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The Incomputability of Calculation: Wittgenstein, Turing and the Question of Artificial Intelligence

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Abstract

Calculation is one of the foundational concepts operating at the basis of the notion of an algorithm. Seemingly intuitive, it remains nonetheless no small task to provide a rigid theoretical framework for articulating an ontology of computation. The central and primary point of oscillation around which the following paper will revolve, is concerned therefore not only with the complicated questions that make up the foundations of logic and mathematics, but the social and political implications that follow directly therefrom. Whether a machine can think is directly tied to the question of whether calculation is a form of thinking. That is, whether human thinking is a form of calculation. Subversively, Wittgenstein claims not only that human thought is irreducible to computation, but that human calculation itself is a form of thinking that is entirely different from anything that could be labeled "mechanical". Wittgenstein's critique of the Turing Thesis paves the way for a new variety of Foucauldian Biopolitics aimed specifically at the discourse surrounding Artificial Intelligence. A discourse that bears a suspicious resemblance to Christian pastoralism.

Keywords
Ludwig Wittgenstein, Michel Foucault, bio-politics, artificial intelligence, machine learning, christianity, Alan Turing, calculation, computation, philosophy

Introduction

One of many fascinating questions that occupied Wittgenstein in his reflections on the foundations of mathematics is the question of whether a machine could think. More importantly, what does it mean at all to say that a machine — or a human being for that matter — thinks? The Wittgenstein-Turing debate presents a very important moment in history, which has left its own mark and exerted its own considerable influence on some of the important questions in contemporary research on AI. The following paper seeks to initiate an open-ended discussion into several epistemological and ontological questions concerning the nature of calculation, human thinking, Artificial Intelligence, the famous Turing Thesis, ethical normativity, rule-following, language-games and more. The central concern of the following reflection is to attempt to offer an alternative view of both the social and mathematical foundations of algorithms as they pertain to the dominant paradigm of machine learning. The discussion will offer a philosophical and historical overview of the major developments in the area, while trying to develop the less popular, Wittgensteinian interpretation of AI philosophy. In order to properly unearth the alternative Wittgensteinian picture, we will draw on Michel Foucault's critical archaeological method of biopolitical critique. The paper will be brought to a finish with an experimental tangent activating a Deleuzian line of flight with the aim to draw a novel parallel between the Wittgensteinian account of calculation and Deleuzian *abstract machines*. Suggesting additional pathways of research and conceptual development.

Methods

The current methodology relies on textual analysis and hermeneutic interpretations of primary and secondary sources. A Foucauldian and Wittgensteinian approach with elements of historical and genealogical studies was combined with a close reading of Wittgenstein's work on the nature of calculation, the foundations of mathematics and various reflections on language, logic and *forms of life* (Lebensform). The Foucauldian and Wittgensteinian perspectives were used to interrogate the main text used for the current study: Stuart Shanker's (2002) *Wittgenstein's Remarks on the Foundations of AI*. Foucauldian discourse analysis was used to examine the history of AI research in a critical vein. The combined methodology offers a new ontological picture of human agency and mathematical calculation, one that tends to contest the conventional picture in the philosophy of mind offered by Turing.

Results

The results of the study have shown that an alternative epistemology of mathematics can offer a new and insightful way of conceptualizing human agency, understanding various findings in the research on Artificial Intelligence, and the mutual overlap between the two. Highlighting further the political and the biopolitical dangers of ignoring these conclusions and their implications.

Discussion

"Is it possible for a machine to think?" Asks Wittgenstein (Shanker, 2002) in the *Blue Book* (Wittgenstein, 1958) adding the qualification that the laws for the operation of such a machine could be formulated in either the propositions of physics or biology. He emphasizes further, that the nature of the question is fundamentally different from the typical interpretation of the question i.e., 'is it possible for a machine to think *yet*?' As in, this is not an issue of computational power, the current state and sophistication of scientific discourse or technological progress. The question is rather posed as a self-questioning of the discourse on A.I. in general.

