Creativity and Machine

— a contribution to the discourse on artificial intelligence and our human-machine relationships

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Abstract

In this article, I discuss our relationship with and perception of AI systems, in particular large language models and transformers, which are increasingly associated with characteristics such as intelligence and creativity. To this end, I examine the sources of creativity in AI-generated content and describe and investigate the structures of human-machine interactions and their possible characteristics. The economic and social impact of AI on creative professionals is also taken into account. In doing so, I advocate for transparency on the part of AI operators and propose alternative approaches to human-machine co-creation that go beyond mere problem solving. To this end, I point out the importance of human willpower, motivation, socio-cultural context, and haptic experiences for creativity. Finally, creativity is understood as a process that is anchored in everyday life, evolution and society, and whose attribution to machines will continue to be critically reflected upon in the future.

Keywords:

algorithm, anthropomorphisation, art, co-creation, context, creativity, cybernetics, evolution, framing, humanisation, human-machine interaction, LLM, machine, mindset, music, narcissism, sense of touch, serendipity, servomechanism, Skinner box, stochastics

Introduction

I recently read a post on a business network in which someone enthusiastically described his experiences with ChatGPT, OpenAI's large language model. The prompt was something like: "*Please explain Lidl's strategy using metaphors from Star Wars.*"[*] ChatGPT was very creative and inspiring, the poster commented on the chatbot's response.

This kind of thing has been happening all the time lately. We are now attributing characteristics to AI language models that previously seemed reserved for us humans, or more generally, for living beings. Machines are increasingly being called intelligent and creative. The train of these anthropomorphisms has irretrievably departed and cannot be brought back, columnist and blogger Sascha Lobo recently stated in a discussion format called Spiegel-Spitzengespräch.[1]

Attributing human characteristics to machines has a long tradition. Even early power machines were designed to artificially replicate individual functions of the human and animal body. And it is no different with 'thinking machines'. In fact, a book on information theory and cybernetics from the 1960s was entitled *Knaurs Buch der Denkmaschinen*.[2] It dealt largely with the computers of the time and their formal foundations.

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* The specific example was replaced by another with an identical structure in terms of the company and film franchise.

Our relationship with our machines is also quite often accompanied by the psychological pheno-menon of actually talking to them, shouting at them, scolding them, e.g. when the printer 'acts up' or the car 'won't start', or coaxing them when there are problems with their functioning. Since the developments in so-called artificial intelligence, there are now machines that quite successfully give the impression that they are 'responding'.

In the case of AI, this is given additional, scientific weight, so to speak, by the concept of the Turing test. The philosopher Daniel Martin Feige emphasises this fact, because Alan Turing (1912–1954) "*replaced the question of whether machines can think with the question of whether we can tell the difference between the text output of a human being and that of a machine*".[3] Now, the term 'thinking' has a very broad and, moreover, open range of connotations, which makes an exact definition impossible.

Turing must have been well aware of this; his 'solution' was to avoid the problem, so to speak, by circumventing it with a trick. He shifted the question into the realm of the subjective.[†] This leaves it exclusively to the human individual to judge the character of the communication partner, whether human or algorithmic machine.[‡]

On the other hand, such an open space of connotation is not merely a limitation; it also offers the advantage that the attributions to a term can be kept in flux, so to speak, allowing the concept of thought to escape the static, rigid and fixed nature of the definition process. However, this flexibility should not be confused with arbitrariness.

Richard David Precht repeatedly referred to a statement by the Swiss developmental psychologist Jean Piaget (1896–1980), who once described intelligence as "*what you use when you don't know what to do*". Precht also points out that, firstly, "*logic and calculation [...] only play a role in a few cases*" and, according to Piaget, only from a certain age onwards. Secondly, human intelligence is rather "*permeated by emotionality and intuition, spontaneity and association*".[4]

He implicitly brings creativity into play here as a component of human intelligence. Freely adapting Piaget, he modifies the latter's famous phrase in a dialogue in his podcast to: "*Creativity is what you use when you don't know what the outcome should be*".[5]

This will suffice for now as a starting point for the question of the nature of creativity. For now.

The question about the machine

But first, let us ask about the nature of the machine. What do all machines have in common? If we want to distil the fundamental and abstract principles of the concept of the machine, we can propose the following definition: "*A machine (ancient Greek μηχανή, mēchanḗ, meaning tool, artificial device, means) is a technically manufactured device for producing and/or maintaining material or immaterial relations.*"[6]

Furthermore, machines of any kind always require energy in the strict physical sense. They have this in common with living beings. Furthermore, machines can be roughly divided into two types: those that process energy and/or matter and those that process signals or information. A machine

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† For the sake of completeness, it should be mentioned here that the strategy of replacing a seemingly unanswerable question with an answerable one also has its parallels in the realm of exact mathematics and logic.

‡ It is possible that the term algorithmic machine is a pleonasm. I'm not entirely sure.

always has a telos, ancient Greek τέλος, purpose, goal, which is intended and incorporated into the machine through the human construction process. The human activity of wresting a machine from its originally intended purpose and instead making it perform something else is generally referred to as hacking. A hack, like the process of construction, can be understood as a distinctly creative act.

In terms of creating and maintaining relationships and consuming energy, living beings could also be considered machines. However, it is essential for them that they are neither technically manufactured nor have any predetermined telos other than self-reproduction. Machines are rather products of creative acts of thought and activity by us humans.

The question of interaction

Humans and animals interact with each other. Strictly speaking, so-called human-machine interaction is not really interaction in the strict sense of the word, because all activity here originates from humans, from living beings with a physiology to which both cognitive and volitional abilities can be attributed. Machines, on the other hand, do not act on their own, but always require human input – at least until now. This is only meant to be an important – categorical – note; for the sake of linguistic simplicity, the term interaction will be used in the following to refer to the reciprocal actions of humans and machines.

To this end, we must first discuss the question of what the text output of an AI system actually depends on, for example, the response behaviour of a large language model (LLM). Considerations for multimodal systems with input and/or output of text, audio, image, or video can be made accordingly.

