

ALGORITHMS AND THE ABUSE OF REASON. REFLECTIONS FROM FRIEDRICH A. VON HAYEK'S THEORY OF KNOWLEDGE.

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Abstract

This essay aims to address the question of whether algorithms, which underlie the operation of the Internet and artificial intelligence, have really changed the nature of the problem concerning the limits of human knowledge – an issue which Hayek had identified since his writings in the second half of the 1930s. Indeed, these are tools that have, and will increasingly have, an extraordinary and unprecedented ability to collect, aggregate, and manage information about individual preferences and desires, the existing supply and demand for goods and services, and so on. The question then posed by some is whether the price mechanism, understood as an indicator of the value of goods and individual preferences, and competition, understood as the process of discovering what does not yet exist, can be replaced by the use of increasingly sophisticated algorithms. The Hayekian theory of knowledge leads to a negative answer to this question.

Keywords: artificial intelligence, algorithms, knowledge problem, Hayek, central planning.

1. Economic calculation, planning, and technologies. Ancient and modern myths

The prediction that artificial intelligence (AI) will radically transform the global economy within a few years has become so widely accepted that it now seems a certainty. AI and the vast networks of data and analytics systems associated with it – decisional, predictive, generative algorithms, neural networks, robots, and artificial workers – are deeply transforming numerous facets of our lives, while at the same time raising new social, ethical, legal, and economic issues. And, as with all epochal changes, most commentators are divided between optimists and pessimists. While the former picture

a new age of abundance, where algorithms will work for us, generating more wealth and expanding our leisure time, the latter believe that AI will “steal our jobs”, thus generating new inequalities and ever greater and more oppressive concentrations of wealth.

Part of the discussion about possible future scenarios has been directed toward exploring AI as a potential tool for economic planning, thus reopening a scientific debate that seemed to have long ceased (although under the ashes something had always continued to burn). Among the factors which have contributed to such revival are cyclical economic crises, environmental and climatic emergencies, and the like. This debate actually exemplifies the ancient aspiration to subject all aspects of human life to the control of reason, or to “rationalize” its existence. Today, this aspiration seems to derive new lifeblood from the transformations that can be induced by AI, which allows for infinitely faster and broader knowledge of consumer preferences than in the past. In fact, one of the issues, if not *the* issue, of economic planning is the so-called “information problem”, which refers to the difficulties in collecting, processing and using the information needed to make centralized economic decisions. The information problem ultimately points to the impossibility of coordinating large-scale economic decisions in the absence of a market mechanism.

As is well known, the first to clearly formulate this problem was Ludwig von Mises¹, who argued that economic calculation in a planned economy is impossible. Whereas in a free market prices provide essential information about the scarcity of goods and consumer preferences, in a planned economy there are no market prices determined by individual preferences, and it is therefore not possible to allocate the available resources to their most efficient uses. Moreover, the absence of private property eliminates the mechanism of profit and loss, thus reducing the incentives for discovery and innovation.

Therefore, Mises had already understood how the problem of planning concerned first and foremost the inability to collect and use information properly: even if planners had the best of intentions, they could never obtain sufficiently accurate information to replace the spontaneous price mechanism. Friedrich A. von Hayek further developed the question along with its philosophical implications, framing it as the problem of how information is dispersed throughout society – the *knowledge*

¹ L. von Mises, *Socialism*, Jonathan Cape, London 1936 [1922].

*problem*². He highlighted how no central committee could collect and process all the necessary information to make efficient economic decisions. According to Hayek, market economy works because information, which is dispersed throughout society, can be employed directly by individuals, thus generating a decentralized decision-making process. This feature makes the market an irreplaceable mechanism for coordinating information and knowledge. The price system is a *system of communication* that allows individuals to coordinate their actions without direct knowledge of all the variables into play, as it conveys dispersed information concisely and immediately. Therefore, Hayek shifted the focus on the problem of dispersed knowledge, showing how, even when in possession of a method for economic calculation, a planner wouldn't have access to all the necessary information for making rational decisions. Central planning cannot work not only because market prices are absent, but also because the government cannot effectively collect, elaborate and process the information scattered among millions of individuals. The market can dispense with the need for a central authority because it is able to coordinate knowledge through the price system and the entrepreneurial process.