In other words, does it *make sense*, at all, to ask whether a machine could think? Are we not getting entangled in a linguistic confusion? Is it possible we are being held captive by a picture (Wittgenstein, 2021; 2010), which instead of asking a real, meaningful question — dazzles our intelligence and results only in the bewitchment of our thoughts? Are we perhaps making a category mistake? The question is therefore a meta-question that serves as a somewhat minimalist, yet all the more effective strategy for subverting the very foundations of Turing's thesis, or at least its unwarranted application to all human creativity. *"And the trouble which is expressed in this question," he continues, "is not really that we don't yet know a machine which could do the job. The question is not analogous to that which someone might have asked a hundred years ago: 'Can a machine liquefy a gas?' The trouble is rather that the sentence, 'A machine thinks (perceives, wishes)' seems somehow nonsensical. It is as though we had asked 'Has the number 3 a colour?'"* Wittgenstein was directly opposed to what Stuart Shanker (2002) refers to as the *Mechanist Thesis*, since, as the above question should have shown, the question concerning the very ontological status of Artificial Intelligence tends to transgress the rules of the *grammar of our language* (Ghosh, 2004).

It is often the case that two great minds tend to talk past each other, this might also hold true for the Turing-Wittgenstein debate as it did with many others. Turing in a way refused to agree, or maybe even acknowledge, that there was a category mistake being made. We *infer* that humans can think — he may have said — just like we *infer* that machines can think. But it seems we do not have an empirical method of verification for the existence or non-existence of thought; the only evidence for thinking is outward behaviour. The question, according to Turing, remains indeed empirical in nature for machines and humans alike. But what sort

Figure 1. Ludwig Wittgenstein

of empiricism does this entail? Wittgenstein refused to give credence to what Shanker terms *Turing's "bridging argument"* (Shanker, 2002), which aims to integrate questions of mathematical logic with certain problems that belong exclusively to the domain of philosophy; the philosophy of mind. Shanker offers a reading of Turing's famous *On Computable Numbers* (Turing, 1936) and an interpretation of Turing Machines. It is the CN paper, where Turing makes a move that takes him from issues concerning mathematics to problems that form part of philosophical epistemology. And this is precisely where Wittgenstein is waiting for him on high-alert. According to Wittgenstein, by attempting to bridge the gap between philosophy and mathematics, Turing has entangled himself in certain philosophical confusions that do little justice to either the proper philosophical questions concerning the nature of the mind, nor the questions that pertain to the foundations of mathematics. This offers a first glimpse at the sophistication of Wittgenstein's thought on these issues. Wittgenstein contends, in a way, that by transgressing the proper bounds of mathematical logic, Turing has in fact created unnecessary misunderstandings for the *mathematical* content in On *Computable Numbers*, and not just the philosophy.

Turing compares human calculation to machine calculation. According to Turing, the pre-conscious processes that underlie human calculations, the smallest constituents of thinking, can be described completely i.e., they are mechanical. Shanker cites the following passage: *"We may compare a man in the process of computing a real number to a machine which is only capable of a finite number of conditions q1, q2, …, qR, which will be called 'm-configurations'. The machine is supplied with a 'tape' …running through it, and divided into sections…each capable of bearing a 'symbol'. At any moment there is just one square, say the r-th, bearing the symbol G(r) which is 'in the machine'. We may call this square the 'scanned symbol'. The 'scanned symbol' is the only one of which the machine is, so to speak, 'directly aware'." (Shanker, 2002).* Shanker wants to bring our attention to two expressions in the passage; the statements: *"so to speak"* and *"directly aware"* are revealing here, he argues, of certain philosophical (not mathematical) presuppositions that may be unjustified. The attempt of reducing recursive functions to binary systems would offer the possibility of constructing a machine that could execute the given commands. This is what Turing extracts from Church's Thesis i.e., that any recursive function can be transformed into a computable function. In other words: *all algorithms can be translated into binary systems.* This poses two challenges for the advocates of the computational theory of the mind: First, it must be shown that recursive systems are in fact computational systems and second, that human actions are *both* recursive and computational.

