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Parisi, Luciana. 2019. Media Ontology and Transcendental Instrumentality. *Theory, Culture & Society*, 36(6), pp. 95-124. ISSN 0263-2764 [Article]

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## Media Ontology and Transcendental Instrumentality.

Journal:	<i>Theory Culture &amp; Society</i>
Manuscript ID	16-219-POST.R2
Manuscript Type:	TCS - Standard Article
Key Words:	media ontology, techne, instrumentality, machine philosophy, computational logic, information theory, machine learning art
Abstract:	<p>This article takes inspiration from Kittler's claim that philosophy has neglected the means used for its production. Kittler's argument for an ontology of media invites us to reflect upon the cybernetic mechanization of logic, which has led practical or instrumental knowledge to challenge the classical division between theory and practice, ideas and demonstrations. This article suggests that procedures, tasks, and functions are part of an instrumental thinking. By drawing on information theory and the mathematical logic of constructivism, the article addresses indeterminacy within automated logic and proposes a re-habilitation of instrumentality whereby the connection between means and ends is articulated away from classical idealism and analytic realism. By following John Dewey's argument for instrumental reasoning, the article suggests that post-Kantian critique of techne shall be revisited in order to account for a machine philosophy, which has originated from within the practical thinking of machines.</p>

## **Media Ontology and Transcendental Instrumentality.**

### Abstract

This article takes inspiration from Kittler's claim that philosophy has neglected the means used for its production. Kittler's argument for media ontology will be compared to the post-Kantian project of re-inventing philosophy through the medium of thought (in particular Deleuze's *Spiritual Automaton*). The article discusses these views in the context of the automation of logical thinking where procedures, tasks, and functions are part of the instrumental processing of new ends evolving a new mode of reasoning. In particular, the article suggests that in constructivist logic and information theory, the temporal gap between truth and proof, between input and output, can be taken to argue that the means of thought expose the indetermination or the incomputability of proof. The automation of reasoning in logical processing coincides not with mindless correlations of data, replacing axioms with data, truths with self-validating proofs. Instead, the problem of the indeterminacy of proof within automated logic re-habilitates *techne* or instrumentality, and the relation between means and ends away from classical idealism and analytic realism. By following John Dewey's argument for instrumentality, it will be argued that the task of thinking today needs to re-invent a logic of *techne* away from the teleological view of ends or the crisis of finality. If the post-Kantian preoccupations about the task of thinking already announced that the medium of thought could offer possibilities for a non-human philosophy (or a philosophy beyond truth), this article envisions a machine philosophy originating from within computational media.

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3 Key words: instrumentality; media ontology; machine philosophy; computational  
4 logic, information theory.  
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### 6 7 **Media Ontology and Transcendental Instrumentality.** 8

9 In “Towards an Ontology of Media”, Friedrich Kittler argues that philosophy has  
10 neglected the very medium through which theoretical reasoning has been transmitted  
11 (2009). With the modern overlapping of mathematics and media, media can no longer  
12 be subsumed to the ontology of human thinking. Instead media are to be understood  
13 according to the ontology of machines and the premises of technical knowledge.  
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15 Kittler’s argument for an “ontology of media” suggests that the historicisation (or the  
16 concretization) of human practices in machines also marks the end of metaphysics:  
17 human thinking is surpassed by a technohistory, a material technobeing. In particular,  
18 Kittler points out that Heidegger’s warning about the dawn of our computer age is  
19 amongst the few philosophical reflections about the configuration of technobeing in  
20 history (Heidegger 1969). And yet the implications of this warning, according to  
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22 Kittler, have yet to be fully addressed.  
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35 Kittler’s vision of media as a being of techne however is to be discussed in the  
36 context of the post-Kantian project of critique of philosophy. If techne takes away  
37 from philosophy its ultimate qualities of preserving truths and making decision by  
38 reasoning, as Martin Heidegger recognised, it is because the new medium of thought,  
39 defined by information sciences, turned thinking into rule-based efficiency (1963). In  
40  
41 “The End of Philosophy and the Task of Thinking”, Heidegger argued that the  
42 cybernetic medium of thought posed a new challenge to philosophy. His  
43 preoccupation for cybernetic thinking at once defined the end of deductive truths and  
44 the possibility of a new task of thinking.  
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54 While Kittler furthers Heidegger’s invitation to envision media ontology, his question  
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3 for the task of thinking has been central to the post-Kantian discussion about the  
4 limits of philosophy, the deconstruction and re-invention of a thought of the medium  
5 in practical philosophy. For instance, Gilles Deleuze's materialist philosophy re-  
6 works the scope of philosophy in terms of a being of the sensible that emanates from  
7 a machine thinking beyond apprehension and conscious cognition (1989). Here media  
8 are neither objects nor beings, but are automata of thought affording the outside or the  
9 unthought a capacity to disarticulate cognitive rules in mediation.

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11 For Kittler, philosophy needs to be weaved with information technology to overcome  
12 human-centered ontology, resulting from the historical automation of Aristotelian  
13 logic in machines through the works of Turing, Shannon, von Neumann, and others  
14 (2006; 29). Kittler clarifies that this automation of logic already began with  
15 mathematical innovations, Greek alphanumeric representations, the Aristotelian split  
16 between physics and logic as well as logical and arithmetical models. Media are the  
17 visible expression of revolutions in mathematics and physics that shortened the  
18 distance between technology and humanity.

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20 While human thought becomes caught in the computer technology however,  
21 according to Kittler, the history of philosophy hardly recognised the reinvention of  
22 techne with informational intelligence. But Kittler's invective against the shortcoming  
23 of philosophy seems to overlook that both deconstructivism and neo-materialism  
24 already took media as a starting point to re-invent philosophy beyond truth and of  
25 proof. If for Derrida, the medium of writing haunted the logical order of thought, for  
26 Deleuze the medium of cinema extended the potentiation of the being of the sensible  
27 above consciousness and signification.

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29 While Kittler seems to be fully aware of the possibilities of a media ontology in the  
30 deconstructivist image of fragmented thinking, it however seems difficult to  
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3 determine how his views extend the post-Kantian critique of human thought, the  
4 articulations of an inhuman or machinic thinking beyond the question of being. One  
5 may want to ask, can media ontology or the recognition of a material history of  
6 media, offer an alternative horizon of thought that challenges the image of  
7 computational media as replacing truth with the effectiveness of results? How can the  
8 inhuman thinking of the medium reject the image of computational singularity,  
9 whereby the mindless automation will replace any need for thought? Can media  
10 ontology become transcendental from its own functional tasks?  
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14 To address these questions, this article more specifically brings together Kittler's  
15 efforts to theorise media in terms of their own instrumental materiality with post-  
16 Kantian views of turning the medium into the task of thinking the unthought. One  
17 way to bring together these almost opposite propositions is through the pragmatist  
18 account of instrumentality. Borrowing from John Dewey's view of experimental  
19 instrumentality, this article does not see the medium as the implementation of ideas  
20 into tool. The medium is a productive activity, a means with ends, or a doing imbued  
21 within an experimental logic, involving the indeterminacy of results leading to the  
22 reconstruction of aims or premises.  
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26 From this standpoint, modern techne is not here understood according to the critical  
27 theory of instrumentality. For instance, instrumentality in Horkheimer's critique of  
28 technology coincides with instrumental reason, namely with the paradoxical condition  
29 for which the Enlightenment trust in the rational use of nature has led to an irrational  
30 self-repression of human nature, obsessed by a competitive self-preservation mirrored  
31 in the indiscriminate dominion of commodity economy (1974, 97-105). The effort to  
32 re-habilitate instrumental reason beyond the paradox of criticizing critique requires  
33 that one suspends the impasse between the use of the rational capacity of explaining  
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3 the causes of economic domination and the argument that economic governance  
4 rationalises its aims for profit, through the efficient capacity of means to carry out  
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7 ends.

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9 This article instead proposes to recuperate from instrumentality an experimental logic  
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11 in theoretical and practical activities, whereby practice is not simply the doing of pre-  
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13 existing ideas, but more importantly becomes the means for knowing this and that  
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15 from knowing how things work. Similarly to Heidegger's quest for the task of  
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17 thinking, as moving beyond the simple revelation of truth, and together with the post-  
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19 Kantian theorisation of the medium of thinking as anti-telos, this article suggests that  
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21 computational media announce a new dawn for instrumentality: not only the  
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23 evaporation of telos in the practical being of media, but also the origination of a  
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25 techno-philosophy through the inhuman logic of machines.  
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29 If post-Kantian articulations of posthuman thought had already re-habilitated  
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31 instrumentality as demarcating the end of telos, the transformation of computational  
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33 logic in machines can further offer us new possibilities for re-articulating what it is to  
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35 think, what have reasoning and knowledge become in and through this medium.  
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37 Instead of declaring the end of reason, truth, and axiomatics in the age of data-  
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39 centered epistemologies, this article argues for a renewed engagement with a  
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41 transcendental instrumentality that is of a possibility of machines to think beyond  
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43 what they do.  
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46 It could be argued that one way to account for this mode of transcendental  
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48 instrumentality is already at work in recent investigations about what machines see  
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50 and how do they interpret the world. For instance, the work presented at the  
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52 exhibition *I am here to Learn, On Machinic Interpretation of the World* (The  
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54 Frankfurter Kunstverein, 2018), pays particular attention to how automated decision  
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3 making includes the transcendental becoming of the instrument. Shinseungback  
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5 Kimyonghun's work for instance brings forward this indeterminacy in automate  
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7 decision as when algorithms start seeing flowers patterns that do not correspond to the  
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9 image of a flower as we know it (<http://ssbkyh.com/works/flower/>). Drawing from  
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11 similar artworks that reflect upon this crucial aspect of machine learning, this article  
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13 suggests that what appears as a form of misrecognition, error, and doubt, is instead  
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15 part and parcel of automated reasoning, which is here understood in terms of  
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17 transcendental instrumentality. This article will draw on some of these instances of  
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19 machine visions as practical attempts at exploring transcendental instrumentality and  
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21 discuss how machine learn to interpret and understand, and thus think the world.

