Peer Community In Archaeology

Automation and Novelty –Archaeocomputational Typo-Praxis in the Wake of the Third Science Revolution

Shumon Tobias Hussain, ***Felix Riede*** *and* ***Sébastien Plutniak*** *based on peer reviews by* ***Rachel Crellin*** *and 1 anonymous reviewer*

Gavin Lucas (2023) Archaeology, Typology and Machine Epistemology. Zenodo, ver. 2, peer-reviewed and recommended by Peer Community in Archaeology.
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Published: 21 March 2023

"Archaeology, Typology and Machine Epistemology" submitted by G. Lucas (1) offers a refreshing and welcome reflection on the role of computer-based practice, type-thinking and approaches to typology in the age of big data and the widely proclaimed 'Third Science Revolution' (2–4). At the annual meeting of the EAA in Maastricht in 2017, a special thematic block was dedicated to issues and opportunities linked to the Third Science Revolution in archaeology "because of [its] profound and wide ranging impact on practice and theory in archaeology for the years to come" (5). Even though the Third Science Revolution, as influentially outlined by Kristiansen in 2014 (2), has occasionally also been met with skepticism and critique as to its often implicit scientism and epistemological naivety (6–8), archaeology as a whole seems largely euphoric as to the promises of the advancing 'revolution'. As Lucas perceptively points out, some even regard it as the long-awaited opportunity to finally fulfil the ambitions and goals of Anglophone processualism. The irony here, as Lucas rightly notes, is that early processualists initially foregrounded issues of theory and scientific epistemology, while much work conducted under the banner of the Third Science Revolution, especially within its computational branches, does not. Big data advocates have echoed Anderson's much-cited "end of theory" (9) or at least emphatically called for an 'empirization' and 'computationalization' of theory, often under the banner of 'data-driven archaeology' (10), yet typically without much specification of what this is supposed to mean for archaeological theory and reflexivity. The latter is indeed often openly opposed by archaeological Third Science Revolution enthusiasts, arguably because it is viewed as part of the supposedly misguided 'post-modernist' project.

Lucas makes an original meta-archaeological contribution here and attempts to center the epistemological, ontological and praxeological dimensions of what is actually – in situated archaeological praxis and knowledge-production – put at stake by the mobilization of computers, algorithms and artificial intelligence (AI), including

its many but presently under-reflected implications for ordering practices such as typologization. Importantly, his perspective thereby explicitly and deliberately breaks with the 'normative project' in traditional philosophy of science, which sought to nail down a universal, prescriptive way of doing science and securing scientific knowledge. He instead focuses on the practical dimensions and consequences of computer-reliant archaeologies, what actually happens on the ground as researchers try to grapple with the digital and the artefactual and try to negotiate new insights and knowledge, including all of the involved messiness – thereby taking up the powerful impetus of the broader *practice turn* in interdisciplinary science studies and STS (*Science and Technology Studies* (11)) (12–14), which have recently also re-oriented archaeological self-observation, metatheory and epistemology (15). This perspective on the dawning big data age in archaeology and incurred changes in the status, nature and aims of type-thinking produces a number of important insights, which Lucas fruitfully discusses in relation to promises of 'automation' and 'novelty' as these feature centrally in the rhetorics and politics of the Third Science Revolution.

With regard to automation, Lucas makes the important point that machine or computer work as championed by big data proponents cannot adequately be qualified or understood if we approach the issue from a purely time-saving perspective. The question we have to ask instead is what *work* do machines actually do and how do they *change* the dynamics of archaeological knowledge production in the process? In this optic, automation and acceleration achieved through computation appear to make most sense in the realm of the uncontroversial, in terms of "reproducing an accepted way of doing things" as Lucas says, and this is precisely what can be observed in archaeological practice as well. The ramifications of this at first sight innocent realization are far-reaching, however. If we accept the noncontroversial claim that automation partially bypasses the need for specialists through the reproduction of already "pre-determined outputs", automated typologization would primarily be useful in dealing with and synthesizing larger amounts of information by sorting artefacts into already accepted types rather than create novel types or typologies. If we identity the big data promise at least in part with automation, even the detection of novel patterns in any archaeological dataset used to construct new types cannot escape the fact that this novelty is always already *prefigured* in the data structure devised. The success of 'supervised learning' in AI-based approaches illustrates this. Automation thus simply shifts the epistemological burden back to data selection and preparation but this is rarely realized, precisely because of the tacit requirement of broad non-contentiousness.

