Meta+phenomenology: a mathematical and epistemic study of experience

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Abstract

The ubiquity of digitally intermediated social relationships has led to an increased impact of network structures and architectures, communication protocols, Big Data, digital privacy, AI ethics, and underlying decision-making algorithms on our society. As such, the foundational aspects and dominating rules of theoretical computer science and information theory that can explain, predict, amplify, or mitigate certain collective digital-social dynamics also deserve close scrutiny. By extending recent breakthroughs in complex systems science implementing algorithmic-information-based approaches, our research posits a formal theoretical and paradigmatic shift in phenomenology by studying and understanding experience and subjectivity through the dynamics of algorithmic information content of the meta-level relational properties between subjects and their environment. This project aims to prove mathematical conjectures demonstrating the existence of sufficient conditions for uncovering structures of control and power; the emergence of complex data, echo chamber effect, and innovation triggering; and the constitution and systemic dominance of status quo and conditional biases. The results can be used to understand how Big Data and the algorithmization of social, political, and economical relationships function within the context of the current and future digitally-intermediated society.

1 Introduction, precedents, and discourse

In *meta+phenomenology*, the experience is formalized as an algorithm that takes as input a set of subjects and outputs a transformed version of them. In this context, subjectivity can be analyzed as the differences in individual change of a collective of subjects effected by an algorithm. Depending on the context within which the subject is embedded, these changes can be understood as "evolutions" or "phase transitions" by extending concepts from *metabiology* and *algorithmic information dynamics* (AID), respectively.

Metabiology introduces a mathematical theory that demonstrates fundamental meta-level properties and quintessential "laws" in evolutionary systems. The theory goes beyond simply proving conditions in which continuous evolution occurs in toy mathematical worlds. It posits a theoretical model for open-ended evolution that achieves a mathematical proof of Darwinian evolution within the framework of *algorithmic information theory* (AIT). The subjects

in metabiology are (software) organisms that evolve by randomly generated (algorithmic) mutations. Through a transdiciplinary interplay between mathematical creativity and biological evolution, metabiological models capture the unbounded increase of algorithmic creativity as a necessary property of the mutating organism.

Inspired by the study of such an unbounded algorithmic creativity, and contributing to metabiology with new results, AID establishes a theoretical and empirical framework for identifying and investigating the underlying processes that cause behavioral change and emergent complexity. The subjects of AID are systems whose behavior can be altered through perturbations effected by external agents, such as an observer or other neighboring systems. In the context of cybernetics, AID provides methods for identifying and quantifying the causal contribution of dominant elements, subparts, or substructures to a system's dynamics; steering the complexity of a system toward or away from randomness; and reprogramming the system's behavior.

The following diagram shows the correlates and relationships between metabiology, AID, and meta+phenomenology.

metabiology	organism	$\leftarrow$	mutation
	$\Updownarrow$		$\Updownarrow$
AID	system	$\leftarrow$	pertubation
	$\Updownarrow$		$\Updownarrow$
meta+phenomenology	subject	$\leftarrow$	experience

Historically, phenomenology has attempted to understand, in an objective manner, the subjective response to an experience. Even though Husserl's phenomenology maintains a logical basis, it does not completely reconcile a digital philosophy. Following Husserl, philosophers such as Martin Heidegger and Maurice Merleau-Ponty continued to deal with overarching concepts of phenomenology: consciousness, perception, intuition, intentionality, and subjectivity. Later, more focused subdomains were created to investigate specific perceptual mechanisms. For example, gestalt psychology tries to understand the perceptual mechanism of gestalt formation; how several objects may or may not be perceived as one. This was initially studied in the visual scene by Kurt Koffka and then extended to the auditory scene by composer James Tenney and researcher Alfred Bregman. More recently, 4E cognition (embodied, embedded, enactive, and extended), has taken phenomenology in new directions by studying the mind-body problem and the intrinsic agent-environment interdependency from previous approaches based on cybernetics and autopoiesis.

