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Thinking and theorizing communication in the context of AI: a historical, epistemological and cybersemiotics point of view

Pensando y teorizando la comunicación en el contexto de la IA: un punto de vista histórico, epistemológico y cibersemiótico

Pensando e teorizando a comunicação no contexto da IA: um ponto de vista histórico, epistemológico e ciber-semiótico

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This paper explores some epistemological problems recognized in the history of the development of artificial intelligence and the implications they may have for thinking and theorizing contemporary communication phenomena. From this, the idea of communication as a social production of meaning is questioned, and cybersemiotics, a transdisciplinary theory of communication, information, meaning, and cognition, is proposed as a conceptual alternative for thinking and theorizing about communication.
KEYWORDS: Artificial intelligence, epistemology, cybersemiotics, information, history.

Este artículo explora algunos problemas epistemológicos reconocidos en la historia del desarrollo de la inteligencia artificial y las implicaciones que podrían tener para pensar y teorizar los fenómenos contemporáneos de comunicación. Desde esta visión se cuestiona la idea de la comunicación como la producción social de sentido al tiempo que se propone a la cibersemiótica, una teoría transdisciplinar de la comunicación, la información, el significado y la cognición, como alternativa conceptual para pensar y teorizar la comunicación.
PALABRAS CLAVE: Inteligencia artificial, epistemología, cibersemiótica, información, historia.

Este artigo explora alguns problemas epistemológicos reconhecidos na história do desenvolvimento da inteligência artificial e as implicações que eles podem ter para pensar e teorizar os fenômenos da comunicação contemporânea. A partir desse ponto de vista, a ideia de comunicação como produção social de significado é questionada e a ciber-semiótica, uma teoria transdisciplinar de comunicação, informação, significado e cognição, é proposta como uma alternativa conceitual para pensar e teorizar a comunicação.
PALAVRAS-CHAVE: Inteligência artificial, epistemologia, ciber-semiótica, informação, história.

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Introduction

Artificial intelligence (AI) has been an interdisciplinary project that took intelligence and knowledge as its focus of attention since its beginnings, which made it dialogue with computer science, logic, biology, psychology, philosophy, communication, and many other disciplines (Zhang & Lu, 2021). For Russell and Norvig (2021), AI encompasses logic, probability, continuous mathematics, perception, reasoning, learning, and action, but also equity, trust, social good, and security. However, since knowledge and intelligence are two central components of AI, its dialogue with epistemology has also been extremely close. Epistemology is a branch of philosophy that studies the nature, resources, and limits of knowledge (Bunge, 1980/2004), however, in the context of AI, it takes on a central role, since this technological advance has not only modified how we interact with the world but has also questioned what counts as knowledge and what is the world with which we interact.

What is knowledge, and what is knowing? Does a machine know or produce knowledge? Can computers create meaning? (Hayles, 2019). These questions are precisely what second-order cybernetics and the biology of knowing have already reflected on (Maturana & Varela, 1980; von Foerster, 2003). However, we still struggle to formulate common answers to these questions. But if we cannot answer what intelligence and knowledge are, how do we know that a machine knows, is intelligent, or produces knowledge? How could we emulate intelligence or produce knowledge with a machine if we cannot say what intelligence or knowledge is in the first place? Does a machine know or produce knowledge? Is a machine intelligent? The question of how machines interact with the world is, at the same time, the question of what is the world they interact with, and what do they know about it.

In this contemporary scenario, every area of knowledge has reflected on the impact that AI has had, is having, and will have on its future development. Its implications are being analyzed in education, politics, culture, the arts, computing, entertainment, security, and, of course, in the development of technology. In the field of communication, we have also conducted many research projects on different topics,

such as journalism, natural language processing, human-robot interaction, social media bots, public relations, and advertising, among many others (Tosyali, 2021).[2] However, we have paid little attention to AI's conceptual implication in theoretical development in communication studies. What is the theoretical relationship between AI and communication? Is communication also a process emulated by machines? Do we communicate with machines? These questions, as I will show, are not settled but lead us directly into the world of the epistemology of artificial intelligence and, in consequence, into the world of communication epistemology.

However, this discussion is not new; it has been carried out since the fifties when the research on AI formally began. What can be considered a novel discussion is its relationship with communication in general and human communication in particular (Gunkel, 2020; Guzman & Lewis, 2020). The research on AI's implication in human communication theory development is almost non-existent. This paper seeks to fill that gap. How has the development of artificial intelligence affected or may affect theoretical construction within communication studies? How has AI transformed communication both as a phenomenon and as a theoretical explanation? How AI influenced theoretical development in communication studies? These are the questions that will be addressed in this article, and to do so, I propose that it is necessary to go back in history to recognize the epistemological foundations in the beginnings of the development of AI that made it possible.

