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Yves Citton

Automatic Endo-Attention, Creative Exo-Attention: the Egocidal and Ecocidal Logic of Neoliberal Capitalism

Abstract:

The beginning of the 21st century could be characterized by the externalization of attention, following the externalization of our other faculties: the term “exo-attention” can be used to refer to the increasing number of electrical devices performing attentional tasks for us outside of our bodies. At the same time, the logic of industrial production continues to demand human beings to develop automated gestures commanded by the planetary assembly line, intellectual gestures being now added to bodily gestures. This automation of our “endo-attention” cannot be considered as a temporary step in the process leading to full automation. On the one hand, it coexists and goes along with the logic of “heteromation”, whereby supposedly automated procedures are actually performed by micro-taskers, click farms and Mechanical Turks. On the other hand, the precarisation of labour conditions analysed by Franco Berardi tends to segment our activity into pre-formatted time-cells which alienate us from the very tasks we accomplish. While our endo-attention threatens to be automated through and through, progress in deep learning programming allows exo-attention to become creative: what used to be the specificity of human attention (i.e., its capacity to extract a meaningful figure from a given background) can now be obtained by unsupervised machine learning. Does all this mean that the creativity of human attention has been merely displaced, from creatively paying attention to (a limited number of) things, to creatively devising algorithms that pay attention to (a higher number of) things? This perspective could be technologically attractive, if it weren't trapped within the constraints of neoliberal capitalism. Social—not technological—logics should be the main cause of our concern (and anxiety) about automation. Neoliberal capitalism tends to globally align the infinite diversity of our individual attentions under one single hegemonic imperative to maximize financial profit. This is both *egocidal*, as it automatizes our endo-attention subjected to segmented tasks that no longer make sense to us (pre-empting emancipatory forms of subjectification), and *eco-cidal*, as the race for short-term profit vandalizes our social and natural environments. We therefore need to sharpen our analyses (and anxieties), in order to deflect our fear of automation towards a rejection of neoliberal capitalism.

Attention in Crisis?

Our current discussions about a ‘crisis of attention’ are usually premised upon a number of supposedly self-evident truths, which deserve to be questioned, if not debunked. I will

briefly list a few of them, in order to clear the ground for a reframing of these issues. First, we usually speak as if the attentional crisis was a new phenomenon, contemporary with the rise of the Internet and digital sociality. Even if the last twenty years have certainly seen major and rapid transformations which deeply affect how we are, and we will be, (in)attentive, most of the complaints heard about chronic distractedness, information overload, over-solicitation, overabundance of cultural offers, superficiality and ‘crazybusiness’ sound like highly repetitive echoes of what could be heard and read fifty, 150 or 500 years ago¹. Let’s call this first bias *amnesism*. Second, the attention crisis is approached in strictly individualist terms. The most common complaint is that ‘our children are (pathologically) distracted’. Instead of taking the youth as a social group, subjected to social pressures and oppression, we tend to envisage them one by one. Little Alex can’t stabilize his attention on a book or on his teacher’s lesson, so we prescribe Ritalin to help him be successful in school². Let’s call this *individualism*. Third, when we look for something, rather than someone, to blame for distracting us all, we usually turn to technological devices. If our youth are distracted, it is due to their immersion in a digital world ruled by an attention economy where smartphones and computer screens are invaded by notifications, pop-ups, seductive hyperlinks and addictive hooks, forcing them to remain constantly connected in fear of missing out³. Let’s call this *technologism*. Fourth, and most surreptitiously, our whole debate on attention rests on an unstated but universally accepted premise, according to which it is good to be attentive, and bad to be distracted. Any thought on the matter, however, suffices to suggest that the very definitions of attention and distraction are highly problematic, inherently contextual, and fundamentally political. What do we call ‘distraction’, if not the fact of being inattentive to what the power in place command us to pay attention to? Distraction is not a mere absence of attentiveness, it is an alternative investment of attention—which may very well have emancipatory effects in certain contexts. Let’s call *manicheism* the highly reductive equation ‘attention = good vs. distraction = bad’.

Once the grip of amnesism, individualism, technologism and manicheism has been somewhat loosened, it appears that another common bias distorts our discussion and structures our anxieties. We tend to consider attention as a faculty strictly confined to human interiority, while technological devices are out there as mere sources of distraction. We also tend to consider creativity as being a privilege of human action, and to limit automaticity to the realm of machines. As my title suggests, this article would like to help turn the tables around.

There certainly is a form of attention operating from within our individual body-minds (*endo-attention*). But, as it is becoming clearer and more widely discussed every day, there are attentional tasks that are performed by technological devices (*exo-attention*), like reading a book in search of a keyword, recognizing the identity of a human face, or driving a car in traffic. Similarly, common assumptions would spontaneously restrict the possibility of being ‘creative’ to *endo-attention* (i.e., to human beings). Many experiments in ‘digital literature’

¹ See for instance Jonathan Crary, *Suspensions of Perception. Attention, Spectacle, and Modern Culture*, Cambridge MA, MIT Press, 1999, and Anne Blair, *Too Much to Know. Managing Scholarly Information before the Modern Age*, New Haven, Yale University Press, 2011.

² See Alan Schwarz, *ADHD Nation. Children, Doctors, Big Pharma, and the Making of an American Epidemic*, New York, Simon & Schuster, 2017.

³ See Stefana Broadbent, *L’intimité au travail*, Paris, FYP, 2011, for an enlightening analysis of the way a train crash, universally blamed on its driver using a smartphone in his cabin, was much more probably due to the tiredness and exhaustion generated by new managerial practices and changes in working conditions.

(rarely circulating outside of artistic niches⁴), but also much-debated performances of self-learning algorithms developed over the past ten years (under the labels of “machine-learning” or “deep-learning”) seem to generate a form of *automated creative exo-attention*. The combination of high-power computation with big data seems to allow for the “spontaneous” emergence of interpretive hypotheses emanating from the sheer virtue of correlation—as when Google Brain claimed to have algorithms (re)discover the visual category humans call a “cat face”, by merely letting their tremendously powerful hardware and self-learning software churn massive amounts of unlabelled images over a three days in 2012⁵.

