REVIEW / DEĞERLENDİRME

SIGNS OF CREATIVITY: ARTEFACTS, LANGUAGE AND SMART OBJECTS

YARATICILIĞIN İŞARETLERİ: ESERLER, DİL VE AKILLI NESNELER

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Bu çalışma araştırma ve yayın etiğine uygun olarak gerçekleştirilmiştir.

Embodied Creativity

The purpose of this paper is to present a series of reflections on the notion of creativity in the context of artificial intelligence (AI). The central argument of this discussion is an attempt to move beyond a simplistic binary perspective on the relationship between technology and human beings: the question of whether AI is creative or not is a contentious one.

When the discussion is reduced to these two positions, the perspective that animates it is a profound anthropocentrism. Whilst the purpose of AI is often considered to be the creation of a machine that simulates the thinking ability of human beings, creativity is widely regarded as an exclusively human capacity. This assertion is arguably valid: *Homo sapiens* are creative. However, to argue this position without fear of contradiction, a single definition of creativity would be required. Instead, creativity manifests across a diverse array of disciplines, including biology, philosophy, literature, neuroscience, sociology and the arts, assuming varied shades and forms.

The following attempt will be to evaluate a different position on creativity and Artificial Intelligence. It is acknowledged that the purpose of this exercise is to raise an issue without offering a solution, a task which requires extensive and in-depth interdisciplinary research. To begin with, it is necessary to consider the broader context.

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Palaeoanthropological research has demonstrated that a fundamental characteristic of human beings is the inclination to voluntarily modify their environment in order to satisfy their needs. This mode of action, which has evolved and consolidated in a cooperative manner, can already be traced back to the construction of the first artefacts.

The emergence of bipedalism as a form of locomotion, i.e. the acquisition of an upright posture, led to the evolution of the skeleton, the liberation of the upper limbs and the development of the brain. The increase in brain size that characterised the genus Homo marked the emergence of early forms of social intelligence, as posited by the theory of mind proposed by Premack and Woodruff in their 1978 essay. Within this evolutionary framework, the lowering of the supraglottic vocal tract is posited as a key factor in the emergence and evolution of language, both in terms of its communicative and cognitive functions.

To illustrate this point, one may consider a scenario in which one of one's ancestors was compelled to confront a wild animal in order to protect oneself or one's possessions. The subject has no suitable hunting tools (such tools having not yet been invented) and takes hold of a piece of flint to hurl at the animal, perhaps with the intention of striking it and causing it to retreat. The object, which is to be found in nature, is employed in an unanticipated and inventive manner, most likely because it has the "affordance" of being grasped and then cast aside. In the event that the action produces the desired result, it will be reiterated in analogous situations and by other ancestors until a piece of flint is used to strike an animal, first to wound it, then to kill it. As time passed, the pebble's function became obsolete. Following the accidental discovery of the power of a sharp object, a blade was forged from a block of flint through a series of increasingly rigorous operations.

Despite being presented in a simplified manner and without any assertion of precision, this reconstruction through images demonstrates that our ancestors engaged in specific actions involving the employment of tools, such as cutting, wounding, and killing. This innate inclination towards creativity is among the earliest manifestations of artificiality. The concept encompasses the fabrication of entities that are not found in nature and are the result of human labour. This encompasses not only the earliest tools but also the most recent technological advancements, such as objects whose operation is guided by an algorithm. We are not interested in organising this diverse collection of objects, but rather in focusing immediately on a fundamental issue that is useful for discussing creativity.

The type of artificiality we have referred to is not opposed to naturalness: on the contrary, technological development encourages us to think of a symbiotic relationship between the natural and artificial worlds, identifying the human body as both a stage for change (e.g. clothes, jewellery, tattoos to cover and embellish the body) and a tool for acting on reality (e.g. tools to achieve a goal and produce a result).

In the contemporary context, creativity has been shown to be an adaptive condition that has developed through symbolic practices, both material and linguistic, linked to a purpose. It is at this juncture that the image of our progenitor must be considered. At a certain point, he comes to understand that his actions have consequences in the present moment as well as in the future. It is evident that actions can be considered as a manifestation of creativity, in a manner analogous to the manner in which artefacts embody creativity.

