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Atmospheric Analytics: Situated Encounters in the Age of Generative AI

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Abstract

This article challenges the view of technologies, and more particularly generative artificial intelligence (AI), as augmenting experience through binary human–computer interactions and offloading tasks. Instead, it argues that such technologies exhibit atmospheric qualities, shaping situated encounters through an interplay of infrastructure and affect. The article proposes atmospheric analytics as a heuristic framework for investigating these encounters. The framework is intended to be relevant for multiple social and cultural contexts, and is illustrated here by applying it to educational settings. The framework attends to the relational complexity of emerging technologies, such as generative AI, through the careful deployment of three analytical optics: density, saturation, and viscosity. These optics direct attention to atmospheric variations in intensity, vitality, and resistance associated with the proliferation of technologies like generative AI in everyday situations. By focusing on situations, atmospheric analytics move beyond simplistic notions of technologies as instrumental tools or threats, instead examining how they are agentially interwoven within practices. Ultimately, atmospheric analytics contributes to a critical understanding of the social, political, and ethical implications of algorithmic technologies, moving beyond determinism to explore the nuanced and multifaceted realities of human–technology coexistence.

Keywords
technologies, generative artificial intelligence, atmosphere, situation, affect, offloading, infrastructures, edtech

Introduction

The explosive rise of generative artificial intelligence (AI) applications and usage from the end of 2022 can be considered as a disruptive global event that raises important theoretical and empirical questions. In this analytical article, we propose an interpretative and heuristic framework to guide (critical) research into how multiple social realities are increas-

ingly influenced by, and at the same time influencing, the advent of generative AI and other related algorithmic technologies as a sociotechnical phenomenon, infrastructure and—as we will argue—a variable and localized atmospheric condition. According to the marketing rhetoric that accompanies it, the distinctive character of generative AI is that it constitutes a general-purpose technology that can be manipulated by end users to delegate or *offload* cognitive and creative tasks that would normally require varying degrees of practical or epistemic expertise. However, such offloading never constitutes a one-way street that can be singularly deployed, but rather always is a highly performative act enacted in daily, local practices (Wagener-Böck et al. 2023). Despite the gradual upsurge of more critical research along those lines, positioning generative AI—and automated technologies more generally—as tools that can partake in cognitive or creative offloading has proven very effective and indeed is sustained by significant achievements in algorithmic innovation in the 2020s. As has been argued in great detail, generative AI is simultaneously an infrastructural technology built upon an established planetary network of natural resources and platform ecosystems, and a customizable offloading technology targeting end-users in distinctively localized sociocultural contexts (Crawford 2021; Fröscher et al. 2022). In this article, we are particularly interested in these localized conditions of use *beyond* individual sensemaking, as well as in these infrastructural conditions *beyond* their status as a rendition of globally emerging computational systems (Bratton 2015; Van der Vlist, Helmond, and Ferrari 2024). In other words, we are interested in what lies between the minutiae of algorithmic operations—including the biased and sometimes blatantly harmful outputs that emerge downstream when humans interact with computational inter-faces—and the broader structural, global dimension—including the planetary impact generated upstream through the extraction of natural resources for AI applications.

Our point of departure builds on the observation that generative AI has recently made landfall in multiple institutional settings, such as workplaces, schools, and public health systems, with distinct sociopolitical repercussions (Mettler 2024; Vallès-Peris and Pareto 2025; Williamson, Molnar, and Boninger 2024). In doing so, our empirical and analytical suggestion is that generative AI has, in its wake, created localized *atmospheres* that are as affective as they are effective: they enfold situations with positive or negative valences that steer bodily and emotional responses and agency, but equally animate nondeterministic forms of distributed and relational sensemaking that exceed the level of the single, bounded

individual. We consider atmospheres as spatiotemporal constellations where situational dynamism and local sensemaking unfold and can be empirically studied, all the while still susceptible to broader infra-structural dynamics and movements.

The resulting heuristic proposal—*atmospheric analytics*—is borne out of a double critical purpose: to challenge the emphasis on binary interactions purported to augment human experience through the proclaimed offloading affordances of generative AI; and to extend and complicate current understandings of infrastructure that assume rigid hierarchies and relations overly solidified into "accidental megastructures" (Bratton 2015, 5). In that sense, the framework of atmospheric analytics explicitly commences from concrete *situations*, which is a foundational perspective that has remained largely underexplored within the social theorization of computational technologies (e.g., Jaton and Sormani 2023; Pink 2022). Moreover, as the argument below demonstrates, it is our explicit intention that the atmospheric analytics framework is not only applicable to generative AI but can equally be deployed in other contexts of increasing algorithmic and technological emergence.