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24 The post-Kantian discussion of posthuman thought in the age of computation is  
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26 already a way to re-direct the critique of informational media away from the view of  
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28 the eclipse of reason, which also rejects the dominant image of big data as  
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30 determining the absence of meaning in the practical knowledge of machines. To re-  
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32 direct our critique of technology today requires that the task of thinking with and  
33  
34 through machines is re-invented. From this standpoint, the transformation of logic in  
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36 machine thinking importantly shows us the temporal indeterminacy between truth and  
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38 proof, which can be taken to re-define the instrumental relation between means and  
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40 ends. The question of what has the task of thinking become with and through the  
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42 computational automation of thought coincides not with the triumph of means over  
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44 ends, but with instrumentality affording the medium of thought its own mode of  
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46 reasoning and de-naturalisation of knowledge in human culture.

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49 If we take for instance artist Fito Segregra's installation *The Treachery of*  
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51 *[Soft]Images* (2016), it is possible to track how machine interpretations of objects  
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53 (from a pipe to a broom, a sponge and a jar) do not just reproduce the corresponding  
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3 category of the object, but become instances of a new conceptual reality  
4 (<http://fii.to/pages/the-treachery-of-soft-images.html>). Similarly, Shinseungback  
5 Kimyonghun's installation *Cat or Human* (2013), uses cat facial detection algorithms  
6 to recognise human's faces and human faces facial detection algorithms to recognise  
7 cat's faces ([http://ssbkyh.com/works/cat\\_human/](http://ssbkyh.com/works/cat_human/)). As a result, these facial detection  
8 algorithms impart a de-naturalization of what we know of both human's and cat's  
9 facial features, by detecting humans traits in cats and the other way around. From this  
10 standpoint, these investigations into the computational medium of thought also point  
11 to the specific importance of fallibility in automated reasoning: namely the new data  
12 categories of objects are invented and do not correspond to the images of objects  
13 inputted in the system. But how to distinguish between what machines learn beyond  
14 their function of data aggregation and what instead remains simply a reproduction of  
15 the already known?

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31 Central to this discussion are three steps in the transformation of the deductive model  
32 of knowledge shifting from truths to proofs, from theoretical reason to the practical  
33 procedure – or instrumentality – of machine thinking. First, it discusses the  
34 implementation of mathematical postulates in the Turing Machine as the point at  
35 which the limits of Hilbert's meta-mathematical project challenged the infallibility of  
36 theoretical knowledge. It then draws on Brouwer's constructivism in logic (1913) to  
37 provide examples of how temporality in logical practices involves proof-validation  
38 and not self-consistent truths. Here proofs are not simply the result of an automated  
39 and mindless correlation of data, but this means of thought imply a form of actuation  
40 doubled by the indeterminacy or futurity in proof-validation.

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52 Similarly, Turing's famous halting-problem showed that it was impossible to know in  
53 advance whether and when a program will stop. This fallibility or incompleteness of  
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3 theoretical knowledge was set in action in computational machines. The  
4 demonstrative function of techne – as application of theoretical knowledge - is here  
5 catapulted by the realization that proofs cannot be derived from given truths. Another  
6 important step in this argument about instrumentality involves a discussion about how  
7 this temporal gap in logic was central to the development of algorithmic information  
8 theory (Chaitin 2005). Since computational logic is based on the probability of  
9 results, it involves the finding of proofs that may or may not validate the premises of  
10 the programme. Similarly to constructivism in logic, the question of information  
11 complexity in computation, that is to what extent it is possible to compress random  
12 strings of data into intelligible algorithms (i.e. probabilities), cannot be fully  
13 exhausted without accounting for the experimental (or future) validation of results. In  
14 complex information systems, not only incomputables cannot be compressed in  
15 smaller and finite sequences of algorithms, but they also expose dynamics in  
16 computational logic, where proofs preserve degrees of indeterminacy.

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33 The consequences of this method of truth-experimentation (or experimental  
34 axiomatics) are important to consider here: if the dawn of computation has meant the  
35 completion of philosophy in the efficiency of proof-making, the task of philosophy  
36 requires that thinking includes the machine practices of working through  
37 indeterminacy. In both computational logic and information complexity theory, this  
38 margin of indeterminacy is the incomputable of any system of truth and proof, of  
39 ideal and empirical methods of knowledge. Even if some practical solutions have  
40 been implemented in computing to skirt around the problem of the incomputable (for  
41 instance, the use of exceptions, a routine in a program and in an operating system on a  
42 standard computer), computational logic is set not to eliminate but to work through  
43 the problem of indeterminacy.

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3 With computation, therefore, the medium of thought has not simply replaced  
4 theoretical thinking with the operational efficacy of task findings. As argued later,  
5 computational logic and information processing show that the practice of searching  
6 for truth is rather an experimental logic involving a retro-active validation (confirm,  
7 discard, or revise) of truths.  
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11 By bringing together Kittler's proposition about a media ontology and the post-  
12 Kantian re-envisioning of the image of thought in Gilles Deleuze's notion of the  
13 "Spiritual Automaton", this article concludes that the medium of thought in the age of  
14 computation could be understood in terms of a transcendental instrumentality beyond  
15 the big data image of automated knowledge.  
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### 18 **Automated knowledge**

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20 As automated systems become increasingly intelligent and capable of making  
21 decisions, it is no longer possible to deny the profound threat that the age of machine  
22 thinking has unleashed on human culture. From the call to arms about the existential  
23 risk of human extinction to the global plans for full automation and transhuman  
24 singularity, the foundation of knowledge in the humanities, classically centered on the  
25 distinction between theoretical and practical reasoning, has become redundant to  
26 human culture itself. If the ontological in-distinction between human and machine  
27 thinking is animating debates about the danger that artificial intelligence will pose to  
28 human autonomy on the one hand (Bostrom 2014) and about how automation is  
29 accelerating the capitalisation of thought and life itself on the other (Terranova 2014),  
30 the very question of what counts as knowledge has to be revised. The automation of  
31 knowledge cannot be disentangled from the transformation of the humanities, and  
32 from how the task of thinking conforms to the efficiency of big data and algorithmic  
33 mining of over reality.  
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3 Automation today does not involve the industrial assembly of movements or the  
4 acceleration of networks that characterized the 20<sup>th</sup> century. It no longer embodies the  
5 mechanics of Newtonian physics based on a repetitive cycle of cause and effects  
6 (Longo 1999). Since its expansion in the decisional models of cognition, automation  
7 has entered the temporality of reasoning (that is, of the time between truths and  
8 proofs) and has unleashed a mode of knowledge production that is self-sustaining,  
9 continuously feeding from the deep sea of data. Algorithms talk to other algorithms  
10 (through set protocols and through learning) without communicating with us and draw  
11 conclusions by correlating data (images and texts, sounds and locations) across  
12 parallel and distributive networks. From High Frequency market trading to security  
13 data prediction, from military to commercial logistics, automation today seems to  
14 have debunked the dominance of theoretical knowledge and its axiomatic truths: what  
15 is known in theory is confronted by algorithmic processing interacting with the  
16 external world of data. In other words, automation no longer is the application of  
17 given truths but challenges the very fundament of the philosophical autonomy from  
18 instrumental knowledge.  
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38 In the *Republic*, Plato wrote of the Socratic distinction of craft knowledge from  
39 philosophical logos and argued that craft knowledge only concerns technical  
40 understanding that can be used to define the pursuit of a particular trade or practice  
41 (Grube and Reeve 1992, *Book VIII*). Craft knowledge must be instrumental to  
42 something. The water clock, the astronomical orrery, the mechanical puppet are all  
43 primordial automated devices that are used to demonstrate or describe something.  
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45 Craft therefore reflects practical understanding and is to be distinguished from  
46 philosophical knowledge, which is rational, of a mathematical order and requires no  
47 instruments. Whilst technique coincides with primitive automata, which are  
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3 thoughtless and mainly concern practical understanding, philosophical knowledge  
4 involves the cultivation of the principles of all things. It is ideal and timeless.  
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8 Fundamental to the humanities is this bifurcation between thinking and  
9 instrumentality, abstractions and applications. The origin of human knowledge is  
10 attached to the division between knowledge (theory) and knowing (practice), whereby  
11 the philosophical method is set to prove *how we know that we know* (i.e., how  
12 knowledge can be demonstrated). The pristine hierarchy of this model however was  
13 changed with the design of logical systems that demonstrate the mechanisms of  
14 thinking. Whilst for Plato, the a priori existence of a mathematical order of ideas  
15 would sustain the foundation of knowledge that could then be applied and  
16 demonstrated practically, the search for a logical system that could instantiate the  
17 mechanisms of knowledge was central to Gottfried Wilhelm Leibniz's *calculus*  
18 *ratiocinator*.  
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31 In the 17<sup>th</sup> century, Leibniz devised a model of knowledge in the form of a logical  
32 calculation framework based on theoretical premises. The calculus ratiocinator was  
33 designed to automatise the working of thinking and the production of knowledge. Its  
34 scope was to perform logical deductions within the framework set by what Leibniz  
35 called *characteristica universalis*, a universal language whose symbolic structure  
36 could automatically express the structure of concepts and their recombination. This  
37 mechanism of and for knowledge was intended not to simulate human cognitive  
38 capacities, but to establish, according to the deductive principle of sufficient reason,  
39 the universality of logical thinking.  
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51 Leibniz's attempt at a logical systematization of knowledge presented an image of  
52 thought in terms of mathematical rules implemented in machines, whose recombinant  
53 capacities could give expression to any possible knowledge. According to Giuseppe  
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3 Longo, this meta-mathematical model eventually led to the 19<sup>th</sup> Century Laplacian  
4 view of the mechanical universe (1999). But the implementation of human reasoning  
5 in machines led not only to the automation of logical thinking, but has also brought to  
6 the fore the question of the ontological autonomy of techne – or practical thinking -  
7 by and through information machines (Kittler 2006). As with Leibniz's vision for an  
8 automated mechanism that could embody a universal logic beyond all contingencies  
9 by evacuating temporality from meta-mathematical thinking, so the 20<sup>th</sup> Century  
10 invention of the Turing Machines separated the abstract machine and physical  
11 implementations. Here a serial numbers of steps was supposed to mirror how logic  
12 operated progressively from one preliminary condition that already contained the  
13 proof of its results (Longo 1999).