On the other hand, the process of automation—which arguably started with the colonial plantation model, where ‘factors of production’ (sugarcane, machines, slave labour) came to be isolated, extracted and accounted for as such—has been entering a new phase. First, our manual gestures have been standardized, recorded, calibrated, re-assembled, and finally replaced by machines. Now, it seems to be the turn of our intellectual gestures to follow the same process, with algorithms threatening to replace doctors, lawyers and teachers, just like looms and tractors had replaced seamstresses and peasants. As we will see, it may be wise to show some amount of scepticism towards these widely shared and much broadcasted predictions about massive unemployment due to the replacement of human workers by automata⁶. Beyond these sometimes shallow—even if justified and symptomatic—anxieties about job-slashing automation, I would like to focus on two somewhat symmetrical trends, which cross each other on such issues: the potential evolution of exo-attentional devices towards tasks involving a creative dimension, and the pressures towards automation to which our endo-attentions seem increasingly exposed.

Exo-Attention Anxiety

In order to get faster to the political stakes inherent to these questions, I will speed up my argument by stating its more basic building blocks as an ensemble of definitions and axiomatic propositions. I beg the reader’s forgiveness for this dry and dogmatic form of exposition, which authoritatively cuts through countless legitimate objections.

1. *Exo-attention definition*. If *attention* consists in a selective processing of sensory data geared towards steering the organism’s (re)actions, the beginning of the 21st century deserves to be characterized by the *externalisation of attention*, following the externalisation of our other faculties (the flint stone as an exo-claw; the wheel as exo-legs; the book as exo-memory; etc.). Since exo-eyes (cameras) and exo-ears (microphones) have been connected to exo-calculators (computers), an increasing number of electrical devices have started to perform attentional tasks for us outside of our bodies. While a human taxi driver plays the role of external attention to his passenger, we will restrict the definition of exo-attention to attentional tasks performed by technical devices.

⁴ See for example Katherine N. Hayles, *Writing Machines*, Cambridge, MIT Press, 2002; Eduardo Kac (Ed.), *Media Poetry: an International Anthology*, London, Intellect Books, 2006; Adelaide Morris and Thomas Swiss (Eds.), *NEW MEDIA POETICS: Contexts, Technotexts and Theories*. Cambridge, MIT Press, 2006. As an example of digital creolisation of poetry, see the Madeleine Aktypi’s work on <http://cargocollective.com/madeleine-aktypi>.

⁵ See Liat Clarck, ‘Google’s Artificial Brain Learns to Find Cat Videos’, *Wired*, June 26, 2012, <https://www.wired.com/2012/06/google-x-neural-network/>

⁶ See for instance the Oxford Economics Report, ‘How Robots Change the World’, 2014, <http://resources.oxfordeconomics.com/how-robots-change-the-world>

2. *Relevance thesis*. Human (and, more generally, animal) attention attempts to select from the environment those sensory data that are *relevant* in order to adapt the body's practices to the diminishing of pains and augmentation of gratifications.

3. *Categorization thesis*. On an individual as well as on a collective level, human attention sorts out sensory data by devising *categories* that lump together features presented by objects in order to identify and recognize them for future purposes; human subjects orient themselves in their environments through the filter of such categories.

4. *Speed and anticipation thesis*. Standard human attention is driven by an economic principle which pushes it to identify objects through available categories, as speedily as possible; it tends to anticipate the recognition of objects once a few of the features attributed to an object are identified.

5. *Scientific explicitness thesis*. Western science ('rationality') has developed elaborate procedures to define explicitly which characteristics need to be identified in a category for an object to be (almost) certainly anticipated as efficient to produce certain effects within a certain practice. Exo-attention relies on the features explicitly isolated by scientific procedures in order to automatize the application of the categories deemed relevant to recognize and to process the data extracted from a given environment.

6. *Affective sensation thesis*. Animal (including human) attention is differently automatic from machinic attention, insofar as it operates with fuzzy categorisations identifying lumps of joint characteristics that do not require to be explicitly isolated and defined; these fuzzy categories provide orientation to the agent through their affective tonality, rather than through the rigorous ('rational') analysis of isolated features. In spite of numerous attempts, it has not been possible—so far—to replicate in machines this affective, intuition-driven endo-attention operating with fuzzy logic.

7. *Habituation thesis*. The development of habits consists in automatizing certain tasks in order to free the animal from the need to invest attentional effort in their performance.

8. *Background attention thesis*. Behaviours relying on habits operate identifications on the basis of a background attention which intuitively senses affective ambiantal properties rather than isolated figural features.

9. *Creative attention definition*. While *recognitive attention* puts its efforts into classifying sensory objects within previously defined categories (Kant's 'determining' judgement), *creative attention* scans sensory data in order to generate new categories (Kant's 'reflexive' judgement), by extracting newly emerging figures from what was originally confused in the background.

10. *Distraction thesis*. In order to be creative, attention needs to wander and 'err' away from the automatic recognition of pre-identified features presented by sensory data. *Distraction* (understood as erratic attention) is thus as important as concentration, since it plays a central role in the creative potential of human attention. As a consequence, the phrase *errare humanum est* should be interpreted as pointing to a positive specificity of being human, as much as to the limitations of our intellectual capacities.

11. *Time-scope thesis*. While animal attention is essentially reactive to short-term (or traumatic) stimuli, human attention can, under certain conditions, modulate its time-scope to encompass tenuous memories from a distant past, as well as far-removed effects anticipated from a distant future.

