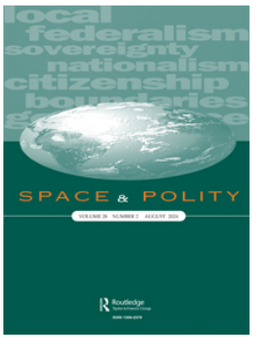

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AUTHOR RESPONSE

Temporal challenges in researching digital timescapes

I am very grateful to the four reviewers of *Digital Timescapes* for their close reading of the text and engaging with the book's arguments. As they note, my ambition in writing the book was to provide a synoptic account of the effects of digital technologies on the temporalities of social, political and economic life. There is always a danger of omission, over-generalization, universalism and surface analysis in such an endeavour. To counter these potential shortcomings, I sought to provide a nuanced, reflexive account that: (1) was explicit about my own positionality while being sensitive to the temporalities produced and experienced by others; (2) recognized the multiplicity of temporalities that unfold in relation to the same phenomenon; (3) provided plenty of empirical examples documenting the emergent nature of temporalities and their uneven and unequal effects across populations; (4) identified gaps and shortcomings in the literature and my own analysis; and (5) tried not overreach or overstate the argument being made, making it clear that while the digital has had a significant, transformative effect on temporal relations and time consciousness, pre-digital temporalities (e.g. clock time) remain important.

Nonetheless, as with every academic book, there are gaps and silences in the focus of analysis and the strength and depth of argument. After two initial chapters setting out the rationale for the book and its conceptual framing, the core of the text consists of six chapters focused on history and memory, politics and policy, governance and governmentality, mobility and logistics, planning and development, and work and labour. Each of these foci could have been the focus of a book by itself (and indeed there are books that concentrate solely on the temporalities of one of these domains). Moreover, I could equally have focused attention instead on the digital timescapes of education, health, welfare, infrastructures and utilities, nature and the environment, or focused on particular sites such as the home, the street, shopping malls, parks, the countryside or public transit. The six themes selected for attention provided sufficient scope, in my view, to elaborate and illustrate my argument. The reviewers seem to accept that to be the case, while also providing some suggestions with respect to other themes worthy of attention or for finessing the argument.

Kinsley (2024) suggests, for example, that it would be productive to further consider the discursive and representational politics of time and temporal experience, and to explore further how digital timescapes impact what it means to be human. This, I think, is a useful observation as I focused little explicit attention on either (though as he notes, they are discussed implicitly). My focus was more on how digital technologies reshape the temporalities of processes, practices, and relations, and in turn how everyday life is planned, managed, governed, serviced and experienced. There is some attention paid to time consciousness, and experiential, embodied and subjective time, however psychological, psychoanalytical, and metaphysical aspects of digital timescapes are weakly articulated.

Likewise, Datta (2024a) suggests further consideration of the relations between time and space, and the entanglement between digitally-mediated time and pre-digital distant time. This critique is perhaps somewhat ironic given I am a geographer by profession, but in my desire to foreground temporal relations, it is fair to observe that I overly suppressed space and its relations to time. Similarly, the focus on the digital no doubt over-privileged its role in temporal relations. Datta's example of Shimla elaborated in her recent article on

'distant time' (Datta, 2024b), highlights how the temporalities of (post)colonial planning and statecraft, and of ecology and weather, as well as the temporal politics of smart city ambitions contributed to recent landslides. In that paper, she highlights how temporalities are never simply digital in nature but are composed of multiple, entangled temporalities stretched from the past to the future, and that temporalities are spatialized and materialized in the landscape with temporal power shaping where on the slope people reside and under what circumstances. In this sense, there are no digital timescapes, but rather simply timespaces (time and space dyadically enjoined as per May and Thrift's (2001) contention that time and space are inseparable) that are co-produced through a configuration of digitally and non-digitally mediated processes.