An Early Sign of Creativity

In his *L'Évolution Créatrice*, Henri Bergson delineated the condition of possibility for evolution through the concept of élan vital, thereby offering an alternative to the prevailing mechanistic process that had already been established in the wake of Darwin's theory of evolution. The fabrication and variation of artificial tools emerge at the point where Bergson attempts to determine the intelligence of humans and certain animal species, with reference to apes and elephants. While certain animals possess the capacity to produce rudimentary instruments, the instrumentality of humans signifies not only intelligence, but also the interrelation between artefacts and societal transformations. The latter perspective disengages the human being from animal instinctuality, hooks intelligence but does not make it solely responsible for the technological and social revolutions of human beings: "intellience, considered in what seems to be its original feature, is the faculty of manufacturing artificial objects, especially tools to make tools, and of indefinitely varying the manufacture " (Bergson, 2012). In the practice of artefact making, matter is as important as the ability to imagine the transformation of matter through action:

> Now, fabricating consists in carving out the form of an object in matter. (…) In other words, an intelligence which aims at fabricating is an intelligence which never stops at the actual form of things nor regards it as final, but, on the contrary, looks upon all matter as if it were carvable at will. (…) But action, and in particular fabrication (…) makes us consider every actual form of things, even the form of natural things, as artificial and provisional; it makes our thought efface from the object perceived, even though organized and living, the lines that outwardly mark its inward structure; in short, it makes us regard its matter as indifferent to its form. The whole of matter is made to appear to our thought as an immense piece of cloth in which we can cut out what we will and sew it together again as we please (Bergson, 2012).

The creative impulse intertwined with intelligence when it converges in the case of toolmaking and provides for variation, i.e. intentional change, appears to lack an element that, in my opinion, needs to be made explicit. This is the tendency towards novelty, the ephemeral nature of which must be properly weighed. In some ways, one cannot but agree with the view that creativity is about the search for the original and the new (see: Wilson, 2017). In this sense, creativity can only be ascribed to the human species since this faculty is closely connected with the prefiguration of the future, with the planning of

actions with a view to achieving a goal, whereas animals as intelligent as chimpanzees live exclusively in the present. Even more than intelligence and the propensity towards the future, according to biology scholars such as Wilson, it is imagination that makes possible not only the faculty to measure ourselves through time and space, but above all the conception of efforts and outcomes that are as yet unknown and destined to become original.

Beyond a reflection on the ontology of objects and social ontology, the faculty of fabricating artificial tools, therefore not available in nature, in the experience of human beings, is a symbolic practice that - at least in the earliest examples of the Australopithecines - did not require the intervention of language. At the same time, from an evolutionary point of view, language as a form of communication cannot be outlawed: through our combinatory capacity, as human beings, we can create endless chains of words, as Humboldt had already intuited; as social practice, we participate in language games in the Wittgensteinian sense. Language scholars, therefore, are aware that linguistic creativity cannot be investigated exclusively in its manifestations in literary productions: research has been renewed by addressing the creative aspects and uses of language, thus including studies on metaphor and irony. The fruitfulness of this research finds a kind of primogeniture in Noam Chomsky's *Cartesian Linguistics* (1966): human language is defined by the creative uses of language, in the wake of a tradition of thought that ideally includes Descartes and Humboldt. As is well known, the first phase of Chomskyan research linked to classical cognitivism does not consider the role of society or the issue of evolution as decisive. Creativity, therefore, remains confined to a combinatory capacity, a prisoner of syntactic recursiveness.

The question must be posed: does the framework we have established thus far also apply to technological artefacts? The following hypothesis is put forward: that digital artefacts, such as smart objects, are capable of displaying indications of creativity.