12. *Delay of categorisation thesis*. The erraticism and capacity to be dis-tracted, crucial to creative attention, require another time-axis manipulation, a capacity to tolerate ‘delays of categorisation’. Jean-Marie Schaeffer has pointed to the tolerance and taste for delays of categorisation as playing a crucial role in ‘aesthetic attention’⁷: when going to a museum or to a performance of contemporary art, we expect to be presented with objects or experiences which defy our pre-existing categories (what does this represent? what is it? what is there to see? what is music? what is art? etc.). We have to tolerate—at first, then hopefully enjoy—experiencing a time delay between the moment when our senses are exposed to a certain block of perceptions and the moment when we can formulate a hypothesis about its identification. Extracting a new figure, never previously identified as such, from a certain background, is the defining feature of creative attention. It is performed by the viewer-listener of contemporary art as much as (even though differently than) by the ‘creator’ of the piece.

14. *Exo-attention anxiety hypothesis*. Our current anxieties relative to the automation of attention express our sensitivity to an excessive reliance on explicit categorisations of figural features (often based on short-term economic goals), warning us to the danger of neglecting the input of our background attention, which we intuit as being wiser than our focused attention. (As a consequence, we may want to reboot our discussions from attention economy to attention ecology⁸.)

Work Matters: Automation, Heteromation, Precarisation

The *exo-attention anxiety hypothesis* runs against several assumptions usually called forth to account for our current automation anxiety. It may be useful to pause at this point, in order to proceed a little more cautiously, and take the time to discuss some of the many objections it is likely to encounter.

Nobody knows for sure how clever and how creative tomorrow’s Artificial Intelligence (AI) will actually be. *Creative exo-attention* still is in its preliminary phase. Andrew Ng and his colleagues from Google Brain reported in 2011 an experiment wherein an exceptionally powerful set of computing resources, ploughing through an exceptionally big set of data, demonstrated the possibility for unsupervised ‘self-taught learning frameworks’ to ‘train neurons to be selective for high-level concepts using entirely unlabeled data’:

we train a 9-layered locally connected sparse autoencoder with pooling and local contrast normalization on a large dataset of images (the model has 1 billion connections, the dataset has 10 million 200x200 pixel images downloaded from the Internet). [...] Contrary to what appears to be a widely-held intuition, our experimental results reveal that it is possible to train a face detector without having to label images as containing a face or not. [...] We also find that the same network is sensitive to other high-level concepts such as cat faces and human bodies⁹.

⁷ Jean-Marie Schaeffer, *L’expérience esthétique*, Paris, Gallimard, 2015.

⁸ See on this, Yves Citton, *The Ecology of Attention*, Cambridge, Polity Press, 2017.

⁹ See Quoc V. Le et al., ‘Building High-level Features Using Large Scale Unsupervised Learning’, 2012, <https://arxiv.org/abs/1112.6209>, p1 & p7. For a good introduction to this type of research, see

Gleefully summarized by one of the researchers, Jeff Dean, the neural network ‘basically invented the concept of a cat’¹⁰. Extracting the category of ‘cat face’ from mulling over billions of images is at the same time very impressive and pathetically basic. If this is the best AI can do at this point, it remains terribly—or hearteningly—far from what human intelligence manages to achieve¹¹. There is a chance that the most powerful AI will never be able to go beyond the mental ability of a four-year-old human. There is a history of innovation-entrepreneurs and corporations making thunderous announcements about major breakthroughs, which get deflated once one considers more carefully what was actually performed, and how¹². To top it all, the very notion of ‘unsupervised’ self-taught learning algorithms remains potentially deceptive since algorithms don’t grow by their own conatus, nor do they behave fully spontaneously: they are programs which have been initially ‘supervised’ and which remain under the ‘supervision’ of human experimenters, even when the latter refrain from labelling ahead of time what is or is not to be considered a cat face. So creative exo-attention may be only the latest in a long history of technological hypes, often ending in deceptions and disappointments.

It may be too comfortable, however, to dismiss creative exo-attention upfront. Should unsupervised neural networks fulfil their promises, they would indeed externalise creative attention, since the machines would be able to extract relevant features from their purely quantitative capacity to correlate massive amounts of data thanks to massive amounts of computing power. Would the brute force of initially blind correlations be capable of making obsolete our most distinctively human (and prestigiously European) capacity to ‘theorise’, as Chris Anderson infamously claimed¹³? It would certainly be reductive, but not fully illegitimate, to consider theory as a capacity to devise interpretive hypotheses about causal determinations between various phenomena observable in our actual world. We all know that a mere correlation does not always amount to a causal relation (I may take the same commuter train as my neighbour, without any of our movements causing the other). But we also suspect, at least since David Hume’s critical essays in the middle of the 18th century¹⁴, that our access to causal relations may not rest on anything else than a careful and systematic sorting out of observed correlations. Anderson upset a lot of people by dancing on Theory’s grave, adding insult to injury by suggesting it can be replaced by algorithms, but Hume may be the one who dug the grave.

The real and most interesting issues, however, rarely lend themselves to a simple replacement of endo-attention by exo-attention. The more realistic anticipations about the large-scale introduction of exo-attention in productive processes tend to depict a world where

the video presentation by Andrew NG, ‘Deep Learning and Unsupervised Learning’, *Google Tech Talks*, 2011, <https://www.youtube.com/watch?v=ZmNOAtZlgIk>.

¹⁰ Quoted in John Markoff, ‘How Many Computers to Identify a Cat? 16,000’, *New York Times*, June 25, 2012.

¹¹ Le et al. stress that their network ‘is still tiny compared to the human visual cortex, which is 106 times larger in terms of the number of neurons and synapses’ (‘Building High-level Features...’, p3).

¹² ‘We trained our network to obtain 15.8% accuracy in recognizing 22,000 object categories from ImageNet, a leap of 70% relative improvement over the previous state-of-the-art.’ (Le, ‘Building High-level Features...’, p1).

¹³ Chris Anderson, ‘The End of Theory. The Data Deluge Makes the Scientific Method Obsolete’, *Wired Magazine*, June 23 2008.

¹⁴ David Hume, *An Enquiry concerning Human Understanding* (1748), London, Pearson, 1955.

machines assist, augment, systematise, check, sharpen and guide human judgement (in medicine, law, finance, etc.), without fully replacing nervous systems with silicone devices¹⁵.