The renowned Polish economist Oskar Lange took into serious consideration the problem of price emergence and rational resource allocation in the absence of a market economy, and he tried to answer by elaborating a model of "market socialism", devised to reconcile central planning with market mechanisms³. In such a model, the State would be able to "simulate" a market mechanism by determining the prices of goods through a process of "trial and error" that could reproduce the results of a competitive market. In the beginning, the State would arbitrarily fix the prices of goods, and it would subsequently observe the reaction of firms and consumers in order to adjust prices according to the growth or fall of demand and supply, until equilibrium prices, altogether similar to those of a market economy, were reached. Planners would act as "public entrepreneurs", with the aim to find the right price level that could grant economic efficiency. Lange, therefore, accepted the problem of

² See above all the essays in F.A. von Hayek, *Individualism and Economic Order*, University of Chicago Press, Chicago 1948, about which we will speak at length in what follows.

³ See above all O. Lange, *On the Economic Theory of Socialism*, University of Minnesota Press 1938 (originally published in 1936 and 1937 «The Review of Economic Studies»).

economic calculation as it was put by Mises, but believed that it could be solved by a central authority that employed prices as tools of economic management⁴.

However, Lange's reflection becomes most interesting for us when it deals with Hayek's critique to the problem of dispersed knowledge. He holds that the evolution of calculation tools (which at the time were the first statistic and data collection systems) would allow planners to collect information about economic conditions in real time, thus enabling them to determine prices in a centralized way, without the need to rely on the dispersed knowledge of individuals. In his works from the Sixties⁵, he declares to be persuaded that the progress in informatic technology allows and will increasingly allow to collect and elaborate data in an ever faster and more efficient way – an idea that foreshadows the role of modern big data and artificial intelligence applied to economic management –, thus making efficient planning possible. Therefore, the problem of dispersed knowledge can be solved through technological development, which allows planners to collect data and use statistical tools to make efficient decisions. Informatic technology would thus make the market process an «old-fashioned»⁶ economic system, because it would enable the creation of a planned economy which would be more rational and efficient than capitalism, avoiding the wastes and injustices that are associated with private profit.

2. State, market, and platforms: the new digital Marxism

Lange's belief that a central planning system, based on the power of new tools for analysis could overcome the criticisms of Mises and Hayek has resurfaced time and again as technology has evolved.

⁴ According to Lange, Mises had actually done a favor to socialism, because he drove socialist economists to develop a more sophisticated system of economic calculation. So much so that he proposed to tribute a statue to Mises in the central headquarters of the ministry for socialist planning: «a statue of Professor Mises ought to occupy an honorable place in the great hall of the Ministry of Socialization or of the Central Planning Board of the socialist state», O. Lange – F.M. Taylor, *On the Economic Theory of Socialism*, New York. McGraw-Hill, 1964 pp. 57-58.

⁵ See in particular O. Lange, *Introduction to Economic Cybernetics*, Pergamos Press, Oxford 1970, based on lectures held at Warsaw University in 1962/63.

⁶ In the essay *The computer and the market*, written shortly before his death, Lange makes a reference to his book *On the Economic Theory of Socialism* (written thirty years prior) and he writes: «Were I to rewrite my essay today my task would be much simpler. My answer to Hayek and Robbins would be: so what's the trouble? Let us put the simultaneous equations on an electronic computer and we shall obtain the solution in less than a second. The market process with its cumbersome tatonnements appears old-fashioned. Indeed, it may be considered as a computing device of the preelectronic age», O. Lange, *The computer and the market*, in C.H. Feinstein (ed.), *Capitalism, Socialism and Economic Growth. Essays Presented to M. H. Dobb*, Cambridge, Cambridge University Press 1967, p.158.

As early as the 1970s, and then more prominently in the 1990s, the introduction of computers and informatic networks led to an improvement in data collection and analysis, and several economists reflected on how these changes could impact on the optimization of the economic process and political choices⁷. It would be impossible to fully recount the history of these studies⁸, but one can, for example, recall the volume *Toward a New Socialism*⁹, published in 1993 by W. Paul Cockshott and Alin Cottrell, where it is argued that modern data processing can overcome the inefficiencies historically attributed to central planning. A socialist economic system exploiting advanced technologies for economic planning could be based on the abolition of money and the introduction of «labor tokens». The authors hold that using units of «socially necessary labor» would allow the complexity of the modern economy to be managed through advanced computational algorithms, thus overcoming the traditional arguments against socialist calculation. They also suggest that computers and telecommunication networks could be employed to collect and analyze information in real time, thereby efficiently coordinating demand and supply. Technology would then make it possible to replace the capitalist market with a planned market, based on prices that can be adjusted with reference to supply and demand, and without private property of the means of production.

