems.

The cognitive complementarity between AI and humans is in this sense undeniably beneficial for decision-making. By combining the strengths of AI – precision, speed and the ability to process large amounts of data with human capabilities judgment, intuition and contextual expertise, decision-makers can benefit from a more complete and balanced perspective when are faced with complex situations. For instance, in the medical field, doctors commonly use AI systems to analyze medical data and offer preliminary diagnoses, while applying their clinical expertise and judgment to make informed decisions about treatment options.

5-1-2 Decision optimization and intelligent personalization:

Optimizing decisions using artificial intelligence represents a major breakthrough in many areas, as it helps improve the quality and efficiency of decision-making processes. Integrating sophisticated algorithms into AI systems makes it possible to analyze massive and complex data sets, extracting valuable

insights that would be difficult to access through traditional methods. This capacity for in-depth analysis allows you to make more informed decisions, based on empirical data rather than subjective hunches.

Still in the field of health, AI systems are in certain circumstances used to analyze patients' medical records, the results of examinations and analyzes, as well as genetic data, in order to recommend personalized treatments adapted to each individual. This approach, based on machine learning and predictive analysis, helps identify the best treatment options based on the specific characteristics of each patient, thereby improving clinical outcomes and reducing the risk of medical errors. A study conducted by (Ribeiro. T, 2023) which clearly demonstrated how machine learning techniques are used to analyze massive medical data, such as patient medical records, and recommend personalized treatments based on patient characteristics individual for each patient.

In the financial field this time, artificial intelligence is extensively exploited to optimize investment decisions. By analyzing real-time market data, economic trends, past asset performance and investor preferences, AI systems are able to recommend personalized investment portfolios in many cases that maximize returns while minimizing costs risks. This approach allows investors to make more nuanced and better informed decisions, taking into account multiple factors and anticipating market fluctuations. To this end, the work of habitant (2019) conclude that leveraging AI systems is very often optimal because it allows real-time analysis of market data, economic trends and investor preferences to advocate personalized investment portfolios that maximize returns while minimizing risks.

5-1-3Machine learning

Machine learning, as a key area of artificial intelligence, relies on sophisticated algorithms that enable computer systems to learn from data and improve their performance without direct human intervention. This revolutionary approach allows machines to detect complex patterns in data and make informed decisions based on these patterns, paving the way for a multitude of innovative and impactful applications in various fields.

SThese algorithms demonstrated a remarkable ability to learn sophisticated strategies and dynamically adapt to changes in the game environment, illustrating the power of machine learning in solving complex problems.

At the same time, the progress made in the field of image recognition using machine learning is also impressive. Other studies have shown how these algorithms can be trained to automatically identify and classify objects in images with remarkable accuracy, comparable or even better than humans. This capability has important implications in fields such as medicine, where automated analysis of medical images can help healthcare professionals diagnose diseases with increased accuracy and improved speed, thereby improving patient outcomes. .

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Furthermore, the widespread use of machine learning in the development of personalized recommendation systems has significantly improved user experience in areas such as e-commerce and content streaming. These systems leverage data on user preferences and behavior to provide tailored recommendations, thereby increasing user engagement and driving platform growth.

Returning to the previous examples, the use of machine learning techniques to analyze Medical data allows researchers to discover new treatments, predict disease outbreaks, and optimize treatment protocols. Similarly, in the financial sector, the application of machine learning in financial data analysis leads to new investment strategies, faster fraud detection and more effective risk management.

5-2 Mechanisms for weakening decision-making rationality:

Artificial intelligence, despite its countless contributions to the optimization of decision-making processes and cognitive complementarity, also reveals problematic facets likely to alter the rationality of individuals. Academic studies and empirical research highlight the propensity of AI systems to induce cognitive and algorithmic biases, thereby impacting users' ability to make decisions autonomously and rationally. This growing dependence on automated recommendations could compromise the exercise of critical discernment and decision-making autonomy of individuals. Additionally, the intrinsic complexity of AI algorithms can obscure their internal workings, leading to a lack of transparency that harms understanding of decision-making processes and user trust. This scientific perspective highlights the urgent need to deepen our understanding of the mechanisms by which artificial intelligence can alter human rationality, in order to better understand its implications and to guide regulatory and ethical policies in an informed manner.