More radically, analysts like Antonio Casilli, Hamid Ekbia or Bonnie Nardi urge us to consider the discourse on automation, and the anxieties that come with it, as a cover-up for a rather different trend, which the latter have named *heteromation*¹⁶. When one scratches under the surface of promotional campaigns, it often appears that what is sold as a replacement of human workers by algorithms consists much more in a *devaluation* than in a substitution of human labor by new machinic assemblages. ‘Automatising’ online services provided by public administrations may lead to reducing the number of civil servants, but it will still take human work to enter personal data into the worksheet. The main difference brought by heteromation is that this work will be done unpaid by the citizens, instead of bringing a wage to a civil servant. Under the glitter of an automation sold as a way for humans to delegate menial tasks to machines, heteromation reveals the mere displacement of work, from waged labour (with benefits) to precarious jobs (self-entrepreneurs, click farms, Mechanical Turks), and from poorly paid micro-tasks to free labour (self-service, gamification, networking).

Since the early days of Adam Smith, many thinkers have denounced the supposedly stultifying effects of the segmented labour driven by the industrial logic of the assembly chain—often mixing their genuine worry about workers’ welfare with class contempt towards manual labourers. Today, the intensified extension of the division/automation of labour to intellectual tasks has led analysts like Franco Berardi or Bernard Stiegler to conceive precarisation of the cognitariat as a further segmentation of our activity into pre-formatted and exchangeable time-cells, which alienate us from the very tasks we accomplish¹⁷.

Financial capitalism thrives as an all-powerful analytical machine which decomposes all of our activities into elementary units (ultimately expressible by a sequence of 0s and 1s), which it can then recombine in an ‘optimised’ manner. Just like chemistry, from Lavoisier to Mendeleev, managed to reduce the open array of chemical substances to a recombination of a small table of elementary units, in the same manner, the competitive pressure exerted by the increasing fluidity of global finance tends to decompose manual and intellectual labour into elemental time-cells, tradeable worldwide. One can imagine our endo-attention functionally dissected as pigs’ bodies on the butchers’ chart, sellable by the piece or by the ton, directly from the global slaughterhouses provided by GAFAM platforms.

Automation, heteromation and precarisation appear as different moments of a single dynamic, illustrated by the working conditions set in place by new giants like Amazon or Uber. Those who collect the various items to be shipped according to our online orders, as well as those who drive us through town with the help of Waze, tend to follow piecemeal commands provided by algorithmic governance: their body and their car turns right or left according to a basic set of commands to which they are expected to respond as quickly and predictably as possible. Their endo-attention is set in a technological environment where its reactions can be almost entirely pre-programmed. Automation, here, means that their endo-

¹⁵ The Economist, ‘Automation and Anxiety’, special report, June 25, 2016.

¹⁶ Hamid Ekbia or Bonnie Nardi, *Heteromation and Other Stories of Computing and Capitalism*, Cambridge, MA, MIT Press, 2017.

¹⁷ Franco ‘Bifo’ Berardi, *The Soul at Work. From Alienation to Autonomy*, Los Angeles, Semiotext(e), 2009, *Heroes: Mass Murder and Suicide*, New York, Verso, 2015, as well as *AND. A Phenomenology of the End*, Los Angeles, Semiotext(e), 2016; Bernard Stiegler, *Automatic Society. The Future of Work*, Cambridge, Polity Press, 2016.

attention has been almost fully alienated to algorithmic control provided by exo-attentional devices.

As we know, for almost two centuries, automation has been a tale of two cities. If you come from the affluent, optimistic, uptown, you will consider Uber drivers and Amazon warehouse workers as transitional figures, bound to be soon replaced by full automation. Exo-attentional devices like self-driving cars and carrying robots will free their endo-attention for more creative and rewarding activities. In the long run and in the global picture, the creativity inherent to attention has been merely displaced, from creatively paying endo-attention to a limited number of surrounding things (as it is the case when we drive a car), to creatively devising algorithms that pay exo-attention to a higher number of things (as illustrated by the cognitive labour of hackers and programmers). In terms of attention economy, replacing costly endo-attention by cheaper exo-attention brings a net gain, from which we can all benefit.

Should you come from the ghetto, you'd know from experience that what rich folks consider as full automation means that you will be paid less for bringing the necessary supplement to what the machines supposed to replace you still fail to perform. And you know that only so-called 'accelerationists' still dream about seeing automation significantly reduce our workweek: never have so many tasks been automatized, never have we felt so crazybusy¹⁸. You may even suggest that this increasing automation of our endo-attention may have less to do with ergonomics than with crowd control: the more one follows piecemeal commands, the less distance one can take towards such commands, the better one obeys, the less one questions, the more smoothly capital flows back with higher rates of return...

Time Matters: Delays, Expectations, Anticipations

Three displacements about the way we frame automation and (in)attention anxieties result from the previous considerations. First, as we have just seen, automation anxiety may be less triggered by a (conservative) fear of seeing human labour replaced by machines, than by a (realist) awareness of the increased level of exploitation applied to the residual heteromated labour that automation never fails to generate. The quality of the environment and the conditions within which our endo-attention is called to perform are no less an issue than the quantity of income we can expect to receive in exchange for alienating our endo-attention.

Second, the most crucial challenges faced by mankind in the Capitalocene may not so much revolve around the opposition between *exo-* vs. *endo-*attention, as around our capacity properly to modulate our individual and collective attentional time-scopes. The contrast between *recognitive* vs. *creative* attention consists in a difference of function: in the first case, one identifies a certain block of sensations as an item of a category already known; in the second case, one constructs a previously unsuspected category in order to account for the singular set of features noticed in a certain block of reality. Common wisdom has it that recognitive attention can now be automated, whereas creative attention remains a privilege of human intelligence.

