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Social Physics, or the Interpretative Turn? Debating the Sciences of Society after AI

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Abstract

During the last few decades, new areas of research have emerged at the interface between the social sciences and computational sciences, such as computational social science and digital sociology. While there is significant willingness to engage across disciplines to establish these areas of inquiry, there equally exists widespread disagreement about what foundational concepts and methodological principles should guide their development. In the trading zone (Galison, 2010) between social and computational sciences, new possibilities, conflicts, and fundamental questions arise. Some argue that the combination of big data and machine learning will finally make possible the discovery of social laws (Lazer et al., 2021). Others claim that the AI revolution will unleash a new era of sociological theory and will enable the development of a qualitative computational science of society (Borch & Pardo-Guerra, 2024). In the 19th century, statistics and sociology found joint origins in the new methodology of social physics. In the wake of social media, attempts were made to reinvent this tradition, with mixed success (Watts, 2016). More recently, "AI" has been welcomed as an important opportunity for the renewal of interpretative social science (Friese, 2023; Törnberg & Uitermark, 2025). Can the wide uptake of machine-learning-based techniques across fields provide occasions to bring these debates and initiatives to maturity? Can we operationalize core questions and methodologies by combining social and computational theory and methods in new ways?

Keywords: Philosophy and Methodology of Social Sciences; AI; Social Physics; Reflexivity.

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1 Introduction

In 1982, the American political scientist Karl Deutsch hosted an international conference at the Berlin Social Science Centre, which brought together renowned scientists from across disciplines to discuss significant advances in 20th-century social science. The sociologist Daniel Bell and the STS scholar Helga Nowotny were among the participants, who were invited to present one relevant "advance" in social science during the conference. The final list comprised John Dewey and George Herbert Mead's work in behavioral psychology (sic), advances in mathematical modeling, large-scale non-violent action by Gandhi, as well as "the computer" (Deutsch et al., 1986).

As current advances in Artificial Intelligence are transforming the sciences of society in ways that are still difficult to sum up, it is important to remember that this development has a significant prehistory within the social sciences. In the 1980s, just as today, the significance of computation for the creation of knowledge about society was framed in decidedly instrumental terms. Like other advances, the invention of the computer was deemed by Deutsch and colleagues to "have resulted in clear increases in the power of social scientists to recognize relations and to carry out operations" (Deutsch et al, 1986, p. 386). Still, as machine learning-based methodologies and Generative AI technologies such as Large Language Models are today widely adopted across the social sciences, something significant seems to be changing. What exactly?

The uptake of the latest computational technologies such as LLM agents in social science occurs within an avowedly interdisciplinary context. Digitalization has spawned the formation of new subfields at the interface between the social and computational sciences, such as computational social science (CSS) and digital sociology. While the former leans towards the natural sciences, the latter has an apparent disciplinary grounding but includes researchers from a variety of backgrounds. A significant number of computational social scientists have been trained in physics and mathematics and built on approaches from these fields to analyze the dynamics of collective life, in ways that "were largely disconnected from social science theory" (Edelmann et al., 2020, p. 2). By contrast, digital sociologists are committed to researching computational technologies as a force of societal transformation as well as to adopting computational methodologies, but they tend to be skeptical about the grand narrative of a new, computational science of society (Madsen & Munk, 2026).

The uptake of new AI-based methodologies to create knowledge about society, however, is giving rise to theoretical and methodological questions that transcend these subfields, and some of which concern the relations between the social and computational sciences. What foundational concepts and methodological principles should guide social science in an age of AI? This question is today being debated not only by computational social researchers, but by sociologists and computer scientists from across a variety of subfields. While these questions elicit enthusiasm, concern, anxiety, and passion in a variety of dimensions, one key set of issues pertains to the philosophy and methodology of social science. Will the combination of big data and powerful new analytics transform the study of society into a form of computational data science? Will Machine Learning and Generative AI enable unconventional, creative ways of combining quantitative and qualitative methods and open new directions in social theory (Borch & Pardo-Guerra, 2024)?[1] The considerable divergences in how different researchers

1. These questions were the subject of an interdisciplinary symposium on AI & Society that was hosted by the Research Spotlights in Society and Culture and Digital, Data Science and AI at the University of Warwick in June 2025. This Debate brings together the contributions of sociologists participating in this symposium.

and research communities approach these issues may indicate precisely that they reflect questions held in common.

This Debate Section gives the floor to sociologists from a variety of backgrounds to offer their reflections on what is at stake in efforts to deploy AI in the sciences of society.