Nowadays, with the rise of AI, the production of writings that make the case for the relevance of planning in a world dominated by big data and algorithms shows no sign of declining. The idea that the algorithms that drive the workings of the web could finally manage to provide real time access to information about time and place, thus allowing for better decision-making, is discussed more and more frequently. According to this view, the impossibility of economic planning is a problem limited to historical circumstances, now overcome by digital innovations that have blazed the trail for a new and better economic and social order¹⁰.

⁷ In this respect, it is worth recalling at least the key figure of Herbert Simon, Nobel Prize in economics but also a scholar in psychology and computer science, who devoted much attention to the relationship between AI and economics and to how the former could help to better understand economic behavior and the decision-making process.

⁸ For a literature review on the impact of AI in different subfields of economics see S.J. Bickley – H.F. Chan, – B. Torgler, *Artificial intelligence in the field of economics*, in «Scientometrics» 127/2022, pp. 2055–2084.

⁹ W.P. Cockshott – A.F. Cottrell, *Towards a New Socialism*. Coronet Books, Philadelphia 1993.

¹⁰ D.E. Saros, *Information technology and socialist construction: The end of capital and the transition to socialism*, Routledge, New York 2014.

This thesis has been argued for in several works, some of scientific nature and others more “ideological”, but all of which have not, however, failed to draw attention. Many of the most common arguments in these writings are actually in line with the neo-Marxist critique of capitalism, which holds that new technologies are not being used to improve people’s lives but rather to increase profits, thus futhering inequalities and exploitation. In the eyes of these critics, a new planned economy based on digital technologies would be able to achieve sustainable production in relation to natural resources, with intelligent factories producing only what is necessary while avoiding wastes and overproduction¹¹. An economy of this kind would also emancipate people from manual and/or alienating jobs (if not free them completely from the need to work): such activities would be assigned to machines, leaving intellectual and decision-making tasks to human beings¹². A new planning achieved on the basis of algorithms would then be able to grant a new era of plenty, in which the problem won’t be how to best produce wealth, as it would be generated by technology, but only how to redistribute it equitably¹³. In the end, therefore, it all amounts to a restatement of a feature in the thought of Karl Marx, who had cloaked classical *myths* – first and foremost the restoration of the golden age – in scientific language.

Another thesis of digital neo-Marxism is that today’s large multinational corporations, which are relying more and more on new digital technologies and on centralized methods of management, have incorporated in the way they operate some distinctive features of a planned economy. This thesis is argued for in the volume *The People’s Republic of Walmart*¹⁴, where Leigh Philips and Michal Rozworski find that, contrary to the dominant narrative according to which capitalism works through free and decentralized markets, many among the biggest firms in the world operate with centrally planned systems. The authors bring up Walmart and Amazon as practical examples of how big data and artificial intelligence make large-scale planning possible, and then argue that those same technologies could be used to build a democratically planned economy. While large multinational

¹¹ L. Eversmann, *Marx’ Reise ins digitale Athen. Eine kleine Geschichte von Kapital, Arbeit, Warren und ihrer Zukunft*, Rotpunktverlag, Zürich 2019.

¹² N. Srnicek – A. Williams, *Inventing the Future: Postcapitalism and a World Without Work*, Verso, New York 2015.

¹³ A. Bastani, *Fully automated luxury communism. A Manifesto*, Verso, New York 2020.

¹⁴ L. Phillips – M. Rozworski, *The People’s Republic of Walmart: How the World’s Biggest Corporations Are Laying the Foundation for Socialism*, Verso, New York 2019.

corporations employ a sort of digital planning to maximize profits, a socialist society could exploit the same technologies to distribute resources according to need, thus turning to its own advantage the lessons and infrastructures created by capitalism itself. The market wouldn't be completely abolished, but its role would be substantially compressed, resulting in the creation of a hybrid system in which public planning would drive the fundamental choices for collective welfare.

Among those captivated by the possibility of a new model of “algorithmic planning” there are not only the critics of capitalism, but also some entrepreneurs. For instance, a great uproar was raised when Jack Ma, the founder of Alibaba Group, publicly spoke against traditional conceptions of the market and planned economy, suggesting a future convergence between the two thanks to the use of data and advanced technologies¹⁵. Through an analogy with the X-ray machine, he suggested that, with the help of data and advanced analytical tools, we could achieve a clearer and more accurate view of economic dynamics. In light of this innovation, Ma argued that the market won't be the optimal model in the future. Adam Smith's “invisible hand” could be replaced or supplemented by an “invisible hand” of data, which would allow a more efficient economic planning based on real information. Thus, what is prospected is not a return to traditional systems of central planning, but rather an evolution of them. It is indeed possible to imagine a “dynamic” planned economy where decisions are made quickly on the basis of algorithms and predictive analyses. This view aims to represent a bridge between the two economic models, combining the efficiency of the market with the (new) planning capacity made possible by big data and algorithms.