Turing wants to extend the computational model to human calculation and herein lies the rhetorical manoeuvre expertly caught by Wittgenstein. By seeking to expand the Mechanist Thesis and failing or refusing to make the distinction between human *thinking* and human *calculation*, Turing (or those who speak on his behalf) unjustifiably reduce(s) all human activity to crunching numbers. It is here that Wittgenstein's objection acquires significant traction: Turing machines, Wittgenstein says, *"are really humans who calculate."* This statement, I want to argue, is a masterful Foucauldian reversal, which targets the most fundamental and abstract questions concerning the philosophical and mathematical foundations of Artificial Intelligence. Instead of affirming together with Turing, that *humans are just machines who calculate*, Wittgenstein dismantles the Mechanist Thesis by arguing that machines are humans who (only) calculate, that is, *without thinking*. Another level of complexity is introduced however, when we look at Wittgenstein's analysis of the nature of calculation in his *Remarks on the Foundations of Mathematics* (Wittgenstein, 1983).

Shanker cites the RFM: *"Does a calculating machine calculate?"* — asks Wittgenstein. Calculation is not a technique that belongs exclusively to the domain of mathematics. It is embedded in our everyday lives. Without the multiple applications to a diversity of different contexts (outside of mathematics), the statement '25 x 20 = 500' would be meaningless on its own. Or at least, it would not carry the air of certainty that we normally associate with it. An innocent truism at face value, Wittgenstein employs his observation concerning the social aspect of mathematical calculation to question Turing's central thesis: *"the idea that recursive functions are mechanically calculable"* (Shanker, 2002). It is especially here, that we can notice another fascinating convergence between Foucault and Wittgenstein. According to Wittgenstein, calculation is a *normative social practice.* By dismantling the notion of mathematical calculation, it seems that Wittgenstein has performed no less than a Genealogical uncovering for the *savoir* of Machine Learning; the series of cultural norms and practices that underlie and support the *connaissance* (the surface effect) of algorithms and certain parts if not the entirety of mathematical disciplines. Not to mention the fact, that for the last 60 to 70 years or so, basic linear algebra has been re-branded and marketed as human (artificial) intelligence.

The *normativity of mathematical discourse* is what we could term the central point of oscillation at the heart of both Wittgenstein's *Lectures on the Foundations of Mathematics* (Wittgenstein, 1989) and the *Remarks on the Foundations of Mathematics* (Wittgenstein, 1983). From a Foucauldian point of view, it would not be entirely unjustified to label these works as *Archaeologies of Proofs.* Which in turn would serve as an important if not an essential component for a thorough Genealogy of A.I. systems.

Mathematicians work with definitions. There is a strict grammatical structure to mathematical proof. Proving a theorem implies multiple instances of assenting to, executing and/or following a rule. The rule is derived from the definition, from the *grammar* of the proposition. But how can we know that a rule is understood, as opposed to having been followed without comprehension? How can we tell the difference between intentional and accidental calculation? Would not the difference consist precisely in that which separates mechanical movement from sentience? *"…the fact that we can map a rule onto S's behaviour does not entail that S is following that rule"* writes Shanker (2002). Something else is needed. But this 'something else' cannot be anything other than observable behaviour. Hence Turing's cunning use of the phrases *"so to speak"* and *"directly aware,"* which are supposed to stand in or somehow denote *mental states.* What evidence could we have that could support (or falsify) the existence of such mythical entities as *mental events*? This carries a flavour of deduction, but it remains as obscure as any myth.