Situational Sensemaking, Offloading, and Infrastructures

The advent of generative AI and automated agents poses distinct challenges to social scientists that require new theoretical and methodological frameworks and questions. Such frameworks and questions vary widely, and we particularly focus on a strand of research that exceeds an individual and atomic view of sociotechnical relationality (e.g., Katzenbach and Pentzold 2024; Pargman, Lindberg, and Buch 2023; Pink 2022). In particular, we take up the principle that relations between people and algorithmic agents cannot be conceived as binary "human–computer interactions," but are instead explicitly and assertively multidirectional, scalar, and simultaneously localized and extending across times and spaces. These (post) human–algorithmic ensembles have been debated at length in the social sciences, and to date there is no uniform conclusion as to whether they under-mine or strengthen autonomy and agency (Hayles 2010; Matzner 2019). As such, it seems particularly warranted to ask in which specific ways the rise of algorithmic and generative agents opens new avenues for research and critique (Amoore 2020; Pink 2022).

As multiple relations—from frictionless to harmful—begin to emerge between people and artificial systems, mainstream understandings of agency, creativity, and responsibility are challenged (Guzdial et al. 2019; Jacob and Magerko 2015; Köbis, Bonnefon, and Rahwan 2021; Suh et al. 2021). Such challenges turn long-standing questions about distributed agency between human and nonhuman entities (e.g., Latour 2005; Marres 2023) into highly consequential and very concrete ethical dilemmas: can an artificial agent influence moral behaviors? Who is responsible for a problematic decision made in "collaboration" with an automated agent? Who owns the "original" outputs of a system that has been trained on aggregated human-produced content?

Mindful of the complexities that underpin these questions, generative AI is described here in a pragmatic fashion, without excessive recourse to technological features and the specialist terminology accompanying AI, such as large language models, deep learning, reinforcement, and so on. In this article, we deploy the concept to refer to interfaces between social actors and digital infrastructures, where natural language prompts initiate and regulate the generation of multimodal content (Amoore et al. 2024). This pragmatic definition does not eschew the criticalities that can be raised against generative AI, namely its extractive nature and detrimental environmental impacts, its biases and harms, its monopolistic business model, its question-able appropriation of human knowledge and creativity through datafied infrastructures and, ultimately, the fact that AI has of late been established uncontroversially as a "thing" that demands collective acceptance, despite the many controversies that surround it (Crawford 2021; Hanna and Bender 2024; Suchman 2023). Indeed, these criticalities are assumed to be evident at this point and remain the backdrop of our argument.

However, focusing on atmospheric dimensions as they become manifest in those contextual and highly grounded dilemmas, brings into view a research problem that has so far been largely neglected in the critical study of AI and other emerging algorithmic technologies: the *situational sense-making* that occurs neither at the level of up-close (micro) interactions, nor at the level of far-off global infrastructural dynamics, but at what we call here the atmospheric level "in between" (cf. Marres 2020, 2023). The notion of situation is, for us, related to that of atmosphere, in the sense that *a situation is an atmosphere making landfall*, which often creates states of impasse that may be momentary or prolonged. This concept is indebted to Berlant's (2011, 5) influential work in affect studies, where she/they described a situation as: "a state of things in which something that will per-

haps matter is unfolding amid the usual activity of life. It is a state of animated and animating suspension that forces itself on consciousness that produces a sense of the emergence of something in the present that may become an event". Put differently, situations are events that have not yet a determined or fixed form, where "things hanging in the air are worth describing" (Stewart 2011, 447). Our concept of situation points to moments and spaces where habitual rule-following breaks down; tensions, disputes, and frictions emerge; and carrying on in a business-as-usual manner is no longer possible (Marres 2020; Marres et al. 2025).