Table 1. AI errors and risks in the human cognitive abilities

AI errors and risks	Human Cognitive Abilities
. Calculation errors due to poor computer programming	Ability to think abstractly and take context into account.
Algorithmic biases caused by unrepresentative training data.	Ability to understand and integrate ethical and moral values into decision-making.
Overconfidence in AI system recommendations, leading to neglect of conflicting information.	Ability to question information and make decisions critically.
Opacity of AI algorithms, making it difficult to understand their decisions and how they work.	Ability to explain and justify decisions made, thus promoting trust and transparency.

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Disempowerment of individuals, transferring responsibility for decisions to AI systems.	Sense of personal responsibility and ability to assume the consequences of one's actions.
Loss of cognitive skills due to overreliance on AI systems.	Ability to learn and adapt to new environments or situations.
Errors due to last minute changes or unforeseen events not taken into account by the algorithms.	Ability to quickly adapt to changes and make decisions based on the current context.

Source : authors,2024.

5-2-1 Algorithmic biases:

Algorithmic bias, resulting from distortions that are inherent in the data used to train artificial intelligence algorithms, can significantly affect decision-making rationality. Cognitive biases, which are systematic tendencies to think irrationally or make decisions based on simplified heuristics, can be reflected in the data used to train artificial intelligence algorithms. When these cognitive biases are incorporated into training data, they become algorithmic biases that can influence decisions made by automated systems. These can arise from a variety of sources, including unbalanced training data, accidental correlations between certain features and expected results, or flaws in algorithm design. Their impact on decision-making rationality is complex and multifactorial.

A relevant illustration of this phenomenon lies in the field of recruitment, where AI systems that are responsible for sorting CVs can reproduce historical biases linked to ethnicity, gender or other protected characteristics. In the healthcare industry, a study by (Obermeyer.Z, 2019) found that healthcare algorithms used to identify patients requiring medical follow-up were biased against Black patients, underestimating them compared to their White counterparts. This distortion in results is attributable to unbalanced training data or accidental correlations between certain characteristics and the expected result, which compromises the validity and fairness of the decisions made by these systems

The opacity of AI algorithms, often protected by trade secrets or intellectual property restrictions, makes it difficult to detect and correct algorithmic bias. This lack of transparency hinders understanding of the underlying mechanisms of AI systems and limits the ability of individuals to assess the fairness of decisions that affect them. As a result, this raises additional concerns around accountability and trust in the growing use of AI in diverse areas, from finance to healthcare to justice.

5-2-2Overconfidence:

Overconfidence, a well-documented phenomenon in cognitive psychology, refers to a human tendency to overestimate one's own abilities or the performance of a system, often without taking into account conflicting information or uncertainties. When it comes to artificial intelligence (AI)

systems, this over-confidence can be exacerbated by the perception of AI as objective and unbiased, leading users to over-trust advice or opinions. decisions provided by these systems.

In the medical field, research has found that doctors may overestimate the ability of diagnostic algorithms to detect certain diseases, leading to overconfidence in the results and neglect of clinical signs or additional data that might contradict AI recommendations (Obermeyer.Z, 2019).

This overconfidence is especially found in the area of financial decision-making, where investors sometimes give too much weight to the investment recommendations of AI systems, without considering their limitations or potential errors (Barber. B. M, 2016). In this context, investors in most cases blindly follow the advice of trading algorithms, forming risky or inappropriate financial decisions.

5-2-3 Removal of responsibility:

Disempowerment is defined as the process by which individuals or organizations transfer responsibility for their actions, decisions or consequences to other entities, often automated systems or processes, such as artificial intelligence algorithms. This results in a decrease in personal involvement in the decision-making process and a loss of sense of individual responsibility. Disempowerment can arise from a variety of factors, including over-reliance on technologies, increased reliance on automated systems, and reduced consideration of the ethical or moral consequences of one's own actions.