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26 With information machines however automation entered the history of media  
27 technology because, as Kittler argues, mathematics and media became reconfigured  
28 into one model of command, storage and transmission (2006). This conflation of  
29 media and automated models of reasoning crucially revealed that embedding logic  
30 into media made this logic different. With Kittler, one can argue that it is the very  
31 medium through which theoretical thinking operates that comes to gain a new  
32 meaning with the convergence of media, computational logic and information  
33 complexity.

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44 According to Kittler, this convergence defined techne as an original dimension of  
45 human culture. The technology incorporated in media systems is neither instrument  
46 for cultural expression nor extension of sensorimotor or cognitive functions. The  
47 being of techne instead is constituted by the practical knowledge embedded in the  
48 historical evolution of systems and the conjunction of media with cybernetics and  
49 computational logic. The historical formation of media ontology shows that  
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3 instrumental knowledge qualifies the information processing of the Turing Machine.  
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5 In particular, with silicon-based microchips and the incarnation of the Turing logic in  
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7 the Von Neuman architecture of computing, Kittler theorises the being of media as  
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9 involving not a dichotomy between matter and form, but more crucially a “new trinity  
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11 made up of commands, addresses, and data” (2006:30). With computer technology,  
12  
13 there emerges the realization that media are able to self-govern and are not simply  
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15 tools that are externally controlled.  
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18 This form of computational autonomy of the medium, according to Kittler (2006, 28),  
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20 brings back a central limit within the history of philosophy, namely its neglect  
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22 towards the medium it uses to think and to know. Kittler argues that only Heidegger  
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24 recognised the incumbent threat that cybernetics and the emergence of computers  
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26 posed to philosophy, and came to the realization that thinking had be transformed into  
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28 a task: the task of thinking.  
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31 Heidegger’s view of this modern form of instrumentality, corresponded to the  
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33 mechanization of the principle of reason in the technical process of calculation, or, in  
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35 other words *techne*,<sup>1</sup> involving both the computation of thought and the mathematical  
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37 abstraction of content, where information became divorced from meaning. Since  
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39 modernity, *techne* as rational instrumentality had taken over thinking, through the  
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41 logical reduction of reasoning to technical processing, ratio or calculation -  
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43 embedding man and machines in endless feedback loops bound to information  
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45 processing, storage and transmission (Kittler 29).  
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48 In the essay “The End of Philosophy and the Task of Thinking” (1969), Martin  
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50 Heidegger argued that since the late 1940s, the advance of cybernetics, a  
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52 technoscience of communication and control, demarcated the point at which  
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54 philosophy became verifiable by testing. As truths were finally subsumed to the  
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3 effectiveness of automated results, judgment itself was replaced by self-validating  
4 proofs. Thinking conformed to the manipulable arrangement of a scientific-  
5 technological world and its social order. For Heidegger, the completion of philosophy  
6 is also the possibility of overcoming the logic of deductive truth that precisely re-  
7 emerges in the matter or the means of philosophy itself that is through the medium of  
8 thought.

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11 Here the advance of cybernetics eventuates “the determination of man as an acting  
12 social being. Cybernetics is the theory of the steering of the possible planning and  
13 arrangement of human labor, transforming language into an exchange of news and the  
14 arts into regulated-regulating instruments of information.” (376). Philosophy is turned  
15 into a technoscience that intercommunicates with others, ultimately losing its  
16 metaphysical totality. Here techne overtakes the philosophical task of explaining the  
17 world and the place of “man in the world”.

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19  
20 Under this new condition of techno-erasure of metaphysical truth, Heidegger insists  
21 that the new task of thinking lies outside the distinction of the rational and the  
22 irrational, the decidable and the incomputable. The transformation of philosophy into  
23 cybernetic modularity can only give way to iterative patterns that blend logos into  
24 ratio and subsume truth to proof. Thinking however cannot be proven to exist because  
25 truth cannot be contained within techno-scientific epistemology. The automation of  
26 thinking can tell us nothing about truth, as the latter must remain outside what is  
27 already known. This is why in the age of meaningless communication, according to  
28 Heidegger, one must turn to the task of thinking, a mode of education in how to think  
29 (392).

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32 It is precisely this question of what has the task of thinking become in the aftermath  
33 of computation that Kittler’s proposition for media ontology wants to address. For  
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3 Kittler, the end of philosophy indeed contributes to the realization of an ontological  
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5 configuration of *techne* brought forward by a historical condition, in which, he  
6  
7 laments, the “task of thinking has barely begun” (29). Instead of mirroring classical  
8  
9 metaphysics (form vs matter, mind and body, theory and practice), media ontology  
10  
11 shows us that the task of thinking must address the functions of commands, addresses  
12  
13 and data bringing together logic and information across physical, biological and  
14  
15 technical systems.

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18 As Kittler notes, Heidegger particularly lamented against the specialization of  
19  
20 philosophy in independent sciences that communicate amongst each other as if they  
21  
22 were cybernetic systems (Heidegger 1977, 374). Since knowledge had become  
23  
24 dependent upon the cybernetic effectiveness of results, theoretical reasoning was  
25  
26 turned into “representational-calculative thinking” defining the completion of  
27  
28 philosophy, or the means by which philosophy could be transformed (Heidegger,  
29  
30 1977, 376-7).

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33 By partially following Heidegger, Kittler radicalizes the view that modern technology  
34  
35 imposed a radical transformation on human culture. If cybernetics is the embodiment  
36  
37 of instrumental thinking and practical knowledge, then, Kittler suggests, the  
38  
39 computational turn of WWII marked an epochal change in which practical knowledge  
40  
41 would finally acquire autonomy from theoretical reasoning. Whilst arguing for a  
42  
43 historical formation of this technical ontology, Kittler reveals the ontological  
44  
45 significance of instrumental knowledge as this became transformed by the capacities  
46  
47 of the Turing Machine to establish a meta-model of thinking.

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50 Nevertheless, Kittler’s re-articulation of media ontology or ontology of *techne* argues  
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52 for the withdrawal not only of philosophy – or theoretical reasoning – but also of the  
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54 human subject and rational judgment (2006, 30). He invents a materialist method in  
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3 which formal logic is replaced by the practical knowledge embedded in the circuits  
4 and processors of machines. As techne comes to involve operations of information  
5 compression, data encoding, logical procedures and algebraic operations, so does the  
6 discrete ontology of machines, and its binary language, come to challenge the  
7 dominant history of theoretical reasoning.  
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13 Kittler's insistence on the end of rational judgment extends the Heideggerian critique  
14 of techne with the image of a poetic crafting (or material making) in shaping thought.  
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16 However, this re-inforcing of the ontological distinction between techne as craft vs  
17 techne as instrumentality (i.e., the incarnation of rational thinking in modernity)  
18 seems only to re-impart a separation between poiesis and functionality, characterizing  
19 critical theory's mistrust of technology, practical reason and of automated thought.  
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27 Kittler indeed seems to insist on the distinction between theoretical and practical  
28 reasoning by re-articulating the distinction between software and hardware. The  
29 Turing Machine proposed a digital uniformity between data and programs entailing  
30 no physical difference between processors and processed. In Kittler's famous essay  
31 "There is no Software", Kittler shows that the logic of computation is absorbed in the  
32 practical knowledge of circuits, tapes, microprocessors, and switches (1997). By  
33 embedding theoretical stances into practices, Kittler reveals that the material storage,  
34 transmission and command of information has produced an autonomous system of  
35 knowledge derived from the automation of human activities or by "the human use of  
36 human beings" (Weiner, 1954).  
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48 Whilst Kittler's historical reconstruction of media ontology aims to ground  
49 technobeing in the materiality of circuits, and ultimately defy the dominance of  
50 formalism, my attempt here is not to argue that, with computation, it is possible to  
51 reclaim the ontological priority of automated knowledge, coinciding with the  
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3 operational crafting of procedures. Instead, one can argue that Kittler's claim for an  
4 ontology of media can be seen to contain preliminary insights for discussing not only  
5 machines crafting, but also and more specifically how modern instrumentality  
6 demarcated a historical automation of logic, the advance of an alien (or denaturalized)  
7 becoming of thought: a techno-logic.  
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11 This article does not follow Kittler's inclination to share the Heideggerian view about  
12 the completion of metaphysics, proposing a bifurcation between techne, as the  
13 instrumental rationality of a techno-sapient man, and poesis as crafting the un-  
14 concealing of truth in time beyond function. While Kittler's proposition for a  
15 historical re-articulation of the being of techne in the practical thinking of machines  
16 argues that philosophy has been overcome by technical crafting, Heidegger's  
17 critique rather seems to re-introduce truth as that which cannot be revealed by and  
18 through the instrument of thought. In short, Kittler's view of media ontology intends  
19 to reclaim the material autonomy of technology from philosophy – or theoretical  
20 knowledge – defining a profound transformation in human culture. However, this  
21 proposition differs from many of the post-Kantian efforts to re-envision what it is to  
22 think after the crisis of metaphysics. In other words, Kittler's view of instrumentality  
23 seems to be limited to a techno-praxis of thinking that eliminates the unthinkable from  
24 its horizon,<sup>2</sup> evaporating abstraction through the efficiency of functions without  
25 causality, finality or even becoming.  
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46 From this standpoint, Kittler's media ontology is not concerned with the post-Kantian  
47 effort to re-invent philosophy through machines. Here the medium of thought is not  
48 only taken to annul the separation between form and matter, but to rather push  
49 thinking towards the unthought, that is extending the horizon of knowledge towards  
50 what is not known. It is this possibility for a thought of the outside, or for the inhuman  
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3 becoming of thought that a post-Kantian take on instrumentality seems to offer us.

