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Research article

The Thinking Machine and the Tiger

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Abstract

In 1937, Jorge Luis Borges wrote a characteristically engimatic historical note and literary reflection on „Ramon Llull' s Thinking Machine." It was the year when the idea of „thinking machines" picked up momentum with Harold Aiken's mechanical Mark I early computer that became the electronic Mark IV. 85 years ahead of ChatGPT (first released in 2022), Borges is looking back some 650 years at Ramon Llull's great arts which includes an ars inveniendi and inspired rational speculation ever since. This is one of five essays that look through the lens of Borges at contemporary learning machines. On one level, it traces the lineage of combinatorial textual generation from Ramon Llull's late-thirteenth-century Ars Magna through André Breton's surrealist automatic writing and Ray Kurzweil's early Cybernetic Poet to contemporary large language models. Relating Jorge Luis Borges's literary critique of thinking machines to Lev Vygotsky's cultural-historical psychology, the essay suggests how both human imagination and generative algorithms rely fundamentally on the recombination of culturally available materials. At the structural level of output, the text-generation mechanics of a human poet and a machine can appear functionally identical, yet contemporary generative AI achieves a highly selective combinatorial excess that obscures the underlying absence of an internal semantic architecture. Drawing on Vygotsky's theory of word meaning as an evolving process forged through prior learning, historical embodiment, and social practice, this essay argues that modern machines dissociate the production of contextually appropriate, meaningful language from the socio-affective history of meaningful thinking. This finally leads to the conclusion that it is becoming impossible to infer authentic meaningful thinking solely from the presence of meaningful language, suggesting that meaning should be viewed not as an isolated asset within the human or the machine, but rather as an emergent property generated within the relational spaces where machine-generated cultural resources encounter human histories of learning.

Keywords: Jorge Luis Borges; Ramon Llull; Thinking machines; Generative AI; Large language models; Recombination; Word meaning; Lev Vygotsky; Creativity; Intertextuality; Automatic writing; Cybernetic Poet

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Научная статья

Мыслительная машина и тигр

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Аннотация
В 1937 году Хорхе Луис Борхес написал характерную для него загадочную историческую заметку и литературное размышление под названием “Мыслящая машина Раймунда Луллия”. Это произошло в тот самый год, когда концепция “мыслящих машин” получила мощный импульс благодаря разработке Говардом Эйкеном механического компьютера Mark I, который впоследствии эволюционировал в электронный Mark IV. За 85 лет до появления ChatGPT (выпущенного в 2022 году) Борхес обращается к событиям 650-летней давности, анализируя великое искусство Раймунда Луллия, включающее в себя ars inveniendi (искусство изобретения) и ставшее с тех пор источником вдохновения для рационалистических спекуляций. Настоящая работа представляет собой одно из пяти эссе, в которых современные обучающиеся машины рассматриваются сквозь призму творчества Борхеса. На первом уровне анализа в статье прослеживается эволюция комбинаторной генерации текстов: от “Ars Magna” Раймунда Луллия (конец XIII века) через сюрреалистическое автоматическое письмо Андре Бретона и раннего “Кибернетического поэта” Рэя Курцвейла до современных больших языковых моделей. Сопоставляя литературную критику мыслящих машин Борхеса с культурно-исторической психологией Льва Выготского, автор показывает, что как человеческое воображение, так и генеративные алгоритмы фундаментально опираются на рекомбинацию доступных в культуре материалов. На структурном уровне выходных данных механизмы генерации текста у поэта-человека и машины могут казаться функционально идентичными. Однако современный генеративный искусственный интеллект достигает высокой степени селективного комбинаторного избытка, который маскирует базовое отсутствие внутренней семантической архитектуры. Опираясь на теорию Выготского, согласно которой значение слова является развивающимся процессом, формируемым предшествующим обучением, исторической телесностью и социальной практикой, автор статьи утверждает, что современные машины отделяют производство контекстуально адекватного, осмысленного языка от социоаффективной истории осмысленного мышления. В итоге делается вывод о том, что становится невозможным делать вывод о подлинном осмысленном мышлении исключительно на основании присутствия осмысленного языка. Это позволяет предположить, что значение следует рассматривать не как изолированный актив внутри человека или машины, а скорее как эмерджентное свойство, возникающее в реляционных пространствах, где сгенерированные машиной культурные ресурсы сталкиваются с индивидуальной историей человеческого обучения.