In the context of our argument, this broad interest in situational sense-making implies inquiring into dimensions of governance and decision-making, in the sense that "GenAI situations" are to be understood as spatiotemporal constellations where affect and politics coalesce in often messy ways around a specific sociotechnical scenario: offloading. We use the term offloading as a broad signifier referring to the exchange of cognitive capacities between people and machines. In this sense, offloading is the key sociotechnical promise driving the promotional rhetoric of automation and, by extension, of generative AI: a promise of liberation from drudgery, animated by a vision of human augmentation where "merging with the machine" reduces the risk of organic obsolescence (Bostrom 2005). Similarly, offloading is called into question as an "entropic" view of automation, where the transfer of capacities to exosomatic cognitive infrastructures has a de-individuating effect that does not enhance agency but dissipates it (Stiegler 2018). Therefore, offloading will either free us by enabling a prodigious transfer of capacities and workloads in the pursuit of personal and collective gains ("good" offloading) or lead to an increased loss of individual and societal agency and control ("bad" offloading).

What is crucial in this respect and beyond such rhetoric is that when offloading occurs through the work of an automated agent, for instance, at the same time there necessarily equally always occur a process of *onboarding* or plugging into a dedicated computational infrastructure. As such, offloading and onboarding—as sides of the same coin—are two among many relational instances that embed humans further within sociotechnical algorithmic infrastructures. Both positions—the "AI as augmentation" and the "AI as dispossession" position—are part of an atmospheric condition that manifests in distinct practices of governance and decision-making. These practices are primarily relational and topological, that is, spatiotemporally composed and reflecting heterogenous "practices of ordering, modelling, networking and mapping" (Goriunova 2019; Lury, Parisi, and Terranova 2012, 5). Hence, both prevailing accounts of offloading are not to be considered as committing

to one vision or the other. Rather, we view them as cultural and affective precursors of sociotechnical genesis and adoption, which indirectly inform how generative AI and other automated technologies are performed into being—and perform themselves into being—within specific situations. In this sense, this article argues that offloading and its specular dynamic of onboarding both represent empirical devices for this codetermination, as the sociotechnical exchange of individual and organizational capacities with infrastructures creates, and is influenced by, affective and cultural conditions which are atmospheric and situational.

It is important to make explicit at this point that we are not conflating the concept of infrastructure with that of atmosphere, and that we treat them as analytically distinct. At the same time, we regard infrastructures and atmospheres as involved in a relation of mutual determination: ubiquitous, black-boxed, and ambient infrastructures shape atmospheric conditions of governance and vice versa (Andrejevic and Volcic 2024; Sellar 2020). In that sense, an atmosphere can be conceptualized as the *eventification* of infrastructural governance in everyday settings through lived experience and affect. Infrastructural governance points to how technologies, standards, and physical systems shape and regulate social life. It highlights that governance is not just about formal institutions but is embedded in the design and operation of infrastructure itself, influencing behavior and social order in often invisible ways (Star and Ruhleder 1996). This allows us to situate and interrogate this infrastructural dimension as it manifests and shifts in the middle layer of social life; that is, between the micro of individual subjectivity and the macro of cultural and economic conditions of possibility.

In this atmospheric milieu, the relations, attachments, and rules of cohabitation associated with offloading and onboarding are unstable and in flux, creating episodes of momentary crisis which are beginning to be commonplace: the private and public dilemmas of what, where, and when to offload; the micro-erosions of trust when attributions of agency, creativity, and authorship become overcomplicated, contradictory, or downright impossible; the small acts of resistance and denial. These situational dynamics generally represent a convergence of structural political-economic forces that together shape bodily and mental habits alike (Berardi 2013). At the same time, they unfold in an unstructured fashion, with people immersed in the mundane and ordinary locales of daily life with all their compromised and tactical enactments. In other words, the notion of atmosphere, to which we turn now, is a conceptual framing through which we can make sense of the situational presence of algorithmic technologies such as generative AI as a shared and

localized set of relations that binds collective feelings at the level of institutions, organizations, and other forms of collective life.

Atmospheres

Contrary to the instrumental idea that technologies are to be considered as mere neutral tools, much research has focused on the performative qualities of said technologies, that is, on the observation that technologies always carry dedicated worldviews, norms, and values that enact specific sorts of worlds—even if such processes of world-making would not be immediately apparent or available at face value for its users (Miller 2021; Sismondo 2011; Woolgar and Lezaun 2013). Similarly, AI—understood as an algorithmic technology—enacts a distinctive form of cybernetic and recursive rationality that has the potential to change the way we live and make sense of our place in the world, for better or worse (Neyland 2015; Ribes 2019; Totaro and Ninno 2016). It is in this ambivalent and embedded status of technologies, and how they co-constitute our contemporary condition in ways that are not always readily apparent for its users, that we see the fruitfulness of adopting atmospheric thinking as it has evolved in the fields of science and technology studies (STS), affect theory, and human geography.