- Shifting responsibility: Individuals often transfer responsibility for their decisions to AI systems, viewing the algorithms' decisions as infallible, thereby disclaiming personal responsibility.
- Loss of decision-making skills: By relying excessively on AI systems to make decisions for them, individuals gradually lose their decision-making skills and their ability to critically evaluate available information.
- Lack of questioning: When faced with the recommendations of AI algorithms, individuals generally do not question the proposed results or decisions, assuming that they are automatically correct or optimal.
- Confirmation bias: Individuals tend to accept results from AI systems that confirm their own beliefs or preferences, even when there is conflicting evidence.
- Loss of control: The use of artificial intelligence often makes individuals feel as if they have lost control over the decision-making process, becoming dependent on the automated recommendations of AI systems.

In the language model example, like Chat GPT, the overconsumption of artificial intelligence implies a lack of responsibility in several ways:

- Reliability Attribution: Users attribute excessive reliability to the answers generated by the model, assuming that they are always correct and accurate. This leads to a lack of responsibility for their own critical judgment and decision-making.

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- Lack of validation: Due to the ease with which responses are generated, users are usually less inclined to verify the accuracy of the information provided by the model. This results in a lack of accountability for fact-checking and data validation.
- Transfer of responsibility: Users are frequently tempted to transfer responsibility for their decisions or actions to the language model, justifying their choices by the answers provided by it. Which also reflects a form of personal disempowerment and a loss of awareness of the consequences of their actions.

It is still essential to remember that disempowerment is not intrinsically linked to artificial intelligence, but rather to the way in which it is used in various contexts. Excessive use of artificial intelligence often stems from time constraints or pressures related to productivity in an environment marked by the hectic pace of the modern world. Under these conditions, individuals are likely to cede responsibility for their decisions to automated systems to save time or avoid tasks deemed tedious. This phenomenon reflects an increased reliance on technology and a decrease in critical thinking about the implications of human actions. Thus, disempowerment in the context of artificial intelligence results more from individual and organizational choices than from an inherent characteristic of the technology itself.

5-2-4 Loss of skills:

Skill loss arises from various processes, including adverse selection, which occurs when excessive use of artificial intelligence diminishes the exercise of cognitive skills. The high prevalence of automation of cognitive tasks necessarily reduces opportunities for individuals to practice reasoning and decision-making. This reduction in cognitive exercise in turn induces an atrophy of cognitive skills, thus leading to a loss of skills over time.

Other mechanisms lead to the destruction and loss of skills: overconfidence and lack of responsibility among others. In cases where individuals overestimate the reliability of algorithmic calculations and overlook conflicting or uncertain information, they become less likely to question their own decisions or actively seek alternatives. This overconfidence leads to a reduction in the exercise of cognitive skills and critical thinking, because it impairs human intellectual abilities to thoroughly analyze available information and evaluate the effects of different possible scenarios. Likewise, the outsourcing of responsibilities to AI systems weakens cognitive skills through the induced effect of passive thinking and decision-making subordinated to the machine.

Furthermore, if the GPS application provides an incorrect or imprecise guess, users may be caught to blindly follow that guidance without questioning its validity. This overconfidence in the capabilities of the application prevents them from exercising their own judgment and looking for contradictory signs in their environment. As a result, they will be less predisposed to develop and

maintain their navigation skills, making them more dependent on the app in the future.

Subsequently, this example illustrates how over-reliance on artificial intelligence, such as a GPS application, contributes to the loss of navigation skills in individuals, weakening their ability to drive autonomously and to exercise critical judgment when planning their trips. What this example also reminds us is that at the level of artificial intelligence, calculation or data processing errors always exist, and can occur due to various factors such as poor computer programming, data processing, incorrect or incomplete input, or last minute changes to the environment. These errors sometimes produce unintended results or erroneous decisions on the part of AI systems, thereby compromising their reliability and effectiveness.