Minimally, therefore, big data approaches ironically curtail their potential for novelty by adhering to conventional data treatment and input formats, rarely problematizing the issue of data construction and the contested status of (observational) data themselves. By contrast, they seek to shield themselves against such attempts and tend to retain a tacit universalism as to the nature of archaeological data. Only in this way is it possible to claim that such data have the capacity to "speak for themselves". To use a concept borrowed from complexity theory, archaeological automation-based type-construction that relies on supposedly basal, incontrovertible data inputs can only ever hope to achieve 'weak emergence' (16) – 'strong emergence' and therefore true, radical novelty require substantial re-thinking of archaeological data and how to construct them. This is not merely a technical question as sometimes argued by computational archaeologies – for example with reference to specifically developed, automated object tracing procedures – as even such procedures cannot escape the fundamental question of typology: which kind of observations to draw on in order to explore what aspects of artefactual variability (and why). The focus on readily measurable features – classically dimensions of artefactual *form* – principally evades the key problem of typology and ironically also reduces the complexity of artefactual realities these approaches assert to take seriously. The rise of computational approaches to typology therefore reintroduces the problem of universalism and, as it currently stands, reduces the *complexity of observational data* potentially relevant for type-construction in order to enable to exploration of the *complexity of pattern*. It has often been noted that this larger configuration promotes 'data fetishism' and because of this *alienates* practitioners from the archaeological record itself – to speak with Marxist theory that Lucas briefly touches upon. We will briefly return to the notion of 'distance' below because it can be described as a symptomatic research-logical trope (and even a goal) in this context of inquiry.

In total, then, the aspiration for novelty is ultimately difficult to uphold if computational archaeologies refuse to engage in fundamental epistemological and reflexive self-engagement. As Lucas poignantly observes, the most promising locus for novelty is currently probably not to be found in the *capacity* of the machines or algorithms themselves, but in the modes of *collaboration* that become possible with archaeological practitioners and specialists (and possibly diverse other groups of knowledge stakeholders). In other words, computers, supercomputers and AI technologies do not revolutionize our knowledge because of their superior computational and pattern-detection capacities – or because of some mysterious 'superintelligence' – but because of the specific 'division of labour' they afford and the cognitive challenge(s) they pose. Working with computers and AI also often requires to ask new questions or at least to adapt the questions we ask. This can already be seen on the ground, when we pay attention to how machine epistemologies are effectively harnessed in archaeological practice (and is somewhat ironic given that the promise of computational archaeology is often identified with its potential to finally resolve "long-standing (old) questions"). The Third Science Revolution likely prompts a consequential transformation in the structural and material conditions of the kinds of 'distributed' processes of knowledge production that STS have documented as characteristic for scientific discoveries and knowledge negotiations more generally (14, 17, 18). This ongoing transformation is thus expected not only to promote new specializations with regard to the utilization of the respective computing infrastructures emerging within big data ecologies but equally to provoke increasing demand for new ways of conceptualizing observations and to reformulate the theoretical needs and goals of typology in archaeology. The rediscovery of reflexivity as an epistemic virtue within big data debates would be an important step into this direction, as it would support the shared goal of achieving true epistemic novelty, which, as Lucas points out, is usually not more than an elusive self-declaration. Big data infrastructures require novel modes of human-machine synergy, which simply cannot be developed or cultivated in an atheoretical and/or epistemological disinterested space.