In one of the most influential pieces on affective atmospheres, geographer Ben Anderson (2009, 78) argues that "[o]n the one hand, atmospheres are real phenomena. They 'envelop' and thus press on a social context 'from all sides' with a certain force. On the other, they are not necessarily sensible phenomena." With this is meant that even though atmospheres have real consequences in how collectives operate, act, and function, at the same time the precise agency of atmospheres themselves is often imperceptible, or at the very least sometimes hard to realize and sense (for those enveloped in the atmosphere), as well as to empirically grasp and pinpoint (for those researching those atmospheres)—except perhaps ex-post, as a form of recollection which is inevitably colored by the representational registers of subjective experience and culture.

At the same time, atmospheric thinking eschews locating explanatory force in either individuals or technologies alone. Instead, atmospheres are considered as being situated at the level of practice, and more specifically at the intersection of the objective and the subjective, the social and the material-infrastructural, the affect and the effect. In this liminal region, the boundaries between things are often collectively constructed, elusive and without distinct, clear-cut shapes (Bille and Simonsen 2021; Edensor and Sumartojo 2015). In adopting a practice perspective, the point is not so much

that atmospheres are (only) an outcome of the actors that constitute the atmosphere, but (equally) that actors partake in creating the practices in which that atmosphere is situated. This suggests that a theory of atmospheres should not just view its objects of analysis as products of the forces that constitute them. Instead, it should delve deeper into how an atmosphere relates to these forces, seeing them as part of a shared arrangement with people, things, and processes that together constitute everyday environments and situations whose contingencies, qualities, and affordances necessitate empirical scrutiny (Pink, Mackley, and Morosanu 2015, 354).

Of interest, then, is how atmospheres are "on this account, always in the process of emerging and transforming. They are always being taken up and reworked in lived experience—becoming part of feelings and emotions that may themselves become elements within other atmospheres" (Anderson 2009, 79). In that sense, even though they are in part ephemeral and subject to constantly changing conditions, atmospheres have a distinct form: they are characterized by diffusion across a particular social setting (e.g., a company, school, hospital), where actors do not always readily sense or perceive the conditions in which they are enveloped. These conditions include the often-unconscious ways in which technologies structure practices and shape human experience within them, including how people sense, feel, and are affected by these technologies (Hitchen 2021; Hughes 2024). Moreover, it includes the various ways in which cognition is increasingly becoming an informational process enacted by automated entities and occurring without consciousness but nonetheless reflecting a distinctive intentionality (Hayles 2017).

Another important aspect of atmospheric thinking is that affect circulates within and between data infrastructures, according to logics that extend beyond the individual emotive sphere, creating tensions between subjective *affections* on the one hand, and atmospheric *affects* that are (or can be) more of an ambient and collective nature, on the other hand (Sellar 2020). Distinguishing individual affections ("feelings") from atmospheric affect is central to the understanding of atmospheric agency (albeit tangential to the analytical framework presented here, whose exclusive purpose is the disentangling of atmospheric affect). Moreover, these tensions have a nonhuman side to them, as they are often brought into being through infrastructural enactments that do not necessarily require human intervention, with algorithms increasingly affecting and being affected by other algorithms. Therefore, the multidimensional and more-than-human notion of atmosphere helps us appreciate how collective cultural and infrastructural conditions relate to situational ambiences (McCormack 2023). Across times

and spaces (i.e., multidimensionally), we share those conditions and variations with others through the transpersonal and mimetic transmission of shared feelings and cognitive schemas, and sometimes this correlates with the formation of an epochal milieu that transcends specific situations. Against this conceptual backdrop, can we say that in the first half of the 2020s the world went through such an epochal atmosphere with regard to AI?