Can we really envision that technological developments, alongside the growth of big data and the possibility to use them in (almost) real time, will really enable us to rationally and efficiently plan economic activities and the life of individuals, while taking into account their preferences in a meaningful way? Can we be sure that Hayek's knowledge problem can be solved by the progress of information technologies? To understand this we need to tackle the epistemological problem as it is presented in Hayek's philosophy.

¹⁵ «Over the past 100 years, we have come to believe that the market economy is the best system, but in my opinion, there will be a significant change in the next three decades, and the planned economy will become increasingly big. Why? Because with access to all kinds of data, we may be able to find the invisible hand of the market. [...] In the age of data, it is like we have an X-ray machine and a CT machine for the world economy, so 30 years later there will be a new theory [on planned economy] out», China International Big Data Expo, May 2016.

3. The problem of knowledge in Hayek's thought

Hayek defined his essay *Economics and Knowledge*¹⁶, which was born out of a 1936 conference, as the critical event in his intellectual biography. In that essay the theme of knowledge rigorously explored – a topic on which Hayek would continue to elaborate for his whole life and that today, in the wake of AI-related phenomena, seems of increasingly pressing importance. Moreover, the essence of Hayek's critique of planning, along with his opposition to that mentality which originates phenomena like rationalism, constructivism, scientism – as Hayek will call them according to their different manifestations – can't be understood without comprehending how, in Hayek's view, man knows the world.

The essay opens with a consideration that, although seemingly simple, has consequences of vital importance: for Hayek, what in economics we call "data" are merely the things as the subject knows them, or as he believes to know them; data are merely the facts inside the mind of the acting person, that which is known (and how) by the subject under consideration. Therefore, there is little relevance to the goods, the objects, the entities in themselves as they are found in the external world, as opposed to the way we perceive them, to the *value* we attribute to them¹⁷. There are, of course, real facts and objective events of which the economist may have knowledge, but the fact remains that individuals have a subjective, and therefore differentiated, understanding of the world that surrounds them. Moreover, the data about the world individuals hold may differ significantly from those possessed by others. Thus, in order to decipher social processes (the economy among them), it is necessary to formulate hypotheses about the relationship between what an individual thinks and the external world, about how and how accurately his individual knowledge matches external facts.

However, there is another fundamental element to consider, aside from the infinite variety of subjective knowledge: the incessant change in individual knowledge. Every action, and therefore every interaction with other people, amounts to a modification in the knowledge of the individual, and this change leads agents to alter their plans of action. Every new piece knowledge can always

¹⁶ F.A. von Hayek, *Economics and Knowledge*, in *Individualism and Economic Order*, University of Chicago Press, Chicago 1948, pp. 33-56

¹⁷ This idea is in many ways the development of Carl Menger's theory of subjective values, which had originated the marginal revolution in economics. It is not by any chance that Hayek, shortly after his arrival in London, had edited the anastatic edition of Carl Menger's Works: C. Menger, *The Collected Works of Carl Menger*, 4 voll, with an Introduction by F.A. Hayek, The London School of Economics and Political Science, London 1933-36.

potentially sever the equilibrium between past and future actions, leading to a change in initial plans. This is also due to the fact that individual *expectations* change, and these are a crucial factor for human action¹⁸. Therefore, people not only have different data, but (perhaps more importantly) human action and the reciprocal interactions between individuals generate continuous changes in individual data, expectations, and courses of action¹⁹. People will adjust their choices based on how their experience of external facts and of other people's actions shifts and progresses, in a process of continuous change that is never complete.

If we do not take these aspects into account we will fail to fully, or even partially, understand the importance of the second problem Hayek poses –that is, the issue which supporters of algorithmic planning think can be overcome by artificial intelligence. We are referring to the fact that knowledge is *dispersed* throughout society, that single individuals possess only a small part – small fragments – of it.