Lucas' exploration ultimately prompts us to ask big questions (again), and this is why this is an important contribution. The elephant in the room, of course, is the overly strong notion of objectivity on which much computational archaeology is arguably premised – linked to the vow to eventually construct 'objective typologies'. This proclivity, however, re-tables all the problematic debates of the 1960s and – to speak with the powerful root metaphor of the machine fueling much of causal-mechanistic science (19, 20) – is bound to what A. Wylie (21) and others have called the 'view from nowhere'. Objectivity, in this latter view, is defined by the *absence* of positionality and subjectivity – chiefly human subjectivity – and the promise of the machine, and by extension of computational archaeology, is to purify and thus to enhance processes of knowledge production by minimizing human interference as much as possible. The distancing of the human from actual processes of data processing and inference is viewed as positive and sometimes even as an explicit goal of scientific development. Interestingly, alienation from the archaeological record is framed as an epistemic virtue here, not as a burden, because close connection with (or even worse, immersion in) the intricacies of artefacts and archaeological contexts supposedly aggravates the problem of bias. The machine, in this optic, is framed as the gatekeeper to an observer-independent reality – which to the backdoor often not only re-introduces Platonian/Aristotelian pledges to a quasi-eternal fabric of reality that only needs to be "discovered" by applying the right (broadly nonhuman) means, it is also largely inconsistent with defendable and currently debated conceptions of scientific objectivity that do not fall prey to dogma.

Furthermore, current discussions on the open AI *ChatGPT* have exposed the enormous and still underreflected dangers of leaning into radical renderings of machine epistemology: precisely because of the principles of automation and the irreducible theory-ladenness of all data, ecologies such as *ChatGPT* tend to reinforce the tacit epistemological background structures on which they operate and in this way can become collaborators in the legitimization and justification of the status quo (which again counteracts the potential for novelty) – they reproduce supposedly established patterns of thought. This is why, among other things, machines and AI can quickly become perpetuators of parochial and neocolonial projects – their supposed authority creates a sense of impartiality that shields against any possible critique. With Lucas, we can thus perhaps cautiously say that what is required in computational archaeology is to defuse the authority of the machine in favour of

a new community archaeology that includes machines as (fallible) *co-workers*. Radically put, computers and AI should be recognized as *subjects* themselves, and treated as such, with interesting perspectives on team science and collaborative practice.

Bibliography

1. Lucas, G. (2022). Archaeology, Typology and Machine Epistemology. https:/doi.org/10.5281/zenodo.7620824.

2. Kristiansen, K. (2014). Towards a New Paradigm? The Third Science Revolution and its Possible Consequences in Archaeology. *Current Swedish Archaeology* 22, 11–34. https://doi.org/10.37718/CSA.2014.01.

3. Kristiansen, K. (2022). *Archaeology and the Genetic Revolution in European Prehistory*. Elements in the Archaeology of Europe. https://doi.org/10.1017/9781009228701

4. Eisenhower, M. S. (1964). The Third Scientific Revolution. *Science News* 85, 322/332. https://www.sciencenews.org/archive/third-scientific-revolution.

5. The 'Third Science Revolution' in Archaeology. http://www.eaa2017maastricht.nl/theme4 (March 16, 2023).

6. Ribeiro, A. (2019). Science, Data, and Case-Studies under the Third Science Revolution: Some Theoretical Considerations. *Current Swedish Archaeology* 27, 115–132. https://doi.org/10.37718/CSA.2019.06

7. Samida, S. (2019). "Archaeology in times of scientific omnipresence" in *Archaeology, History and Biosciences: Interdisciplinary Perspectives,* pp. 9–22. https://doi.org/10.1515/9783110616651

8. Sørensen, T. F.. (2017). The Two Cultures and a World Apart: Archaeology and Science at a New Crossroads. *Norwegian Archaeological Review* 50, 101–115. https://doi.org/10.1080/00293652.2017.1367031

9. Anderson, C. (2008). The end of theory: The data deluge makes the scientific method obsolete. Wired. https://www.wired.com/2008/06/pb-theory/.