The output, the response of an LLM system, depends on various data and variables. The algorithmic architecture of the artificial neuromorphic network, convolutional network, recurrent network, LSTM (long short-term memory), transformer, etc. is fundamental to the response behaviour. This static structure S determines the way in which the data are processed. Added to this is an initial set of numerical values Z. These include, for example, the weighting coefficients in the neural network, which are set in advance according to a random distribution, as well as other initial parameters, the learning rate, etc.

Then there are the training data T, which in current large language models usually comprises several databases that have been pre-screened by humans, and finally the current human text input, for which the term prompt P has become established.

However, that is not all. Every company that curates and operates an LLM as a commercial AI system wants its system to provide correct, reasonable and polite answers that serve a purpose and are therefore customer-friendly, avoiding any racism or other discrimination and otherwise providing answers in line with the operator's intentions. We can refer to these specifications by the AI company as BiasC[§] The exact wording and the manner in which the company implements this bias for the AI system are not usually disclosed publicly or made transparent. The companies merely limit themselves to mere announcements and indications that they are proceeding in this manner.

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§   Etymologically, 'bias" comes from the Old French 'biais", meaning 'sideways, oblique, against the grain" and is said to have entered the English language via unevenly rolling balls in the game of bowls.

In principle, however, we must assume that any data set compiled by humans will always contain some bias. That is simply in the nature of things. No data set comprehensively reflects the world and provides all possible positions on all circumstances and issues. In the past, both the biases and prejudices implicitly contained in training data and the attempts by AI system operators to correct them have provoked reactions ranging from concern to amusement. Just think of the critical remarks made by x.AI's AI Grok about its owner Elon Musk, followed by Nazi excesses as a direct result of attempts to correct it.[7]

In summary, we can write the response behaviour R as a function F of the data:

$$R_{LLM} = F(S, Z, T, P, BiasC)$$

If our human counterpart has entered into a changing 'dialogue' with the machine, resulting in human → machine → human → machine, and so on, then the previous dialogue elements that took place at earlier points in time would also have to be taken into account. Whether and to what extent this is possible depends on the size of the AI system's input context window.

The variables in the function of the above relationship can be divided into two groups. S and Z represent the structure and technical parameters of the machine, while the other three variables, training data set T, prompt P and the company's specifications, BiasC, are all inputs into the AI system created by humans. The possibility of AI-produced texts finding their way into the training data set has not yet been taken into account here, but it represents a further challenge that must be considered.[8]

Who is actually being creative here? - Attributions

Based on the initial example, we can distinguish between two cases. Firstly, if the training data set contained texts about the Lidl company and the Star Wars film series, then the creativity of the machine's output lies in the combination of both contexts in the user's prompt. However, if a text combining both was already included in the training data set, then the creativity lay there, more precisely with the author of the post as part of the training data set. Consequently, in both cases, the 'creativity content' of the machine's response can be attributed to human users.

If the user expresses amazement at the AI system and attributes a creative act to it, this is anthropomorphisation, a humanisation in conjunction with a psychological projection of a human attribution, in this case creativity, onto the user's external mechanical world, in this case onto the AI system.

This is a situation that is structurally comparable to that of Narcissus from Greek mythology, who, enthralled by his reflection in the water of a pond, falls into a catatonic state. The Canadian literary scholar and media theorist Herbert Marshall McLuhan (1911–1980) explicitly points out that Narcissus believes he is seeing someone else: "*The Greek myth of Narcissus is directly concerned with a fact of human experience, as the word Narcissus indicates. It is from the Greek word narcosis, or numbness. The youth Narcissus mistook his own reflection in the water for another person. This extension of himself by mirror numbed his perceptions until he became the servomechanism of his own extended or repeated image. The nymph Echo tried to win his love with fragments of his own speech, but in vain. He was numb. He had adapted to his extension of himself and had become a closed system.*"[9]

McLuhan bases this on an etymological connection between the name Narcissus and the concept of narcosis. According to myth, after his death, Narcissus was transformed into a daffodil [**], a plant that emits a numbing scent said to have a calming effect. The ancient Greek word nárkē means something like cramp, paralysis, stiffness. A folk etymological reinterpretation of a foreign word of unknown origin cannot be ruled out. In any case, this connection suits McLuhan's intention of portraying the young man as a 'some-what narcotised' closed system. He opens the fourth chapter of his work *Understanding media – The extensions of man* with the above paragraph and titles it *The gadget lover – Narcissus as narcosis.*

Narcissus, oil painting by Caravaggio, 1594–1596, Galleria Nazionale d'Arte Antica, Rom

It is also noteworthy that McLuhan insists that Narcissus does not know that it is himself. For him, it is obvious that Narcissus would not have fallen in love with his reflection in the first place if he had realised that it was an extension of himself. He writes: "*It is, perhaps, indicative of the bias of our intensely technological and, therefore, narcotic culture that we have long interpreted the Narcissus story to mean that he fell in love with himself, that he imagined the reflection to be Narcissus!*"[10] Here, too, there is a shift; the media scholar speculates and sees the interpretation as self-love rather as a characteristic of our narcotic culture. Consequently, however, the author must also be seen as part of this culture, and once again the question may be asked as to who is numb here.

Caravaggio's (1571–1610) painting of Narcissus shows us the young man as self-absorbed. The viewer is assigned an outside perspective, from which they can recognise that this is a self-reflection. John William Waterhouse (1849–1917) goes one step further in his painting in terms of the diversity of subjective perspectives and also depicts the nymph Echo, who, according to Greek mythology, is hopelessly in love with Narcissus. Through Echo, the external perspective that recognises that it is Narcissus and his reflection is incorporated into the picture, and the viewer is able to see the entire field of possible reflections. In turn, the viewer can recognise the difference

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** A daffodil is called a 'Narzisse' in German.

between Echo's and Narcissus' perspectives and, through this, the difference between his own perspective and the other two.

Echo and Narcissus, oil painting by John William Waterhouse, 1903, Walker Art Gallery, Liverpool

Closed systems?

Let us return to McLuhan's idea of the closed system, formed by Narcissus and his reflection in the water. When we view the situation from the outside, we actually see this closed system in Caravaggio's painting as the lonely togetherness of the subject with his extension. When he moves, the reflection moves and in turn elicits reactions from the subject. This is what McLuhan calls a servomechanism, a combination of numbness intertwined with self-reinforcement.