The existence of patterns and regularities is not a sufficient condition for us to infer that an *act* of calculation has been *performed*, let alone the existence of some Cartesian 'mental states' that accompany the production of symbols. There is no way for us to tell whether the pattern emerged out of a willed intention or a mere accident. But the distinction is crucial if we are to speak of intelligent sentience i.e., whether calculating machines *calculate. "…rule-following does not reduce to mere regularity… …the agent must do such things as instruct, explain, correct, or justify his or her actions by appealing to the rule"* (Shanker, 2002). These practices are however embedded in a lifeworld (Eden, 2004) and they bear the irreducible complexity of a *Lebensform* (Hanfling, 2003). The *savoir of mathematical knowledge,* unlike mathematical knowledge itself, cannot be quantified; it falls outside of the computational model. Turing's Machines cannot be trained in the meaningful sense, even though they can provide the correct answer to a calculation problem, they are unable to provide justifications for their actions nor introduce true novelty into a system. It takes another human being to *describe the causal nexus*[1] of mechanical interactions that produces the needed results. Furthermore, unlike a child, the machine cannot later take up the job of explaining herself either. Whether the action is explained or justified, it takes a human being to account for the calculation once it has been performed (either correctly or incorrectly).

Wittgenstein's aim was to keep mathematical logic within its proper bounds without letting it overstep and enter the domain of philosophy. This is far from a merely academic concern; the problem is entangled with serious ethical and political issues. Many other prominent figures in the history of mathematics have underlined the fact that the Church-Turing thesis is at least in part an epistemological problem. Wittgenstein's insight here is that Alonzo Church has provided a brilliant and elegant *definition* for recursive computability, however it remains, as all definitions, tautological and syntactical. There is no empirical evidence either in favour or against the formulation, it is a rule, which in the inductive-mathematical sense remains unfalsifiable (Popper, 2002), we cannot imagine a state of affairs that would disprove it. Turing's contribution to Church's Thesis is that effectively computable systems are *Turing Machine Computable* i.e., "a machine could do it," a real physical machine. However, that in no way entails that machines have any human-like cognitive capacities. And in this sense, the CT thesis cannot be used as an argument in favour of A. I. Turing's contention is in a way, paradoxically, the direct opposite; if something is 'machine calculable' this implies precisely the fact that it does *not* require any human intelligence to perform the operation. Does this mean that machines are indeed stupid? Is calculation a *mindless* activity? Not quite.

Though Turing did argue that the elementary instructions, the atomic operations are mechanical and 'dumb', the complexity, which emerges out of the initial inputs begins to form certain blind spots, which today we refer to as black boxes, these in turn introduce an element of uncertainty between the command and the desired output. What happens in-between is allegedly similar to cognitive creativity, which *can* be rendered somewhat analogous to human intelligence. Shanker (2002) notes the transition between 1936, when Turing's interest in machine intelligence was confined exclusively to the domain of mathematics, and 1946, when Turing became interested in a vast set of *"non-numerical problems"* that inevitably brought his research into contact with the military-industrial complex. It wasn't until 1950 that the fully-formed mechanist thesis was introduced in *Computing Machinery and Intelligence.* Turing's project had thereby traversed an immense trajectory from mathematical formulations of recursion theory, to computer science and the final epistemological leap to Artificial Intelligence.

Gödel's critique of the mechanist thesis runs parallel to Wittgenstein's objection. According to Gödel, Turing has offered a brilliant reformulation of formal systems as computable structures. Any formal system is Turing-Computable. However, this would only imply that the *Incompleteness Theorem,* the idea that any formal system contains at least one proposition, which is unprovable within the system, would now apply to both formal systems as well as recursive-computational systems i.e., software programs. Once again, we can notice something along the lines of an 'Archaeology of Proofs', where the surface effect of effective procedure (its sharp conceptual formulation) tends to hide and disguise its underlying *savoir*, the flawed and contingent quasi-structures of human practice, culture and life, not to mention the institutional and political-economic matrix of power-relations that sustains the algorithmic *connaissance*. The fundamental question for machine intelligence is therefore, *not* whether the machine can calculate well or whether it can solve well-articulated problems better than a human, but whether it can participate in non-formalizable, embodied and spontaneous human practices that constitute the savoir of our life. Furthermore, Wittgenstein's ideas concerning human calculation create new problems that pertain to the question of where one would place calculation itself, with respect to the savoir/connaissance division? As it turns out, even calculation has its own inherent vagueness when we think about it as being embedded in a way of life. If calculation is a normative practice, can we even think of machines as capable of calculation, let alone the ability to reproduce other varieties of human creativity?