Therefore, this paper is organized into four sections. The first one goes back to the mid-fifties of the past century with the famous

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[2] The bibliometric study by Tosyali (2021) analyses 459 scientific studies collected from the Web of Science Core Collection database and published between 1982 and 2021 in communication studies. The study reveals that journalism and advertising are among the areas where these studies on AI are primarily carried out. The most frequently used words in abstracts and keywords were "artificial intelligence", "media", "journalism", "communication", "data", "news", "digital", and "information". As can be seen, there is no interest in the conceptual or theoretical implications of AI in human communication theory development.

summer of research at Dartmouth College proposed by John McCarthy, Marvin Minsky, Nathan Rochester, and Claude Shannon. In the second section, I will discuss some of the epistemological premises behind AI, specifically those put forward by McCarthy in the 1970s. In the third, I will explore some of the consequences of the epistemological debate taking as an example Esposito's proposal which implies moving from artificial intelligence to artificial communication. I will end with a reflection on the conceptual opportunities for thinking about AI from the perspective of cybersemiotics, a transdisciplinary theory of information, communication, cognition, and signification.

The problem of defining intelligence in artificial intelligence

The term *artificial intelligence* (AI) defines both a scientific field and a particular type of technology, however, for Gunkel (2020), the problem is that the perceptions and expectations of its implications for socio-technical development come neither from science nor technology but, above all, from science fiction, a point of view shared by some other authors (Kline, 2015; Soni & Goodman, 2017; Vidales, 2023a). But the scientific history of the concept dates back to the summer of 1956 with the proposal made by John McCarthy, Marvin Minsky, Nathan Rochester, and Claude Shannon for an intensive seminar that sought to solve some of the problems they considered central to what they called *artificial intelligence*. In their proposal (McCarthy et al., 1955), the authors sought funding from the Rockefeller Foundation for a summer of research at Dartmouth College, where McCarthy was a professor of mathematics. They opened with the following explanation:

> We propose that a two month of ten man study of artificial intelligence can be carried out during the summer of 1956 at Dartmouth College in Hanover, New Hampshire. The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves (McCarthy et al., 1955, p. 2).

This is not only one of the first writings where the concept of artificial intelligence appears, but it is also an early antecedent where the concept is linked to a particular research agenda. Among the topics proposed were the design of automatic computers, how to make a computer program use language, neural networks, the size theory of computation, self-improvement, abstractions, as well as randomness and creativity. Additionally, each author proposed a particular set of problems to be addressed.[3] Even though some of these problems were discussed and some of them continue to be discussed, their main objective persists to this day, specifically, the idea that any characteristic of intelligence could, in principle, be described with sufficient precision that a machine could simulate it. But if this is so, we would have to be able to define what intelligence is in the first place. However, this is a tricky issue where there is still no general agreement on what it is or should be in the framework of scientific research on the subject.

The problem of defining what intelligence is was recognized by Schank (1987) in the late 1980s. According to this author, for mathematicians, intelligence was related to a search for appropriate formalisms for knowledge representation; for programming engineers, it was related to how to introduce knowledge into a computer program; for linguists, it appeared as a possible link for the development and application of their theories of language; for psychology, it was about understanding the processes that produce human knowledge to be emulated in a machine, and so, for each scientific discipline, there

[3] McCarthy would focus on the study of the relationship between language and intelligence with a view to the development of artificial languages. Minsky would focus on what can be considered machine learning, a proposal centered on many of the fundamentals that had already been developed by Wiener's cybernetics. In addition, Rochester would study originality in machine performance, the process of invention and discovery, as well as the machine with randomness. Shannon was interested in the application of information theory concepts to computing machines and existing brain models, as well as the matched environment brain model approach to automata of that time (McCarthy et al., 1955).

seemed to be a precise link and a particular definition of intelligence. In the end, for Schank, what AI is ultimately depends on the goals of each research and each researcher, so any definition that could be given of what AI is also depends on the methods used in building the models that each research or researcher used.