The theme of how knowledge is distributed closely parallels the concept of the division of labor, which was first articulated by Adam Smith. And the latter is embodied in the issue of how an order which is able to use knowledge efficiently can result from a situation where such knowledge is not fully possessed by anyone, as it is in fact dispersed among many individuals who are strangers to one another. As previously mentioned, Hayek held that an order able to mobilize dispersed knowledge cannot consist in a “centralization” of individual knowledge in a single mind or in a bureaucratic apparatus. A correct use of dispersed knowledge can only be brought about by spontaneous, unplanned coordination, similarly to that which is achieved in a free market system. In a society based on the division of labor and on dispersed knowledge, competition, structured around the price mechanism, is the only system able to efficiently employ the differences in individual knowledge, allowing people to adapt to each other's actions.

This description of the process of competition provides further insights into the limitations of artificial intelligence. Competition is a dynamic process. Understanding what is the lowest cost for the production of a good, what is a valuable good and what is not, which alternatives can be proposed for satisfying people's needs, what are the untapped opportunities to exploit, is a discovery that happens

¹⁸ Hayek's main reference in this respect is of course L. von Mises, *Human Action: A Treatise on Economics*, Yale University Press, New Haven 1949.

¹⁹ F.A. von Hayek, *The meaning of competition*, in *Individualism and Economic Order*, cit., pp. 92-106.

with the competitive process, not something given from the beginning; it is what must be discovered through competition, not the assumption from which the latter can start.

A similar argument applies to consumers: the knowledge they possess before entering the market is different from the one they'll acquire during the process. The knowledge of available alternatives is the result of what happens in the market, and the very emergence of needs to be satisfied (partially) depends on how alternatives are presented and on their subjective interpretation. This means that it is only in the moment of interaction that we can discern what people's needs are, what goods are valued, and what is the best employment for available resources. All of this is discovered on the basis of hypotheses that are verified or discarded when they are proposed to interacting subjects.

Hayek describes this process with a series of illuminating metaphors. Competition is a «voyage of exploration into the unknown»²⁰, it is «a process of the formation of opinion by spreading information»²¹, it is «a discovery procedure»²² of facts that no one could know, or at least make use of, without it.

Competition is a process of exploration of the unknown also because we don't know, nay, we cannot know, in advance what the participants' actions will be. This becomes clear if we remember what Hayek had said concerning the subjective character of data (i.e. facts as they are known by the human mind) and the fact that human knowledge, and therefore actions and expectations, are subject to uninterrupted change. Hence, competition is valuable because its results are *unpredictable*. They are sometimes, or even often, different from those we planned to achieve at the beginning of the process, as they emerge from attempts to discover new ways of doing things.

It is evident, as Hayek had clearly understood, that the study of the market process goes well beyond the simple problem of how to produce goods and services efficiently. Economics is in fact the science which has come closest to solving the problem shared by all social sciences: the way in which the combination of fragmented knowledge, possessed by different individuals, can lead to results which,

²⁰ F.A. von Hayek, *The meaning of competition*, cit., p. 101.

²¹ *Ivi*, p. 105.

²² F.A. von Hayek., *Competition as a discovery procedure*, in *New Studies in Philosophy, Economics and the History of Ideas*, Routledge & Kegan Paul, London 1978, pp. 179-190.

if consciously pursued, would require a knowledge that no single decision-maker could ever gather²³. The market process serves as an example of all the processes that are based on the interaction between human beings and imply a continuous change in information. Their importance is obscured by any theory that treats data as constants, even in the short-term.

Before looking at why this has crucial implications for what we can expect from the development of the use of algorithms, it will be useful to delve into some other aspects, always keeping an eye on Hayek's thought.

4. Complex phenomena and their interpretation

Starting from the complexity, variety and continuous transformation of the data within individuals' minds and the use they make of them, Hayek identifies precise limitations to the predictive ability of the social sciences.

In the physical sciences it is possible to make accurate predictions, at least to a certain degree, because there exist isolable connections between cause and effect. Such is the case with mechanics, elementary physics, and many other natural sciences that deal with what Hayek terms simple phenomena. However, even the predictive ability of the natural sciences - or at least their ability to make detailed and accurate predictions - is diminished when confronted with essentially complex phenomena, i.e. those that depend on a large number of variables. Meteorology, for instance, can make short-term predictions, although this time-span could be increased to the mid-long term with the improvement in tools and data. Nonetheless, long-term and greatly accurate predictions will *always* be unattainable, not only because there are multiple elements to be taken into account, but also because we cannot know how they will react when they interact or clash with one another.