The supporters of the mechanist thesis respond by saying that the Incompleteness Theorem can be interpreted not as a limitation, but as a paradox which could serve to strengthen the computational theory. Gödel has shown that thinking is at least (or at best) a *quasi*-computational process. The fact that thinking is algorithmically open only removes the need for perfect algorithms. But we are still then faced with the Wittgensteinian problem of whether we can tell if an outcome (either desired or undesired) is a result of intentional action or a mere accident. Non-sentience can take many forms, it can be both productive and unproductive, predictable or random, correct or incorrect — in either case we have the popular account, which posits intelligence for whatever the outcome. How are we to know that we are not investing algorithms with an agency they do not really possess in either case? Is it all just a matter of faith in the end? If we just keep shoving "intelligence" wherever we encounter either a black box or a transparent algorithmic computation, how are we to say that the current discourse on A.I. is any different than the religious rhetoric that speaks of God as either the mysterious unfathomable (i.e. a Black Box) or intelligent design (i.e. the rational clock-work Universe)?

The Incompleteness Theorem, perhaps far from a limitation, could have opened-up the possibility for higher-order problem solving capabilities for artificial systems. Such higher-order skills are termed "*heuristic problem-solving*" (Shanker, 2002); they entail the capacity for algorithms to train themselves. A.I. experts define 'learning' as any kind of modification in the system that results in a lasting change in the system's ability to adapt to its surroundings.

According to Wittgenstein, any question of learning must fundamentally concern itself with the notion of *following a rule.* Analogously, Turing had introduced the concept of *mechanical rule-following* for machines. Algorithmic thinking is the dominant paradigm in our age, we are located, so to speak, within an *algorithmic epistemic formation.* Recursive systems are not just programs or useful instruments for crunching numbers, they are considered to be a very convenient way to make sense of things, a way to think about the world in general. An algorithm can be conceived as a collection of rules or commands needed to arrive from a given set of initial conditions to some desired result. Algorithms are essentially functions, and just like functions they can exhibit various degrees of opacity, but only due to the inherent limitations in human ability to follow and remember every single step of the mapping operation. Fundamentally, algorithms are simple i.e., mechanically computable, but at higher levels of complexity, just like complex life-forms, they begin to acquire emergent properties that are irreducible to the simple set of instructions that served as their starting point. There is an exponential increase in the "size" of the Black Box. The transition from simple to complex algorithms is marked by the ability of the program to rewrite its own "initial" set of commands, to reformulate the rules governing its own behaviour (Romanycia, & Pelletier, 1985). In a Foucauldian sense, the program would be able to subject itself to its own technology, to *apply itself to itself* the way we do; to become and 'unbecome' a subject; to *subjectify* (Heller, 1996), *desubjectify* (Mcloughlin, 2021) and *re-subjectify* its own self. Does this imply that the semi-open Turing-Machine can "reach beneath itself," the way humans do? Can it read a book by Sartre and suddenly decide to take on new projects? Could it experience an existential crisis and overheat? Would it be able to partake in our way of life? Could it *dwell* in the cultural *savoir* of human relationships?