In any case, Schank (1987) considered that any researcher would agree to accept that AI had two main goals: a) to build an intelligent machine, and b) to find out about the nature of intelligence. For the author, it is possible to identify that both goals have at their core the question of intelligence, a question that has not yet been precisely answered and on which there is no general agreement. This seems a contradiction. What then is intelligence and how is it possible to simulate it or, as intended, emulate it? The answer Shank gave at the time was that, while it was not possible to answer the question precisely, it was at least possible to list characteristics of what an intelligent entity might be expected to have, even if none of them defined intelligence per se, or even if intelligent entities lacked some of them. The characteristics the author posited were: communication (strangely associated with meaning), internal knowledge (knowledge about oneself), knowledge about the world (an extremely complicated subject), intentionality (goal-oriented behavior), and creativity. As I will show in the following sections, the third characteristic is very important.

According to Boden (2018), before the 1960s there was no clear distinction between people modelling language or logical thinking and people modelling purposive/adaptive motor behavior. And in some cases, there were researchers working in both areas. But at this time an intellectual schism developed, because those interested in *life* stayed in cybernetics, and those interested in *mind* turned to symbolic computing. This distinction separated cybernetics from AI and created a new and emerging field of inquiry. Then, by the 1970s, AI was related to symbolic processing and was defined as the simulation of human problem-solving using computers, relying heavily on symbolic reasoning and ruled-based systems. Later on, in the 1980s, AI was now related to knowledge-based systems and was understood as systems designed to replicate human expertise using large knowledge bases and inference engines. In the 1990s, AI allowed us to think about

the emergence of intelligent agents and became defined as the study of intelligent agents, which means entities that perceive their environment and act to achieve goals.

But this definition, as I will explain in the following sections, goes back to the sixties with the work of John McCarthy, and it is at the core of what intelligence is in the context of AI research. Then, by the 2000s, AI was increasingly defined by its ability to learn and adapt from data, with machine learning becoming a central component. AI was framed then as a system that could identify patterns, make predictions, and improve with experience. By the 2010s, AI was now focused on generalization, and neural networks centered on autonomy and self-improvement, a feature already present in the summer of research at Dartmouth College, as I have shown. More recently, AI has been human-centered and it is related to systems designed to augment human abilities, emphasizing fairness, transparency, and societal impact. Then, after decades of research on AI we have normalized the word *intelligence*, but we have been unable to define it and to produce a general agreement of what it describes in the context of artificial intelligence research.

Russell and Norvig (2021) have also addressed this issue. From their point of view, some AI scholars have defined intelligence in terms of fidelity to human performance, while others have linked it to rationality. Some consider intelligence to be a property of the internal processes of thinking and reasoning, while others focus on intelligent behavior, i.e., an external characterization (action). This organizes the discussion into two blocks, human vs. rational on the one hand, and thought vs. behavior on the other, which in turn modifies the methods of approach. Then, it is very relevant to recognize that AI has problems in defining what intelligence is, but it turned this question into a research program.

In addition, in defining intelligence, communication emerges as a characteristic of intelligent entities, but what does that mean? What is communication that makes it possible for it to be considered as a central characteristic of intelligent entities? Schank (1987) is not very clear on this, but Shannon (1948) is; however, it is a notion of communication that has nothing to do with signification nor with the (social) production of meaning. Communication is the transmission of messages, which may or may not contain information; the information will depend on the receiver and the possibilities of choice.

Then, when we talk about artificial intelligence, what we are describing is a field of knowledge and a particular type of technological development, but we are not talking about intelligence or artificial intelligence as such. At this point, it is important to mention that, since the late 1960s, McCarthy and Hayes (1969) proposed to divide the problems of artificial intelligence in two, an epistemological and a heuristic part, as Roitblat (2020) also recognizes, a proposal that deserves a closer look.

Some epistemological problems of artificial intelligence: intelligence as a model of the world

In their work in the late 1960s, McCarthy and Hayes (1969) recognized the need to resort to philosophy in search of conceptual foundations, since, from their point of view, if the goal was to develop computer programs that were capable of acting intelligently in the world, such programs should have a general representation of that world with which they could interpret their entries. This required a particular notion of what knowledge is and how it is obtained. The goal was the development of computer programs that could decide what to do by iferring in a formal language that a given strategy would meet its assigned objective. This is why the authors considered it important to formalize the concepts of causality, ability, and knowledge developed in philosophical logic. This was a central task because, for the authors, philosophical reflection appeared naturally when the idea of making an intelligent machine was taken seriously, which required adequate metaphysical and epistemological representations of the world to function.