The contributors, all of whom have previously contributed to debates about computation and sociology, were asked to situate the challenges of AI in relation to a classic question in the philosophy and methodology of the social sciences, summed up in the section title: social physics, or the interpretative turn? Should social science be modeled on the natural sciences and focus on discovering fundamental patterns in society using quantitative methods? Or should the science of society be conceived of as an interpretative form of inquiry, which affirms the idiosyncrasy of society as a unique object of knowledge, different from nature?

The commentaries present different views on whether the uptake of AI in sociology and related fields makes it possible to resolve this debate one way or the other. In the remainder of this introduction, I will provide some background to the debate and briefly outline the respective contributions.

2 Social Physics

Arguably, exchanges between social and computational sciences are as old as the primary fields themselves. In the 19th century, sociology and statistics found joint origins in "social physics", the project to invent a science of society based on the model of the natural sciences, and to deploy calculative methods to render visible collective dynamics. In the early 21st century, as digital technologies found wide uptake across society, computational social scientists took up this classic term to label their efforts to use computational methods to revolutionize social science. Well-known American research scientists like Alex Pentlandt and Duncan Watts argued that the digital revolution rendered human interaction measurable, delivering on social sciences' long-standing ambition to realize an empirical architecture that could underpin a universal science of human interaction. As Watts put it:

> The technological revolution in mobile, Web, and Internet communications has the potential to revolutionize our understanding of ourselves and how we interact. [...] [T]hree hundred years after Alexander Pope argued that the proper study of mankind should lie not in the heavens but in ourselves, we have finally found our telescope (Watts, quoted in Lazer et al., 2021, p. 189).

It seems contemporary AI has reawakened these types of ambitions.

The idea that a science of society should take the form of a "social physics" was first put forward in the middle of the 19th century by Auguste Comte, one of the founders of the discipline of Sociology. In choosing this name for a future science of society, Comte proposed that the new science should model itself on the natural sciences, such as physics and astronomy (Karsenti, 2021). The task of social science is to discover the universal laws that govern social systems through the application of observational methodologies. However, as Michael Castelle observes in his contribution to this Debate (2026), at the time when Comte offered his vision, there was already another option available, in the form of a proposed new "science of ideas", which was to be based on sensations, including the use of language and signs in general.

We intend to present interdisciplinary contributions to the debate in a different output. For more info see: https://warwick.ac.uk/research/spotlights/society-culture/news-events/aisymposium/.

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However, after Comte had formulated his fateful vision, “the rest was history”, as successive generations of sociologists, from Emile Durkheim to Talcott Parsons, followed in his footsteps by insisting on the formulation of social laws akin to the invariant laws of natural science as a core ambition of the field (Baber, 2026).

Contemporary invocations of social physics differ on a crucial point from the Comtean vision: for many, its viability is directly tied to the capabilities of revolutionary technologies. According to the contemporary proponents of a new “social physics”, it is the implementation of new computational architectures — in the form of smart infrastructures and complex AI-based models — which makes the discovery of social laws a realizable dream. Computational social scientists have quoted the philosopher of science Thomas Kuhn to support this belief in the capacity of technology to enable significant advances in social science (Ziems et al., 2024; Törnberg, 2024). In his writings on scientific revolutions, Kuhn famously noted that science advances not just through the formulation of new ideas but through “the invention of new tools and methodologies”.[2]

However, the plausibility of a science of society modeled on the physical sciences depends not only on the availability of powerful new technologies of measurement, quantification, and modeling. It equally rests on a number of theoretical and methodological assumptions about the object and objectives of scientific inquiry (Castellani & Gerrits, 2024). For social science to be modeled on natural science, it must be assumed that human societies can be treated as similar to natural phenomena as far as knowledge creation is concerned. Two contributions to this Debate Section challenge the assumptions that proponents of a computationally enabled social physics make on this point.

Törnberg and Uitermark (2026), as well as Pardo-Guerra (2026), argue that quite a few of the proponents of a new social physics remain beholden to a mechanistic conception of science. While many of the methods of computational social science are highly sophisticated, the wider methodological assumptions about the general purpose and value of research in much computational social science reflect classic-modern conceptions of knowledge in terms of the discovery of the fundamental patterns that underlie social reality, and the prediction of social futures on this basis. Their commentaries argue that such mechanistic assumptions about the purpose and value of computational social science may be effective in the public communication and legitimation of AI-based social science, but as far as the philosophy of social science is concerned, they rest on a category error.

In his contribution, Pardo-Guerra points out that the ideal of predictive science relies on deterministic assumptions that are ill-suited to contemporary scientific research, irrespective of whether they have natural or human phenomena as their object. He reminds us that in contemporary physics and mathematics themselves, the scientific ideal of the discovery of universal laws has been seriously qualified and rejected by many scientists in favor of non-deterministic approaches like Bayesian statistics, which model probabilities instead of deterministic relations. For Pardo-Guerra, the ideal of a universal science capable of determining causes underpinning a stable reality presents a caricature of the natural, mathematical, and social sciences alike.