In the humanities, such a difficulty is inherent and insurmountable. Here, the "data" refer to the complex phenomena of life, mind, and society, with respect to which predictions as intended in the natural sciences are not feasible²⁴. The tools we have at hand are intrinsically inadequate, statistics

²³ This what, already in *Economics and Knowledge*, Hayek had metaphorically called the problem of the "social mind", F.A. von Hayek, *Economics and Knowledge*, cit., p. 54.

²⁴ The first and most important considerations about this topics are developed in F.A. von Hayek, *The Theory Of Complex Phenomena*, in *Studies in Philosophy, Politics and Economics*, Routledge & Kegan Paul, London 1967, pp. 22-42, an essay that, not coincidentally, was originally published (1964) in a volume in honor of Hayek's friend Karl Popper, whose studies on methodological issues in the social sciences had a decisive influence on Hayek's reflection.

being the first among them. The latter deals with large numbers problems by doing away with their complexity. The elements with which it deals are treated as if they were not systematically interconnected, and they are considered in a static dimension, whereas in reality they are dynamic. Statistics operates on the assumption that there is no need for information about how elements are connected to one another. This condemns it to irrelevance in addressing problems where the relationships between elements which have different properties are what matters the most.

Complex phenomena, then, are those in which individual events depend on so many variables and circumstances that they can never be fully ascertained. Hence, it is not only impossible to make predictions (at least beyond certain limits), but also to control these phenomena and pinpoint regular connections between events through empirical observation. Every event in a person's life can have consequences on their future actions, thus making it impossible to accurately predict these actions and, by extension, specific future events. Although by reading some passages one could suspect the opposite, Hayek is of course not arguing that it's in principle impossible to make hypotheses about individual actions, or to predict how agents will react to certain impulses or how their expectations may vary. These hypotheses are habitually made, in economics as well as in politics, and people regularly "plan" their future actions. What Hayek does is to warn us about the limits of predictions and of the attempts to control complex phenomena. These attempts can always diverge from what was expected at first, as new elements emerge in an unpredictable and sometimes casual way, and because the individual personality is a unique phenomenon whose development can never be fully foretold. Human beings can be, and everywhere are, influenced in many ways: we can steer them in one direction or the other, but we could never make exact predictions about the future behavior of single individuals. We will never know what particular events will influence their personality and decisions, and we can actually suppose, as psychology teaches us, that individuals themselves do not know this.

But again, this does not mean that there are no theories that are able to explain, and to a certain extent to "predict" (or at least hypothesize about), changes in complex phenomena. An example is the Darwinian theory of evolution. This theory describes a general model of evolution, but it never claims to identify the details which have contributed to the emergence of a given species as the final outcome. It is not possible, and it will never be, to ascertain all the specific circumstances that have determined (and will determine) the emergence of existing forms of life (and of those that will survive).

Nevertheless, the Darwinian theory remains valid, and it provides a model of how we can understand complex phenomena: it is the description of a process which abstracts from the particular (unknowable) circumstances of its unfolding. It is a general theory which describes a wide spectrum of possibilities; it doesn't allow us to make specific predictions, nor to control future evolution, and it cannot say for sure what the pivotal individual events have been, what were the relevant circumstances, and what the future ones will be. However, it gives us a general explanation of the phenomenon, a paradigm for understanding how evolution came about. It is therefore a scientific theory, even if it cannot be used to make predictions. This shows that the idea according to which, through direct (and ever more accurate and sophisticated) observation, it will always be possible to discover regularities among all phenomena, and that this attitude is at the foundation of the scientific method, is nothing more than a "naive superstition".

This "scientific" superstition, that is, the tendency of economists and social scientists to imitate the methods of physical sciences, is also condemned at the beginning of *The Pretence of Knowledge*, the speech Hayek gave when he was awarded the Nobel Prize for economics in 1974. Hayek's persuasion is that, in the disciplines that deal with complex phenomena, the number of quantitative data we can gather about the different aspects of events we should take into consideration is inevitably and severely limited, and it may not include the relevant information. As we have already seen, complex phenomena depend on the actions of many individuals; this implies that the circumstances which determine the outcome of a process are never completely known or measurable, and that relevant features include not only the properties of individual elements, but also the way in which they are connected at a given time.