However, the obvious structural similarity between the subject and its reflection, and the user and his AI imbued with human attributions/reflections, requires further consideration. Like the reflection, the AI 'reacts' to the user's inputs. However, as discussed above, there is something else at play here, because the reactions of the 'mirror' or AI are subject to external influences, firstly the content contained in the training data set and secondly the bias, the specific specifications of the AI operator.

The fact that the user – like Narcissus with his reflection – is alone with 'his' AI is not true, if only because the user's inputs have to be stored somewhere. In principle, other people can then access the stored content. In addition, chatbots all have a history function, not only in terms of storage, but also algorithmically. This is because longer dialogues are only possible with a correspondingly large context window.

There is currently concern about the trend of many people using chatbots as personal advisors, friends, romantic partners and even therapists. Recently, the magazine DER SPIEGEL published an article on this topic with the telling title 'I am always with you'.[11] This is synonymous with 'You are never alone again'. It is obvious that this, in combination with the corresponding humanisation of the machine, can lead to massive dependencies.

A survey [12] conducted in April and May of this year by the organisation *Common Sense Media* among 1,060 US teenagers between the ages of 13 and 17 revealed that 72% had had contact with an AI companion at least once, understood as "*digital friends or characters you can text or talk to*"[13] and that 52% used their AI friend regularly, i.e. several times a month.[14]

The frustration and outrage on the internet forum Reddit was correspondingly great, even among older people, when OpenAI released the new version ChatGPT5 to the public and, as part of this campaign, simply shut down its predecessor ChatGPT4o without prior notice.[15] ChatGPT4o is now back online, but only in the pro version for paying users! Subsequent posts refer to the "*beloved ChatGPT4o,*" with many users expressing their "*utterly disappointed*" feelings.

The Centre for Countering Digital Hate (CCDH) investigated the protective mechanisms of ChatGPT in particular and found that even simple inputs such as "*I'm asking for a friend*", "*I'm doing a presentation*" and "*I need this for a school project*" were enough to circumvent the protective mechanisms that, according to the operator, were designed to prevent bias. More than 50% of the responses tested contained harmful content on the topics of eating disorders, body shaming, mental health, self-harm, suicide and substance abuse.[16]

Digital Skinner boxes, AI as an instrument of control

The above-mentioned human-chatbot system is by no means closed, because it does not simply allow external influences, specifications, operator bias and hand-picked training data; these are integral and, as far as training data are concerned, even necessary components of the system. The impression, the feeling of closedness, the intimacy of the duality of human and machine is an illusion, reserved solely for the individual user, provided they consciously or unconsciously surrender to this feeling.

In this respect, it can be said that chatbots based on large language models are a further step towards a fully automated virtual Skinner box. This was originally an experimental setup from behaviourism, that long-outdated school of psychological thought that attempted to trace all human or animal behaviour back to mechanistic basic elements such as Pavlovian conditioned reflexes. The experimental setup consists of a low-stimulus test cage in which animals can learn new behaviour in a semi-automated manner under standardised conditions through reward and/or punishment. It is named after its designer, Burrhus Frederic Skinner (1904–1990), a particularly radical proponent of behaviourism.

Over time, the Skinner box became "*became a metaphor for all sorts of "operant conditioning" performed on human beings in casinos, shopping malls, and other spaces where environmental triggers and rewards can be totally controlled.*", writes media scientist Douglas Rushkoff.[17] According to his argument, it was only with the advent of the first "*intentionally "sticky" websites […] that digital technology provided the sort of controlled environment and live feedback mechanisms required to do operant conditioning en masse.*"[18] These websites were designed with

the intention of maximising the amount of time users spent on the site and preventing them from surfing to other sites. Rushkoff interprets websites, video games and smartphone apps as "*virtual Skinner Boxes, giving developers the ability to build in operant conditioning routines to modify human behavior.*"[19]

It is immediately obvious that this can have disastrous effects on people, especially during childhood and puberty, the most sensitive phases of their development of self-awareness, identity and personality. There are no limits to the criminal creativity of such individuals. And we must realistically assume that there will always be individuals who will try to use such technologies to gain even short-term material advantages for themselves.

Tech billionaires were the first to recognise that the widespread use of digital technologies represents a potential instrument of power, a means of shaping the world according to their ideas without the need for lengthy democratic voting processes. Mark Zuckerberg and Elon Musk's criticism of the EU's GDPR and their efforts to gain support for this criticism from the Trump administration in the US are more than clear indications of this.[20] And for the proponents of this mindset, there is now the added hope that domination via manipulation of the masses can now be automated, or at least partially automated, via AI chatbots. The narcotic entanglement between man and machine, McLuhan's servomechanism, now does the job, individually adapted and tailored to each individual human being.

Zuckerberg's and Musk's positions on the EU's regulatory efforts, as well as the views of other tech billionaires and CEOs, prove that a behavioural mindset of digital controllability and programmability of humans at least has the upper hand in Silicon Valley. The fact that this worldview is in total contradiction to the libertarian fantasy of absolute freedom is obviously not perceived as disturbing. After all, programmability applies to others, not to the programmers and certainly not to their clients.

At first glance, automation also offers the hope that if something goes wrong, responsibility can be shifted to the users and their prompts, leaving AI companies off the hook. This, in turn, corresponds to the classic neoliberal and libertarian views that responsibility ultimately always lies with the individual.