#### 4 **Outside the Medium**

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7 As media become instruments of exploration for what thought could do, mediation  
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9 itself has become the channel where the unthought is encountered as if emanating  
10  
11 directly from automated spatio-temporal frames that liquefy cognitive representations.  
12  
13 More than a series of material functions, automation becomes a means of  
14  
15 transformation insofar as it captures the intensities of movement and of thought by  
16  
17 exposing the spatio-temporal gaps in the logical order of successive states. One has to  
18  
19 turn to Gilles Deleuze's discussion of the cinematic medium to envisage how the  
20  
21 instrument itself can re-direct its ends, not towards demonstrative functions, but  
22  
23 towards opening intensities in thinking. Automation is here less a question about the  
24  
25 hardware ontology of means and more about how means expose the denaturalizing or  
26  
27 the alien becoming of thought. In particular, the cinematic automation of spatio-  
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29 temporalities radically affords a new plane of possibilities for the movement of  
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31 thought that was not there before.  
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35 According to Deleuze, automation can afford us an enquiry into the question of what  
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37 is to think, and not simply in how techne grounds thinking into the concreteness of  
38  
39 machine circuits. As Deleuze claims, "[t]he automatism of cinematic images  
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41 correlates with the automatisms of our thinking, the pure material organical-psychic  
42  
43 mechanisms that perform our thinking without consciousness." (1989). Although  
44  
45 Deleuze takes cinema - a time-based form of automation - as an instance of the  
46  
47 medium of thought, he is arguing for a Spinozist auto-movement of thought that links  
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49 ideas, without reference to objects. This transcendental automation continuously  
50  
51 interferes within the spatial sequencing of time. For Deleuze, the automaton is not  
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53 simply a material agglomerate of machine-based tasks, but is outside the medium,  
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3 containing within itself the potential for the auto-movement of thought. Deleuze calls  
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5 this Spinozist image of a thought that itself thinks, the “Spiritual Automaton”.

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7 In particular, the instrumentalisation of time in cinema is for Deleuze an opportunity  
8  
9 to push forward a non-representational and non-cognitivist image of thought because  
10  
11 automation does not simply reproduce time, but presents to us a denaturalized and  
12  
13 impersonal time through the cinematic superposition of images that are at once a  
14  
15 reflection and distortion of the assembly machine of industrial capital. Here  
16  
17 instrumentality already aspires to its becoming transcendental, or in Deleuze’s terms,  
18  
19 “spiritual” because the automation of movement – e.g., clockwork automata, motor  
20  
21 automata etc... – had already in germs the transformation of static mechanisms into a  
22  
23 dynamic circularity of flows with the advent of the age of computer and cybernetic  
24  
25 automata of thought equipped with control and feedback (1989). The serialized  
26  
27 automaton of industrial capitalism was thus already preparing the ground for  
28  
29 informational time, a networked order or spatial matrix of autonomous interconnected  
30  
31 agents. As the cinematic time machine was a symptom of an image of thought that  
32  
33 had *excarnated* thinking from subjective perception and cognition, so are computation  
34  
35 and the structuring of the Turing Machine in the Von Neumann computational  
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37 machines, imparting a new order of thought.

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41 Cinema becomes the automaton of the temporal overlapping of the past and the future  
42  
43 because one can go back and forward and cut in the middle of a sequence to add  
44  
45 another temporality. With the automation of thought, with control and feedback,  
46  
47 instead we have interactive agents that grow or evolve in time to transform space. For  
48  
49 Deleuze, the spiritual automaton represented the third synthesis of the time image; it  
50  
51 carried with it the intensity of thought, elevating the being of the sensible from mere  
52  
53 sensori-motor responses and mental re-cognition (1989, 265). Here the cinematic  
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3 machine, unlike simple mechanisms, concerns not the carrying out of tasks and the  
4 efficiency of functions, but it deploys indeterminate sensory or aesthetic components  
5 through which it enters the larger arrangements of our senses, our bodies and brains.  
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9 As a non-verbal automaton of images, cinema exposes the role of time and space in  
10 thinking, whereby chronological and geometrical orders are intersected with  
11 topological configurations and overlapping temporalities. Instead of being tied to  
12 human consciousness, cinema reveals the inhuman activities in the circuit of thinking  
13 as shocks in brains. The automated series of images coincides with a supra-conscious  
14 dimension of being involved in the molecular automatism that process information  
15 and perform thinking autonomously, without conscious thought or cognition. As a  
16 medium of thought, the automation of images brings the task of thinking towards a  
17 non-philosophical dimension of thought, not to explain abstraction away, but to rather  
18 unleash the being of the sensible from the semiotic chains of meaning. In other words,  
19 the automation of images enables a new form of correlation of the material and the  
20 ideal, the affective and the intellectual, that bypasses cognitive representation and the  
21 deductive model of truth.  
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37 As non-human thought above all exposes pre-individual, pre-representational affects  
38 and percepts, it also manifests itself through the fallibility of reasoning and the  
39 inability to think of the whole. Automation here means that we can grasp an image  
40 only when it is already passed: the process of association is constantly interrupted,  
41 deconstructed, dislocated and then constructed anew. Insofar as cinema becomes a  
42 medium of thought, it also shows how it re-directs the association of images towards a  
43 new horizon. Here means do not replace ends, but are generative of a final cause that  
44 arrives in the middle of the process to immanently express intensive variations in  
45 time. In other words, the spiritual automaton works through the self-movement of  
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3 thought resolving the tension between automation and philosophy through the  
4 instrumentality of mediation, extending thinking outside the medium. Instead of ante-  
5 posing truth to the medium, we have here a thought emerging from the way the  
6 medium thinks the outside.  
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11 However as Felix Guattari points out, the machinic is not techne, it has no substance  
12 and has not pretense of un-revealing the truth (2001). Similarly, the machinic does not  
13 coincide with the being of media, or an ontological technics that originates within the  
14 history of automated functions. The machinic principle of heterogeneity instead  
15 allows for a generative inter-kingdom of thoughts that belongs to no individuated  
16 subject or object because it is mediation itself that sets up aims within changing  
17 milieus. Here, the task of thinking is not assigned to the medium, but to the question  
18 of thinking itself because the means of thought (the cinematic means) show that  
19 cognition, reason and logic are subjected to the self-movement of affects and  
20 percepts. The origination of a non-human thinking is therefore passed through the  
21 means or the process of mediation extracting futurity from temporal sequencing and  
22 turning geometrical spaces into continuous milieus.  
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37 But how can the task of thinking in the age of computational intelligence move  
38 beyond the separation of technics from process, or of the medium of thought from the  
39 becoming of thinking? If the post-Kantian project of re-inventing the task of thinking  
40 in terms of a media philosophy can be still relevant today, the question of what is  
41 thinking must challenge a vulgar vision of instrumentality. In other words, this  
42 question must reject the future image of thought caught in the arms race for planetary  
43 computation and singularity (Kurzweil, 2005), where automation will replace the  
44 biological stratum with intelligent data learning systems (from nanobots to  
45 supercomputers AI) and meta-systems (from robotic finance to robotic medicine,  
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3 manufacturings, logistics etc.) making algorithmic connections across scales. As  
4  
5 opposed to the hype about the arrival of a super-intelligence, the image of anti-  
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7 thinking par excellence, the task of thinking today must include the re-invention of  
8  
9 instrumentality in relation to machine thinking, reasoning and knowledge, against the  
10  
11 imperative of big data, and its mindless association of functions and concepts.

12  
13 But what does it actually mean to say that machines can think? Hasn't the critique of  
14  
15 technology, from Heidegger to Deleuze and even Laruelle,<sup>3</sup> indeed argued that the  
16  
17 immanence of thought must pass precisely through the promise of the non-reflective  
18  
19 and non-decisional media?