Hayek illustrates these ideas through the example of a "ball game". Even if we know in detail the many variables which will condition the game's outcome (starting with the psychophysical condition of the players), we could only make general forecasts, but not predict particular events. Although Hayek does not devote much space to this example, it is nonetheless illuminating. The different players will choose their movements and actions on the spot, based on their perception of what their teammates and opponents are doing or could do in that specific moment. Of course we can predict which among their characteristics players will try to exploit, what kind of action will result in a goal, which among the two teams will win and by what measure, but we cannot make a certain prediction about the moment in which a goal will be scored, about who will score it and how, because this will

depend on unpredictable circumstances. Where such an organized complexity prevails, it is never possible to acquire the kind of complete knowledge that would give us full control over the events. The teaching that Hayek derives from this, and which is presented with clarity in his essay, is the heart of his philosophy. It must be acknowledged that there are unsurmountable constraints to knowledge, and therefore precise limits to what we can expect to be achieved by science. We must not entrust science and technology with more than we can attain from them. The knowledge we are able to acquire cannot be employed to bend to our design the economy and society, but only to understand what is the appropriate environment in which they can flourish, just like a gardener does with his plants, and not like an artisan would do with inanimate objects to which he can give the shape he likes.

The recognition of the insuperable limits to his knowledge ought indeed to teach the student of society a lesson of humility which should guard him against becoming an accomplice in men's fatal striving to control society – a striving which makes him not only a tyrant over his fellows, but which may well make him the destroyer of a civilization which no brain has designed but which has grown from the free efforts of millions of individuals.²⁵

The extraordinary advances in knowledge notwithstanding, the results of our efforts continue to depend on circumstances about which we know very little, and on organizing forces we cannot control. The threat to our civilization does not come from the progress of science, but from the scientific error due to the illusion, or the conceit, that we possess a knowledge we actually do not have. As Hayek had already written in 1952: «It may indeed prove to be far the most difficult and not the least important task for human reason rationally to comprehend its own limitations. It is essential for the growth of reason that as individuals we should bow to forces and obey principles which we cannot hope fully to understand, yet on which the advance and even the preservation of civilization depends»²⁶. We will progress only if we know that what the progress of civilization requires is not (only) the result of a deliberate choice, of predictive capacity, or of scientific development.

²⁵ F.A. von Hayek, *The Pretence of Knowledge*, in «The American Economic Review», 79/1989, pp. 3-7.

²⁶ F.A. von Hayek, *The Counter-revolution of Science. Studies on the Abuse of Reason*, The Free Press, Glencoe 1952, p. 92.

The criticism of planning, therefore, is nothing but the application to the economic field of a theory of knowledge that emphasizes the epistemological limits of what we can know and control. As Hayek writes at the end of *Law, Legislation and Liberty*, the work in which he derives the consequences of his reflection about the limits of knowledge for law and politics, «man is not and never will be the master of his fate: his very reason always progresses by leading him into the unknown and unforeseen where he learns new things»²⁷.

5. Simple algorithms, complex systems

Let's return to the problem from which the present work has started: is it possible to hypothesize that today, with the ever more pervasive use of algorithms, the difficulties faced by economic planning could be overcome? And could this allow a more "rational" organization of the economy and society that keeps into account individual preferences and expectations, which can be now traced and processed almost in real time? After all, our real life has become more and more intertwined with virtual reality, an environment that has features that are different from those of physical reality, and that allows to see and know the actions of people and their interactions with other individuals in a dynamic way. Modern models of automated learning, like machine learning, as well as «synthetic intellects»²⁸ whose objective is to optimize the processes by which knowledge is generated, can assimilate great quantities of «structured» and «unstructured» data from a large pool of sources: financial markets, social media, sensor networks²⁹. Does this mean that Hayek's objections about the limits of knowledge – specifically concerning the fact that knowledge is dispersed, fragmented, and can't be centralized in a single organizing mind – are now obsolete?

On closer inspection, Hayek's objections do not appear to have been defeated³⁰. The limits of knowledge he points to are of an epistemological nature, and thus they cannot be overcome by the

²⁷ F.A. von Hayek, *Law, Legislation and Liberty*, Routledge, London-New York 1982, p. 176.

²⁸ J. Kaplan, *Humans Need Not Apply: A Guide to Wealth and Work in the Age of Artificial Intelligence*, Yale University Press, New Haven 2015 uses the term «synthetic intellects», defining them as automata which operate in synergy with «artificial workers» in doing activities that could radically improve our wellbeing, but which could also replace a large part of our skills on the job market.

²⁹ M.I. Jordan, T.M. Mitchell, *Machine learning: Trends, perspectives, and prospects*, in «Science», 349/2015, pp. 255–260.