Artificial Creativity

Although rooted in human evolution, creativity is interwoven with artificiality. Smart objects represent the contemporary context of technological objects designed and manufactured by humans to satisfy a 2.0 urge or to externalise certain cognitive processes (Novak & Hoffman, 2019, p. 218):

> Smart objects are physical devices or assemblages of devices, such as smart lights, smart homes, robot pets, and smart cars. Smart objects also include non-physical services such as those provided by the web service company IFTTT (If-This-Then-That), a virtual assistant such as Amazon Alexa, or an AI computer program such as DeepMind's AlphaGo.

The category of objects is very broad, including algorithmic services and robotic agents: in the modes of use or relationship between human and

non-human agents, the problem of creative interactions arises. This aspect is not a question concentrated in contemporary technology, but has always interested theorists who have investigated the possibility of building a machine that thinks, from Ada Lovelace to Alan Turing (Turing 1948)[1].

Contemporary Artificial Intelligence is interested in creativity as a secondary issue, subordinate to the challenge of building a machine that thinks, i.e. not just a machine with computing capabilities beyond human comprehension, but a machine capable of performing a series of human activities.

The most extensive reflection on creativity in computer science is due to Margaret Boden, who focuses on the existence of three criteria of creativity[2]. According to Boden , creativity is a skill related to novelty, surprise and value. Novelty can be understood both as creation from nothing and as a person's first experience. Value refers to the kind of meaningful use that can be made of it, so the ideas generated must be useful and/or interesting. Finally, surprise concerns the constellation of expectations regarding the product. Boden identifies three distinct forms of creativity: combinatorial, exploratory and transformational. These forms differ from one another in terms of the manner in which psychological processes determine the conception of novelty.

> Combinational creativity involves the generation of unfamiliar (and interesting) combinations of familiar ideas (…) In exploratory creativity, the existing stylistic rules or conventions are used to generate novel structures (ideas), whose possibility may or may not have been realised before the exploration took place. (…)
>
> Transformational creativity is different, for here the variation is greater, and the stylistic dimension that is being varied is deeper. The resulting change is so marked that the new idea may be difficult to accept, or even to understand (Boden, 2009).

The taxonomy of creativity is also reflected in the language sciences. For instance, combinatorial creativity is inextricably linked to Chomsky's *Cartesian linguistics*, which posits that the creative aspect of language is characterised by human language and analogous to the ars combinatoria. Exploratory creativity is predicated on the notion of improvisation and the unanticipated; conversely, transformational creativity involves the modification of the conceptual domain, thereby engendering the emergence of novel and unanticipated ideas.

In consideration of Boden's thesis on creativity, the question of the creative aspects exhibited by smart objects must be revisited.

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[1] Lady Ada Lovelace studied Babbage's Analytical Engine in detail and she claimed that "The Analytical Engine has no pretentions to originate anything. It can do whatever we know how to order it to perform", denying any kind of creativity.

[2] In order to have an overwiev on creativity and AI, see Margaret Boden (2003) *The creative mind: myths and mechanisms*, and Margaret Boden (2012) *Creativity and Art: Three Roads To Surprise.*

Signs of Creativity in Robotics

The category of smart objects is so broad that it encompasses a wide range of devices, from the simplest to the most sophisticated social robots.

In general, a robot is a physical and material agent that performs actions by manipulating the physical world through effectors, which simulate the functionality of limbs. Robots are equipped with sensors to sense the surroundings in which they are located or move. Robots are generally defined as cooperative agents, insofar as they execute activities that facilitate the achievement of human goals, operating within a context in which human users are present. The robot's ability to function in the world of humans, which is full of unpredictability, is made possible by reinforcement learning (RL).

The world of humans is beginning to be populated by social robots, already used in contexts such as caring for the elderly or people with conditions such as dementia, while the use of robots with waiter functions is becoming more widespread.