For McCarthy and Hayes (1969), artificial intelligence was born with the work of two prominent mathematicians, that of Alan Turing (1950)[4] on computable numbers and that of Claude Shannon

[4] For a detailed explanation of the importance of Alan Turing's work, see the works of Copeland devoted to Turing's contributions to modern science, specifically Copeland (2002, 2005, 2012). Also see Vidales (2023a), specifically the section devoted to Turing's work as one of the foundations of cybernetics.

(1950)[5] on how to program a machine to play chess. In addition, they also recognized that solving the problem of defining what intelligence was, or what was meant by it, was central to advancing research, so building intelligent machines as manipulators of facts might be the best bet for both, building artificial intelligence and understanding natural intelligence. The key here was to conceive and construct an intelligent entity endowed with a representation or model of the world.

> On this basis we shall say that an entity is intelligent if it has an adequate model of the world (including the intellectual world of mathematics, understanding of its own goals and other mental processes), if it is clever enough to answer a wide variety of questions on the basis of this model, if it can get additional information from the external world when required, and can perform such tasks in the external world as its goals demand and its physical abilities permit (McCarthy & Hayes, 1969, p. 432).

We could agree or disagree with this definition, but the important fact is that it is an epistemological basis for thinking about what will be emulated in a computer. Then, qualities are not what define intelligence in this proposal, but a model of the world and a form of action (behavior). This is why, for McCarthy and Hayes (1969), artificial intelligence had two parts, an epistemological part focused on the representation of the

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5 Shannon (1950) recognized in his paper that perhaps the idea of programming a machine to play chess might seem of little practical importance, but he considered it to be of great theoretical interest since it was ultimately a matter of constructing a computational routine or "program" for a modern general-purpose computer. He proposed that solving this problem could be used to solve a whole range of other similar and much more important problems such as building machines to manage the routing of telephone calls based on individual circumstances rather than fixed patterns, machines to perform symbolic (not numerical) mathematical operations, machines capable of translating from one language to another, machines to make strategic decisions in simplified military operations, machines capable of orchestrating a melody, or machines capable of logical deductions among many others. Today, all of these machines have been produced.

world (in such a way that the solution of problems is deduced from the facts expressed in that representation); and a heuristic part, which is linked to the mechanism that, based on the information, solves the problem and decides what to do. For the authors, most of the research that had been developed so far had to do with the heuristic part and not with the epistemological part. What was being modeled then?

In a later work, McCarthy (1977) would go deeper into this epistemological aspect and argued that it is precisely the epistemological dimension of AI that places its center of interest on three central issues: a) what kinds of facts about the world are available to an observer with given opportunities to observe, b) how those facts can be represented in the memory of a computer, and c) what rules allow legitimate conclusions to be drawn from these facts. What was left aside, as belonging to the realm of heuristics, was the search for possibility spaces and how it was possible to match patterns to the world and to draw legitimate conclusions from them.

For McCarthy (1977), the word *epistemology* is associated with that which is potentially knowable with the maximum possibilities of observation and calculation from the point of view of philosophy, while from the point of view of AI, it refers to that which is knowable with the available means of observation and calculation, although much of the formalizations are of interest to both areas. It is from this framework that the author discussed the facts that a person or robot must take into account to achieve a goal by some strategy of action, ignoring the question of how these facts are represented, e.g., whether they are represented by sentences from which inferences are made or whether they are instead incorporated into the program. McCarthy recognized that this involved starting from a great generality, which in turn would cause many difficulties, however, he also maintained that one could proceed in a certain way in such a way as to obtain successively simpler problems so that at some point one would arrive at a problem that can indeed be solved.

In summary, what McCarthy tried to show is that philosophy has a more direct relationship with artificial intelligence than with other sciences since both require the formalization of common-sense

knowledge and the repair of its deficiencies.[6] Thus, since a robot with general intelligence requires a general worldview, deficiencies in programmers' introspection about their own worldviews can lead to operational deficiencies in the program. And this is the core of the whole debate, the worldview that underlies logic and computational programming. This is why McCarthy is recognized as one of the fathers of AI. However, the discussion on the epistemology of AI is far from over. For example, some works emphasize the close relationship between analytical epistemology and AI (Wheeler & Moniz, 2003, 2004) or between ethics and AI (Russo et al., 2023). Others point out the need to review the epistemology of artificial intelligence in light of the epistemological rupture it produces between nature and culture (Ganascia, 2010, 2023) and, more recently, the idea that intelligence is not only a human attribute but can be found in other biological species, so by analyzing the history of the development of intelligence in other species it can be seen that intelligence is also an evolutionary phenomenon. From this perspective, intelligence is defined as a new form of informational life (Zhang, 2024).[7]

In any case, whatever position we take regarding intelligence, it is important to remember that since the 1970s McCarthy (1977) pointed out that integrating a worldview into the structure of a program does not give it the ability to state it explicitly, i.e., the program is not able to know what its worldview is, it only replicates that which has been

6 The issue of common sense will be a topic developed extensively by McCarthy. See McCarthy (1989, 1986) as an example also of his circumscription method.