³⁰ On the topic see P.J Boettke and R.A. Candela, *On the feasibility of technosocialism*, George Mason University Department of Economics Working Paper No. 22-43, 2022 pp. 1-34; S. Davidson *The economic institutions of artificial*

increase in knowledge and by the mapping of specific cases. Algorithms can never predict complex events and phenomena due to the lack of adequate data. Like statistics, they can only produce a static view of data, whereas the process of competition – an exploration into the unknown, as Hayek described it – is always dynamic. Even algorithms, therefore, no matter how much they increase our knowledge about the preferences and expectations of individuals, clash with the unpredictable nature of social dynamics, with the imponderable complexity of interaction between different subjects.

Social and economic dynamics depend on a myriad of variables which can't be calculated in advance, on an enormous number of contingent and reciprocally interacting variables which even an algorithm couldn't predict. An algorithm can draw on historical data to make a reliable prediction on a single case or on a single individual, but it could never predict how a group of people will interact, and what the consequences of such an interaction will be. Even if we had an adequate theoretical model for describing these phenomena, it would be impossible to collect all the necessary data to make accurate forecasts. As Hayek had found, this applies not only to markets and biological evolution, but also to the majority of the aspects of social life, which is made of interactions whose outcome is epistemologically unpredictable, regardless of the quantity of initial data we can acquire and process. Another important issue, on which Hayek's works had already shed some light and which was more clearly developed by Michael Polanyi³¹ almost at the same time, is the concept of tacit knowledge, that is, the implicit and empirical understanding that individuals develop over time. A large part of human decisions is based on elements which are hardly translatable into numbers or algorithms. Even if AI can analyze data about bookings and monitor online trends, it struggles to replicate that form of tacit knowledge that is originated by our everyday contact with real people and situations, the heuristic relevance of which is exceedingly difficult to reproduce and represent through AI and tools for *machine learning*³².

Thus, Hayek's lesson, according to which there are insurmountable limits to how much we can centralize our knowledge and predict the results of human interaction, also applies to algorithms.

intelligence, in «*Journal of Institutional Economics*», 20/2024, pp. 1-16; C. Sunstein, *The use of algorithms in society*, in «*The Review of Austrian Economics*» 37/2024, pp. 399–420.

³¹ M. Polanyi, *Personal knowledge: towards a post-critical philosophy*, The University of Chicago Press, Chicago 1958.

³² This problem was first pointed out at the very beginning of AI's development: see for instance M. Minsky, *Heuristic aspects of the artificial intelligence problem*, Ed. Services Technical Information agency, Springfield, distributed by the Clearinghouse for Federal Scientific and Technical Information, Department of Commerce 1956.

Algorithms are not able to make reliable predictions not because they are intrinsically flawed, but because the information required to do so can't be known in advance. The issue is not one of computational power, but of the impossibility to access information that doesn't yet exist, or that is embedded in the "personal knowledge" of individuals and is *intrinsically* unpredictable. If this information can't be known in advance, if algorithms can't predict the unpredictable, then they shall be forever subject to the same structural limitations as the central planners criticized by Hayek³³.

But why shouldn't a system of algorithmic planning, even with the structural limits pointed out above, be nonetheless considered a good alternative to a market system based on competition, itself of course imperfect? In seeking an answer to this question, Hayek's reflections prove once more to be of great interest.

Isaac Asimov once said that the expression that paves the way for scientific discovery is not "eureka" but "how strange". The matter, then, is not how to better observe reality, or how to accumulate data in order to find better solutions. As Popper – Hayek's teacher about many methodological issues – argued, observation by itself is meaningless: we observe with reference to some question, to a problem we identify and want to solve³⁴. What is needed in a discovery process, as the market in the Hayekian definition, is first and foremost a good question, a question about possible alternatives, about what is not there yet. Accumulating observations and data is not enough to obtain something new; the future is not written in the data of the past and, above all, it is not the growth in the quantity of data that can lead us to identify something that does not yet exist, or that could be different from how it is.

It is simply because of this that human beings remain essential. It is wonder that leads to the necessity of raising a question; it is bedazzlement that drives knowledge and discovery³⁵. And this wonder could never, by nature, be experienced by machines and algorithms, because it is an exclusive feature of human beings.

³³ C. Sunstein, *The use of algorithms in society*, p. 401.

³⁴ See K. Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge*, Routledge & Kegan Paul, London 1963, chapter 1.

³⁵ F.A. von Hayek, *The Theory Of Complex Phenomena*, cit., p. 22.



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