A social robot is defined as a three-dimensional object which occupies a physical space and has been designed to interact with people and perform tasks that are typically carried out by humans (or companion animals). This definition supports the notion that the social robot can serve as a substitute and should demonstrate the capacity to respond appropriately to novel situations. This is an implicit acknowledgement of creative behaviour, or indeed, behaviour defined by improvisation, which is challenging to identify within a set of instructions and rules that determine the robot's behaviour. Moreover, the predetermined and repetitive character of the response to the actions of individuals utilising social robots should result in the diminution of elements such as surprise and value, thereby reducing the expectations of the individual, while preserving only the character of the combination of instructions, as mentioned by Boden. In such cases, the principles of surprise and value can be ensured by employing reinforcement learning through subsequent adjustments. Nevertheless, the potential for emulation and prediction of human behaviour, as well as the anticipation of human desire and need, may not necessarily result in enhanced robotic performance. At present, one of the technological possibilities is a modelling of the shared context of action between robotic agent and human being that identifies a kind of joint agent. Thus, the argument of creativity could be posed like this: is the behaviour of the joint agent creative? It is a question of shifting the focus from the individual robotic agent to the relationship between human and artificial agent.

Signs of Creativity in LLM's

In the early stages of research into artificial intelligence as a distinct discipline, the prevailing approach was rooted in a symbolic perspective. A symbolic AI programme is capable of combining and processing symbols (i.e. words and

phrases) to perform the assigned task, as demonstrated by the General Problem Solver (GPS). It is a general observation that such programmes are typically implemented through the utilisation of human language. Indeed, the simulation of human language (and verbal behaviour) has served as the testing ground for AI since its inception with the Dartmouth seminar in 1956. It is also noteworthy to mention experimental forms of proto-chatbots such as Eliza or Parry, which consider language as computation and symbol manipulation, exploiting the principle of recursion. The inherent limitations of these systems are evident. The utilisation of vague semantics and the incorporation of pragmatic elements, such as context-dependent information and the speaker's intentions, renders these artificial systems a rudimentary endeavour in natural language processing.

In the domain of machine learning, research in the field of natural language processing has yielded unexpected results, with applications such as *ChatGPT* and *Bert* or text-to-image generators being notable examples. The applications under discussion are based on linguistic models (Russell & Norvig, 2022, p. 875):

> We define a language model as a probability distribution describing the likelihood of Language model any string. Such a model should say that "Do I dare disturb the universe?" has a reasonable probability as a string of English, but "Universe dare the I disturb do?" is extremely unlikely. With a language model, we can predict what words are likely to come next in a text, and thereby suggest completions for an email or text message. We can compute which alterations to a text would make it more probable, and thereby suggest spelling or grammar corrections. With a pair of models, we can compute the most probable translation of a sentence. With some example question/answer pairs as training data, we can compute the most likely answer to a question. So language models are at the heart of a broad range of natural language tasks. The language modeling task itself also serves as a common benchmark to measure progress in language understanding.

Large language models as pre-trained autoregressive models, i.e. natural language processing models, are trained using a large amount of texts, including books, articles, web content and human conversations. Language models such as *GPT-3* and *GPT-4* are designed to generate texts autonomously from prompts and instructions. The ultimate aspiration of language models is the generation of texts that are perceived as analogous to those produced by humans and are comprehensible to them. In conclusion, the objective is to produce written compositions whose authorship is attributed to a human being, as opposed to an algorithm that merely predicts the sequence of words most analogous to those produced by a human author.

The issue of the essence of creativity in LLMs is emerging as a recurrent theme in research, albeit without the establishment of definitive theses. This is primarily due to two factors. Firstly, the rapid progression of these systems. Secondly, the nature of the texts that have been examined to date. The research groups involved in these studies have considered creativity in the con-

text of the generation of narrative texts (see: Mirowski et al., 2023, Yang et al., 2022, Yuan et al., 2022) and their primary focus has been on creative writing (see: Orwig et al., 2024).

The advent of text generation has given rise to a series of inquiries, particularly from the perspectives of semiotics and linguistics, concerning the nature of the generated text. A fundamental question that emerges is the determination of the criteria that would categorize a text as "generated by AI", thereby delineating its status as a text of artificial origin. It is challenging to interrogate the notion of coherence, and perhaps even more so to challenge cohesion. However, this approach often results in the loss of authorship and intentionality, consequently leading to a diminution of the integrated elements of creativity. These are concepts that necessitate redefinition in order to articulate the creativity of LLMs.