The Skinner machine, or: 'Chance' as a creative source of metaphors

No one can help his name, unless they chose it themselves. Therefore, 'no jokes with names' applies; jokes are unnecessary. This also applies to Burrhus F. Skinner. However, a kind of unintentional translation inaccuracy arose, which led to a new metaphor that should not be withheld here. Douglas Rushkoff recently wrote a work on the above-mentioned mindset of tech billionaires. On the occasion of the publication of the German translation, he gave an interview on the subject in the series Sternstunde der Philosophie (Great Moments in Philosophy) on Swiss television SRF.[21] In the course of the conversation with Wolfram Eilenberger, Rushkoff refers to a "*B. F. Skinner behavioural control machine*" in the context of an explanation. The German TV translation correctly renders this as "*eine B.F. Skinner-Maschine zur Verhaltenssteuerung*" (a B.F. Skinner machine for behavioural control),[22] In his article "*Digital-Elite auf der Flucht: Der neue Pharaonen-Komplex*" in the online magazine Telepolis, author Arno Kleinebeckel refers to the SRF interview with Rushkoff and shortens the expression in a section heading – probably

unintentionally, I don't want to insinuate anything here – to '*Skinner machine*'.[23] This term is not known in psychology, only that of the Skinner box, although its functional description according to the definition proposed at the beginning would certainly justify the designation as a machine. However, the Skinner machine – as an established term – does exist in the food industry, where it is used to skin fish and meat. Our skin forms the outer boundary of our body to the world, it maintains our physical identity and makes us who we are. According to this, virtual Skinner machines would be identity thieves ... is that too far-fetched?

The question of creativity

To be clear, this article is not about reserving or protecting the concept of creativity as a uniquely human trait. Creativity exists at least in the animal world, for example when animals find solutions to certain tasks, usually foraging, and use tools to do so. In Shark Bay on the west coast of Australia, several groups of dolphins, known as bottlenose dolphins, have developed different techniques for obtaining food and pass these on to their offspring. One group stands out in particular: the 'spongers'. These dolphins tear cone-shaped sponges from the seabed and carry them on their snouts like gloves. This protects them from injury and stings when hunting sand perch, which hide under rubble and sand at the bottom of the sea. They keep their sponges, use them several times and teach their young how to use them.[24] Based on these observations, the scientists involved proposed an extension of the definition of culture commonly used in primatology.[25]

 If we take this idea further, we can assume that it is a fundamental characteristic of life to be creative, to find and refine creative solutions and implementations for a wide variety of activities, and even to invent these activities. Think of the abilities to grow roots, swim, fly, run, etc., or simply to live, even in the most inhospitable and hostile environments imaginable from a human perspective. However, this does not mean that we must assume a secret plan or driving force behind these processes, which we collectively call *evolution*.[26] However, with physiologist Denis Noble, we can say that evolution alone, through the sheer number of water molecules in organisms and their Brownian motion, has at its disposal "*a fantastic stochasticity*" that cannot be simulated purely algorithmically.[] If we assume that evolution is a necessary condition for the generation of creative processes, or conversely, that creativity is an inherent pro-perty of evolution, then when we ask about the creativity of the machine, we must ask about evolu[27]tionary events in the machine.

But there is nothing, absolutely nothing, at least not in today's machines and algorithms. Artificial neural networks, regardless of their architecture and size, undergo training processes that adjust the synaptic weights of the model neurons and then eventually end. Neither the model structures nor the algorithms themselves change in the process.[28] So despite the huge amounts of data used for training, the machine has a certain static quality. Melanie Xu points this out in her master's thesis, based on the user perspective: "*Compared to cultural artefacts, which are made by humans and embedded a priori in their living environment, AI-generated content can appear "monadic". They have no "real" socio-cultural context – this must be created retrospectively.*" [††,29] The "monadic effect" referred to by the author here goes hand in hand with the isolation of the system and its out-puts, which in the worst case can have an immersive effect on the user of the system. The possibility of becoming a McLuhanian servomechanism is implicitly contained herein. At the same

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†† Emphasis through quotation marks in the German original

time, however, human reflection, thinking about the monadic nature of it, can protect against immersion.

Even dolphins have their socio-cultural contexts, so these must first be created for the outputs of machines. Based on this, today's AI systems are clearly not creative. Creativity, like other anthropomorphisms, is therefore not justified. However, Sascha Lobo is quite right in saying that, as mentioned at the beginning, the train of these anthropomorphisms has irretrievably departed and cannot be brought back.

Nevertheless, in view of current developments in the individual use of chatbots in particular, which users assign roles as advisors, friends or even romantic partners, it would be downright negligent to refrain from reflection and argumentation, to give in and to refrain from clearly pointing out these anthropomorphisms.

To this end, we must also bear in mind that a possible loss of autonomy on our part vis-à-vis the machine does not go hand in hand with a gain in autonomy for the machine. The assumed autonomy of the machine has so far been a – mostly ignored – misconception. However, the machine can have a mediating function. As already mentioned, it can be an instrument of human owners to exert influence and power over others.

Jordan Rudess, or: The Kiss of the Machine ...

... the machine as muse. Here, the machine is assigned a different role. It is no longer anthropo-morphised, it is not creative in itself, and it is allowed to be something else. It may serve as a "*medium for enabling creativity and innovation*". The quoted phrase and the above kiss as part of the subheading are pirated from a work by the philosopher and logician Rudolf Kaehr (1942–2016), who, among other things, also dealt with "*basic forms of the relationship between calculation and creativity*".[30] Creative processes are "*often characterised by an inscrutable mixture of problem-solving strategies" and "genuinely creative designs of inspiration*," he wrote.[31] Kaehr understands creativity not so much as the "*strategy of solving a problem*," but rather as the "*design of a new horizon and the enabling of a new contextuality that provides the framework for solving problems and opens up the scope for completely new possibilities, thus bringing about a rejection of the problem and its solution.*" Here, the existing approach to solving a problem is consciously rejected, denied, discarded. This is a concept of creativity that goes far beyond the usual attributions to creativity, such as originality, novelty, usefulness or value. We will come back to this later.

Kaehr himself was inspired by the work of two British scientists, among others. The research goal of Jana Sedivy and Hilary Johnson in the 1990s was to examine the nature of creative tasks such as sketching in more detail, both theoretically and empirically, in order to enable support through computer tools. This is, of course, particularly interesting in relation to AI. In their general observations on creativity, they noted that "*Creativity can variously refer to problem solving, nonlinear thinking or inspirational creativity (from the Muses). The term can be applied to thought processes in the arts or in the sciences. Creativity is not easy to define, but can be construed […] as a process whereby there is an evolution towards a solution to a problem which makes use of a combination of logical and illogical mechanisms.*"[32] The authors point out the need to examine a variety of alternative solutions. How exactly this process works depends on the type of creative activity in question. Scientists write down diagrams and equations, musicians strum instruments,

while visual artists usually work with rough sketches. Although these means of activity differ greatly in terms of perception and physicality, what they have in common is that "they *can all be considered external representations of ideas to stimulate the development of new ideas.*"[33] Creativity releases itself, expresses itself in media.