7 At this point, it is important to mention that I am only taking as an example the work and discussion of McCarthy, but he is not the only one who conceptualizes AI. If we want to have a more comprehensive history of this discussion, we also need to take into account the work of Marvin Minsky, Richard Ernest Bellman, John Haugeland, Eugene Charniak and Drew McDermontt, Keith Mackworth and Randy Goebel, Nils J. Nilsson, Raymond Kurzweil, Elaine Rich and Kevin Knight, Patrick Winston, Stuart Russell and Peter Norvig, and, of course, the work of Claude Shannon and Alan Turing, among many others.

conferred by its programmer. So, if artificial intelligence is not properly intelligent, but it does involve a series of steps for problem-solving, then what we call intelligence is an algorithm. This is precisely the topic explored by Esposito (2022) in a recent work on which I will now dwell given its implications for building communication theory.

From artificial intelligence to artificial communication

According to Esposito (2022), we are moving from communicating with people to communicating with machines, and from communicating with machines to communicating with algorithms. While it is not yet possible to assume that algorithms can think, what can be said is that contemporary algorithms based on machine learning and big data can participate as partners in communication processes. Nowadays, algorithms are not only the authors of a huge amount of information we see and read on the Internet, but at the same time, they are the ones we talk to directly in an infinite number of online transactions. But, "How should we interpret these amazing developments in the communicative performance of algorithms?" (p. 2).

For a long time, we have placed communication in the human domain, but if we can communicate with machines in contemporary communication processes, does this mean that machines have become human or have learned to reproduce human intelligence? For Esposito (2022), the interaction we establish with algorithms is not necessarily an artificial form of intelligence but, on the contrary, an artificial form of communication: intelligence and communicative capacity are two different things. Modern algorithms are very effective not because they have learned to imitate human intelligence or to understand information, but because they abandoned the efforts and ambitions to do so and were reoriented towards a different model. Consequently, for Esposito, these modern algorithms do not reproduce human intelligence but human communicative skills. Therefore, the concept of communication must be reconsidered. "Can we still talk of communication when one of the partners has no understanding of the information conveyed? What does this mean for social information processing?" (p. 3).

At this point, it should be remembered that an algorithm is not a thing in itself or an entity determined in space-time, it is a "step-by-step ordered and finite set of prescribed operations along an optimal path, whose use permits the solution of a specific class of problems" (François, 2004, p. 29). How is it then possible for us to communicate with operations or processes? Although the development of technology simultaneously implied the use of concepts such as *artificial intelligence*, *algorithm*, *system*, *computation*, or *machine*, the fact is that those are concepts that have a long history and in no sense are confined to the field of engineering or programming, but are found even in everyday life (Christian & Griffiths, 2016; McCarthy, 1986, 1989) and have a social history too (Pasquinelli, 2023). Then, for Esposito (2022), what is new is not the use of algorithms but the exploitation of one of their central features: their lack of intelligence.

Algorithms do not require any kind of "creative thinking" in their execution, since what they do is to carry out operations in a given sequence according to certain precise instructions, and they do so mechanically. "In algorithms, and in the digital management of data that relies on them, information processing and mapping have nothing to do with understanding –indeed, in many cases, a need for understanding would rather be an obstacle" (Esposito, 2022, p. 3). Understanding is then the first serious problem when talking about communication with algorithms, an issue that had been central for talking about human communication. How can we talk about a communicative process if no mutual understanding or comprehension has been derived from that process? How can there be anything "mutual" when the other party is not only not a person, but also not a concrete thing, but a process? Artificial intelligence is not intelligent, but we can communicate with it because communication is not the process of meaning production, but the process of message interchange.