There was certainly something in the air when, in 2023, ChatGPT showcased a level of explosive viral growth by reaching 100 million users—faster than TikTok and Instagram in a comparable period. Between March and May 2023, OpenAI launched GPT-4, while many competitors such as Anthropic and Google responded with their own chatbots powered by proprietary language models (i.e., Claude and Gemini). During the same period, Italy temporarily banned ChatGPT over data concerns and Sam Altman, OpenAI's CEO, testified to the US Congress over AI regulation needs, while Microsoft began to power ChatGPT's web access through its Azure cloud infrastructure. In atmospheric terms, these frantic developments precipitated a generalized state of hype and anxiety, where themes of offloading featured prominently—and continue to do so at the time of writing—in often ambivalent ways. The atmosphere reached a peak of cultural and affective apoplexy when public warnings about AI as an existential challenge to humanity (Taylor and Hern 2023) went hand in hand with a heady rhetoric of leap-frogging progress "more profound than the discovery of fire" (60 Minutes 2023).

This GenAI atmosphere is not only a hyperbolic discursive affair, but a very real and material space–time of intense dynamism characterized by huge economic investments, aggressive infrastructure development, gaping policy vacuums, and public controversies heavily steered by techno-scientific authorities (Marres et al. 2025). As a result, many people across public and private sectors of so-called "knowledge-intensive" economies found themselves contemplating, rightly or wrongly, the sudden obsolescence of some of their core practices and functions. While epochal atmospheres, such as the advent of the "generative AI atmosphere" we started to unpack above, pro-vide general conditions of possibility that must be acknowledged and interrogated, their rarified, multiscalar and multitemporal character—not least the fact that we are often immersed in them—is easily confusing and overwhelming. Therefore, we argue that we should examine atmospheres as they make landfall and circulate across situations of daily life and governance: workplaces, corporate boardrooms, government departments, staff meetings, schools, and universities. What is at stake is that an atmosphere always constitutes "an attunement of the senses, of labors, and imaginaries to potential

ways of living in or living through things" (Stewart 2011, 452). This analytical endeavor necessitates a suitable theoretical and analytical toolbox that allows the apprehension of situational sensemaking while remaining attentive to the broader climatic and epochal conditions that hang over multiple similar situations. In what follows, we will illustrate this argument with examples from the familiar field of education.

Atmospheric Analytics

In this section, we provide three interrelated analytical optics. Taken together, these optics operate as a heuristic framework bridging the level of globally sprawling megastructures with that of agent-to-agent situational interaction, where "agent" may refer indistinctly to humans or machines, thus contemplating the possibility of interactions that are entirely machinic. We call this framework *atmospheric analytics*, and its purpose is to under-stand how technologies are endowed with and exert atmospheric qualities in and across situations. This implies a proximity to situations through a variety of research methods, be they ethnographically, genealogically, or computationally informed. Based on our understanding of situations as atmospheres making landfall, situations are further operationalized as affectively charged, spatiotemporal constellations that are "structured in a certain way, that opens possibilities and perspectives for action, and points to appropriate actions to take" (Quéré 1998, 241). A situation thus emerges when something takes shape, its development unfolding unpredictably through a sequence of events, contingencies, feelings, and strategic actions (Quéré 1998, 242). By paying attention to situations, atmospheric analytics allows us to scrutinize the multiple agential capacities exchanged within a situated encounter, transcending singular views of agency and structure (Sarkar 2021). Ultimately, this approach paves the way for the close examination of episodes of situational sensemaking, understood as temporally and spatially distributed moments of a morphogenetic process: a process that exhibits distinct atmospheric forms (Jagodzinski 2024; Marenko 2018).

In what follows, we will take the phenomenon of offloading as one particular rendition of these newly emerging forms elicited with, by, and through the advent and upsurge of automated technologies. The different analytical optics—density, saturation, and viscosity—represent our proposal to detect and interrogate such forms, and changes in forms. The optics rep-resent three tools in the atmospheric analytics toolbox that work best when they are considered together and reciprocally, and that can be deployed to investigate situational sensemaking in nuanced and distributed ways.

Density

The first characteristic pertains to the density of a situational atmosphere, pointing to how thickly distributed certain types of actors are. Even though the notion of density has been described in a variety of ways, we employ the term here as a qualifier and approximation of how different actors are pre-sent in a certain atmosphere, and how they relate to one another (Bruyns, Higgins, and Nell 2021; McCormack 2023). This implies paying attention to how subjectivities and practices are being enveloped by a mist of technological affordances, which are always part of broader cybernetic systems (Sellar 2020). This means that it will not always be possible to determine *a priori* who or what those participants will be. Instead, which human–technology ensembles matter and how they are distributed in practice, turns into an open question warranting empirical investigation (Pink 2022).