¹⁸ See Nick Srnicek and Alex Williams, *Inventing the Future: Postcapitalism and a World Without Work*, New York, Verso, 2014, and Edward Hallowell, *CrazyBusy: Overstretched, Overbooked, and About to Snap! Strategies for Handling Your Fast-Paced Life*, New York, Ballantine, 2007.

As we have seen in passing, however, this difference in function is intimately bound to a difference in time-frame. When I drive my car, my (and my fellow-drivers') survival depends on my capacity to identify, as accurately and rapidly possible, that this given block of sensations includes a stop sign, while that one includes a cyclist gushing from a side street. Speed is of the essence, in a matter of life and death. The same stop sign, and the same cyclist, if encountered within a museum or on a theatre stage, could perfectly bring nourishment to my creative attention: I could scrutinize their design, shades of red, minor imperfections and inspiring oddities. The stop sign may have discreet but insistent traces of rust which, taken together and noticed for themselves, compose a unique, and extremely gratifying texture I have never encountered previously, but with which I will compare many metallic objects crossing my path in the future. The cyclist may wear a disturbing mix of Che Guevara portrait along with religious symbols, which clash in my mind but apparently not in hers—thus leading me to reconsider my categories of possible theologico-political affiliations.

Developing and exercising one's creative attention, however, is not so much a matter of taste, inclination, belief, as it is a matter of pressures imposed by a certain environment, and by one's social position within this environment. A driver who has to work 15 hours a day in order to reimburse his car loan, after Uber has increased the percentage it takes on each ride, is in poor position to develop his creative attention. Noticing traces of rust or religious symbols would cause crashes. So creative attention is first and foremost a *matter of time*—according to the principle stated by Gustave Flaubert in one of his letters: 'it suffices to observe anything long enough to find something interesting in it'¹⁹.

The implications of such a simple observation are enormous. Through a certain (creative) work of endo-attention, time generates value: what was not interesting (deprived of any value) becomes interesting (valuable). 'To look is to labour', Jonathan Beller reminded us several years ago²⁰. We do not only generate value when we produce valued things or services, but also when we (re)consider pre-existing but unnoticed things, and when we discover value in them as a consequence of this re-consideration. Here too, however, this receptive generation of value, just like its productive counterpart, needs time. It needs a time delay between the perception and the judgement—the time delay of creative attention which extracts a meaningful value from an originally indifferent ground.

Enjoying the luxury of such a time delay between the moment of perception and the expected reaction is a precondition to thought itself. Gilles Deleuze used to say that the most precious ontological feature presented by our brains was their hollowness. They maintain a form of vacuum, allowing for a break (*un écart, un saut, un intervalle*) to take place in the universe. From a temporal point of view, they loosen the otherwise tight linkage between the stimulus and the reaction enacted by the rest of the nervous system. Of course, Deleuze being deeply Spinozist, the link of causal determination can never be abolished. Thought itself is automatic, and humans are no less automata than windmills or computers. But they are automata that include the possibility of an extremely fruitful time delay within their circuitry.

¹⁹ Gustave Flaubert, *Letter to Alfred Poitevin* (September 16, 1845), in *Correspondance*, Paris, Gallimard, Pléiade, tome 1, p252.

²⁰ Jonathan Beller, *The Cinematic Mode of Production: Attention Economy And the Society of the Spectacle*, Hanover, Dartmouth College Press, 2006. See also Georg Franck, 'Mental Capitalism', 2005, http://www.iemar.tuwien.ac.at/publications/Franck_2005c.pdf.

Benefiting from this time delay is what endo-attention can do best with its free time: turn itself upon itself to become *reflective* attention, to question what it attends to and what else it could attend to. This allows us to question the valuations through which we filter and objectify the sensory data, instead of merely—automatically—applying the inherited values and categorisations spontaneously mobilised to sort out these data. This is how individuals become *subjects*: by using their capacity to re-evaluate values. This is how their filtering of data singularises them, by a constant adjustment between ever-changing conditions of living and ever-evolving processes of (re-)evaluations (involving desires and fears, anticipations and observations, expectations and disappointments, confirmations and surprises).

From this temporal perspective, exo-attention appears as a mere accelerator. How long would it take for our endo-attentions to look at all the available web pages, in order to find the ones best suited to our query? The exo-attentional device provided by Google's PageRank—a most complex algorithm, operating on a most extensive (and energy consuming) network of servers—does the job for us in a fraction of a second. A huge number of micro-judgements of value are automatically compiled to generate this highly efficient ranking. The acceleration allowed by such a device performs two distinct operations at the same time. On the one hand, it merely reproduces—and thereby confirms and strengthens—the pre-existing valuations it collects on the web (as manifested by hyperlinks, previous clicks, time spent on pages, etc.). On the other hand, it necessarily recombines these pre-existing valuation through its own process of valuation, by establishing certain coefficients of ponderation between the various criteria it selects as relevant.

The most important point is that this acceleration provided by exo-attentional devices is currently enslaved—as long as we tolerate the development of the internet to be commercially driven—to a dynamic ruled by the *anticipation of expectations*. The quasi-instantaneous results PageRank (or Facebook, or Twitter, or Amazon) gives me—for free, i.e., in exchange for the possibility of accessing, harvesting and selling data on my endo-attentional behaviour—are geared towards what I am computed to *expect*, based on what I (and others supposed to be like me) have appeared to be expecting in the past. Of course, one *could* set alternative algorithms that would belie and surprise our expectations, instead of comforting them—and the core of modern and contemporary arts specialises in such an endeavour. But the fact is that the dominant social logic that rules our exo-attentional devices does not play the game of surprise, because it is more commercially rewarding to play the game of expectations.

This orientation towards expectations generates feedback loops which not only 'reflect' people's expectations, but also entraps them through a dynamic of *anticipation*. By pre-selecting what is supposed to satisfy my preferences, exo-attentional devices short-circuit my choices thanks to the self-fulfilling power of such anticipations²¹. By doing so, they literally *precipitate* my choices: by 'accelerating' and by-passing the possibility of re-evaluation, they solidify, harden, rigidify and reify my preferences, in a way that is similar to the chemical 'precipitation' of a liquid substance into a solid compound.