This is precisely Esposito's (2022) central argument, since for her, the communicative relevance of algorithms is related to their independence from understanding, and it has been indeed this abandonment of the ambition to reproduce in digital form the process of the human mind that has greatly boosted the digital processing of information. Contradictory as it may seem, having abandoned attempts

to reproduce our consciousness (by imitation or by analogy), algorithms are increasingly able to act as competent communication partners by responding appropriately to our queries and providing information that has not been constructed, nor could it be reconstructed, by a human mind. Programs do not "understand" or do not try to understand what they are translating, nor do their programmers, who do not even work based on any language learning theory. Algorithms can translate a text from Spanish to English without knowing English, even without understanding what they are translating. For Esposito (2022), these programs are not reproducing human intelligence but, on the contrary, what they are reproducing is their communicative competence, hence it makes no sense to continue talking about artificial intelligence, but artificial communication.[8]

Algorithms are not intelligent, but they are communicative, although they are still artificial. This is why Esposito (2022) considers that perhaps our societies have become "smarter", not because they have artificially reproduced human intelligence, but because they have created a new form of communication from the use of data in different ways. Consequently, the focus on the Internet is on communication rather than intelligence. "The web today is organized more through contacts, links, tweets, and likes than by meaningful connections between content and between sites –it is driven by communication, not by meaning and understanding" (p. 5). What do we do then with meaning? Where do we place it in this configuration? Is it irrelevant for artificial communication? Is artificial communication the communicative configuration of the contemporary technological era? For Esposito (2022), what we require is a change in the conception of the problem, it is about changing the focus of attention from artificial intelligence to artificial communi-

8 For authors such as Crawford (2021), the fact that machines can play chess or any other game incredibly does not make them intelligent, but precisely capable of playing such games. The problem is that we have associated the notion of "intelligence" with certain activities, such as games of skill, which is not necessarily a proven causal association and is also a consequence of not having yet defined or produced a general agreement on what intelligence is.

cation, which implies that attention should no longer be placed on the participants, but above all on the process of information production, a process that does not involve meaning, but becomes its antechamber. By assuming that we communicate with machines, we also assume that we are dealing with a situation in which the other in the communication process is an algorithm that does not understand the message, does not interpret it, and does not produce a shared meaning, but only processes and works with data. No information is produced because what we share are messages, not information.

Although this idea seems new and radical, it is precisely the communication proposal that Claude Shannon would have developed in the 1940s. For Shannon (1948), the engineering problem of those years was to reproduce at a specific point a message in an exact or approximate manner coming from another specific point. In this process, the author recognized that the messages usually had a meaning, that is, that they could refer to or were correlated according to some system with certain physical or conceptual entities. However, for Shannon, these semantic aspects of communication were irrelevant to the engineering problem. From this, Shannon proposed that any communication system, both those conceived in his time and those that would have been conceived in antiquity and could be conceived in the future, could be explained by a simple process involving a source of information, a message, a transmitter, a signal, a possible source of noise, a receiver and an addressee. None of its components presupposed an understanding of the information, a process of signification, or mutual understanding between sender and receiver. Shannon's concept of information is not a semantic concept and, then, it is not related to meaning, reference, or representation, since none of them can be quantified (Shannon, 1948; Soni & Goodman, 2017; Vidales, 2023a). In addition, what is transmitted is not information, it is a message, it is data. Information was, and is, associated with freedom of choice, not with the data sent. This is recognized by Esposito (2022) in her own proposal; hence, she considers the need to rethink the concept of communication and recover the one proposed by Luhmann in his systems theory as an alternative. In a sense, this perspective aligns with Pasquinelli's (2023) view of AI, as he argues that the core of AI is not rooted in the imitation of biological

intelligence but rather in the intelligence embedded in labor and social relations.

To assert that communication is not synonymous with signification or the production of meaning does not imply that there is no relationship between them; rather, it highlights that they belong to distinct conceptual and phenomenological domains. While Shannon laid the groundwork for understanding communication, his work did not address meaning. From my perspective, communication serves as the antechamber or prerequisite for signification. Any message may contain information, and any information may or may not carry meaning, which always depends on the presence of an external observer. In other words, messages (communication) can hold meaning for someone or something, thereby transforming into signs, the starting point of signification or semiosis. This idea aligns closely with the proposal of cybersemiotics. I will conclude with a final observation on this theoretical framework.