10. Gattiglia, G. (2015). Think big about data: Archaeology and the Big Data challenge. *Archäologische Informationen* 38, 113–124. https://doi.org/10.11588/ai.2015.1.26155

11. Hackett, E. J. (2008). *The handbook of science and technology studies*, Third edition, MIT Press/Society for the Social Studies of Science.

12. Ankeny, R., Chang, H., Boumans, M. and Boon, M. (2011). Introduction: philosophy of science in practice. *Euro Jnl Phil Sci* 1, 303. https://doi.org/10.1007/s13194-011-0036-4

13. Soler, L., Zwart, S., Lynch, M., Israel-Jost, V. (2014). *Science after the Practice Turn in the Philosophy, History, and Social Studies of Science,* Routledge.

14. Latour, B. and Woolgar, S. (1986). *Laboratory life: the construction of scientific facts*, Princeton University Press.

15. Chapman, R. and Wylie, A. (2016) *Evidential reasoning in archaeology,* Bloomsbury Academic.

16. Greve, J. and Schnabel, A. (2011). *Emergenz: zur Analyse und Erklärung komplexer Strukturen,* Suhrkamp.

17. Shapin, S., Schaffer, S. and Hobbes, T. (1985). *Leviathan and the air-pump: Hobbes, Boyle, and the experimental life,* including a translation of Thomas Hobbes, Dialogus physicus de natura aeris by Simon Schaffer, Princeton University Press.

18. Galison, P. L. and Stump, D. J. (1996).*The Disunity of Science: Boundaries, Contexts, and Power,* Stanford University Press.

19. Pepper, S. C. (1972). *World hypotheses: a study in evidence*, 7. print, University of California Press.

20. Hussain, S. T. (2019). *The French-Anglophone divide in lithic research: A plea for pluralism in Palaeolithic Archaeology,* Open Access Leiden Dissertations. https://hdl.handle.net/1887/69812

21. A. Wylie, A. (2015). "A plurality of pluralisms: Collaborative practice in archaeology" in *Objectivity in Science*, pp. 189-210, Springer. https://doi.org/10.1007/978-3-319-14349-1_10

Reviews

Evaluation round #2

Reviewed by anonymous reviewer 1, 01 March 2023

I would like to thank the author for the updates and responses. This is an excellent topic with many different directions to take. So any review will be endless. For that, I am happy with the current version. I hope to read more studies like this.

Reviewed by Rachel Crellin, 21 February 2023

The author has clearly and carefully responded to the two peer reviews. The changes have added more clarity and thereby improved an already strong text. The addition of the discussion about the etymology of the word robot was particularly good.

This paper is well written, has good clarity, addresses an important topic effectively and adds an important contribution to the debates surrouding AI and robots in archaeology. I recommend it for publication in the current format.

Evaluation round #1

DOI or URL of the preprint: https://zenodo.org/record/7267834
Version of the preprint: 1

Authors' reply, 08 February 2023

Hi,

I uploaded 2 versions of the revision - a clean copy without mark up and a tracked changes copy. The latter can be used to see how I have responded to the reviewers comments.

Reviewers' comments in *italics*, my response in **bold**.

Reviewer #1 (Rachel Crellin)

The section labelled 'Conclusions' would benefit from a re-titling – it is really a very thoughtful discission on machines in archaeology more broadly. It makes a series of excellent points about how approaches to machine learning and the labels we apply to it uphold an unhelpful nature/culture dualism. This is a great point and not one that I have seen made elsewhere. Breaking this part of the paper into its own section would help drive this home and make the paper more readable. I suggest shifting the sub-heading 'conclusion' to sit before the final three paragraphs and re-naming the current 'conclusions' section with a different sub-heading.

This I have done – I re-titled the first part 'Implications' and inserted a new sub-title before the last 3 paragraphs 'Concluding Remarks'. I have also tried to tie the text better back to the preceding discussion.

Minor points.