As we can see, time matters insofar as it reveals two very different dynamics, which are not simply aligned on the endo- vs. exo-attention divide. Both can be considered, at least from

²¹ See on this issue the dossier 'Quand le néolibéralisme court-circuite nos choix' published in the journal *Multitudes*, 68, 2017, as well as Mark B.N. Hansen, *Feed-Forward. On the Future of 21st Century Media*, University of Chicago Press, 2015.

a Deleuzian-Spinozist perspective, as automatisms. What matters is the presence or absence of a significant (and meaning-producing) time delay within the circuitry of the automaton. Reflexive and creative endo-attentions are made possible by the luxury of a time delay between the exposition to the stimulus and the emergence of a category through which the organism will react to what it has extracted from the background as relevant to orient its behaviour. This slower form of re-evaluating reaction, which can take place in endo-attentional organisms provided with the luxury of time delays, finds itself immersed in powerful networks ruled by a symmetrical, commercially-driven dynamic of acceleration, whereby exo-attentional devices tend to anticipate expectations. Within this immersed state, agency rests more in the exo-attentional system of pressures than in the endo-attentional capacity to pause for thought.

Abstraction Matters: Explicitness, Intuitions, Entanglements

A third displacement will help understand the nature and the stakes of the two previous ones. Beyond matters of work and matters of time, automation anxieties linked to attentional questions should be considered in terms of different *modes of abstraction*. Any form of knowledge or sensation ‘prehends’, ‘extracts’ or ‘abstracts’ certain features from the infinitely rich sensory environment out of which it grows. Most of such prehensions, extractions or abstractions are performed by the organism on an automated basis. When I walk up a stairway and enter into a room, I usually do not have to pay (focused) attention to the size of the steps or the precise location of the door. I just walk up and through. Some amount of attention is paid to my surroundings, and when this amount happens to be too low, I may fall in the stairs or hit my nose against a door. But this type of accidents happens remarkably rarely.

Two aspects of this largely automatic *environmental endo-attention* should be stressed for our present purpose. First, the attention I pay to my surroundings is of a very odd type. I can be ‘concentrated’ on a discussion with a friend and still manage to climb up the stairs and enter the room without a bloody nose. Being ‘aware of one’s surroundings’ is a rather paradoxical form of awareness, since one is barely aware of it. While we usually represent attention as a spotlight, concentrating its focus on an object to identify or on an operation to perform, this environmental endo-attention seems to be distributed all around us, for purposes of orientation rather than identification or action. One ‘feels’ one’s surroundings as a background—or as a ‘superobject’, to use the word proposed by French neurologist Jean-Philippe Lachaux to name the flow of moving data within which one locate one’s movements²².

The second crucial aspect of this environmental endo-attention is that it remains at an *implicit* level of (un)awareness. Most of us can easily walk up a stairway. But nobody could explain with enough accuracy to a robot visiting from Saturn exactly how high and how fast one has to lift the left leg, and push ahead the left foot, in order to keep one’s balance in such a basic and yet terribly intricate operation. We implicitly know much more than we can explicitly say. This mode of abstraction, performed at all times and apparently effortlessly by our endo-attention in order to adjust our gestures to our environment, is experienced as a form of intuition, rather than ‘knowledge’.

One of the defining specificities of our computational exo-attention is that it rests exclusively on an *explicit* mode of abstraction. While the ‘things’ that populate our material

²² Jean-Philippe Lachaux, *Le cerveau funambule*, Paris, Odile Jacob, 2016.

world appear to our senses and intellect as infinitely rich blocks of sensations, the data that circulate in our digital networks can all be reduced to complex but limited sequences of 0s and 1s. As Vilém Flusser used to stress, they are ‘models’²³, resulting from the thorough analysis of our environment into elemental entities, and from the recombination of such entities in potentially new aggregates, whose rules of construction need to be as explicit (unambiguous, unequivocal) as the rules of the analysis had been.

The dreaded failure message *Object reference not set to an instance of an object*, which occasionally appears on our screens as a result of faulty manipulation, reveals the deeper ontology of the digital world: one cannot simply refer to existing things; reference needs to be ‘set’ to ‘objects’ that have been explicitly pre-formatted as “an instance of an object”; models can only interact with, and be compared to, models. Even the background needs to be modeled as an object, i.e., as a special type of figure, whose parameters demand to be fully specified. Instead of being an open reserve of untapped, unsuspected and unknown potentials, the background, modeled as a figure, only provides what a certain modeling system has decided to put into it.

These two modes of abstraction present a sharp contrast: while endo-attention abstracts implicit blocks of sensations rooted in a background felt on an intuitive basis, exo-attention provides figures modeled according to what explicit human knowledge has been able to abstract from its surroundings. The same contrast can be approached in terms of *entanglements*: endo-attention abstracts a limited amount of relations within the infinitely complex meshwork of entanglements composing our universe; exo-attention circulates models of entanglements, previously abstracted, in limited number, by endo-attention.

This contrast remains valid even in alleged cases of unsupervised deep learning using neural networks. This type of creative exo-attention does indeed exceed our human capacity to understand what criteria and ponderations are applied in order to adjust the computation to optimised results. A strong and troubling negative correlation has been established between the prediction accuracy and the explainability of artificial intelligence systems—neural networks being among the most accurate and the most opaque²⁴. One certainly cannot consider such black boxes as ‘explicit’, since nobody understands how they work. Yet, they remain based on a limited amount of entanglements, previously abstracted and previously made explicit by human programmers’ endo-attention. Only their recombination within the black box of deep neural networks remains opaque, not their building elements, which remain the results of explicit modeling.

Abstraction matters. By intuitively extracting certain features of reality as more relevant than others, endo-attention determines what matters to us. Exo-attentional devices (creative or not) do increasingly produce and structure our material world from within. But the type of abstraction at work matters even more than abstraction itself. It is now time, in conclusion, to draw some the socio-political consequences of the three displacements proposed so far.