Ключевые слова: Хорхе Луис Борхес; Раймунд Луллий; Мыслительные машины; Генеративный ИИ; Большие языковые модели; Рекомбинация; Значение слова; Лев Выготский; Креативность; Интертекстуальность; Автоматическое письмо; “Кибернетический поэт”

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INTRODUCTION

In 1937, Jorge Luis Borges published a short essay on a machine that was already more than six hundred years old. Its inventor, the Majorcan philosopher and theologian Ramon Llull, had devised his *Ars Magna* in the late thirteenth century as a method for producing religious knowledge by systematically combining a limited number of fundamental concepts. Borges (1999) calls it, with characteristic generosity and irony, a "thinking machine." He then immediately takes the name away again. Llull's mechanism, he observes, is no more capable of thinking a thought than Athanasius Kircher's (1646) later magic lantern is capable of magic. Judged by the ambition of its inventor, the machine simply does not work. Yet Borges is less interested in dismissing failed machines than in asking what their failures might reveal. The fact that an invention is useless does not necessarily make it uninteresting.

The machine itself is deceptively simple. One version reproduced by Borges consists of a diagram of nine divine attributes: goodness, greatness, eternity, power, wisdom, volition, virtue, truth, and glory. Each is represented by a letter and connected with all the others. The diagram can consequently generate statements such as glory is eternal, eternity is glorious, power is wise, or wisdom is powerful. The later and more elaborate version consists of concentric rotating disks whose compartments can be brought into changing relations with one another. Llull's *Ars Magna* thus makes possible a mechanical exploration of combinations. Just a small number of elements can produce a surprisingly large space of propositions. What to Llull (1985) offered a method for approaching truth appears to Borges as an almost comic proliferation of statements. The problem is not a scarcity of answers but their abundance. As Borges asks his reader to contemplate the magnitude of his "etcetera," the possibilities already exceed what a page can contain.

Borges make a move that gives his essay its peculiar contemporary force. He initially declares that Llull's machine does not work, only to correct himself a few pages later: *elle ne fonctionne que trop* – it works all too well. Give the letters colours and ask the machine to determine the true colour of a tiger, and it will happily produce blue, yellow, black, white, green, and purple tigers, followed by ever more extravagant combinations: yellowishly blue, blackly blue, whitely blue, and so on. What emerges is what Borges calls a "torrential ambiguity." The machine has no difficulty producing possibilities. Its difficulty is that it has no obvious principle for distinguishing the illuminating combination from the pointless one.

For Borges, however, this failure contains the possibility of another kind of success. Llull intended his *Ars* as an instrument of philosophical investigation, and as such, Borges concludes, it is absurd. But what if we regard it instead as a literary machine? In the brief final section of his essay, Borges suddenly moves from theology and logic to poetry. A rhyming dictionary, he notes, might itself be considered a rudimentary thinking machine. More provocatively, Borges claims that the poet looking for an adjective to accompany

the word tiger, does so “in a manner identical to the machine.” The poet tries possibilities until one is sufficiently startling. A black tiger might become a tiger of the night. A red tiger evokes blood and through blood, perhaps violence, danger, death.

With this final tiger, Borges quietly changes the problem. The question is no longer whether a machine can produce combinations. Obviously, it can. Nor is combination uniquely mechanical. A poet also places words beside other words, test them out, discard or select relevant associations. The unsettling question is what happens between the words. Why is red tiger potentially a poetic image while thousands of other grammatically possible combinations remain inert? How does one juxtaposition become meaningful, another absurd, and a third a metaphor capable of changing how we perceive both red and tiger?

Nearly ninety years after Borges's essay, this question has acquired an unexpected urgency. Generative language technologies have made the production of plausible and surprising word combinations incomparably more sophisticated than anything Llull could have imagined. Yet this technological difference may obscure the older problem Borges identified. An abundance of linguistic combinations is not necessarily an abundance of meaning. Contemporary generative AI therefore invites us to return to Borges's tiger rather than leave it behind. If both poet and machine can combine words, what makes a combination a thought, a metaphor, or a poem? The problem may ultimately concern not the machine's capacity to manipulate language, but our conception of word meaning itself.