6-Synergy between human cognition and artificial intelligence:

The nuanced effects, that are demonstrated through the comparison Human cognition excels in the ability to understand cultural contexts, linguistic nuances, and unanticipated situations. It is also endowed with an ability to reason flexibly, consider ethical values, and exercise moral judgment. In contrast, artificial intelligence shines in quickly processing large amounts of data, detecting complex patterns, and making algorithmic decisions. It can automate repetitive and tedious tasks, allowing humans to focus on more complex and cognitively demanding tasks.

Together, these two components form a cognitive ecosystem where interactions are continuous and bidirectional. Humans feed AI with data, context, and expertise, while AI provides humans with accurate insights, relevant recommendations, and tools to improve their productivity and efficiency.

However, as in any other system, the cognitive ecosystem also contains conflicts and tensions. These antagonisms emerge at different levels, notably in competition for skills, ethical questions related to decision-making, accountability, transparency and cultural diversity. While AI offers opportunities for innovation and efficiency, it also raises concerns about its impact on professional identity, ethical values and social trust.

This phenomenon goes far beyond the framework of a simple philosophical debate to become a central concern in matters of governance, ethics and politics. Emerging questions surrounding data privacy, algorithmic justice, and the distribution of power between human and non-human actors underscore the need for careful thought and concerted action to shape a future where AI truly serves the common good while preserving the fundamental values of humanity.

In this context, the distortions and challenges encountered in the current cognitive ecosystem are already fueling discussions and institutional reflections on the need to rethink existing regulatory frameworks and institutional structures. Faced with the rapid advances in artificial intelligence and its

profound implications, governments, institutions and regulatory bodies are faced with the need to develop new policies, standards and laws to govern the use of these technologies in a manner that is ethical, responsible and fair. In this dynamic of adaptation and regulation, it is crucial to recognize that the rise of artificial intelligence is not limited to a simple technological evolution, but also represents a major societal transformation. The widespread use of AI systems in healthcare could, for example, revolutionize healthcare, enabling earlier diagnoses and more effective treatments; however, this raises questions about medical data privacy and equitable access to advanced technologies. Similarly, in the field of justice, AI can be used to predict criminal trends or assist in judicial decisions, but this otherwise requires increased vigilance to avoid bias and systemic injustices. In short, the increasing integration of artificial intelligence (AI) in modern societies raises fundamental questions that cut across diverse domains, from creativity to education.

All these concerns and ambivalences indicate only one thing: the cohabitation between artificial intelligence and human cognition is becoming a subject of capital importance which inevitably leads to a radical upheaval of social structures, of our educational policies and of our mechanisms of communication. In this, artificial intelligence goes beyond simple economic disruption to profoundly impact our social fabric. To successfully navigate this new technological landscape, several measures are being taken in several countries and others are being considered, based on scientific principles and illustrated by concrete examples:

- **Ethical development:** This requires a methodical and rigorous approach, where researchers and developers are required to incorporate fundamental ethical principles throughout the process of designing and programming AI systems. It is imperative that values such as transparency, accountability and fairness are intrinsically integrated into decision-making algorithms. An illustration of this approach is provided by the Algorithm Watch Project, founded in 2016 in Germany, with the aim of monitoring and evaluating AI systems, which is dedicated to a critical assessment of the use of algorithms in various fields, highlighting the social and ethical implications and tirelessly advocating for increased transparency and accountability in the use of these technologies. Indeed, this project serves as an essential reference in the promotion of an ethical and thoughtful approach in the development of AI, by highlighting the crucial importance of critical analysis and continuous monitoring of algorithmic applications in order to ensure their alignment with rigorous ethical and social standards.
- **Strengthening education and training:** This is essential to enable individuals to understand and take advantage of the opportunities offered by this emerging technology, while meeting the challenges it poses. Academic institutions need to integrate specific modules on AI into their curricula to provide students with an in-depth understanding of its concepts, applications and implications in various

fields. For example, by studying machine learning algorithms, students can learn the skills needed to design and develop AI systems. Also, awareness of the ethics of AI is crucial to ensure that these technologies are used responsibly and are respectful of human rights. UNESCO's "AI for Good" program perfectly illustrates this approach by encouraging young people to explore how AI can be used to solve major social problems such as health, education and the environment. By training the next generation of leaders and professionals to harness AI ethically and responsibly, these initiatives help shape a future where this technology is used to serve the common good and social progress.