Overcoming Ecocidal and Egocidal Capitalism

²³ Vilém Flusser, *Into the Universe of Technical Images* (1985), Minneapolis, University of Minnesota Press, 2011.

²⁴ See David Gunning, ‘Explainable Artificial Intelligence’, 2016, <https://www.darpa.mil/attachments/XAIProgramUpdate.pdf>

The *exo-attention anxiety hypothesis* formulated above suggests that most of us intuitively trust our intuitive background endo-attention more than we trust the type of abstract models which populate our digitalised world. If our adjustment to our surroundings rests on the type of environmental attention, fuzzy logic and affective feedback illustrated by walking up a stairway, it is far from irrational to mistrust forms of governance based on the abstraction of explicit, pre-selected, entanglements.

It goes without saying that, when revisited and reconfigured by artistic minds and practices, exo-attentional devices can provide ways to exceed our expectations, by making us see, hear, read and conceive forms and experiences that would never have been accessible without the power of abstraction offered by machinic computation. Even if exo-attentional devices can dramatically increase our knowledge and control over our environment, the functional need for explicitness inherent to their ontology as digital objects carries with itself the threat of a worrying impoverishment of our background attention²⁵. They tend to hypnotise us with figures unduly isolated from their nourishing ground. One can therefore suspect them to be intimately linked to the extractivist mode of production which has come to threaten the environmental sustainability of our forms of life.

The three displacements discussed above—pushing us to consider matters of work, of time and of abstraction as more decisive than the issue of automation in itself—all point towards the same direction. Automation anxieties are not so much mistaken as misplaced: it is our socio-economic regime of production, of consumption and of commercial competition, dominated by the ruling abstraction of finance, which should be considered as cause for anxiety, rather than the technological development themselves. The three displacements advocated here converge in suggesting that capitalism is more to be feared than automation.

From the attentional point of view developed on the issue of work, capitalism can be defined by its tendency to align all of our individual and collective attentions worldwide on one single principle of relevance: financial profit. The complex nature of this alignment need to be specified, however, in order to prevent oversimplifications. While globalisation may certainly induce processes of standardisation and homogenisation, Erin Manning and Brian Massumi are right to stress that

the forms of life captured by the capitalist process produce value by distinguishing themselves from each other. Capitalism is as *singularising* as it is subsuming. The issue is that the singularisation is subject to competition in a way that foregrounds quantitative measures of success over the richness of qualitative diversity. The heterogeneity of forms of life is important only to the extent that those forms add capital value²⁶.

It is by the same movement that the capitalist axiomatic tends to destroy our environments and our subjectivations. It is *ecocidal* insofar as it ravages the richness of qualitative biodiversity, which is sustained in ‘natural’ environments by the very multiplicity of cross-pollinating ends and principles of relevance, as they are brought into a given

²⁵ On this point, see David Abram, *The Spell of the Sensuous: Perception and Language in a More-Than-Human World*, New York, Vintage, 1997, as well as Pietro Montani, *Tecnologia della sensibilità. Estetica e immaginazione interattiva*, Milano, Raffaello Cortina, 2014.

²⁶ Erin Manning & Brian Massumi, *Thought in the Act. Passages in the Ecology of Experience*, Minneapolis, University of Minnesota Press, p122. For further developments on this analysis, see Brian Massumi, *99 Theses on the Re-Evaluation of Value*, Durham, Duke University Press, 2018.

ecosystem by its many heterogeneous dwellers. By exacerbating a ruthless and reckless competition, whose only meta-principle of relevance is financial profit, (neoliberal) capitalism aligns our attentions on a single extractivist attractor, which plunders our resources treated solely as financial ‘assets’. As Anna Tsing has eloquently documented, it mines them to exhaustion, before leaving ruined landscapes in search for other territories and energies to exploit²⁷.

Capitalism is *egocidal* insofar as it plunders our subjectivities in the same extractivist manner as it plunders our physical, biological and social resources. Neoliberal competition not only exhausts, but undermines the psychological foundations of the ego it so ostensibly deifies²⁸. As we saw when discussing issues of work, the competition for financial profit induces a fragmentation of our working activities into standardised time-cells, which only make sense from the superior point of view of global financial management. At the level of our individual work experience, this fragmentation hollows out our labour, simultaneously, from its stable income and from its subjective meaning. As for the treatment of time enacted by financial capitalism, we saw how the dynamics set in place through exo-attentional devices driven by commercial interests tend to anticipate our expectations, tying us to our past and to those deemed similar to us, making it ever more difficult to afford the luxury of the time delay necessary for the concrescence of our subjectivity.

These ecocidal and egocidal tendencies converge when one considers the specific mode of abstraction promoted and fed upon by financial capitalism in the age of digital media. By becoming increasingly reliant upon exo-attentional abstractions limited by the explicit categorisations needed to program algorithmic machines, computational media simultaneously tend to isolate us from ‘the richness of qualitative diversity’ inherent to our analog prehensions of our backgrounds, and threaten to prevent the anchoring of our subjectivation within singularities that have not been pre-formatted to fit ‘optimised’ models.

How can we overcome such tendencies? Automation anxieties, as this article attempted to interpret them in the particular domain of the much lamented (in)attentional crisis, should be understood both as a symptom and as a catalyst for change. We need to counter-effect the increasing precarisation of our work conditions. This could be achieved by demanding the instauration of a universal basic income, conceived not on the model of public assistance to the needy, but as an enabling advance of wage: your monthly check of 1 000 euros will be granted to make it possible for you to pay attention to what you consider to be worth it—and humans being sociable creatures, most of us will tend to do things with and for other people, instead of just watching TV 24/7 This could be justified and designed as a social investment in the time delay needed for reflexive attention—a precondition to thought, invention, subjectivation and the re-evaluation of values²⁹.