FROM LLULL TO BRETON TO KURZWEIL’S CYBERNETIC POET

Borges's comparison between Llull's machine and the poet becomes less paradoxical if poetic creation is itself understood as a practice of recombination. Llull's *Ars* was built around precisely such a procedure. Letters stood for a limited set of principles (goodness, greatness, eternity, power, wisdom, and so forth) and diagrams and rotating figures brought them into systematically changing relations. In the mature *Ars Magna*, nine divine principles could be combined with nine relational principles such as difference, concordance, beginning, middle and end. The machine did not create its elements. It rearranged relations among elements supplied in advance – somewhat similar to modern language models. What Borges finds absurd is the hope that such recombinations might mechanically disclose philosophical truth. Yet the same procedure looks rather different when moved from philosophy into poetry.

A striking example appears almost six centuries later in Surrealism. André Breton's (1931) experiments with automatic writing were intended to loosen the control of conscious intention and allow unexpected associations to enter the text. His poem *Free Union*, written only a few years before Borges's essay, proceeds through an almost excessive sequence of associations organized around the recurring phrase “My wife.” Hair becomes a wood fire, thoughts become heat lightning, shoulders become champagne, wrists become matches. The images do not proceed by conventional

description or logical deduction. They collide, and the collision itself generates poetic possibilities. In this respect Breton's procedure strangely resembles Borges's reading of Llull. Both create conditions under which combinations can emerge that have not been fully specified beforehand. But where Llull sought to constrain combination sufficiently to reveal necessary truths, Surrealism deliberately loosened constraints in the hope that unexpected conjunctions might escape the habits of rational consciousness.

This displacement of authorial control takes another turn in Ray Kurzweil's Cybernetic Poet Machine, first developed in the 1980s and an early forerunner of today's Large Language Models (Kurzweil, 2000). Here the combinatorial procedure is no longer a set of rotating disks, nor a human attempt to suspend conscious censorship. The program reads a selection of poems, constructs a "language model" from them, and uses this model to generate new poetic sequences. It can even combine the writings of several poets into what Kurzweil calls a blended "poet personality." After reading Robert Louis Stevenson, for example, the program produced lines connecting winter, streams, foam and dreams, which are recognizably poetic associations that had not occurred together in the poems from which the model was constructed.

Llull, Breton, and Kurzweil are obviously doing very different things. Llull seeks theological truth, Breton seeks liberation from the conventions of conscious reason, and Kurzweil seeks to computationally reproduce features of poetic language. Yet all three unsettle a familiar picture of the sovereign author who first forms an intention or meaning internally and subsequently chooses words in which to express it. In each case, an apparatus is introduced that permits something unforeseen to happen between the elements already available: rotating disks, automatic association, or a computational language model. The resulting combination is therefore not entirely selected in advance by an intending author.

This makes it too easy to draw a sharp dividing line between human creativity and machine recombination. Human imagination also recombines. Following the Russian psychologist Lev Vygotsky (1896-1934), even the apparently fantastic products of imagination are made from elements of preceding experience. An imagination does not create from nothing but separates, alters and recombines materials encountered in reality. A flying carpet remains composed of culturally available elements (flying and carpet) placed into a relation that reality has not supplied in that form. As I have argued elsewhere, drawing on Vygotsky, our possibilities for making new connections are simultaneously creative and historically constrained. What can be recombined depends upon the cultural resources made available through preceding learning experiences (Hasse, 2022).

The important distinction, then, cannot simply be that humans create while machines combine. Llull combines; Breton combines; Borges's poet searching for the adjective of a tiger combines; Kurzweil's Cybernetic Poet combines. Contemporary generative AI vastly expands the speed, scale and statistical sophistication with which such recombinations can be produced. But none of this answers the question raised by

Borges's red tiger. If recombination is common to Llull, Surrealism, poetry and machines, recombination itself cannot tell us what meaning is. To understand why one unexpected conjunction becomes meaningful while another remains merely strange, we have to move from the production of word combinations to Vygotsky's more difficult problem of word meaning.