A fundamental tenet of metabiology is the relation between mathematical and biological creativity in terms of how new information enters the system of the metabiological model. The fact that metabiology intrinsically incorporates notions of creativity suggests a new understanding of experience, a new phenomenology, one based on a digital philosophy: the view that our world is made of information whose dynamics are governed by algorithms and irreducible creativity manifests as the emergence of algorithmic information. AID goes further by providing methods to analyze, deconstruct, and control the overall governing dynamics of a given system with alternatives and complements to traditional methods of experimental inference such as statistical machine learning and classical information theory. In this project, we intend to take the next steps: to more profoundly understand collective behavior through the subjective and

intersubjective mechanisms of the experience and to employ the results by proposing ways to monitor, mitigate, and/or foster certain systemic properties in societies with a high degree of digital intermediation.

2 Theoretical objectives and results

As a proper phenomenology must take into account how subjects will react differently to similar experiences both between each other and over time, we will demonstrate that the experience of novelty is subjectively relative. For example, an experience that is novel to one subject may not be to another who has already experienced a similar event. This fact correlates to a well-defined concept and measure of beauty that accounts for subjectivity: the transformative effect measured by the amount of emergent algorithmic information of a subject through an experience. This is equivalent to an evolutionary leap in metabiology as an organism passes through an algorithmic mutation and to a phase transition in AID as a system undergoes an algorithmic perturbation. Our examination will also study seemingly destructive mutations, where a subject may decrease in complexity or increase in size without increasing in complexity.

Contrary to a strictly naive individual-centered approach, we will also show how subjectivity arises precisely because experience is predicated on, and emerges from, the intersubjective relationships of subjects in an environment (including other subjects). For this reason, *status quo bias*, i.e., the degree that two similar individuals have similar experiences, and *conditional bias* (also known as "the bubble effect" or "echo chamber effect"), i.e., the degree that an individual can be influenced by other individuals in a given network neighborhood, play a central role in our theory. We aim to prove that experiences similar to a highly transformative experience that has already occurred will have a lesser effect over time and subjects that have a high level of mutual algorithmic information are more likely to be transformed a similar amount by experiences that have a high level of mutual algorithmic information. Our results will show how biases arise among similar members of a population, which in turn will also refute the greatest misunderstanding of some phenomenologies: that an aesthetic object possesses the universal quality of goodness or badness.

3 Practical contributions, impacts, and initiatives

We envision our research to create groundbreaking research in mathematical, sociological, and bio-inspired epistemology as outline below.

1. How the limits of computer science, information theories, 4E cognition theories, and complex systems science affect the societal production of knowledge, subjectivity, culture and other social structures.

2. How incompleteness and algorithmic randomness can help create progressive and innovative policies. Policies that address the emergence of structures of control and power in societies with pervasive digital / computational intermediation of social relationships in order to mitigate the type of polarizing, self-reinforcing phenomena that we are witnessing with social media today.

3. How our results can be employed in the investigation of the emergence of complex data, consensus, echo chamber effect, niche construction, innovation triggering, and constitution of status quo. This research could give insight into how to limit conditional and status quo biases, identify structures of control that have undemocratic level of dominance, and enhance the resilience of digitally-intermediated social networks to both external and internal control.

In the interest of continuing to work together, and through searching for research fellowships that are broad enough in scope to accommodate the radical interdisciplinary nature of our research, we believe we have identified a niche for a new research program, *Transdisciplinary Epistemologies and the Societal Impact of the Limits of Computation and Knowledge*, within which this specific research project would fit. Motivated by the promise that such a program would foster similarly synergistic collaborations among distinct fields that impact society—e.g., uniting artists and mathematicians, philosophers and technologists, scholars of jurisprudence and psychologists, computer scientists and policy makers—we intend to pursue the arduous task of converting this vision into a reality.