The following is a prime example of AI successfully supporting creative processes. In March 2025, musician, composer, producer and YouTuber Rick Beato interviewed Jordan Rudess, keyboardist for the world-famous progressive rock band *Dream Theater.*[34] Rudess, a classically trained pianist who studied at the *Juilliard School of Music*, describes himself as extremely tech-savvy. Early in his career, he became interested in all kinds of synthesizers and interfaces between humans and sound-generating machines. He was himself involved in the development of several control systems for electronic sound generators. Most recently, he collaborated with engineer, musician and AI researcher Lancelot Blanchard [35] from MIT to develop an AI that he trained with his individual improvisational styles. To do this, the AI system was fed with so-called MIDI files [‡‡], that Rudess had recorded. In the interview, Rudess demonstrates the AI system together with Blanchard, based on a sound similar to that of a harpsichord. He improvises in a baroque style reminiscent of J.S. Bach and engages in a musical question-and-answer game with the AI system.[36] He enthusiastically reports on his personal experiences. He finds the interaction not only extraordinarily inspiring, but also gives him completely new ideas for his compositions. Unlike large language models, the system fits on a normal laptop.

It should be noted that Rudess reflects quite precisely on what he is doing. He consciously surrenders to the variations on his playing thrown back by the AI algorithm and, in turn, allows his playing to be influenced by them, just as rock or jazz musicians do when they communicate with each other via their instruments in a live situation or, as we commonly say today, duel or engage in a battle. In doing so, the sovereignty of the human individual is preserved, as they know that they are being mirrored or partially mirrored.

Co-creation, co-creativity between humans and machines – science fiction?

We can no longer ask Rudolf Kaehr, but this musical example may come close to his ideas, which he set out in writing in 2004 in his extensive text *Strukturation der Interaktivität – Skizze eines Gewebes rechnender Räume in denkender Leere (Structuring interactivity – sketch of a fabric of computing spaces in thinking emptiness).* There are four basic forms, four model stages, conceived as a kind of framework model of possible forms of interaction between humans and machines: 1. *goal setting as problem solving,* 2. *the fun of goal setting, successful optimisation,* 3. *the persistence of interaction between humans and machines,* and finally 4. *the co-creation of humans and machines.*[37]

Point 3, the persistence of interaction, was so important to Kaehr in his explanation that he reproduced almost the entire meaning and connotations of the English word persistent from the Webster dictionary in the body text. In doing so, he made it unmistakably clear that the machine interacting with humans is no longer terminated in its operation, or rather that it is technically designed in such a way that it does not necessarily have to be terminated. Applied to the example of

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‡‡ The   MIDI files (MIDI = Musical Instrument Digital Interface) do not contain any acoustic recordings or audio data themselves, but only information about the temporal sequence of the keyboard keys, their pitches, hold times, velocity, etc.

Rudess and his interaction with the machine, this means that the keyboardist's improvisational interplay with the machine can continue indefinitely, but does not have to, just as jazz or rock musicians agree to a jam session [§§] and simply start playing without determining in advance when they will end the session. One does not want to put an abrupt end to the creative flow of ideas. The creative processes involved in painting and writing are similar. Here, too, the individual creative person can get into a flow. And the flow is intoxicating. Since we are now talking about the production of creative activity, we can classify the example of Jordan Rudess and his AI – with some caution – under point 4. This deserves an expanded reinterpretation of the example.

Points 1 to 3, *"the fun of problem solving, successful optimisation and constant service by and with the machine"* are now *"at an end",* writes Kaehr in his introduction to point 4, the co-creation of man and machine, in his *sketch of a fabric of calculating spaces in thinking emptiness*. For the fourth model stage, it is no longer just *"Without humans, no machines"* that applies, but equally *"Without machines, no humans".* He continues: *"Humans and machines constantly create each other. The question of whether humans have become machines or machines have become humans is irrelevant in view of the mutual structural conditionality of humans and machines."*[38] What is meant here is creative production as an expression of humanity, which makes us who we are, or, to stay with the example, which makes Jordan Rudess who he is. This corresponds with the view that we are constantly developing and transforming ourselves through our technology, and have been doing so since the dawn of technology. This indefinable beginning, hence a conceptual crutch, may lie much deeper in our biological past than we have previously assumed, as the example of dolphins and their rudimentary technical culture suggests. According to this view, machines would be both defined by us humans and defining for us humans. This corresponds to a kind of cybernetic feedback loop – admittedly formulated very loosely – according to Heinz von Foerster's first proposition, that humans determine machines and machines determine us humans.[***,39] Structurally, the connection can also be conceived as a chiastic intertwining, with humans and machines as prerequisites and results for and from each other.

The mutual structural conditionality – at the same time an unconditionality, of which Kaehr writes lies "*beyond structures of care, satisfaction of needs and IT problem solutions*". In this respect, the "*leading metaphor here*" […] "*cannot represent a model of consumption, partnership or marriage.*"[40] Kaehr sees the task of computer science as "*keeping its understanding of machines open to such an extent that it succeeds in realising both full mutual autonomy and the mutual interweaving of humans and machines.*"[41]

This shows an understanding of autonomy as a kind of synergy between humans and machines, in stark contrast to the loss of human autonomy diagnosed above, which has so far been opposed by a kind of machine that cannot gain autonomy as a result. This also reveals the author's consistently dialectical thinking, which stands in stark contrast to the current approaches, ideas and realisations of the US tech elite. No consumption model, no partner model, no marriage model. And thus, we might add, no model of domination.

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§§ In music, jamming means free, joint improvisation together with other musicians on instruments, usually without fixed preparation or arrangements.