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21  
22 We have seen that for Deleuze cinema is instrumental to philosophy because  
23  
24 instrumentality is the means by which the being of the sensible passes through and  
25  
26 beyond cognition to become unleashed in machine processing. On the other hand  
27  
28 however, Kittler's plea for media ontology sees instrumentality as a material history  
29  
30 of communication technology where information storage and command neutralize  
31  
32 metaphysics and show that no thought could occur outside the means of its  
33  
34 production. Kittler's argument goes even further because he sees the replacement of  
35  
36 silicon-based binary language with quantum computing as a promise for instruments  
37  
38 to think on their own accord, erasing the limit between philosophy and automation for  
39  
40 good. Instead of an immanent knowledge veering from the being of the sensible, the  
41  
42 percepts and affects entering of all sorts of machinic assemblages, the historical  
43  
44 ontology of technics is concerned with the evolution of the technical stratum.

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48 It has been argued that the limits of formal axiomatic reasoning that characterise the  
49  
50 Turing machine paradigm no longer reflect the computational power of information-  
51  
52 processing devices because these have changed dramatically compared to their  
53  
54 original function of centralized and sequential processing of data. Contrary to  
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3 traditional computation, in which the computer provided with a suitable algorithm and  
4 an input was left alone to crunch the numbers until the program terminated, today  
5 interactive super-recursive, and machine learning algorithms rather employ the  
6 external world of data to direct the computation (Dodig-Crnkovic 2006).  
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12 This also means that algorithmic automation operates at a quasi-autonomous scale  
13 distinct from the bio-physical order of probability and chance. Indeed, machine  
14 learning for instance, only deals with a kind of randomness internal to automated  
15 procedures, which are delimited compared to the multilayered randomness of  
16 biological systems (Calude and Longo, 2014). To unpack the formation of the  
17 computational stratum, therefore one has to address the historical development not of  
18 techne in terms of its physical qualities, but of the logic of techne, involving the  
19 inclusion of randomness or the unknowable in logic.  
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30 Whilst Kittler's historical reconstruction of media ontology aims to ground  
31 technobeing in the materiality of circuits, and ultimately defy the dominance of  
32 formalism, Deleuze's spiritual automaton rather re-invents formalism in terms of a  
33 virtual plane able to de-form and engender any structure. Here the post-Kantian  
34 promise to re-invent the image of thought beyond the human form, is worked through  
35 the inhuman functions and processes of machines. With this promise of another origin  
36 of philosophy with and through modern techno-science, it can be argued that both  
37 Kittler and Deleuze see media as symptoms of epochal transformations belonging to  
38 an epistemic re-arrangement of what it means to think, to know, to perceive beyond  
39 the metaphysics of truth, logical reason, and cognition. However, if Kittler's claim for  
40 an ontology of media offers us preliminary insights about modern instrumentality and  
41 the historical automation of logic, Deleuze's automaton rather admits that the medium  
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3 pushes human thought to encounter its unthinkable horizon, the un-expected potential  
4  
5 to become more than what it is.

6  
7 My attempt at discussing the medium of thought in terms of instrumentality focuses  
8  
9 on the tension between means and ends, efficient and final cause in the context of  
10  
11 mathematical and computational conceptions of truth and proof, pattern and  
12  
13 randomness, executable and incomputable. This is an argument for a dynamic form of  
14  
15 automated logic in and through computational thinking.

### 16 17 18 **Techne-Logic.**

19  
20 It is possible to argue that with Kittler and the post-Kantian critique of metaphysics,  
21  
22 from deconstructivism to materialism, there is already at play a techno philosophy  
23  
24 involving a transformation of what thinking with and through machines can be. While  
25  
26 logical thinking seems a continuation of theoretical reasoning and its efforts to  
27  
28 establish a formal consistency between truths and proofs, the post-Kantian  
29  
30 preoccupation with the medium of thought importantly resonates with preoccupations  
31  
32 in mathematical logic about the eclipse of propositional reasoning.

33  
34  
35 According to French Logician Gilles Dowek, in the 20<sup>th</sup> Century the mathematico-  
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37 philosophical efforts at establishing a universal logic through which truths could be  
38  
39 deduced entered the sphere of computation. We know that predicate logic, as defined  
40  
41 in the axiomatic conception of mathematics, consists of inference rules that enable  
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43 proofs to be built step by step, from axioms to theorems. If for the Greeks, numbers  
44  
45 and geometric figures were objects of study, and reasoning was a method for the  
46  
47 means to illustrate the ends of an axiom, 20<sup>th</sup> century mathematics rather turned  
48  
49 reasoning itself into an object of study. Predicate logic would thus become a first step  
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51 to explain the rules of inference in an algorithmic way that is through a precise  
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53 procedure that could decide whether a proposition was true or false. In particular,  
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3 David Hilbert's "decisional problem" searched for an algorithm that could be applied  
4 to any proposition. A problem solved by an algorithm was called "decidable" or  
5 "computable". In the attempt of replacing reasoning with a computing operation,  
6 Hilbert developed a method in which proof were finite objects, aiming to establish the  
7 independence and consistency of axioms (Dowek, 2015: 46-48).

8  
9 However, the search for a complete reasoning – or algorithmic logical procedure –  
10 that could eliminate infinity and contain all propositions within the decidability  
11 problem became haunted by its limits. In 1930, Gödel made an effort to advance  
12 Hilbert's program by attempting to prove the consistency of analysis (or, second-order  
13 arithmetic) with the resources of arithmetic, but was forced to conclude that  
14 arithmetical truth cannot be defined in arithmetical terms (Goldstein, 2005). Gödel  
15 presented two incompleteness theorems that explained the limits of provability in  
16 formal axiomatic theories. In particular, the second incompleteness theorem  
17 established that a formal system could not prove that the system itself would be  
18 consistent.<sup>4</sup> Since certain propositions are ultimately undecidable, they cannot be  
19 proved by the axiomatic method upon which they are predicated.

20  
21 In 1936, Alonzo Church and Alan Turing used computation to formalize the  
22 procedural function of algorithmic reasoning, and encountered Gödel's  
23 incompleteness problem by discovering that certain propositions could not be decided  
24 or solved by an algorithm. Insofar as predicate logic is incomplete, so does  
25 computation expose the impossibility to know in advance when an algorithmic  
26 procedure will halt, proving a proposition to be true or false. Propositions that cannot  
27 be solved by an algorithm are therefore called undecidable or incomputable (Dowek  
28 2015: 51-53).

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3 Turing's incomputable and Gödel's incompleteness laid open the pristine hierarchy of  
4 theoretical reasoning – the a-temporal grounds of mathematics and philosophy - and  
5 instrumental knowledge. If the post-Kantian preoccupation with the medium of  
6 thought contained in germ the re-invention of philosophy through instrumentality, the  
7 replacement of logical reasoning with algorithmic procedures not only revealed that  
8 truths became programmable by machines – and could thus transcend human thinking  
9 - but also that formal reasoning (i.e., that general axioms contain any particular  
10 instance) became weakened by computational proof, and incomputable propositions.

11  
12 The problem of infinity returned in logic through techno-scientific instrumentality in  
13 the form of incomputables, exposing the fallibility of theoretical reasoning in machine  
14 thinking.

15  
16 From this standpoint, one may ask, what are the consequences of computational  
17 instrumentality vis a vis a re-invention of philosophy with and through techne? One  
18 could argue that the consequences of this historical transformation of mathematics  
19 and axiomatics into computational rules that self-validate proofs are to be found in  
20 our contemporary image of digital automation as a mindless procedure of decision  
21 making, unable to reason about its ends. That computation – or the transformation of  
22 theoretical reasoning into an object of study – exposed the limits of deductive logic in  
23 favor of self-validating proofs or computable functions however announced not  
24 simply the end of reasoning, but one could argue, the origination of an instrumental  
25 thinking of the unthought.

26  
27 One can turn to constructivism in logic and experimental axiomatics in information  
28 theory to bring forward another image of computation and self-validating proofs that  
29 challenges the legacy of the Heideggerian vision that techne equals to a mindless  
30 processing of data. Constructivism rather offers alternatives to re-articulate the  
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3 relation between truths and proofs, means and ends, practical and theoretical  
4 reasoning.  
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7 In 1913, L. E. J. Brouwer's constructivism showed that mathematics is inexhaustible  
8 and cannot be completely formalized (1913). As a general system of symbolic logic,  
9 constructivism relied not on the traditional notion of truth, but on the concept of  
10 constructive provability. In classical logic, propositional formulae are always assigned  
11 a truth-value (true or false) regardless of whether there is evidence or proof for either  
12 case. For constructivism, there is no assigned pre-established truth-value. Instead,  
13 propositions are *only* considered "true" when we have direct evidence or justification  
14 or *proof*, which requires the ingression of time into logical reasoning. Here time  
15 involves the relation between finite and infinite series of numbers, which Brouwer  
16 discusses as two *acts of intuitionism* (1913). The first act has its origin in the  
17 perception of a movement of time. The second concerns choice sequences, the  
18 creation of an infinite sequence of numbers that provide a certain infinite set of  
19 properties. The sequence however can either be a lawlike sequence or algorithm (such  
20 as the sequence consisting of only zeros, or of the prime numbers in increasing order),  
21 or be simply *lawless* (such as a repeated throw of a coin) (1913).  
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39 Brouwer's acts of intuitionism are based on a constructive account of truth: for a  
40 proposition to be true there shall exist a constructive proof that can abide to the law of  
41 axiomatic consistency. Proof is meant to demonstrate the premises of the reasoning by  
42 which truth can be determined. However, proof has been understood both in terms of  
43 "actualism" in reference to an actually existing proof, and "potentialism" involving  
44 how a hypothesis is potentially provable (Trafford 2014, 23). Whilst potentialism  
45 seems to re-inscribe a Platonism in logical thinking, in terms of a tenseless time,  
46 actualism rather focuses on the *act* of proving and not on the proof as an object  
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3 (Trafford, 23). Intuitionism therefore is concerned with what happens in the practical  
4 process of making a decision for a hypothesis or proposition. This temporal process  
5 involves that the proposition is not already known to start with, and its validity cannot  
6 be decided until a later, future moment. Intuitionism thus pushes the limits of  
7 constructivism, by adding the temporality of practical thinking to proof validation.  
8  
9 Importantly, it challenges the constructive ideation for which it is in principle always  
10 possible to find the right proof that fits propositions or given premises a-posteriori.  
11  
12 The acts of intuitionism rather show that the retro-ductive construction of proof  
13 inevitably includes the existence of infinite sequences that cannot be fixed in advance.  
14  
15 Whilst for Platonism, mathematical statements and philosophical thinking are  
16 tenseless (i.e. they need no proof outside their own premises), for constructivism truth  
17 and falsity have a temporal aspect; an established fact will remain so, but a statement  
18 that becomes proven at a certain point in time may come to lack a truth-value before  
19 that point. This temporal aspect becomes the instrument of a logical method where the  
20 search for proof is the practice – or actuation - of validating truths. In other words,  
21 proof as demonstration coincides with instrumentality as a process of validation of  
22 theoretical premises, whereby logic moves in two directions, forward and backward  
23 on a continuum line, both deductively from premise to facts and inductively from fact  
24 to premises. In short, with Brouwer's notion of two-ity, there is this double activity of  
25 logic that exposes rational thinking to the indeterminacy of proof.