The integrative framework of cybersemiotics: from communication to meaning

Cybersemiotics is a transdisciplinary theory that integrates semiotics (semiosis) with cybernetics (control and communication in living beings and machines) to create an integrative framework on communication, cognition, information, and signification in artificial and living systems. The proposal has been developed by Brier (2001), who since the 1990s sought to conceptualize and model the internal, external, and social relationships of living organisms that determine the semantic dimension of meaning and language, as well as the influence this has on cognition and communication as central elements of the development of living systems. The first step was the cybernetics of Wiener (1948/1961) from which it was possible to construct a scientific view of the relationship between human beings, machines, culture, and nature. Psychology and behavioral sciences were the first to advance in this direction, but with the emergence of AI and neurosciences, behavioral planning and programming took a new direction that would eventually lead to the development of cognitive sciences and the information processing paradigm. For Brier (2008), the latter

framework has been based on the vision of thermodynamic systems and evolutionary systems by combining matter, energy, and information as ontological components in an emerging dynamic evolutionary vision that has served to explain the internal, external and social reality of living beings, even allowing the resulting knowledge to be compatible with computers. This is precisely the path that AI has followed and of which I have given a more detailed account in the previous sections.

However, the problem recognized by Brier (2008) is very similar to the one recognized since the 1950s by AI, cybernetics, information theory, and, in general, what Brier called the informational paradigm, and that is that these models tended to view communication and cognition from a disembodied informational point of view, which ended up leaving out the emotional and connotative dimensions. These models had major problems in modeling the semantic dimension of language, perception, and intelligence, as well as the influence they have on cognition, communication, and action. This is a key point that has also been investigated by AI in terms of modeling the perceptual world and, of course, the issue of intelligence that I have been discussing. Therefore, to address this problem, Brier began by integrating second-order cybernetics, specifically that proposed by von Foerster (2003). From this framework, information is defined as something that an observer notices as internally created in an autopoietic system and that has formed structural couplings in reaction to environmental perturbations, a definition that links cybernetics with the biology of knowing (Maturana & Varela, 1980) and that allows us to identify it as a perspective that moves beyond the point of view of objectivist, denotative and logical theories of information and language towards more constructivist theories. This path introduced the observer into the universe of the observed, a problem that McCarthy had also recognized in his exposition on the epistemology of AI.

The integration of first and second-order cybernetics with autopoiesis is an attempt to understand the biological bases of cognition and communication; however, for Brier (2008), these two theories share a problem: they have a bioconstructivist starting point, that is, they begin with the explanation of the organization and cognition of living systems

and from there they move to the rest of the levels of reality until they reach science and scientific knowledge. This is why Brier will turn to the work of Luhmann, who developed a systemic theoretical model of social communication by incorporating parts of the bio-cognitive vision of second-order cybernetics with parts of the autopoietic theory of cognition. This is also Esposito's proposal for thinking communication phenomena and will be a second major foundation of cybersemiotics because it extends the model of autopoiesis to posit three systems: biological, psychic, and social systems.

However, although Luhmann develops a socio-communicative theory and criticizes the idea of a transcendental being, he does not develop a phenomenological theory of cognition, meaning, and signification within a reflexive phenomenological theory of the embodied being and its existence, desire, and emotions, that is, he focuses on a properly social aspect of the human being, but ignores in a certain sense the psychological and biological aspect of it in the production of meaning and social significance.

This is why Brier turns to the semiotics of Peirce, and it is at this point in the conceptual integration that the place of significance or meaning becomes clear. However, this in no way suggests a sequentiality in the processes of meaning emergence, but for now, it only indicates that communication, signification, information, and cognition are distinct conceptual domains. The biology of knowing (autopoiesis) seems to leave out the experience of the first person, qualities, and free will; hence, Peircean semiotics becomes an important element, specifically because in his pragmatic and evolutionary semiotics, phenomenology is integrated with triadic semiosis. Here appears a phenomenological or phaneroscopic universe, using Peirce's own language, which focuses on the phaneron. For Peirce (1955), phaneroscopy (phenomenology) is the description of the phaneron, which is defined as "the collective total of all that is in any way or in any sense present to the mind, quite regardless of whatever it corresponds to any real thing or not" (p. 74), i.e., it is the universe of what is perceptible and thinkable by the human mind, hence it is not necessary to answer when or for what mind, since the characteristics of the phaneron that have been described are present for all human minds. As noted, this is precisely

the epistemological question that McCarthy also recognized, since the phenomenological world that the machine "perceives" depends on the model of the world of the observer who designs it. What world do we want the machine to perceive? What is the phenomenological world of machines? Do these questions make any sense?