Shanker (2002) notes that the self-modifying, higher functioning A.I. is in fact *post-computational.* But there is a sense in which for Wittgenstein, even basic algorithms may exhibit a level of complexity that exceeds 'mechanical rule-following'. Wittgenstein had a bone to pick with the idea that one could 'thoughtlessly' follow a series of 'meaningless sub-rules' like a machine scanning symbols on a piece of tape, or at least that such behaviour would constitute a cognitive phenomenon. "*There is an important distinction" Shanker writes, "between describing a subject as following the sub-rules of an algorithm, and describing a subject as grasping the algorithm itself*" (2002). We can follow a rule without understanding the rule itself. The mastery of a rule implies more than the ability to apply the rule. It involves one's ability to give reasons for the application, as well as the ability to re-adjust oneself vis-à-vis the rule. Learning how to act under a series of circumstances (no matter how many), does not yet imply that one has mastered the game as a whole. Similarly, learning how to execute a single (or several) atomic rule(s) does not mean, that the machine has 'learned an algorithm'. Moreover: "*The simplicity versus complexity of a rule has no bearing on the normativity of rule-following*" (Shanker, 2002), because the sub-rules can each be considered as a rule in itself and therefore, understanding an atomic rule implies the same *cognitive-affective attunement* as following any of the higher-order rules.

This culminates in the paradox of one having to deal with a *meaningless rule*. What would such a rule be like? A rule is a meaningful set of instructions, what else could it be? How can one speak of a meaningless rule without slipping into unavoidable contradictions? Once again, we are forced to ask, as we did with Hubert Dreyfus; *"how such a radical thesis could have been so readily and uncritically accepted"* (Shanker, 2002).

It is no doubt fascinating that despite having been engaged in acts of calculation for more than 2000 years, it was not until 1936 that humans have (allegedly) arrived at a satisfactory *definition* of computation. To reiterate, Turing attempted to reduce calculation (a rich, vast, normative and culturally value-laden process, as argued by Wittgenstein) to *mechanical* calculation. By doing so he has in a way invented a whole new category of ontologically very questionable "rules" of conduct. Shanker formulates this ontological ambiguity by arguing that Turing has in effect abolished the difference between *"following a rule mechanically and following a 'mechanical rule'."* We could paraphrase this by saying that Turing performed an epistemic leap by collapsing the idea of *a very simple rule*, or a rule that is *very easy* to understand, interpret and follow, to *a rule that requires no interpretation* and such that can be followed "mechanically." But does this make any sense at all? Is there such a thing as a "neutral rule?" I argue that Turing's ideas concerning mechanical rule-following, mind states and machines, are in fact *theological concepts, having* no real empirical or analytical backing.

With Wittgenstein, we saw that calculation, even (or perhaps especially) the simplest instance of computational activities, is a normative practice. Turing is in one way or another aiming to remove precisely this normative (according to Wittgenstein — irreducible) human element, in order to formulate the computational theory of mind and eventually, a computational theory of human action. There seems to be an implicit dehumanization of calculative activities in Turing's program. In the event that rendering calculation into an automated and neutral action governed by "meaningless rules," proves epistemically untenable, then we should begin to look for alternative reasons and motivations for why the discourse on Artificial Intelligence has proven so popular. Intuitively however, we could already anticipate where this line of reasoning will take us: It is quite possible, if not very likely, that far from an epistemically "meaningless" and "neutral" technical process that computation was portrayed to be, algorithmic technologies may in fact turn out to be, much like Christian techniques of subjugation and control, *nothing more*(!) than political technologies for warfare and internal state governance.