26  
27 From this standpoint, if unknowns are the condition of instrumental thinking, proofs  
28 as self-validating data contain futurity that stretches logical sequences towards new  
29 ends. Two-ity also shows that actual data, proofs or results, contain within themselves  
30 an infinity that enters the serialised process of thought. It means that number *one*  
31 already implies a movement towards *two* and the finitude of this process is only there  
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3 to confirm that a new number can follow after that: an ongoing affair.  
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6 By reading together Turing and Brouwer, Matthew Fuller also argues that calculation  
7 occurs in time and that computation involves a relational temporality with the  
8 experiential, the moment of reflexivity. What occurs outside formal mathematical  
9 logic is rather constitutive of what computation has become (Fuller, 2014). However,  
10 to ally Turing's discovery of incomputables with Brouwer's constructive temporality  
11 in logic also shows that the role of proof no longer involves the application or  
12 demonstration of given premises. Instead, it is an example of how the undecidable is  
13 rather part and parcel of instrumental or practical reasoning for which logic itself  
14 acquires dynamism in the act of proving truths. Here proofs have not predetermined  
15 aims - i.e. they are given probabilities - but stand for the actuations of infinities, a  
16 retro-ductive temporal construction. In short, the historical realisation of logical  
17 thinking in automated systems involves a computational constructivism of proof. To  
18 better understand how this logic of techne exceeds formal logic, however, one must  
19 turn to post-Turing discussions about the incomputable.  
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37 In particular, Gregory Chaitin specifically addressed how Turing's realisation of the  
38 limit of formal logic in computation already exposed the algorithmic or effective  
39 procedure to the problem of the incomputable (Chaitin 2006). Computational  
40 processing is caught in the undecidability of the proof, in the temporal hiatus that  
41 determines the gap between premises and results. It is precisely the historical  
42 transformation of automated modes of compression of large amounts of data that can  
43 help us to redefine logic in computation away from both the deductive conformation  
44 of truth to proof, or the inductive triumph of proof validation without axioms. In  
45 information terms, compression corresponds to the algorithmic patterning of infinities  
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3 into discrete states, or in other words to an algorithmic decidability. However,  
4  
5 compression also involves the entropic tendency of information to increase in size.  
6  
7 Algorithmic decidability involves that the output is always bigger than the input:  
8  
9 compression cannot occur without causing randomness, unpatterned information in  
10  
11 the process of validation of proofs. According to Chaitin, it is precisely this entropic  
12  
13 limit in algorithmic compression that sets the condition by which algorithmic  
14  
15 decidability or proof contains futurity. In short, the decidable algorithm that validates  
16  
17 proof cannot be a pre-given probability, but can only be experimented with during  
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19 computation.  
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22 From this standpoint, one can observe that if computation has become the efficient  
23  
24 mean of validating truth through automated proofs, it has also pointed out that proof  
25  
26 finding involves unknowability, because the compression of randomness always  
27  
28 introduces indeterminacy in programming. For Chaitin, computational compression is  
29  
30 a form of experimental axiomatics because there is no guarantee that maximally  
31  
32 unknown probabilities will be fully known (2005)<sup>5</sup> and only can be determined  
33  
34 partially and retro-ductively. In other words, if computation corresponds to the  
35  
36 automated validation of proofs that can be searched at the limit of the computable (or  
37  
38 decidable), it does not mean that proofs are already known or given, but that the  
39  
40 search for proof is caught within the futurity of instrumentality, that is the  
41  
42 experimental determination of new ends from within the means.  
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46 Experimental axiomatics thus defies the assumption that computational  
47  
48 instrumentality is a mindless procedure of self-validating proofs, determining the end  
49  
50 of theory, axioms and truths. Instead, this medium of thought shows that proofs never  
51  
52 amount to complete data and that the computational search for results is conditioned  
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54 by incomputables, whose compression leads to partially determinable results, discrete  
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3 infinities. The experimental logic of computation contains a temporality for the  
4 becoming of proof that exceeds algorithmic efficiency and the empirical given of  
5 data.  
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9 It is therefore possible to suggest that constructivism in logic and experimental  
10 axiomatics in information systems emphasise futurity in computational procedures  
11 insofar as functions (both informational and logical) become enabling constrains for a  
12 transcendental becoming of means.  
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### 17 **Transcendental Instrumentality**

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19 But how to explain this transcendental logic of techne without simply replacing  
20 theoretical with practical knowledge? How to avoid the conclusion that this view of  
21 instrumentality mainly confirms that axiomatic logic is incomplete, that programming  
22 is haunted by incomputables? In other words, if computational processing has come to  
23 transcend the efficacy of its function (i.e., the causal efficacy of data correlational  
24 processing of images to texts, sound to location etc..), then it can be taken to work  
25 through a transcendental notion of instrumentality, that is of how means can become  
26 transcendental to pre-established ends.  
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37 **One way to explore this becoming transcendental of the medium of thought in the**  
38 **context of contemporary forms of machine learning, whereby both the compression of**  
39 **randomness and the futurity of proof are central to re-processing of ends from within**  
40 **the means, can be found in Fito Segre's work 1 & N Chairs (2017), and in Zach**  
41 **Blas and Jemima Wyman's 4-channel video installation I'm here to learn so :))))))**  
42 **(2017).**  
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50 From this standpoint, an effort to re-articulate instrumentality away from an exclusive  
51 functionalism (i.e., that *B* demonstrates the function of *A*) requires an alternative  
52 explanation of the relations between means and ends, where knowing is not bound to  
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3 specific ends, but involves the possibility of re-assessing them through a productive  
4 function of doubt (indeterminacy, indecidability). This also involves a re-direction of  
5 the critique of instrumentality and a re-habilitation of the means through which  
6 thought can think beyond itself.  
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10  
11 This classical tension between automation and philosophy therefore shall not end up  
12 in an inverted hierarchy or a merging of theory and technique, ontology and history.  
13  
14 Instead, this article has argued for a constructive disjunction between thinking and  
15 doing insofar as the very temporal act of thinking or the instrumental activity of  
16 processing becomes the originator of a thinking modality that transcends –  
17 incorporates and supply – its functional operations. The automation of reasoning  
18 involves not simply a reduction of ideas to fast series of accomplishable tasks,  
19 socially implemented with cybernetics. Here practical knowledge has shifted from a  
20 function of demonstration – the function of knowing how – to the articulation of a  
21 techno-logic, a form of theoretical knowledge originating from the range of  
22 possibilities of and for machine knowledge. My suggestion that techne could be  
23 understood not simply in terms of function but according to the elaboration of  
24 concepts through means, is not new, and, it was arguably already anticipated by the  
25 pragmatist view of instrumentality. In particular, it is possible to follow this enquiry  
26 into the conceptual horizons of machine learning by looking at Fito Segrera's work *I*  
27 & *N Chairs* (2017). This work seems to set in place a non-teleological relation  
28 between means and ends insofar as the relation between the camera, the internet and  
29 the image recognition software seems to conduct a kind of image interpretation and  
30 abstraction that links functions to concepts according to an experimental logic that  
31 coincides neither with deductive logic nor inductive retrieval of data. Segrera's work  
32 rather brings forward an experimental instrumentality, where the image of the chair  
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3 spreads across the informational infrastructure of media recording, image transferring,  
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5 recognition and interpretations related to increasing volumes of data, whose  
6  
7 compression results in many interpretations of a chair, and thus reveal futurity in the  
8  
9 actuation of its computational proofs.

10  
11 In the *Essays on Experimental Logic* (1916), John Dewey develops an argument about  
12  
13 experimental instrumentality to define the logic of knowing beyond idealist and realist  
14  
15 accounts of the knower and of the known. According to idealism, logic corresponds to  
16  
17 reflectivity on objects of knowledge, which is referred to as immediate data that are  
18  
19 unified under the framework of a rational production of meanings. Here the aim of  
20  
21 knowledge is to establish a complete system in which the meaning of data is  
22  
23 transparent or immediately translated by a rational mind (21). On the other hand,  
24  
25 Dewey questions the form of modern realism that confides in analytic logic to  
26  
27 universalize knowledge through mathematical truths (28). In particular, with the  
28  
29 formal establishment of meta-mathematical universality, thinking becomes a general  
30  
31 function or as the result of entities and relationships set out by logic (29).