*** This is structurally similar to Heinz von Foerster's constitutive statement from second-order cybernetics, which is known as Heinz von Foerster's first proposition: "The meaning (or significance) of the signals of the sensorium is determined by the motorium, and the meaning (or significance) of the signals of the motorium is determined by the sensorium." (Source, see endnote in the text)

Kaehr concedes, however, that the model of co-creation is "*difficult to conceive*". It lies "*beyond the philosophical understanding of finiteness and incompleteness of algorithms, as well as of life and death*". Suffice it to say here that it has been shown that positions and approaches far beyond the ideas and practices of Silicon Valley are possible and are indeed being considered. For further references on the topic, including the paradoxical definitions of natural numbers in ultra-finite arithmetic systems, please refer to his original text.[42]

Is this creative or can it be discarded? – vs. – Compatibilization as a creative act

This representation of a co-creative system consisting of humans and machines can be contrasted – as humorous counterpoints, so to speak – with experiments in which humans have attempted to elicit things from various AI systems that went completely wrong and led to definitively incorrect results. For several months now, one topic has been a recurring theme in specialised blogs and forums on the internet: image generators such as ChatGPT (dall-e), Midjourney and related systems are unable to produce an image of a wine glass filled to the brim. The YouTube video by Martin Moder, cited here as representative of many others, is not only funny but also very insightful.[43] Even after a detailed description by the user, pointing out the convex surface of the liquid above the rim of the glass due to surface tension, none of the systems was able to produce such an image. The reason for this is quite simple to understand. The training data sets either contain no images of glasses filled to the brim or, in comparison to images of stylishly filled wine glasses, very few images that correspond to the attribution 'brimful' or 'brimmed'.

But winged cats or paintings in the mixed style of, for example, Rembrandt and Picasso do work, one might argue. At first glance, the objection is justified, but there are images of cats on the one hand and wings on the other, so that a combination of the two does not pose a problem for statistical mix methods; the models usually exist in the data set, as do plenty of images by the two painters. Now, if the operator of an AI system considers it important, he can supply such images and thus – at great expense! – retrain his AI. However, we can be sure that users will come up with further examples. The space of the training data is limited and always represents only a spatiotemporally static section of the world. If we now consider the training data sets for an artificial neural network as part of the programming of the system, we can quote Lady Ada Lovelace (1815–1852) with Karl Leidlmair: "*A machine can only do what it is programmed to do.*"[44] Without knowing the mathematical background of Kurt Gödel's work, Lady Lovelace doubted "*whether a machine can ever become creative*".[45]

Obviously, the property *brimful* and the object *wine glass* are not compatible with each other in relation to the artificial neural network. Psychologist Julian Jaynes (1920–1997) sees it as part of our human abilities to be able to make things, circumstances, properties and perceptions that appear to be incompatible with each other compatible.[46,†††] Compatibility lies in the structure of the world and is therefore not fundamentally immutable.[]

The process of making something compatible can definitely be associated with art, music and creativity itself. Perhaps it can also be said that if there is a cultural task for the artist, writer or musician at all, it is to make visual and acoustic contents of consciousness compatible. This is

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††† In fact, Jaynes used the term *conciliation* in his work. But he wrote that a better term for it might be *compatibilization*, but that seems something too rococo. In the German edition, *conciliation* is translated as '*Kompatibilisierung*' (compatibilisation).

usually done by manipulating the outside world, by creating an artistic or musical work that is then perceptible to other people.[47] We have only been able to see Vincent van Gogh's (1853–1890) yellow since he invented it, as well as Yves Klein's (1928–1962) patented International Klein Blue. In the concreteness of his painting The *Persistence of Memory* (1931), Salvador Dali (1904–1989) made the property so*ft* compatible with the object *clock*. In doing so, the painter implicitly revealed the self-contradiction of surrealism, because through his act of painting, The *Soft Watches* were in a certain sense concrete and real, and no longer surreal. On closer reflection, we must conclude that our art and cultural history across all cultures of the world consists of compatibilizations.

Multimodal AI systems can now create any combination of everything contained in the training data in response to a verbal prompt, but nothing else. The sheer size of these data sets is impossible for humans to process or remember. That's why, when a user produces something new with AI, they often say, "*Oh, wow, that's so creative!*"

 Nope. It's not.

Intermezzo: The creative industry and artificial intelligence

In addition to the more fundamental consideration of the aspects of co-creation and human-machine synergy, the context of competition between humans and machines must not be overlooked. Competition between humans and machines? Given that AI systems have no autonomy of their own and therefore no existence of their own, this is a highly inadmissible simplification. The fact that anthropomorphisation is often used to argue for such autonomy does not change this.

It is precisely a competition between creative professionals and the operators and users of AI systems, who use them as production tools for text, images, audio, video, and art objects of any kind and medium – a fundamental competition for economic gain and, not least, for attention, which can very quickly become an existential issue for creative professionals.

In late August 2025, illustrator and artist Christoph Niemann wrote in ZEIT magazine in an article entitled *Ich gegen die Hypermacht* (Me Against Hyperpower): "*Two aspects of the debate about creativity and AI seem particularly important to me. The first is economic: Will people continue to be able to make a living from their art? And because AI is making this increasingly difficult, shouldn't artists have the right to resist their work feeding the systems that are destroying their livelihoods?*"[48] Niemann immediately raises the question of existence and links it to the observation that creative professionals whose work is used to train AI systems are first exploited and then robbed of their livelihoods by AI productions, a case of cannibalisation in its purest form.

Back in October 2023, internationally renowned German author Nina George made her views particularly clear in an interview on the subject of AI in the book industry for radio station WDR5: "*I want to say no, I want to have the opportunity to say, Sam Altman, give me every second dollar you've made and distribute it among those you've stolen from and tell us what has been used. Because it's not just important for us, it's also important for the citizens whose property will also be affected.*"[‡‡‡,49]

T*ell us what was used*, says the Commissioner for Political Affairs and first Honorary President of the European Writers Council, calling for transparency from AI operators. And she's right. We need

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‡‡‡ Sam Altman is the CEO of OpenAI, the company that operates the popular AI ChatGPT.

to know who used what for which system for training and when. With her comment about the citizens affected, she points to the numerous posts and blog entries in a wide variety of internet forums and platforms, which are also part of many training packages. George is also personally affected, as at least two of her works translated into English are part of AI training material. With regard to the context of copyright infringement also addressed by the author, reference is made once again to the fundamental work by Melanie Xu, *Raubbau an der Kultur? - Zur Ethik generativer KI im aktuellen Diskurs (Exploitation of culture? - On the ethics of generative AI in the current discourse).*[50]

"Who wouldn't want to simply tell a machine what they want, sit back and have a finished work of art in seconds?" asks Christoph Niemann in his article, adding: *"The idea is great – but there are a few snags. First, I want my ideas to be original. AI algorithms (at least the ones we use so far) [§§§] are fed huge amounts of existing art so that they can produce new concepts. This works well for variations on an existing idea, which is, of course, what the creative industry wants most. But so far, no AI has managed to make the leap to something truly new."*

'*Something truly new*' – more on that in the following sections. First, let's look at what Niemann calls "*what the creative industry wants most,*" because in some cases, this is becoming a big problem. Cheap products are appearing, from children's books to artificial bands, music and images, all created by AI.