· The author might consider offering a brief explanation of what they mean by emic and etic categories on page 2 to help readers unfamiliar with these terms.

I have added a few sentences on this and slightly re-jigged this paragraph.

· The author might consider adding references to papers from the Arch-I-Scan project

Done

· On page 6, line 7 'thar' should be replaced by 'that'

Done

· Add a citation of Kristiansen 2014. Towards a new paradigm. The third science revolution and its possible consequences in archaeology. Current Swedish Archaeology 22(1): 11-34 into the section on theory and big data.

Done

· Add a citation of Barad, K. 2007. Meeting the Universe Half Way into the section on the materiality of science (p10)

Done

Reviewer # 2 (anonymous)

Title:

The title is informative and descriptive, but it may not entirely represent the essay. I wonder if ontology is also not a prime component of the author's discussion.

Ontology is important but I think it is better to foreground another concept so I retitled the piece by adding 'typology' – Archaeology, Typology and Machine Epistemology

Abstract:

The abstract is informative, but as above, it is not entirely representative of the work. At the very least, one would expect to see some mention of automation and novelty. In the current version, it reads too generic with wide-spanning questions.

Indeed – the abstract was written before I really knew what I was going to say, so I have now re-written it to better reflect the paper.

Introduction:

It is clear and to the point. Here, the author builds upon the ontological discussions, so we miss the machine epistemology. The author assumes we all know what these epistemologies are. I would have preferred to read the author's position more clearly -so that the rest of the essay had a more solid framework.

I have worked on making the introduction flow better so it sets up the purpose of the paper and I hope this is now clearer.

In-line comments:

• "Typological debates have periodically surfaced in the history of archaeology but in the Anglophone world … " Wouldn't it be nice to discuss the take of the "non-Anglosphere world" on this matter? Are we not missing opportunities to build better machine epistemologies by not being more inclusive?

I have added a disclaimer here and stressed the anglophone perspective represents my own limited experience

• Since the author mentions Deleuze in the essay, I wonder how would the "research question" "our question today should be what do types do " would differ from what might types do (as I brutally caricaturise Todd May's comparison of Deleuze's philosophy with earlier work. I lack expertise in this matter, but as an outsider to new-materialist approaches, I am motivated more by the imbalanced agency inherent to the subject-object relation.)

I have re-phrased this to accommodate this subtle, yet significant difference

Materials:

Automation

The section is well-written and could be an essay on its own. There is not much to comment on it

in general. So I provide below some in-line comments:

• It would be beneficial to provide a reference from Marx, as the author explicitly mentions "Marx's famous critique of automation."

Done

• It would also be beneficial to highlight the "labour theory of value" within the context of time-saving and labour-saving automation. At the end of the day, and however we define it, automation changes archaeological labour relations, so the value of what and how we labour.

I have made a passing reference to this without going into detail – would take me too far off point

• This is one of the most critical views in the essay. The author states: "My sense is, automation works best when it is applied to reproducing an accepted way of doing something; that is, to accelerate a pre-determined output." At this point, one should also stop and ask what is the pre-determined output -hence an ontological rather than an epistemological problem. The fallacies of pre-determination (biases one may read) are more visible in law and medicine, yet archaeology (despite the lack big data in its true sense) is not immune to past biases -as we scavenge through legacy data.

I am not sure I fully understood what the reviewer is getting at here but I have tried to stress what I mean by pre-determined output

• Finally, the author is being computationally simplistic -as he tacks between supervised and unsupervised classifications, probably to make a point. But how about semi-supervised learning or reinforcement learning? What are the implications of such techniques?

To an extent but in the next section I do discuss semi-supervised learning in more detail; however I have added the term at the end of this section to avoid obvious dichotomizing.

Novelty

Compared to the "automation" section, the "novelty" section is more straightforward and less speculative -if I may use that word. Nevertheless, it would have been beneficial to read the author's definition of novelty: what is considered the novel? Can there be a thing ever entirely novel? Is it a fantasy that we expect computers to create novel things while we are not fully "capable"? Are we the victims of digital hype? As these are very subjective questions, it would have been nicer for the reader to have a "boundary" around this section.