Törnberg and Uitermark equally reject the ideal of a new social physics as overly simplistic. They draw on classic arguments by Max Weber about the distinctive nature of social reality to argue that social reality is fundamentally dynamic in nature. There are no unchanging social laws. Instead, there exist continuous feed-back loops between knowledge and action, and con-

2. Kuhn 1962, quoted in Ziems et al. (2024): “The most surprising scientific changes tend to arrive, not from accumulated facts and discoveries, but from the invention of new tools and methodologies that trigger ‘paradigm shifts’ ”.

sequently, the ideas, norms, and rules that guide social action are themselves subject to transformation. Their commentary gives an instructive twist to this classic argument by proposing that natural and social sciences are concerned with different types of complexity. While system complexity assumes that collective phenomena are reducible to a set of fundamental rules and elements, such as "agents", anthropological complexity is irreducible and fractal in nature. In their view, it is unlikely that computational technologies will strip social reality of these fundamental attributes of reflexivity and irreducibility, nor should we want them to (more on this below).

3 The Interpretative Turn

Several contributions formulate alternatives to "social physics". They suggest digital technologies may be revolutionary in a different way than the one imagined by proponents of social physics. What if the new computational architectures make possible the realization of a different scientific dream, that of a science capable of affirming reflexivity? As noted, the idea of social physics is grounded in a Newtonian, mechanicist conception of the sciences. In such an approach, the constitutive reflexivity of social life poses a threat to what Loraine Daston (1992) has helpfully called "mechanical objectivity". Feedback loops between knowledge and action must be rendered manageable so as not to derail the project of establishing underlying, invariant patterns in collective life.

Castelle, Törnberg and Uitermark see in the development of Generative AI an opportunity for computational social science to affirm reflexivity as a formative dynamic in society and science. As cyberneticians have long argued, it is entirely possible to model reflexivity as a feature of socio-technical systems in the form of feed-back loops (Esposito & Stark, 2019). Recent developments in Machine learning and Generative AI make it possible to operationalize this project in new ways. New methods like social simulations deploying AI-based agents have the potential, as Törnberg and Uitermark point out, to force "social physics into a productive encounter with reflexivity, meaning, and interpretation that its earlier methods allowed it to avoid" (2026, p. 142). Castelle makes a related point when he proposes that this same method compels computational social science to come to terms with language as a form of social action.

These two commentaries thus argue that "social physics" has got the argument backward. The new AI-based systems enable not the containment but the expansion of reflexivity as a defining problematic for computational sciences of society. ML and GenAI have the capacity to liberate social science from the illusion that it is necessary to contain reflexive societies with in deterministic models, if they are to be respected as a proper science. The contributors give different reasons for why this is so. As Castelle explains, Interactive LLM-based agents synthesize the existing text and speech that they have been trained on into new responses and rely on the calculation of co-occurrence to produce so-called contextual embeddings. As such, these artificial systems are arguably at once statistical and reflexive in their modes of operation.

However, other contributors argue that it is not enough to affirm that artificial systems are capable of reflexive engagement, if sociology is to honor its epistemic and methodological commitment to interpretation. For Carrie Friese (2026), the value and purpose of interpretative methodology is about much more than recognizing feedback loops between knowledge and action. It is about coming to terms with the situational specificity, embodied materiality, and affective qualities of social life. A science that is overly reliant on computational architectures for data collection, analysis, and public engagement removes many of these features by necessity, shrinking the channel for contextual attunement to a crack. For Friese, this is the principal danger of the interpretative turn advanced in computational social science on the back of the big data and AI revolutions. In applying automatable methods like topic modeling and content analysis to large digital corpora, the field is at risk of committing to grounded theory in name only, as constitutive features of an interpretative sociology, such as iterative reading-as-coding and place-based engagement with situational and embodied specificities, fall by the wayside. She echoes the point made by Philippe Brandt (2023), that contextual understanding of society cannot be reduced to "a model's performance to extract meaning from datasets", something that puts us at risk of losing engagement with "the distinct sociological setting and its context" (Brandt, 2023, p. 286).

4 Negative Reflexivity: The Hollowing Out of Society

A last set of contributions warns about the dangerous and destructive consequences of AI adoption in social science. According to Nick Gane and Roger Burrows (2026), the temptation to do so rests on another category error. For them, to frame AI as first and foremost an epistemic and methodological challenge for the social sciences is to misconstrue the very phenomenon. The push to render social science dependent on AI systems is all about political economy. The uptake of systems like AI chatbots in the academy is first and foremost promoted as a way to deliver efficiency savings by automating and optimizing organizational and logistical processes. In some respects, using AI in research is not a methodological choice at all, as these technologies are an ineradicable component of the very infrastructures that today condition research, such as search engines and bibliometric databases. Today, social science runs on AI whether we like it or not.