Of course, the universal basic income made possible by the accelerationists’ promise of ‘full automation’ would not in any way be a panacea. One would be well inspired to follow Donna Haraway or Anna Tsing in looking for a deeper cause than Capital to our current ego-

²⁷ For a wonderful analysis of this extractivist dynamics, see Anna Lowenhaupt Tsing, *The Mushroom at the End of the World. On the Possibilities of Life in Capitalist Ruins*, Princeton University Press, 2015.

²⁸ See the special issue ‘Quand le néolibéralisme court-circuite nos choix’ published by the journal *Multitudes*, 68, 2017.

²⁹ For a proposal, see Yves Citton, ‘Revenu inconditionnel d’existence et économie générale de l’attention’, *Multitudes*, 63, 2016, p59-71.

and ecocide. More than blaming human beings in general (*'Anthropocene'*), or a certain dynamics of economic motivation and exploitation (*'Capitalocene'*), one should locate the deeper roots of our looming collapse in the extractivist attitude developed over the last five centuries towards the colonisation of all natural processes (*Plantationocene*)³⁰. Our environments are ruined insofar as they are reduced to 'plantations', i.e., to monocultures of profit crushing the multi-species milieus they trample upon, extracting short-term gains to the expense of future generations, without paying attention to any collateral damage.

If attention does indeed consist in a selective processing of sensory data geared towards steering the organism's (re)actions, one could deem it extractivist in itself: whatever it is geared towards, it attempts to extract useful affordances from its environment. Capitalism merely intensifies this attitude: it steers and fosters our spontaneous attentional extractivism under the superior, more powerful and more abstract rule of financial extractivism. But the deeper problem is the colonisation of our environments, reduced to plantations by the unleashed forces of extractivist abstractions. Indeed, abstraction matters: our material world is dramatically reshaped, and tragically ruined, by it.

We therefore need to fence off the dangers inherent to this exponential abstraction of our ever-more mediated access to reality. Some very real dangers loom large over our heads in the form of what Timothy Morton has named 'hyperobjects'³¹: phenomena like climate change or nuclear contamination are too wide in scale, spatially and temporally, too diffuse, too sticky, for us to be able to apprehend, conceive, experience and manage them as we are used to manage objects from our everyday life. Hyperobjects need exo-attentional devices for us to become more aware of their presence and threats. We need to extract and abstract data on a scale without common proportion to what we were used to, we need to model hyperobjects we are unable to see, hear, smell or touch as such, we need to devise, test and confirm explicit causal hypotheses about what can be done to prevent calamities linked to such hyperobjects. We need creative exo-attention to help us regain some control over the monsters that have escaped from our extractivist black box.

For the much more common countless objects to which we devote our attention, however, we should mistrust the piling up of abstractions over abstractions which constitute our daily news. We need to give priority to what we can experience in unmediated contact with our material surroundings, since the background attention allowing us to climb stairs without accident is much more trustworthy than the computerised figures extracted from the computerised figures which saturate our screens.

As several important books have recently and convincingly argued, we also need to reconsider a large spectrum of artistic practices developed in conjunction with digital devices as modes of *dis-automation*. Pierre-Damien Huyghe invites us to consider research in the arts as a way to escape from the usually narrow range of quasi-automatic uses we draw from our technical apparatuses, which remain to be "dis-covered" for their largely untapped potentials³². Similarly, Pietro Montani sees the artistic experience as a way to "dis-automatize" the patterns of perception and the patterns of thoughts induced in us by our

³⁰ See Donna Haraway, *Staying with the Trouble. Making Kin in the Chthulucene*, Durham, Duke University Press, 2016; Tsing, *The Mushroom at the End of the World*, op. cit..

³¹ Timothy Morton, *Hyperobjects. Philosophy and Ecology After the End of the World*, Minneapolis, University of Minnesota Press, 2013.

³² Pierre-Damien Huyghe, *Contre-temps. De la recherche et de ses enjeux. Arts, architecture, design*, Paris, B42, 2017.

increasing reliance on the mediation of language and digital media³³. What is most striking—and most promising—in these two thinkers is the reversal operated on the traditional relation between human subjects and technical objects. Instead of identifying automation with machines and humans with freedom, both reconfigure the issue by locating automation in our human behaviours rather than in the mechanicity of machines. Both invite us to look deeper into our human institutions, our human languages and our human ideologies in order to understand the pressures pushing us towards automation. Both suggest that dis-automation processes can come from where we expect them the least—from the automata themselves! Pierre-Damien Huyghe argues for a different use (and design) of technical apparatuses, so that their automatisms (and settings) open up a broader field of aesthetic experimentations, while Pietro Montani looks into the mental automaton of our nocturnal dreams as a resource against the automation of our waking attentions.

More generally, this article has attempted to show that the dominant framing of our (in)attentional crisis in terms of amnesism, individualism, technologism and manicheism tends to distract us from the deeper issues. These require us to adopt a longer time-frame (going back to the roots of extractivism in the colonial-industrial project), an ecological approach (analysing how individual behaviours are conditioned by their environment), a socio-economic framework (re-inscribing technological devices within the relations of power that command their usage), a political critique (questioning the generally implicit authority responsible for the partition of the sensible operated between what is worthy and unworthy of whose attention), and a set of artistic practices (mobilising automata to disautomatize our attentional patterns).

The main conclusion is that, if our individual and collective attentions are indeed in crisis, our current anxieties should lead us to denounce the damages of neoliberal capitalism insofar as it tends to globally align the infinite diversity of our individual attentions under one single hegemonic imperative to maximize financial profit. As we have seen, this hegemony is both egocidal, as it automatizes our endo-attention subjected to segmented tasks that no longer make sense to us (pre-empting emancipatory forms of subjectivation), and ecocidal, as the race for short-term profit vandalizes our social and natural environments. We therefore need to sharpen our analyses (and anxieties), in order to deflect our fear of automation towards a rejection of neoliberal capitalism.

³³ Pietro Montani, *Tre forme di creatività : tecnica, arte, politica*, Napoli, Cronopio, 2018.