I have added a paragraph at the start of this section on what I mean by novelty, though this opens a can of worms and is a topic I address in more detail in another paper (which I cite later on).

Conclusion:

It is an unorthodox section. It is very long. But most importantly, I cannot directly tie the great arguments in previous sections with the "conclusion" section. It stands on its own and reads almost as if part of another essay. It might be a good idea to create a "results" section where the author builds towards a "discussion/conclusion" section.

See response above to Reviewer #1

As far as I can tell, this is a chapter for a volume. So I assume some key topics like "new materialism" is discussed elsewhere. Otherwise, some concepts and ideas float.

All unusual concepts have links to citations; there is a limit to how much explaining I can do without digressing and breaking the flow and so I have also had to assume some background knowledge on the part of the reader. Obviously this will vary and I cannot always strike the right balance but hopefully most readers will cope.

In-line comments:

• I would disagree with the naiveté of Anderson's claim on "the end of theory." Now I use this example -only to point at how such "naïve" positions can also be highly influential and shift the arguments; one may only look at Trump's way of using social media and his success in creating an army of trolls. In the digital age, it is not clear anymore who is naïve and who is not.

Fair point – it may be naïve to assume Anderson is being naïve. I have altered this accordingly.

• I wonder if adding a Marxist definition of technology (see David Harvey, Marx, Capital and the Madness of Economic Reason) would support the author's arguments.

Interesting idea but I felt this would perhaps open another can of worms I could not deal with. So I have not done anything here.

• It would have been great to read what the author thinks about the term: robot, both in Čapek's original and modern ways.

Brilliant point – I was not familiar with this etymology and loved it, so I added a paragraph.

• Finally, is the difference intentional? I have not read Simondon's work: "a distinction between three levels of autonomy: elements, individual and ensembles" and "re-thinking this concept. His distinction between elements, objects and ensembles" Are individuals and objects the same?

A mistake – they are not the same. I have corrected it. The right word in both cases should be 'individual'. An object is just one kind of individual – and even then, not only that.

Besides all these changes, I also made a few minor edits here and there and added an acknowledgements section at the end.

Download author's reply
Download tracked changes file

Decision by Shumon Tobias Hussain, Felix Riede and Sébastien Plutniak, posted 22 January 2023, validated 23 January 2023

Invitation to revise your preprint

Dear Gavin,

many thanks for going along with our PCI-based review and revision process. As you will see from the reviewers' comments, your chapter is considered a great and valuable contribution, packed with useful observations, arguments and insight.

Both reviewers have only minor comments but some of the points they raise may be helpful for improving the chapter. Both reviewers also point out that the conclusion section should probably better be articulated with the rest of the text and they make a few good suggestions.

In total, this is a strong chapter that will fit beautifully into the volume - thank you again for your submission. We are looking forward to seeing your revised version in due time.

Best wishes,

Shumon

Reviewed by Rachel Crellin, 20 January 2023

This was an enjoyable and informative read. The paper is well written, very clear and makes a series of interesting and important points about the way that archaeologists are engaging with machine learning. It is rooted in clear thinking, helpful theory, and excellent subject knowledge. The article is carefully thought through and well argued, as a result my comments are minor. The discussion of the pros and cons of automation was effective (though I did find myself wondering if in fact papers discussing the ontology and impact of machine learning are important places to consider the role of slow archaeology and slow science). The section on novelty makes a key point that the potential for new things to emerge from using machine learning is pre-defined by the data. This is an important point and might be made more strongly with a small thumbnail example to help the reader understand significance.

The section labelled 'Conclusions' would benefit from a re-titling – it is really a very thoughtful discission on machines in archaeology more broadly. It makes a series of excellent points about how approaches to machine learning and the labels we apply to it uphold an unhelpful nature/culture dualism. This is a great point and not one that I have seen made elsewhere. Breaking this part of the paper into its own section would help drive this home and make the paper more readable. I suggest shifting the sub-heading 'conclusion' to sit before the final three paragraphs and re-naming the current 'conclusions' section with a different sub-heading.