Cybersemiotics have already been explored in art, education, Buddhism, theory of knowledge, and communication theory, among many other areas (Vidales, 2017; Vidales & Brier, 2021). However, there is still much work to be done, but within the framework of the conceptual development of a theory of communication that can dialogue with contemporary developments in cognitive sciences, artificial intelligence, and many other advances and theories of contemporary science in various areas of knowledge, it seems to be a promising framework. Perhaps it is not that we should think of artificial communication as proposed by Esposito, but rather that we should begin by placing communication in the framework of much more fundamental processes, that is, perhaps we can begin by placing it at the level of the emergence of living systems and differentiate it from the emergence of signification or meaning. This, of course, would seem to indicate that we are returning to the past to an old discussion, one that the academic field itself had criticized and, to a certain extent, completely rejected: the informational and cybernetic origin of communication and communication theory (Craig, 1999; Winkin, 1981/2005). But the truth is that what we have been rejecting is what has communicatively transformed the world in which we live today.

In the end, it is important to recognize that cybersemiotics is not the only existing conceptual framework with these pretensions, since there are other frameworks with the same aims, such as the Human-Machine Communication (HMC) project based on the study of the creation of meaning among humans and machines and the development of theory on the interaction between humans and technology, and basically, about people's interactions with technologies designed as communicative subjects, instead of mere interactive objects (Guzman, 2018; Guzman & Lewis, 2020).

Hayles (1999, 2019) has also explored in detail over the last decades the relationship between cybernetics, communication, semiotics,

and AI in the current discussion of post-humanism, from which a new research agenda has emerged. What Hayles (2019) proposes is biotechnoevolution, a hybrid process in which information, interpretations, and meanings circulate through flexible interactive human-computational collectivities or, as she named it, cognitive assemblages. For other authors, such as Kockelman (2013), there are other forms in which we can establish the relationship between meaning and information, since for him, information is the enclosure of meaning.

Then, cybersemiotics is not the only theoretical framework addressing this issue, and perhaps not even the best one, but it is the only one that has explicitly proposed communication in a transdisciplinary theory alongside information, signification, and cognition to explain their multiple interdependencies (Brier, 2008; Vidales, 2023a, 2023b) that allow us to think in a theoretical key the technological advances that are creating our new forms of coexistence, development and, it must also be said (self-)annihilation.

Preliminary conclusions

The path I have outlined consists of two key components: one historical and the other epistemological. On the historical side, our contemporary technological progress can be traced back to past theories –frameworks that remain relevant today and have seen significant development. However, these theories are often overlooked because much of our focus has been directed toward understanding their social implications rather than their conceptual foundations.

Epistemologically, understanding artificial intelligence requires delving into the language that underpins a specific perspective on constructing knowledge and interpreting human intelligence. Here, we are not dealing with a mere simulation of human intelligence but rather with an entirely distinct form of intelligence, as some authors have suggested (Miller, 2001).

As a result, both the historical and the conceptual components intermingle in various ways. To look into the past of the conceptual construction of AI is to look into the past of the construction of the field of communication because these discussions also involve first

and second-order cybernetics, information theory, logic, programming, cognition, signification, and, centrally, communication. Therefore, constructing communication theory to explain contemporary communication phenomena must also imply an account of the past of our conceptual history. But it is not a past centered on facts, artifacts, characters, or particular territories, but a conceptual and epistemological past. In the end, as Gunkel (2012) argued a decade ago, even when the debate about whether the successful simulation of human-level communicative ability necessarily implies the presence of intelligence or not persist:

> What is not debated is that machines are in fact capable of communicating successfully with human users in a variety of contexts and in a way that is often indistinguishable from another person. And for research in communication studies –where communication and not intelligence is the focus– this is a real game changer (pp. 9-10).

It is from this account of the conceptual foundations of communication, meaning, information, and human cognition that cybersemiotics is born as an integrative theory. It aims to be able to discuss, contribute, debate, and clarify some of the most important topics of the international research agenda and, in the particular case of communication, to participate in its empirical understanding and conceptual construction. From here we can critique the idea of communication as an eminently social process whose product is meaning. But this is not a call to return to the past; it is an invitation to think about what happens if we follow alternative theoretical frameworks for theoretical construction within communication studies. At least, from these integrative frameworks we can move conceptually from technological development to the development of living organisms, from the explanation of intelligence to its computational simulation, from logic to mathematics, and from information to emotions. In all these areas there is communication or has been a communicative component. Perhaps we have now the theoretical foundations for understanding its real nature.

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