The study of recent literature on the use of LLMs in creative writing begins with a definition of creativity borrowed from computer science and Boden's research (Franceschelli, Musolesi 2023). By examining the model derived from *ChatGPT* (from version 3, optimised with reinforcement learning and human feedback, to version 4), a study shows that this system can only exhibit combinatorial creativity. The latter, in fact, is not linked to expectations, performance or value, and therefore does not call into question either exploratory or transformative creativity, nor generative language models (LLM) (see: Franceschelli & Musolesi, 2024).

In the field of creative writing, creativity should be bound up with inspiration, which would require intuition, memory, imagination, perception, consciousness (also applies to robots). This raises the question of whether there is a type of creativity that can be attributed to AI, but which still requires humans to manifest itself. As Mitchell (2019) argues, a machine can, in principle, be creative. But creativity means having the ability to understand and judge the artificial artefact generated, whether it is a text, an image or a piece of music. Thus, two issue are relevant: the first concerns the degree and parameters of creativity of texts produced by LLMs; the recognition of creative texts by creative writing experts falls within this research spectrum. The second issue appears to bear a certain resemblance to the Turing test and Searle's Chinese room experiment: given a text X, do an LLMs and a creative writing expert provide a concordant assessment of it? A research answer to those questions (see: Chakrabarty et al., 2023). To answer the first question, there is a modification to the Torrance Test of Creativity (TTCT) that assesses fluency, flexibility, originality and elaboration - in this protocol, creativity is a process. Instead, the starting point is to modify the protocol so as to assess creativity as a product, by preparing the Torrance Test of Creative Writing (TTCW). The corpus of texts is as follows: 12 stories written by professional authors and 36 stories produced by *ChatGPT*, *GPT4* and *Claude 1.3*. The total of 50 texts were submitted to 10 creative writing experts according to the TTCW-designed pro-

tocol, resulting in 3 ratings for each story. Two relevant issues emerge from the research because they constitute an experimental basis for the idea of creativity proposed in section 3.

The 12 stories written by people pass an average of 84.7% of the tests. Stories 'written' by LLMs pass between 9% and 30% of the tests. This result does not indicate the presence or absence of creativity, but rather points to a possible creative capacity in the future: much will depend on the development of LLMs, considering that at the moment a certain type of creativity - probably combinatorial creativity - is present in these texts generated by an artificial agent.

The question on the evaluation agreement of text X between creative writing experts and LLMs finds a unique result: there is no agreement. This result indicates that the evaluative elements of creativity and creative writing diverge incomparably when the evaluators are human beings and sequences of algorithms.

Open Conclusion

At the beginning of this brief reflection, we raised the issue of creativity in AI, freeing it from the polarisation that can be summarised as follows: AI is creative or AI is not creative. The first point to consider is to clarify what idea of creativity we can adopt. If creativity has a biological and evolutionary matrix, as it does in humans, then we must consider this constraint such as to exclude creativity from AI. Adopting this anthropocentric view closes the debate on creativity. However, it is possible to change perspective. A first attempt has been made by computer scientists who, adopting Boden's criteria, are working on the evaluation of texts generated by AI (and perhaps they should start evaluating the behaviour of social robots that interact with human beings, including those who are fragile and have pathologies): at most, we can glimpse the possibility of combinatory creativity.

The gap between human creativity and combinatory creativity is immeasurable, but it offers us the opportunity to ask ourselves whether it is possible to articulate creativity without using the human lens alone. Perhaps one path for interdisciplinary research could be the comparative study of signs of creativity, seeking to identify the simplest forms to the most sophisticated (human creativity, for example, linguistic creativity, is one example) and also to evaluate the possibility of identifying a difference not of degree but of nature between different types of creativity.

To adopt a different perspective, we need to change the initial question: no longer whether AI is creative, but what signs of creativity it shows.

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