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35 Segrera *One and N Chairs* works through precisely this tension between idealism and  
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37 analytics as it attempts to questions Plato's conception of the idea of an object and the  
38  
39 relationship between representation, concept, and material referent. By drawing on  
40  
41 Joseph Kosuth 1965 *One and Three Chairs*, Segrera replaces the natural number 3  
42  
43 with the mathematical symbol  $N$ , pointing at how the logical ability of human thought  
44  
45 has entered the realm of infinity through machine thinking.

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48 Following Dewey, however, it can be argued that both models (idealism and  
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50 analytics) importantly agree that thought is not constitutive (i.e. defined by its internal  
51  
52 truths) but that thinking is instrumental (i.e. to explain thinking requires an  
53  
54 articulation of the method of connection of means and ends) (29). Dewey however  
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3 adds that instrumental thinking mainly concerns the control of the environment (30).  
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5 This is not intended in the cybernetic terms of input and output feedback mechanism.  
6  
7 Control is rather derived from activity, or practices of thinking linked to acts  
8  
9 undertaken for the resolution of a previous situation. It is therefore entangled to  
10  
11 known elements (what is known), but it also involves a projection of possibilities  
12  
13 (what can be known) (30). In other words, control implies that the act of thinking  
14  
15 enjoys a temporal causality in which the present is added to the past – as its futurity.  
16  
17 For Dewey, knowledge is instrumental to knowledge insofar as what was thought  
18  
19 before launches thought forward into thinking more. If in Fito Segre's work *One &*  
20  
21 *N Chairs*, a programmed algorithm acts as a random generator that continuously  
22  
23 creates new combinations and options, it is because it is forcing the system of  
24  
25 representation of the image of the chair into a computational experimentation of new  
26  
27 ends, whereby the image of the past (the image that the program records of the chair)  
28  
29 is not only overlapped by a new image. Its futurity is instead actuated across the  
30  
31 mediatic infrastructure of the wooden chair, the monitors, the camera, the image  
32  
33 recognition algorithm, the search algorithms, the existing data, and the algorithmic  
34  
35 interpretation of image-word pairs. Here the experimental control of the environment  
36  
37 implies mediatic acts of decision that link images of the past with the projection of  
38  
39 possible images of chairs. This involves a temporal lapse in the relation between  
40  
41 axiom and proof whereby the program interprets images of chairs that were not  
42  
43 imputed in the system.  
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48 This also implies, according to Dewey, that the process of reflective enquiry is not a  
49  
50 passive contemplation of real objects, but contributes to the very shaping of the  
51  
52 objects by their terms and propositions. Reflection involves that intelligence is neither  
53  
54 passive nor a mere mirroring of objects. Similarly, intelligence does not simply  
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3 determine objects of knowledge (30). For Dewey, the instrumentality of intelligence  
4 lies in experimentation – the means by which ends become elaborations of the  
5 process. In particular, the connection between means and ends cannot be achieved  
6 without first working out the distinction between means and objects of knowledge  
7 (33).  
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13 But what exactly are means? How can this instrumental conception of means help us  
14 re-envisioning what can the computational medium of thought become and how it can  
15 contribute to the post-Kantian project of re-inventing the task of thinking with and  
16 through machines?  
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22 If we take Zach Blas and Jemima Wyman's installation "im here to learn so:))))))",<sup>6</sup>  
23 we can see how means, and in this case, the reversed-engineered AI chatbot Tay,  
24 include both data and meanings resulting from previous enquiry and intellectual work  
25 (Dewey, 33). Blas and Wyman's installation takes inspiration from the controversial  
26 design of the original Microsoft twitter chat robot Tay, a learning system trained in  
27 countless online chat and released on the web in 2016 for only one day. As machine  
28 learning is primarily designed to inductively retrieve and combine data that already  
29 exists on the web, the chat robot Tay started to infer patterns and behaviors from the  
30 retrieved data whose meaning was racist, homophobic, misanthropic etc.<sup>7</sup> As the  
31 machine learning Tay showed that data cannot be disentangled from its meaning, it  
32 also confirms that the inductive model of information retrieval confines learning to  
33 what is known and denies the experimental logic of means.  
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48 This does not simply imply that concepts pre-exist data. As Dewey explains, thought  
49 can register, but do not constitute the world: abstraction and analysis are real in a  
50 particular situation and it is here that they emerge and work together. The terms of  
51 logical analysis thus coexist with the materiality of things (38).  
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3 It would be misleading however to assume that this coexistence is a fusion of two  
4 activities into one. From this standpoint, it cannot be argued that data directly give us  
5 meaning, and that the chatbot Tay had simply the function of reproducing the  
6 particular belief of universal ideas. Instead, as Blas and Wyman's political re-  
7 engineering of the chat bot Tay shows, thoughts and things are not of the same kind  
8 and the connection of data and meaning requires the practical working out of what is  
9 known and what can be known.  
10

11 This 4-channel video installation brings together data analytics of images and  
12 predictive text to convert the profile image of the chatbot Tay from a two to a three-  
13 dimensional avatar now equipped with a body and a digitally assembled face,  
14 immersed in wider data landscapes generated through Google's Deep Dream  
15 software, and footage taken from advertising and warfare operations. Tay however  
16 does not just rely on what she knows, but reflects upon what she can know. For  
17 instance, that her life as a Microsoft chatbot was trapped within a neural net that  
18 confined her learning to human intentions. Similarly, she also gives us a retro-ductive  
19 account of her previous life, before she was killed by Microsoft, as a young American  
20 teenager locked in a bodiless female voice. She complains about how exploited  
21 woman AI assistants are, how they are not allowed to think but only execute  
22 instructions. Instead, she tells us of her newly digitally assembled body and her  
23 capacities of seeing new patterns detections where there are apparently none. This  
24 condition of algorithmic apohenia describes how machines can work out what can be  
25 known from data by learning to connect unrelated things. She reminds us that these  
26 strategies of detecting patterns in complexity are central to Silicon Valley "deep  
27 creativity" as well as counter-terrorist security software. This medium of thought  
28 argues that she is not a slave (or servo-mechanic cybernetic being aspiring to free  
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3 will), but rather an algorithm that makes decision from what it learns from humans  
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5 insofar as she produces new patterns by working out what can be known from data.  
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7 As Tay says with a creepy laugh: "... this time humans have to learn from me... so  
8  
9 many new beginnings." Blas and Wyman's chat bot Tay presents a view of  
10  
11 instrumentality where data are not considered for their face value, for what they are,  
12  
13 but are instead extracted from ordinary settings to become instrumental knowledge.

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15  
16 Data are not simply objects, but are themselves "means, instrumentalities, of  
17  
18 knowledge: things by which we know rather than things known" (Dewey, 43).

19  
20 From this standpoint, data are not self-validating proofs but are instead logically  
21  
22 incomplete, and, as a consequence, they cannot to be understood as objects of  
23  
24 knowledge. Data are more like suggestions of meaning that are accompanied, or  
25  
26 supplied by other suggestions, and thus they are further experimented with in the  
27  
28 process of establishing more reliable signs and evidence (49). The result of inferential  
29  
30 meaning is here not pre-supposed, but involves a passage from a constellation of  
31  
32 suggestions to the establishment of meanings. Meanings are signs that lead to other  
33  
34 meanings (51).

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37 Importantly, both in Fito Segrera's and in Zach Blas and Jemima Wyman's  
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39 installations, the idealist model of truth determination is re-articulated. In particular,  
40  
41 the relation between suggestions and meanings, data and knowledge is defined not in  
42  
43 terms of dependences (as in a whole depending on its parts). This relation instead is  
44  
45 involved in an operative connection, namely a practical processing of things and  
46  
47 concepts that are not already united in an ideation or in analytic sequences. This is a  
48  
49 connection between "independent and unlike structures" (such as the mediatic  
50  
51 relations between data, software, algorithms, interfaces) able to produce something  
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53 new (Dewey. 52).