The analysis of atmospheric density in a situation begins with the granular, almost taxonomic, documentation of families of infrastructural technologies as they become observable in specific time–spaces. As we are concerned with education, this first optic allows us to mobilize, for illustrative purposes, the critical scholarship on governance and education technology (edtech) which, over the past decade, has dissected the multisided commercial relationships that have led to crowded, dense edtech ecosystems. These have geopolitical nuances but are also remarkably global, sharing a small set of monopolistic infrastructural conditions (Decuypere et al. 2025; Williamson 2022). Focusing on the density of a given situation is best accomplished by focusing on forms of situated practice, which in education means first and foremost teaching, examining how the overlapping and competing technological affordances offered to teachers and professors concoct a dense spectacle of desire and enticement that promises much-needed efficiencies in a generalized atmosphere of time poverty, burnout, and de-professionalization (Creagh et al. 2025). Generative AI is therefore the culmination of a process of edtech densification, which is now resulting in a cacophony of offloading promises emanating from large and small companies—all of them peddling a plethora of different ways to offload, marketed as capable of relieving teachers' burdens.

The affective valence of density is therefore often targeting scarcity or (over)abundance, with promises of future benefits touching down in specific locales and practices and creating intense situational spacetimes in which some broader atmospheres are apprehended by subjects, and others, conversely, are ignored. As Anderson (2014, 145) puts it: "On the one hand, atmospheres require completion by the subject that 'apprehend' them. They

belong to the perceiving subject. On the other hand, atmospheres 'emanate' from the ensemble of elements that make up the aesthetic object." Following this line of thought, the analytical suggestion is to pay attention to the aesthetic experience of being enveloped by a mist of "irresistible" technological affordances, while sharing a collective mood defined by temporal compression and professional encumbrance, with tasks and responsibilities overlapping: curriculum delivery, assessment, behavior management, pastoral care, administrative and clerical routines, and so forth. What happens inside this milieu will inevitably exhibit emic—that is, cultural and sociological—variation. Indeed, this is when the episodic variability of situational sensemaking will manifest. There might be "occasions of more localized place-informed ideas and policies" (McKenzie, Lewis, and Gulson 2021, 397) with actors apprehending (making sense of) atmospheric conditions according to variable local speeds and effects. In turn, this apprehension might result in actor constellations which are more or less (dys-)functional. In the latter case, different (incompatible) atmospheric conditions might lead to resistance and potential friction, eventually giving rise to unfavorable or turbulent conditions (Bruyns, Higgins, and Nell 2021). Conversely, the situational apprehension or sensemaking of an atmosphere might equally result in unconscious habituation. This is the "ironic" outcome that some human–computer interaction scholars have documented, arising when people are so immersed in dense elemental conditions of semi-automation that they become delusional about their own cognitive capabilities, which are artificially sustained by the intersecting infrastructures of offloading and onboarding (Simkute et al. 2025).

In sum, the density of atmospheres operates as a descriptor for which actors are present in a certain situation and how they relate to each other. Yet, focusing on atmospheric density alone would suffer from important limitations—the prime one being that descriptions of density are descriptions of atmospheres at particular points in space and time, but say nothing about how atmospheric conditions evolve dynamically and indeed situationally. These are issues that the optic of saturation allows us to partly overcome.

Saturation

A second atmospheric quality is saturation, pointing to the various ways in which actors and relations grow in intensity and contrast under certain spatiotemporal atmospheric conditions. Although density describes how atmospheric features accrue and concentrate at distinct points in space and time, the optic of saturation is interested in atmospheric fluctuations in terms of

energy, potency, vibrancy, and ambience. While the timescape of density is therefore relatively stationary—shaped by broader atmospheric influences and large-scale infrastructural development—the timescape of saturation is that of situational changes in terms of "co-presences, transformations, and processes" (Jue and Ruiz 2021, 1). As a distinct optic in pursuing the analysis of situational sensemaking, saturation allows to attend to forms of movement and change between (distributions of) actors, or to how a particular situational apprehension of an atmosphere would make a distinct "rupture" with conditions that were (more) prevalent before. In this sense, the saturation optic resembles topological frameworks and methods that allow us to focus on processes of flux and flow, and how within such flux and flow essential (atmospheric) features and (morphological) characteristics might still be retained (Decuypere 2021; Lury 2020).