Turing's formulation of computability can therefore be seen as the "Biblical Canon" of Artificial Intelligence research. By attempting to nullify the meaning of a rule, a sub-rule or an action, Turing attempted to create a new mode of spiritual ascension, whereby a certain activity would become purely syntactical; a form without content. An impossible *Aufhebung* (Burbidge, 2020). *"…no matter how simple a rule might be, this does not serve to remove its 'semantic content,'"* (Shanker, 2002). We cannot exclude the fact, that Turing's Neo-Platonic delusion, may result in very dire consequences for the human race. These have already been formulated in various ways under the more or less common, overarching general phrase: *"the disappearance of the human"* (Foucault, 2005), (Han-Pile, 2010). Another important component therefore, of the theological unconscious of the current science-drive age, is a eugenicist if not an altogether genocidal and fascist epistemological anti-humanism. "The system is not the problem, the code is not the problem, the robot is not the problem etc. — it's the *underlying human element*," says the computational regime. It is the human which is "flawed" and requires excommunication: An exorcism. What we encounter here again, is nothing more and nothing less than the Encratism; the self-renunciation, the abolition and destruction of the self, found in Christian technologies of self-conduct. The *spectralization* of subjectivity (Stypinska, 2024). The self is the source of evil, the source of glitches, errors, misapplication and so forth. By removing the self and handing oneself over to the (pastoral) algorithm, we should let "A.I. take the wheel" and carry us forward into the Artificial Kingdom of pure, transparent computation. It sounds all too familiar.

Oversimplifying things a bit, we could argue that there are two kinds of statements in the world: *Descriptive* and *Prescriptive*. The order of normative rules susceptible to interpretation belongs to the latter, whereas the order of causes and effects belongs to the former. In the first case it makes no sense to speak of 'errors' or 'blunders,' as long as we describe the causal chain more or less accurately it remains what it is, just a series of events that follow one another. In the second case, when we are, for example, taught *how to describe* things, we have a whole plethora of institutional practices and techniques for training and education whereby one is taught to execute an action in a manner that is more or less accurate, more or less requiring correction and alignment. This is deeply intertwined with discipline and the strictness of instruction[2] but we can never speak here of someone having finally reached the ultimate point where their action *is* mechanical. The prescriptive paradigm is a very loose system of human activity, which requires interpretation, elucidation, justification and performance. This is not a shortcoming of this mode of discourse, it is simply its own characteristic domain. Turing's "computational alchemy" creates the illusion that human action, thought and creative activity (the prescriptive modality) can be reduced to a series of (in principle) observable cause-and-effect relations (the descriptive modality). In his attempt to bridge the gap between mathematical logic and the philosophy of mind, Turing has in effect compromised the integrity of both disciplines.

The theological unconscious is then a *machinic unconscious,* but not in the sense that Deleuze and Guattari give it (Guattari, 2010), quite the opposite — a rigid, docile and uncreative machinic unconscious. The Theologico-Machinic unconscious is therefore what shapes the *positive unconscious* (Vighi & Feldner, 2007) of our episteme; the *savoir* of Artificial Intelligence. Wittgenstein's work on the foundations of mathematics and the epistemology of calculation provides us with all means necessary to reveal, through an *archaeology of proofs*, the *genealogy of self-improvement technologies;* the collection of social practices that operate as the hidden cultural and political force that sustains the on-going research and popularity of technological developments in A. I. The underlying "trick" therefore, disguised both meticulously and spontaneously by Turing as well as those anonymous structures of power that benefit from this rhetorical maneuver, lies *in the substitution of a mechanical process for a normative one*. The political agenda here is becoming increasingly clear: To replace normative human behaviour with mechanical devices. Why? Because humans have the capacity to question their actions and their inevitable ethical implications. Machines on the other hand only serve to create distance and responsibility gaps that benefit those humans who either fail, refuse to acknowledge and/or directly benefit from the machine's inability to follow a rule in the strictly correct (creative) sense of the word.

Let us return to the question: what separates *"mechanically following a rule"* from *"following a 'mechanical rule'?"* Shanker (2002) notes that Wittgenstein did not exclude the possibility that an agent could follow a rule "mechanically", that is, without conscious awareness; without *reflection*. But not without *thinking*. The analogy is nonetheless misleading, if not dangerous. We can compare our actions to the working of a mechanical device when we perform an action without paying much explicit attention to it, like certain things we do every day (brushing our teeth, driving a car, putting our glasses on etc.), but we cannot *identify* our behaviour with a machine. Anything that is actually and exclusively causal/automatic is categorically different from human thinking. As discussed before, these are two separate modalities of actions and events, which only apparently seem to converge, but they never become identical. Hence the contradiction: "Can a machine think?"