Wacjman (2024) notes a need to consider the effects of artificial intelligence on the management of time. This is under-examined in the book, only arising in passing with regard to the automation of work. There are though undoubtedly a number of issues that require attention given the expansion of AI use across all kinds of sectors and domains, not least of which is the temporalities of AI itself. One of the key drivers of AI adoption is its time efficiency and productivity gains. Work that used to take months by hand takes seconds or minutes. For example, in a current project we have tested RegEx pattern matching and newer 'zero shot' LLM techniques to extract structured data from 19,480 legal dispute resolution cases scraped from a state agency website. This task would have taken a small team a few months to complete manually, whereas it took six minutes using RegEx and four days using a locally running LLM on a relatively GPU-constrained device (the latter taking less effort to develop and returning fewer false positives for particular fields). This said, the setting up of the techniques took a few days, and the AI processes used have multiple temporalities – processor time, compilation time, run time, read time, write time, training time, inferencing time and memory operations. Some of these are hardware-dependent and some can be altered through changing parameters or reducing the size and precision of models. There are many trade-offs to be considered – for example, speed versus quality of results and cost (the longer the process the more energy is consumed). Testing, ground-truthing, debugging and refining may take weeks or months. If training data had been used, then assembling data and building models might have taken months or years and involved using substantial human labour (Sudmann, 2021). In our case, a mixture of computational approaches worked best to balance time, cost and energy. Another aspect is the conceptualization of time both with and by AI. Whereas humans tend to understand time as linear and continuous, AI treats time as discrete and fragmented events, and in quantum systems, time is a spectrum of possibilities that exist simultaneously (Nosta, 2024). Interestingly, how AI treats time means that a LLM such as ChatGPT can struggle to answer temporal questions, such as 'how long has this conversation lasted?', because it treats each query discretely rather than a measured time sequence (Kulbashian, 2024). As yet, we know relatively little about AI temporalities and their consequences (Coeckelbergh, 2021).

The core empirical chapters in the book are followed by two chapters that examine how temporal power is reproduced and extended by digital technologies, and how such temporal power might be challenged and reconfigured more justly. I remain strongly of the view that it was important to not only document digital timescapes and their associated temporal power and justice, but to also consider what might be done to address inequalities and abuses. The reviewers found this to be a particular strength of the book, but likewise suggest gaps or weaknesses that can require attention. For example, Jacobsen (2024) and Wacjman (2024) both caution against forwarding slowness as a counter to the speed and temporal density and fragmentation of digitally mediated life, noting that not everybody has the autonomy to adopt such a temporal strategy. This is a fair observation, one that is noted in the text itself where it is

observed that slowness is not only a strategy of claiming temporal sovereignty but can be a discriminatory practice when exerted by the powerful, such as in regimes of slow violence. Moreover, I detailed the ways in which different groups such as women and gig workers have little ability to practice autonomy in their temporal relations being bound up in temporal arbitrage. Instead, collective efforts are needed to provide temporal rights and to reconfigure temporal power, rather than relying on an individual's self-autonomy to claim temporal sovereignty. This includes using tactics of speed where necessary, such as adopting fast activism. Practicing such temporal politics is not easy, especially given the temporal power of vested interests and the formation of a new temporal doxa that, as Kinsley (2024) notes, is pharmacological in nature. That is, digital technologies are simultaneously seductive and oppressive, 'remedy and poison[,] at the same time' (p. x), providing benefits as well as risks; for example, a digital time management tool provides a means to manage temporal density and fragmentation at the same time as it reproduces and reinforces those relations.

There is only so much that can be expressed in two chapters and the contours of temporal politics and power in the digital era and the strategies and tactics necessary to reconfigure temporal relations in more just ways requires much further consideration. Adding to this challenge is the constant innovation and creative destruction of digital technologies and the constant reconstitution of temporal relations which means that scholarship on digital timescapes has its own temporal challenges. My book was an attempt to capture the state of play at a particular moment of time and provide insights and conceptual tools for making sense of and tracking the unfolding of digital timescapes; hopefully, it will fulfil that ambition.

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