- **Strengthening interdisciplinary collaboration:** this is of crucial importance to address the complex and multifaceted issues linked to this emerging technology. AI research and development initiatives must imperatively encourage synergy between different disciplines such as science, ethics, law, sociology and public policy. This collaboration makes it possible to take into account the various ethical, social, legal and political aspects of AI, and to develop holistic and balanced solutions. For example, the "Global Partnership on AI" is an illustration of this collaborative approach, bringing together world-leading researchers, policymakers and ethics experts to develop guidelines on the responsible use of AI. By promoting dialogue and cooperation between the different actors involved in the development and regulation of AI, such initiatives help promote ethical, equitable and beneficial use of this technology, while respecting the fundamental values of society.

- **Investment in research into ethical and responsible artificial intelligence (AI):** this is an imperative approach to shaping a future where this technology is put at the service of the common good. Research funding bodies have a duty to actively support projects which are focused on ethical AI, providing grants to initiatives that aim to ensure that the development and use of AI respects fundamental ethical principles. The Future of Life Institute, as a major player in this field, plays a crucial role in funding research projects that focus on developing guidelines and frameworks for the responsible use of AI. This initiative illustrates the scientific community's strong commitment to ensuring that advances in AI benefit humanity as a whole. By investing in ethical AI research, funding bodies help steer technological development in a consistent direction with ethical and social values, thereby ensuring a positive impact on society while preserving the rights and dignity of individuals.

All of these initiatives reflect a growing recognition of the need to integrate artificial intelligence (AI) ethically and responsibly into the overall cognitive system. This involves a transition to an approach where technological advancements are guided by ethical, social and legal considerations, in addition to simple technological innovation. By adopting ethical AI development practices, strengthening AI education, and promoting interdisciplinary collaboration, society recognizes that AI can only be fully harnessed when it is aligned with fundamental human values. Promoting appropriate governance and

regulation, as well as investing in ethical AI research, indicates a desire to shape a future where AI contributes positively to the cognitive system by respecting rights, values and the dignity of individuals. In short, this means that the integration of AI into the cognitive system must be done thoughtfully and ethically, recognizing both its potential benefits and the ethical and social challenges that it poses.

7-Conclusion:

In conclusion, the impact of artificial intelligence on the rationality of human actors, particularly in the economic context, is both ambivalent and complex. On the one hand, AI offers opportunities to improve decision-making through its advanced data analysis and complex scenario modeling capabilities. However, it also carries risks, such as over-reliance on algorithms and potentiating of existing biases in data and models. These ambivalent effects highlight the need for institutional measures and decisions to mitigate possible weakening of human rationality.

To counter these risks, institutional measures must be put in place to regulate the use of AI in economic decision-making processes. This could include implementing strict regulatory frameworks to ensure transparency and accountability in the use of AI, as well as ethical standards to guide the development and deployment of these technologies. It is essential to invest in raising awareness and training economic players on the issues related to the use of AI, in order to strengthen their ability to make informed decisions and understand the limits of these technologies.

At the same time, continuous monitoring and evaluation mechanisms are necessary to monitor the impact of AI on the rationality of economic actors and to adjust policies and regulations accordingly. This could involve the creation of dedicated regulatory bodies that are responsible for monitoring the application of AI standards and guidelines in the economic field.

Managing the ambivalent effects of artificial intelligence on the rationality of economic actors requires a holistic and proactive approach, involving both regulatory measures and awareness-raising and training actions. Only institutional decisions and concerted initiatives will ensure that AI contributes positively to improving economic decision-making processes while preserving rationality and fundamental values in the world.

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