Minor points.

· The author might consider offering a brief explanation of what they mean by emic and etic categories on page 2 to help readers unfamiliar with these terms.

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Reviewed by anonymous reviewer 1, 20 January 2023

Title: The title is informative and descriptive, but it may not entirely represent the essay. I wonder if ontology is also not a prime component of the author's discussion. **Abstract:** The abstract is informative, but as above, it is not entirely representative of the work. At the very least, one would expect to see some mention of automation and novelty. In the current version, it reads too generic with wide-spanning questions. **Introduction:** It is clear and to the point. Here, the author builds upon the ontological discussions, so we miss the machine epistemology. The author assumes we all know what these epistemologies are. I would have preferred to read the author's position more clearly -so that the rest of the essay had a more solid framework. In-line comments:

- "Typological debates have periodically surfaced in the history of archaeology but in the Anglophone world … " Wouldn't it be nice to discuss the take of the "non-Anglosphere world" on this matter? Are we not missing opportunities to build better machine epistemologies by not being more inclusive?

- Since the author mentions Deleuze in the essay, I wonder how would the "research question" "our question today should be what do types do " would differ from what might types do (as I brutally caricaturise Todd May's comparison of Deleuze's philosophy with earlier work. I lack expertise in this matter, but as an outsider to new-materialist approaches, I am motivated more by the imbalanced agency inherent to the subject-object relation.)

Materials:*Automation*The section is well-written and could be an essay on its own. There is not much to comment on it in general. So I provide below some in-line comments:

- It would be beneficial to provide a reference from Marx, as the author explicitly mentions “Marx’s famous critique of automation.”
- It would also be beneficial to highlight the “labour theory of value” within the context of time-saving and labour-saving automation. At the end of the day, and however we define it, automation changes archaeological labour relations, so the value of what and how we labour.
- This is one of the most critical views in the essay. The author states: “My sense is, automation works best when it is applied to reproducing an accepted way of doing something; that is, to accelerate a pre-determined output.” At this point, one should also stop and ask what is the pre-determined output -hence an ontological rather than an epistemological problem. The fallacies of pre-determination (biases one may read) are more visible in law and medicine, yet archaeology (despite the lack big data in its true sense) is not immune to past biases -as we scavenge through legacy data.
- Finally, the author is being computationally simplistic -as he tacks between supervised and unsupervised classifications, probably to make a point. But how about semi-supervised learning or reinforcement learning? What are the implications of such techniques?

*Novelty*Compared to the ”automation” section, the ”novelty” section is more straightforward and less speculative -if I may use that word. Nevertheless, it would have been beneficial to read the author’s definition of novelty: what is considered the novel? Can there be a thing ever entirely novel? Is it a fantasy that we expect computers to create novel things while we are not fully ”capable”? Are we the victims of digital hype? As these are very subjective questions, it would have been nicer for the reader to have a ”boundary” around this section. **Conclusion:**It is an unorthodox section. It is very long. But most importantly, I cannot directly tie the great arguments in previous sections with the “conclusion” section. It stands on its own and reads almost as if part of another essay. It might be a good idea to create a “results” section where the author builds towards a “discussion/conclusion” section. As far as I can tell, this is a chapter for a volume. So I assume some key topics like “new materialism” is discussed elsewhere. Otherwise, some concepts and ideas float. In-line comments:

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- I wonder if adding a Marxist definition of technology (see David Harvey, Marx, Capital and the Madness of Economic Reason) would support the author’s arguments.
- It would have been great to read what the author thinks about the term: robot, both in Čapek’s original and modern ways.
- Finally, is the difference intentional? I have not read Simondon’s work: “a distinction between three levels of autonomy: elements, individual and ensembles” and “re-thinking this concept. His distinction between elements, objects and ensembles” Are individuals and objects the same?