We feel strongly that the success of such a program will be predicated on pro-diversity policies that promote an inclusive environment. In particular, we see the program as a catalyst for collaborations between researchers from the Global South with researchers from the Global North and are hoping to identify a worldwide network of host institutions starting with those in Europe and Latin America. We have already reached out to other researchers and luminaries who reflect the diversity that the research aims to celebrate to inquire about their potential participation as collaborators, invited senior fellows, or principal investigators at external institutions. We have also identified several aspiring doctoral candidates who have been looking for such a program and whose work would benefit from the open framework we are proposing in that they would not have to mold their research to pre-existing norms. The positive responses demonstrates that there is a demand for such a program and have encouraged us to further pursue our vision.

4 Methodology and work plan

Our research can be divided into two parts: establishing formal theoretical definitions and results of our phenomenology and then applying those results to devising network architectures and governing policies that can be tested and implemented. We believe a clear timeline will naturally evolve from the theoretical (first two years) to the practical (second two years) to a culmination of our research in two major publications (final year).

Throughout the first year, we plan to accumulate a comprehensive review of the discourse and construct a common framework to develop our research by participating in and attending discussion groups, workshops, and conferences related to our research. By the end of the first year, we intend to submit at least one paper to a high-impact, peer-reviewed journal in the fields of complex systems science, cybernetics, cognitive science, information systems, computer science, or epistemology.

In the successive three years, we would like to organize workshops and seminars inviting scholars and artists from around the world to collaborate towards a series of curated lectures,

concerts, and exhibitions related to this phenomenology. This would give the immediate community deep insight into the discourse and show how it relates to the practice of scholars and artists in different domains.

While we will continue submitting individual papers to journals and conferences throughout our tenure; in our final year, we intend to culminate our research and publications into a book-long treatise on meta+phenomenology. The treatise will be complemented by a companion volume that we would co-edit of texts contributed from the researchers and artists who participated in the workshops and seminars we organized.

Selected bibliography

[1] M. Winter. Meta+phenomenology: Primer towards a phenomenology formally based on algorithmic information theory and metabiology. In S. Wuppuluri and F.A. Doria, editors, *Unravelling Complexity: The Life And Work Of Gregory Chaitin*. World Scientific, 2020.

[2] F. S. Abrahão and H. Zenil. Emergence and algorithmic information dynamics of systems and observers. *arXiv Preprints*, 2021.

[3] V. Chaitin and G. Chaitin. A philosophical perspective on a metatheory of biological evolution. In S. Wuppuluri and F.A. Doria, editors, *The Map and the Territory: Exploring the Foundations of Science, Thought and Reality*. Springer International Publishing, 2018.

[4] G. Chaitin. *Proving Darwin: Making Biology Mathematical*. Vintage Books, 2013.

[5] H. Zenil, N. Kiani, F. S. Abrahão, and J. Tegnér. Algorithmic information dynamics. *Scholarpedia Journal*, 2020.

[6] F. S. Abrahão, K. Wehmuth, and A. Ziviani. Algorithmic networks: Central time to trigger expected emergent open-endedness. *Theoretical Computer Science*, 785, 2019.

[7] F. S. Abrahão, K. Wehmuth, and A. Ziviani. Emergent open-endedness from contagion of the fittest. *Complex Systems*, 27(04), 2018.

[8] G. Dodig-Crnkovic. Cognition as embodied morphological computation. In Vincent C. Müller, editor, *Philosophy and Theory of Artificial Intelligence 2017*. Springer International Publishing, 2018.

[9] J. Tenney. Meta+Hodos. In L. Polansky, L. Pratt, R. Wannamaker, and M. Winter, editors, *From Scratch: Writings in Music Theory*. University of Illinois Press, 2015.

[10] A. Bregman. *Auditory Scene Analysis: The Perceptual Organization of Sound*. MIT Press, 1990.

[11] E. Husserl. *Logical Investigations*, volume 1. Routledge, 2001.