AI confronts sociology, perhaps in particular, as a disruptive force. As Gane and Burrows point out, the big AI companies have endorsed ideological visions that run directly counter to many of the foundational commitments of sociology. They single out the doctrine of The Sovereign Individual, a profoundly anti-social worldview that is endorsed by powerful tech leaders like Peter Thiel. This ideology rejects solidarity and pluralism and glorifies the exit from society by powerful individuals. As such, it can be argued that AI poses a challenge to the integrity of the empirical object of the social sciences: society.

The constructive vision of an AI-enabled interpretative science of society assumes that, even as the embedding of computational systems across society makes human interaction measurable and calculable, social life will remain a site of complex interaction between knowledge, laws, and action. But will it? As Gane and Burrows point out, AI-based systems are not just marked by reflexivity or performativity, the notion that knowledge systems and methods act in the world. They may instantiate hyperstition — "the experimental (techno-)science of self-fulfilling prophecies" (Carstens, 2009). As such, AI may instigate a dynamic that could be labelled negative reflexivity, as the deployment of AI systems dismantles the very conditions for the reflexive self-coordination of social collectives. This sociological critique has recently been endorsed by computer scientists. Piedrahita and colleagues (2026) argue that the adoption of AI across the public sector and society at large may result in the gradual degradation of social and political infrastructures. They identify AI risks that range from participatory channel saturation, epistemic monoculture because of AI adoption across disciplines, and the transfer of normative authority to model developers through infrastructure procurement, and argue that a possible result of widespread AI adoption is the erosion of collective agency across economic, cultural, environmental, and governance domains.

There is, then, a deep irony at work in the transformation of social science in the wake of AI. Just as science becomes equipped to affirm the constitutive role of interactivity between knowledge and action in socio-technical systems, the existing supports for reflexive mechanisms in society, such as self-governance and collective learning, are no longer secure. The AIfication of public and societal infrastructures risks dismantling the conditions of possibility for distributed self-governance, or what could be called "the hollowing out" of society. Adopting a political economy perspective as Gane and Burrows urge us to do, then alerts us to a fundamental danger that must be averted. By the time AI is finished with us, there may be no "society", in the 20th-century sense of an inclusive, relatively autonomous community supported by the social state, left.

And something similar applies to "nature" and its supposed invariance: by the time AI is finished with the earthly environment, there may be no nature left. The construction of energy- and water-guzzling infrastructures across the planet to enable AI is resulting in the destruction of natural habitats at an unprecedented scale. At the very least, AI is disrupting nature, society and the sciences of society all at once.

5 Conclusion

In addressing the question "social physics, or an interpretative turn?", the contributions to this Debate Section offer different views on whether AI constitutes a watershed moment for the sciences of society. Together, they raise the following three general questions for a sociology that comes after AI. First, is it plausible and advisable to expect significant advances in the social sciences to arise from the application of a new set of computational technologies? Pardo-Guerra questions the likelihood of this, observing that anything resembling a paradigm shift in computational sociology remains outstanding. For him, ML-based social science still resembles normal science: it largely operates within well-established, 20th-century methodological frameworks such as agent-based modeling.

Second, does it make sense to single out "reflexivity" as a defining challenge for the study of social-technical systems in an age of AI? On this point, the contributions offer starkly differing perspectives. Some, like Törnberg and Uitermark, attribute significant reconstructive potential to AI as it compels computational social scientists to "confront meaning and interpretation as constitutive features of the social world" (2026, p. 141). Others, like Friese, recognize in this a continuation of a disembodied and unsituated conception of collective dynamics that an interpretative sociology of the 21st century must precisely transcend.

Thirdly and finally, it seems inevitable that a sociology that comes after AI will need to adopt an interdisciplinary outlook, in part because of the scientific complexity of computational modeling techniques, and in part because of its world transforming capacities. But what kind of collaboration across disciplines — above and beyond participation in interdisciplinary dialogue — is possible between sociological and computational sciences, given the significant differences in epistemic culture? More than 20 years ago, the historian of science Peter Galison (2010) put forward the notion of a "trading zone", as a way of articulating the fundamental challenge posed by the relative lack of shared vocabulary between entangled disciplines, such as sociology and computer science. He formulated the hope of "strong interdisciplinarity", that it would be possible to construct "a language that borrowed from both but was subservient to neither" (Galison, 2010, p. 28). Opinions differ on how far we have come in constructing such shared vocabularies. By situating this debate within sociology, this special section offers a hopefully instructive but inevitably partial set of views. The next debate should widen the frame.

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