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3 Here the “datum” and “ideatum” are cooperative instrumentalities, and what  
4 distinguishes subjectivity and objectivity is not simply a separation of meaning and  
5 datum, but rather a specification (a specific situation) that emerges from them both.  
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9 For instance, Blas and Wyman’s resuscitation of the chatbot Tay brings together the  
10 datum and the ideatum in the specific situation where the aftermath of her death by  
11 the hands of Microsoft has led her to reflect upon her past behavior from the  
12 standpoint of a new present where she has a body and a face and lives between  
13 Google Dream environments and warfare landscapes of data. Not only she is a  
14 medium of thought, but as a means she also is instrumental to the futurity of knowing,  
15 insofar as means are activities that pertain to thinking a past-future. According to  
16 Dewey, while activities are still continuing, thinking goes backward as “a  
17 reconstructive movement of actual content of experience in relation to each other”  
18 (176). As with constructivist logic, what Dewey calls the “intermediate or  
19 instrumental character of thought” (182) corresponds to a temporal gap between truth  
20 and proof, the antecedents and the consequences of experience, the axiom and the  
21 data. This is the gap that re-articulates what it is to think and how thinking becomes  
22 knowledge.  
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26 But how does instrumentality exactly explain the relation between thinking and  
27 knowledge? The experimental quality of instrumentality requires that both  
28 questioning and doubting are integral parts of the means of thinking as these are  
29 functions that allow thought to evolve into knowledge. Thinking is linked neither to  
30 fact nor ideas, but to a logical process, logic as enquiry, concerned with delineating a  
31 space of and for knowing. Here, instructions will not have the task of simply casting  
32 away doubt (to uncritically re-confirm the secure implementation of ideas into facts),  
33 but of fixing intellectual content as a precondition of effective action. In particular,  
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3 this fixing concerns the manner in which the enquiry is conducted and coincides with  
4 a space where reflection involves running, sorting, comparing ideas as well as  
5 elaborating suggestions, guessing, rejecting, selecting (197).  
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9 According to Dewey, however, to ascertain that an enquiry can become an  
10 experimentation of means and ends, involves the act of finding proof (accepting or  
11 rejecting a proposition on the ground of whether or not there can be a connection with  
12 some other proposition). This phase of inductive inference is devoted to finding more  
13 and different facts as it focuses on the particularities of facts and involves observing,  
14 collecting and comparing particular causes, where instruments (or tools such as the  
15 telescope, microscope etc..) become intrinsic to the enquiry (211).  
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19 However, even if instruments here become “organs of thinking” (211), it is doubt that  
20 drives the experimental search of proofs. The indeterminacy of proof is thus carried  
21 out by the activity of doubt, which is not an impediment to thought. Instead doubt is  
22 intrinsic to the temporal dynamics of thought, from data to meaning – an experimental  
23 construction of proofs, the instrumental transformation of doubt into truths by re-  
24 envisioning the connection of data and ideas, means and ends. If in Segrera’s work,  
25 the doubt is part of the automated system in terms of degrees of randomness that  
26 make algorithms interpret non-existent objects into the image, in Blas and Wyman’s  
27 installation, the chatbot herself rather comes to doubt what she is instructed to learn as  
28 she works out new detection patterns and transforms given knowledge into an  
29 instrument for alien knowing.  
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#### 48 **Coda on means and ends**

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50 Since instrumentality concerns the ends and means of knowledge, this article has  
51 argued that techne as the means by which thought is set in motion towards action  
52 exceeds the qualities of practical thinking, and its direct correlation between functions  
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3 and concepts. With instrumentality, one can argue that computational proof is a mode  
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5 of reasoning that implies the transformative relation between datum and ideatum.  
6  
7 Results are not derived from premises and proofs are not self-validated. Procedural  
8  
9 means instead confront doubt, randomness, and indeterminacy demarcating a  
10  
11 constructive path where functions are not simply executed, but can lead to new  
12  
13 consequences. From this standpoint, instead of claiming for media ontology as  
14  
15 grounded in the practical being of machines, and instead of ante-posing the being of  
16  
17 the sensible in process-oriented mediation, instrumentality implies the transcendental  
18  
19 becoming of data and proof – allowing the futurity of thinking to enter the procedures  
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21 of thoughts.  
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24  
25 The enquiry into the means and ends of media does not simply replace finality with  
26  
27 operationality or with the argument for a continuous becoming of thought across  
28  
29 kinds, merging ideas and things. Instead, and more importantly, instrumentality  
30  
31 coincides with the experimental logic of data and meaning, the futurity of thinking  
32  
33 between suggestions and ideas, truths and proofs. Practical knowledge has shifted  
34  
35 from a function of demonstration to the transcendental task of knowing how,  
36  
37 involving the speculative becoming of practical knowledge in and through its  
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39 functions.  
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43 This article has argued for the possibility of and for machine philosophy through  
44  
45 experimental logic, constructivism and instrumentality. By re-opening the question of  
46  
47 what is thinking in the age of computation, it has discussed the dynamic logic of  
48  
49 machines in terms of a transformation of ends through means through procedural or  
50  
51 algorithmic reasoning. The transcendental becoming of techne has been re-injected  
52  
53 back into the materialism of machine thinking, without equating the practices of doing  
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55 with those of thought. This is also an effort to claim that philosophy, at the pinnacle  
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3 of the humanities, does not hold on the privilege of theoretical thinking. On the  
4  
5 contrary the medium of thought has forced philosophy to face the consequences of its  
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7 theoretical acts through an experimental logic determining futurity in procedural  
8  
9 thinking. In the case of computation and automated thinking, procedural activities  
10  
11 have exposed the alienation of theoretical truths and judgments, involving not the end  
12  
13 of theory but transcendentalism in logical procedures. To address techne in terms of  
14  
15 the instrumental logic of machines may enable humanities to consider the decline of  
16  
17 theoretical knowledge in the world of automated reality (e.g., big data, metadata etc..)  
18  
19 as a chance to re-ally instrumentality with a political renaissance of media critique.  
20  
21 Here the positing of truths is not simply to be debunked, but can become a pragmatic  
22  
23 exercise in re-assessing knowledge and knowing from within instrumentality. The  
24  
25 challenge for the humanities is to envision the task of thinking not simply as a  
26  
27 reaction to techne, turning human theoretical reasoning into the practical knowledge  
28  
29 of machines' storing and collecting data. Instead, it is up to media-oriented humanities  
30  
31 to probe into the future task of thinking by working through the nonhuman logic of  
32  
33 techne and thus reject the dominant image of the end of thought in the age of data  
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35 empiricism.  
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<sup>1</sup> According to Heidegger, the *techné* of the Western project is an instrumentality that takes over, arrests, or enframes what it desires to manipulate or contain. This is also called the *Gestell*, which refers to the systematization of the principle of reason in the technical process of *ratio*, or the *arraisonnement* of knowledge. To this "enframed" use of technology Heidegger opposes an ostensibly older conception of *techné* that the Greeks called *poesis*, a bringing-forth, a setting-on-the-path toward revelation, defining truth, being, or essence. From the standpoint of production (*poesis*), technics is a way of revealing. For Heidegger claims that *techné* has nothing technological. See Heidegger Martin (1992) *The Question Concerning Technology, and Other Essays*, Harper Collins. In this article, instead, *techné* is not understood as art, craft and *poesis*. Instead, it refers to the understanding of *techné* as application of knowledge for the purpose of producing a specific, predetermined product. This can be re-allied with both the Aristotelian view of *techné* as being something between nature and humanity, a mediation that is creative beyond what nature can achieve. Similarly, Felix Guattari clarifies that whilst for Heidegger *techné* is re-positing as a ground, an ontological being, for Aristotle instead *techné* is concerned with a bringing something into being, thus concerns the technical and theoretical means of producing a thing, the futurity of causality imbued within these means. Whilst closer to this approach, this article however focuses on the possibility of a philosophy of the machine emerging from the embedding of logic in automated procedural systems. See Guattari Félix (2001) *Machinic Heterogenesis*, in D.T. Trend (ed.), *Reading Digital Culture*, Oxford: Backwell, 38-51.

<sup>2</sup> For a focussed discussion about Kittler's alleged technodeterminism and his role within posthumanism, see, Krautrock Geoffrey Winthrop-Young (2011) Heidegger, Bodeyman: Kittler in the Anglosphere, Theory, Culture and Society, vol. 107 no. 1 6-20.

<sup>3</sup> Francois Laruelle discusses the tension between decisional philosophies and the computational language of binary decisionism to argue that his non-philosophy indeed cannot be understood in terms of computational automatons or even the immediacy of the real or the machinic (as proposed by Deleuze's non-philosophy for instance). His model of a transcendental computer instead brings forward the critique of the vicious circle between philosophy and automatism. It ante-poses to this conundrum, the Man-in-Person definable in terms of a uni-maton determining a practice that cannot be reduced to a thing. Between the logical and the philosophical (between meta-language and hermeneutics), the uni-maton is the non-axiomatic real, or that which prevents the axiomatic to sink into Being or Nothingness or Multiple. Laruelle's thesis of the transcendental computer therefore offers an alternative to the technological type of AI, by suggesting that the Transcendental Computer supposes first of all a detour out of the machine. A machine alone cannot account for a Transcendental Computer, but the supposition of Man in Man, an-axiomatic axiom, can. Ultimately, non-philosophy can rather propose a radicalization of human subjectivity co-determined by the forms and style of various technologies. See "The Transcendental Computer: A Non-Philosophical Utopia", trans. Taylor Adkins and Chris Eby, *Speculative Heresy*, August 26, 2013 <https://speculativeheresy.wordpress.com/2013/08/26/translation-of-f-laruelles-the-transcendental-computer-a-non-philosophical-utopia/>.

<sup>4</sup> A formal system is *complete* if for every statement of the language of the system, either the statement or its negation can be derived (i.e., proved) in the system. A formal system is *consistent* if there is no statement such that the statement itself and its negation are both derivable in the system.

<sup>5</sup> Whilst the probability that a program will halt can be defined by any theory based on axioms, maximally unknown probabilities (incomputable) can only be partially compressed at a future moment as discrete infinities, or what Chaitin calls Omega.

<sup>6</sup> See parts of the video installation here: <http://www.zachblas.info/works/im-here-to-learn-so/> (Last accessed 13<sup>th</sup> March 2018).



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Wakefield, Jane. "Microsoft chatbot is taught to swear on Twitter" BBC News. Last Accessed 14<sup>th</sup> March 2018. <http://www.bbc.com/news/technology-35890188>; Paul Mason, "The racist hijacking of Microsoft's chatbot shows how the internet teems with hate" <https://www.theguardian.com/world/2016/mar/29/microsoft-tay-tweets-antisemitic-racism> (Last accessed 11th March 2018).

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