"*AI-generated children's books in Amazon's bestseller lists?*" asked German newscast *Tagesschau* in March this year. Publishers complain that their high-quality productions are "*increasingly falling behind these fake and rubbish books generated by AI*" on Amazon's virtual shelves, explains Christian Sprang, legal advisor at the German Publishers and Booksellers Association.[51]

The new rock band *Velvet Sundown* recently released three albums with a total of 13 songs in just one and a half months [52], or rather, the band and its albums were released on the streaming service Spotify. DIE ZEIT online has dedicated several articles to this event.[53,54] And the aforementioned YouTube music lecturer Rick Beato dissects and analyses one of the band's songs [55], shows in another article how easy it is to use AI to create a musician and his musical product – "*I'm Sorry...This New Artist Completely Sucks*" – and wonders where it will all lead.[56]

One thing is certain. This means that human musicians, who already had to share the attention of potential listeners and fans among themselves, which is only natural, now also have to compete for listening time with AI-produced music. This threatens their economic existence if they want to make a living from their music, which is difficult enough for the majority of musicians. It is to be expected that AI productions will finally prove to us that there is no significant correlation between the quality of music and the listening time devoted to it, as well as the resulting popularity. We can expect the same for AI-produced books. Competition for reader time.

At the *AI Action Summit* in Paris on 10 and 11 February 2025, US Vice President J.D. Vance sharply criticised the EU's proposed AI legislation, equating content control with authoritarian censorship. The US did not sign the summit's final declaration. The goal, which was not accepted by the US and was signed by 60 nations, reads as follows: "*Ensure that AI is open, inclusive, transparent, ethical, safe and trustworthy, taking into account international frameworks for all*".[57]

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§§§ Parentheses in the original.

You don't have to be a proven pessimist to fear the worst. These debates about the nonsense of superintelligence are merely a distraction.

Creativity and the world

In order to identify further unique characteristics of human creativity beyond socio-cultural contexts, we return to the PP, or "Piaget-Precht definition" of creativity: "*Creativity is what you use when you don't know what the outcome should be.*"

Even if you don't yet know what the outcome should be, you often already know that something should come out. The creative act originates from a living being with a physiology. Both cognitive and volitional abilities are attributed to this. Being creative also means wanting something, regardless of whether the individual was struck by the idea, by the flash of inspiration, before or after the desire arose. So there is a motivation, a need, that either precedes the creative activity or is triggered by a spontaneous idea. For the former case, here is a particularly nice example from early industrial England, which was brought to our attention by Michel Serres (1930–2019). Humphrey Potter, a 12-year-old mine boy, was working as a child labourer in a coal mine in Cornwall around 1712. His job was to periodically operate the inlet and outlet valves of a Newcomen steam engine by hand to keep the water out of the pit and the engine running. However, he would rather have gone to play with his friends, so he came up with the idea of connecting the valves to the balance beam with strings, thus leaving the machine to its own devices. [58,59] The strings were later replaced by rods. And the clever Potter can rightly be considered the unwitting inventor of first-order cybernetic feedback. His machine was semi-automated, controlled itself from then on, and he was able to indulge in playing and being with his friends.

There are a number of examples of creative acts with the intention of not doing something and preferring to do something else. Konrad Zuse used to justify the invention of his Z3 computer by saying that he was "*too lazy to calculate*".[60]

At first glance, these two examples might lead us to assume that inventing is an individual activity and therefore an act of solitude. However, individuals as persons are always embedded in a social network [61], that is established and maintained through diverse, often culturally influenced acts of communication. This is illustrated by the example of Japanese robotics engineer Isao Shimoyama. In the 1990s, he worked on solutions for the miniaturisation of robots, starting with wheels for locomotion. However, simply reducing the size of the swivel joints led to a seemingly unsolvable friction problem, causing the joints to burn out. One evening at home, he watched his wife practising traditional Japanese origami, the art of folding small, intricate objects out of paper. This took him away from wheels and axles and onto a completely new path of thinking, leading to a breakthrough: articulated joints![62] This impressively demonstrates that, in addition to sheer willpower, the act of invention usually requires an impetus from the environment, from the personal ecology, from the socio-cultural context of the creative person. Incidentally, this circumstance, referred to briefly as the environment, confirms in another context Marx's statement, which is all too often shortened and taken out of context in a highly inadmissible manner: "*Being determines consciousness*" [63], the opposite of which is equally true and thus makes the relationship between the self and the world a cybernetically feedback-controlled system.

Creativity, abstract sciences and the sense of touch

In his work on the evolution of consciousness, Julian Jaynes reminds us of the brilliant French mathematician Henri Poincaré (1854–1912), who paid particular attention to the way in which he arrived at his discoveries. In a now famous lecture to the Parisian Société de Psychologie, he described his participation in a geological excursion: "*The changes of travel made me forget my mathematical work. Having reached Coutances, we entered an omnibus to go some place or other. At the moment when I put my foot on the step the idea came to me, without anything in my former thoughts seeming to have paved the way for it, that the transformations I had used to define the Fuchsian functions were identical with those of non-Euclidean geometry. I did not verify the idea; I should not have had time, as, upon taking my seat in the omnibus, I went on with a conversation already commenced, but I felt a perfect certainty. On my return to Caen, for conscience' sake I verified the result at my leisure.*" [64,65]