Nonetheless cognitivism[3] maintains that *"we can learn how the mind works by mapping verbal protocols — transcripts of everything a subject says while solving some problem — onto* *a very different kind of formal model: viz., a computer program*" (Shanker, 2002). Cognitivism is one of several sub-branches of what is generally understood as *psychologism* in traditional philosophy. It was thought for some time, especially before the advent of Artificial Intelligence, that psychologism was largely overthrown by both phenomenology (Husserl) and logicism (Frege), however it seems we have come full circle with a new revival of psychologism through cognitive science and AI (Zahavi, 1994; Frege, 1960). *Computational Psychologism*. An interesting detail emerges where computation is conceived not as a logical process, but nonetheless as an algorithmic effective procedure. An algorithm is fundamentally empirical, which explains the predominance of black-boxes in digital systems. This is not the case with logic, logic only reveals what is already stated explicitly. However, if logic is given a psychologistic interpretation, where the logician as a subject is taken into consideration, then the black-box returns as a series of gaps, lapses, mistakes or simply opaque unconscious processes that emerge in-between deductive operations. With logic, unlike algorithms, nothing is hidden.[4] It seems therefore, that computational models can approximate the workings of ordinary language much better than formal-deductive models. And in fact, logic strictly speaking, wants nothing to do with everyday language. We have therefore, competing accounts of calculation, where Wittgenstein's version belongs neither to the first nor the second.

Let us go out on a limb, take a line of flight and posit an extravagant hypothesis: Is it possible that the later Wittgenstein, in his formulation of an *Anti-Turing-Computable* account of calculation, has in fact offered us something along the lines of a Deleuzian machinic ontology of rhizomatic, algorithmic networks? What if the universe is in fact "Deleuze-Computable?" And what would that entail?

Conclusion

The flat ontology offered by Deleuze (DeLanda, 2013) is very similar to Wittgenstein's conception of language-games. Every kind of statement and discursive act is located on the same ontological plane as any other. No one kind of entity has a metaphysical precedence over another. Everything is a machine; a machine that is nonetheless very different from a Turing machine or a symbolic engine. Unlike Turing machines, Deleuzian machines operate through *irreducibilities* and *irreductions*. They are not governed by mystical "mind-states" nor can they be accounted for through simple 1–0 binaries. A curiously post-structuralist stance offered by Wittgenstein's rejection of a private language resonates here quite strongly: "*Everything is out on the open, nothing is hidden*" i.e. there is no depth. Most interestingly, the Deleuzian world, including the human mind, is not "*like* a machine," it is very literally and quite directly, an interconnected network of machines. Can we therefore speak of a complex world of overlapping *Machinic Language-Games? Rhizomatic Families of Robots? Algorithmic Plateaus of Immanence?* More importantly, could a Deleuzian reading of Wittgenstein, offer us a new, more effective epistemology for understanding Machine-Learning Systems, Autonomous Systems and Cybernetic Capitalism in general?

Apart from an exceptional minority of scholars, the general academic consensus is that Turing was a mechanical reductionist, while Wittgenstein was directly opposed to most if not all forms of empirical "reductionisms". Deleuze holds a similar position in formulating his machinic ontology. But unlike Deleuze, Wittgenstein was directly engaged with and even lectured the young Turing. The fact that Wittgenstein had read Turing's seminal *On Computable Numbers*, is a historical fact, evidenced also by his writing in the *Blue and Brown Books* and the *Philosophical Investigations*. Whether we can indeed combine Wittgenstein's insights on the foundation of mathematics with a Deleuzian philosophy of abstract machines will unfortunately have to be addressed at another time. What matters for the moment, is the possibility of an alternative lifestyle and a different practice of mathematical calculation that could open new vistas for addressing the contemporary problems concerning human nature and machinic intelligence.

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