FROM COMBINATION TO WORD MEANING

If recombination cannot in itself distinguish Llull's machine from the poet, we need to look more closely at what happens when words become meaningful. Here Vygotsky offers a useful shift in perspective. This psychologist, who died a few years before Borges wrote his text about Lulls Thinking Machine, described developing processes of meaningfulness which involve material words, things, technologies, and the creation through learning as new developmental zones. In his work thought and language do not engage as two already constituted entities, but thinking and speech evolve together in relation to one another (Vygotsky, 1978; 1987). His concern was not to locate meaning somewhere behind language, as though thought existed in a finished form prior to the words through which it was expressed or clothed. He explicitly rejected the conception of pure thought that merely acquires a verbal form, like a person putting on a coat. Thought, on his account, is not simply expressed but “completed and formed” in the word. Speech therefore does not merely transport an already finished thought from one mind to another. In becoming verbal, thinking itself changes. The human relation between words and thinking has a developmental history, and the production of words can itself restructure thinking.

This is why word meaning became such an important unit of analysis for Vygotsky. It allowed him to avoid two equally problematic positions, namely, on the one hand the view that words and thoughts are independent entities somehow connected externally, and on the other hand that thinking and language are simply the same thing.

Instead, word meaning provides a unit in which thinking and speech are joined, but also generalization and social interaction and thus thinking and communicating. A word does more than point towards an object. It places that object within a system of connections and relations. A word such as ‚garden,‘ for instance, may evoke earth, vegetable beds and cucumbers, but can also enter more abstract relations with agriculture, diet, or economic value. These connections are not all present from the beginning. The crucial Vygotskian proposition is that word meaning develops through learning.

This developmental point matters for Borges's tiger. The words red and tiger may appear stable enough. We can print them on Llullian disks, enter them into a computer or write them on a page. Yet their meaningfulness is not exhausted by their capacity to designate a colour and an animal. A child, a zoologist, a painter, and a poet may recognize the same words while bringing very different systems of connections to them. Meanings develop through participation in social practices, communication and encounters with a

material world. Vygotsky's later work increasingly stressed precisely this point: the characteristics of word meaning reflect the communicative and social practices in which they develop.

We can now return to Borges's provocative claim that the poet looking for an adjective for tiger proceeds "in a manner identical to the machine." At one level he is right. The poet and the machine may both produce a red tiger. Nothing in the two-word sequence reveals how it came about. At the level of combination, the operations may even appear identical. But at the level of meaningful thinking, Borges's "identical" becomes questionable. For a human poet, red and tiger enter a history of connections acquired through previous encounters with words, people, and things. Red may evoke blood, but blood may evoke injury, violence, birth, death, sacrifice, revolution, or something intensely personal. Tiger may belong simultaneously to zoology, childhood stories, paintings, previous poems, and encounters with an actual animal. The new conjunction does not merely add one word to another. It can reorganize the connections through which both are perceived.

This does not mean that humans possess some mysterious substance called "meaning" that machines lack. Such an explanation would merely relocate the problem inside the individual. A Vygotskian account points in the opposite direction. Human word meaning has a history because humans themselves have histories of participation in socially and materially organized worlds. Meaning is therefore neither simply contained in the word nor privately contained in the individual mind. Even understanding another person's words ultimately requires more than identifying their conventional definitions. Vygotsky extends understanding towards the thoughts, motives and affective relations from which an utterance emerges.

I have used the term ‚preceding learning' to emphasize this temporal dimension of meaningfulness (Hasse, 2020). What we have previously learned changes what we are capable of noticing, connecting and learning in a new situation. The same material word can consequently become meaningful through quite different relations. Someone whose concept of a robot has developed primarily through science-fiction films does not encounter the word robot with precisely the same material-conceptual relations as someone who has built, programmed or worked with robots. Word meaning cannot simply be shuffled arbitrarily because preceding learning has already formed patterns of relations through which people perceive and think.

This becomes particularly important when words are generated by machines. In my work on human encounters with AI, I have argued that cultural resources should not be understood as discrete pieces of information stored somewhere and retrieved when required. What humans bring from preceding learning becomes a potential in a new situation. What we have previously learned affects what appears relevant, surprising, offensive, beautiful, or meaningless. Thus, identical linguistic material can become differently meaningful for different people. In the famous case of Microsoft's chatbot Tay, for example, words that were socially and affectively meaningful to the humans involved

were processed by the machine without the preceding learning through which those expressions had acquired their situated significance.

This suggests a different way of drawing the human-machine distinction. The decisive difference need not lie in the words produced when a machine and a poet can both give us red tiger. Nor does it lie simply in the fact that humans combine while machines merely recombine, since, as we have seen, human imagination also works by recombination. The difference concerns the processes of relations through which the combination becomes meaningful. For Vygotsky, words participate in histories of social interaction that transform thinking itself. For humans, the unexpected combination can consequently become a new way of thinking and perceiving.