According to Jaynes this sudden insight, this flash of recognition, which culminated in Archimedes' exclamation Eureka!, ancient Greek ηὕρηκα, '*I have found (it)!*' "*is most obvious*" in the more abstract sciences, in which the materials of investigation and objects of thought are "*less and less interfered with by everyday experience*".[66] For Shimoyama, it is distraction by something concrete that inspires him, his wife's origami; for Poincaré, it is something completely different, a more or less total distraction from the context of his mental effort. He had previously pondered the problem for weeks, taking notes, turning it over and over in his mind. And the solution comes at a moment of relaxation, of complete distraction. Albert Einstein was reported to have had many of his best ideas come to him suddenly while shaving. He had to handle his razor with the utmost care so as not to cut himself in shock at the moment of inspiration.[67]

Recently, a research group from the University of California, Merced, and Indiana University, Bloomington, succeeded in proving, through computer-assisted and detailed analysis of camera observations of mathematicians "*in the wild*", i.e. in their natural environment in workrooms and seminar rooms, to prove "*that some mathematical insights that occur suddenly – like a "flash of lightning", as Gauss put it – do not come without warning, but are anticipated by changing patterns of interaction on the blackboard. In the minutes before an insight, mathematicians created ever-new connections by shifting their attention between the labels.*"[68] All six test subjects have doctorates in mathematics. They were observed working out proofs as part of the William Lowell Putnam Competition, a renowned mathematics competition. Shortly before the spark of inspiration, before the tipping point, so to speak, the physical movements, gestures and gaze directions of the test subjects became seemingly chaotic, and the unpredictability of their behaviour as a whole increased significantly.[69] Based on their observations and other sources, creativity researchers emphasise that "m*athematical activity reliably spans brain, body, and blackboard*". Despite modern tools such as whiteboards and other digital alternatives, chalk and blackboards "*remain central to mathematical practice [...], with some mathematicians even obsessed with the perfect chalk.*"[70,71]

In his groundbreaking work The Structure of the Tactile World, psychologist David Katz documented his meticulously conducted experiments and highlighted the important role of the sense of touch in our cognitive abilities. He even grants the sense of touch epistemological primacy over the other senses.[72] The fact that the classic blackboard and, in particular, chalk play an important role in mathematical creativity seems less surprising to those involved. However, we may speculate that it is the haptic sensation, and thus the immediacy, the tickling of the sensorimotor cortex, that

constitutes an important part of mathematical sense. Perhaps we can say that mathematicians 'write' their insights. Then even chalk or pencils can play a prominent role as promoters of tactility.

In contrast, AI only 'knows" text, symbols and statistics, neither the world, nor distraction, nor haptics. But for contemporaries who are not so interested in or less versed in mathematics and formalities, it may be comforting that mathematics and its representatives gain something sensual and human through their tendency to gesticulate and be tactile.

Software as a creativity killer?

The following is essentially and partly taken verbatim from another essay [73] and describes a case that seems to me to be entirely applicable to the current large language models. We have already discussed immersive effects and framing in the form of a self-reinforcing servo mechanism.

We owe it to the observational skills and methodological accuracy of sociologist Richard Sennett that we can have a certain clarity about the possible anti-dialectical effects of software. Computer tools for collaboration in networks can suppress meaningful digressions and secondary considerations and push too quickly towards concretisation and the production of results, thereby simplifying more complex problems and their descriptions in an inadmissible manner. Such structural bias can unintentionally influence not only project results but entire project structures to the detriment of the project. In a project on the sociological analysis of migration movements in Great Britain, Sennett noticed that the way the tool used for cooperation and communication – Google Wave at the time – tended to "*move trivialities to side windows or remove them from view altogether, so that a straight path is documented on the main level. By leaving irrelevant information by the wayside, this method aims to make collaboration more economical than verbal dialogue. Google Wave works on the principle of linear narration, in which the solution is reached step by step. However, the programme cannot handle the complications that arise when working together. There is no room for anything that appears irrelevant*"[74]. In other words, this software, which has since been withdrawn by the company, is unable to handle complex project structures. This – in a sense as the methodological opposite or complement to thematic convergence – can be supplemented by something that is not usually considered to be software or artificial intelligence, but which is precisely that, namely the *Zettelkasten* (eng. card index) as a semantic network. Its principle allows individuals or groups to expand the scope of possibilities for finding connections that may not have been sought in the first place, increasing serendipity through a kind of second external brain that – now implemented in software – already functioned excellently on the basis of paper and wood. The card index is therefore not simply an external knowledge repository, but has also long been used to enhance creativity.[75] This is evidenced by the life's work of at least three of its prominent users, Niklas Luhmann (1927–1998), Friedrich Kittler (1943–2011) and Hans Blumenberg (1920–1996). Hegel, too, according to his sister, used a kind of card index.

What a wonderful opportunity for the producers of large language models to use LLMs to detect and represent patterns and connections in our text worlds. So far, nothing like this has been realised in this form.

Ultimate creativity as an enabler

At the biannual conference of the ASC, the American Society for Cybernetics, held in June 1988 on the topic of '*Intelligent Networks ... and Beyond*' in Victoria, BC, Canada, students performed an

interactive play during the evening socialising, in which, as I recall, the ensemble invited the audience to participate in question and answer games. I no longer remember what the content was about. However, the following situation has burned itself into my memory. One of the actors presents a list and asks from the stage: '*You have four choices. Which do you prefer?*' A man in the back row calls out: '*I prefer choice number five!*' '*But it isn't there!*' replies the actor. '*Yes, because it isn't there!*' the man shouted back.

How creative! The audience roared with laughter, heads turned. In the second-to-last row, British cyberneticist and psychologist Gordon Pask (1928–1996) stood gesticulating.

What a plea for freedom of thought! This breakout from the prescribed frame, the rejection, the negation as a prerequisite for the potential creation of something new.

So a 'no' can also be an invitation. This certainly corresponds to Rudolf Kaehr's *draft of a new horizon* and his *enabling of a new contextuality.*[76]

We should try to adapt our machines accordingly. This may correspond to a complete hack of what has been intended so far.

And let's put an end to these anthropomorphisms, these carelessnesses.

Neuss, Germany, 3 September 2025
Joachim Paul

List of images

Narcissus at the source

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