Borges's tiger therefore leads us beyond the question of who, or what, can put two words together. A machine may produce a linguistic combination that a human reader experiences as startling, beautiful, or profound. That does not make the combination meaningless. On the contrary, it may become intensely meaningful for the reader and may subsequently change what that reader can think. The more difficult question is whether producing a meaningful sequence is the same thing as participating in the history through which it becomes meaningful. Vygotsky gives us good reason not to assume that they are.

GENAI: BORGES'S MACHINE FINALLY WORKS TOO WELL

Borges's old thinking machine has acquired a new relevance with generative AI. The continuity, however, is not that Llull somehow anticipated the computer or the large language model. It lies in a more fundamental problem of linguistic abundance. Llull's *Ars Magna* could mechanically generate combinations but generated far too many of them. Asked for the colour of the tiger, Borges's imaginary machine gives us not only the black, white, red or blue tiger, but an expanding series of combinations whose very abundance makes them useless. This is why Borges corrects his initial verdict that the machine does not work to emphasising that it works all too well. Its weakness is not its inability to generate possibilities, but its inability to distinguish the combination that matters from the innumerable combinations that do not.

Generative AI might be understood as a radically more sophisticated answer to this problem. Its achievement is not simply combinatorial excess but selective combinatorial excess. Ask a generative language model for an adjective to accompany tiger and it does not normally provide an indiscriminate catalogue of possible adjectives. It produces a limited sequence that is responsive to the words and instructions that precede it. If asked for a zoological description, a children's story, and a surrealist poem, it will produce quite different tigers. In this respect, the distance from Llull's rotating disks is enormous. Yet the old Borgesian problem has not disappeared. It has just become harder to see. The contemporary machine does not confront us with the absurdity of all possible combinations. It confronts us with combinations that have already been selected so effectively that they frequently appear relevant, intentional, and meaningful.

The Vygotskian distinction is important because meaningful language and meaningful thinking cannot simply be equated. Vygotsky's point was not that thought exists fully formed behind the word, nor that speech and thought are identical. The relationship itself develops, and word meaning is the unit in which thinking and speech become functionally related. Word meaning is simultaneously generalization and social interaction, thinking and communication. Moreover, since verbal thinking cannot finally be separated from affect and motivation, Vygotsky emphasises that thinking has a "motive force" in needs, interests, incentives and tendencies, rather than constituting an autonomous stream of thoughts. This makes it problematic to infer a similar history of meaningful thinking simply from the appearance of a meaningful linguistic sequence.

But this need not lead back to the familiar conclusion that the machine manipulates words while only humans possess meaning. Such a conclusion would reinstall the sovereign human subject that a posthumanist theory of learning seeks to complicate. Once generated, the machine's words become material cultural resources in new processes of relations. A generated red tiger can surprise me, remind me of blood or revolution, lead me back to Borges or to another poem, or make me perceive a problem differently. It can enter dialogue, teaching, writing and further learning. In such encounters, preceding learning matters, i.e., what the generated words can become for a person depends partly on histories of learned relations that precede the encounter. Meaningfulness therefore need not be located exclusively inside either the human or the machine. It can emerge through changing relations between human histories of learning, material words, technological processes, and the situations in which they come together.

It is here, perhaps where Borges's apparently obsolete machine becomes most contemporary. Llull hoped that combinatorial machinery might assist the discovery of truth; Borges discovered instead its literary potential. Kurzweil's Cybernetic Poet subsequently demonstrated that computationally produced combinations could be experienced as poetry. Generative AI intensifies the puzzle because its linguistic selections can now be so contextually appropriate that the difference between producing meaningful language and engaging in meaningful thinking becomes increasingly difficult to discern from the linguistic product alone. GenAI makes it increasingly difficult to infer meaningful thinking from meaningful language.

Borges may therefore have been both right and wrong when he claimed that the poet searching for an adjective proceeds "in a manner identical to the machine." At the level of the resulting combination, poet and machine may indeed arrive at exactly the same words: red tiger. At the level of the processes through which words become meaningful, however, identity cannot be inferred from similarity of output. The machine can give us the red tiger and its words can become consequential participants in our thinking. What the red tiger means, and how that meaning may change what can be thought next, remains a question of relations and their histories.

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