By focusing on the processes through which a situation becomes saturated with (a) specific sort(s) of agents, we can account for spatiotemporal evolutions and (gradual or radical) shifts in atmospheric conditions (e.g., ruptures and discontinuities). The analytical devices of AI offloading and onboarding offer an entry point and a template that we apply once more to education for illustrative purposes, but which could also be extended to other domains. The suggestion in this case is to pay attention to how situations become more or less saturated with (e.g., AI-infused) technologies over specific time intervals. The ethnographic observation of key workflows as they unfold during temporal intervals may prove particularly fruitful in this regard: an impromptu staff meeting where teachers discuss AI-assisted "good practices" to offload the identification and disciplining of rampant AI cheating; a classroom observation carried out at the hectic start of a school day, with the teacher offloading a seemingly trivial function (e.g., the roll call) to an automated service (Selwyn 2022); a "backward planning" discussion, where professors reflect on and experiment with AI-assisted offloading strategies to achieve certain learning goals (Keppler, Sinchaisri, and Snyder 2024).

The analysis of saturation entails an attentiveness to how actors and relations become momentarily aligned and may equally shift or misalign depending on the extemporaneous flow of practice. These situations should be treated as spatiotemporal flashpoints that afford "thick" empirical insights. Their affective valence is intensity, either raw and nonrepresentational or mediated by language and symbols: enthusiasm, activation, cognitive arousal, and so forth (Nemorin 2017). A key aspect of saturation is, thus, that it focuses on the spatiotemporal characteristics of flows and functions: it can change at various moments and/or in different aspects of a situation(al evolvement). Saturation, then, focuses

on onto-logically dense situations and on the "thick distribution of many co-present elements," and how such situations may bring about phase changes: "material thresholds where an element is on the verge of changing form" (Jue and Ruiz 2021, 3).

Viscosity

The third optic of atmospheric analytics is the viscosity of the conditions enveloping situated encounters between human and technological actors. In general, the viscosity of an atmosphere indirectly relates to the "stickiness" of conditions: how (quickly) do technologies and their logics stick to practices and relations, enabling or impairing action and movement? Situational apprehension and sensemaking may therefore result in viscosity, or they may be a reaction to it—creating a tension between tolerance and resistance. A highly viscous situation will cause exchanges between agents to be laborious, taxing, and cumbersome. A low-viscosity situation will, on the other hand, encourage faster and more streamlined relations, as actors move without being held back—or down—by sticky and clammy conditions.

The empirical analysis of viscosity requires a careful exercise in foregrounding and backgrounding that involves the previous optics of density and saturation, paying attention to how variations along those two dimensions may cause shifts in vitality. Thus, a highly dense and low-saturation situation may create highly viscous conditions characterized by a relatively high amount of resistance to relational flow. In education, this may entail analyzing situations in which the sociotechnical grammars of offloading and onboarding have become relatively commonplace and institutionalized, with the hype and anxiety (i.e., the saturation) dissipating and leaving only the "articulation work" that occurs when actors—teachers in this case—are left quite literally to their own devices (Selwyn, Nemorin, and Johnson 2017). Articulation work refers here to the cognitive and affective coordination with dense but also loosely coupled sociotechnical systems, which promise automation and efficiencies while still demanding a great deal of mundane maintenance (Bijker 2006). Such coordination ensures the system's smooth functioning and alleviates the vulnerabilities that may manifest as actual technical breakdowns, but also as relational tensions between social actors experiencing fatigue or despondency (Shestakofsky and Kelkar 2020). Conversely, low density and high saturation may codetermine an upsurge of engagement with a specific, monopolistic AI system which has come to dominate over others (as it happens among certain student populations that

over-rely on dedicated AI technologies, see Sok and Heng 2023). In certain relational constellations, this intensified and vitalized usage could ultimately precipitate affective and/or cognitive lock-ins, with actors unable to operate autonomously once unplugged from the infrastructure (Hansen 2024).

What also becomes apparent from these scenarios is that the optic of viscosity is concerned with labor, and especially with morphologies that arise when actors work (and feel) their way through a situation that transitions from vibrancy to stasis as atmospheric conditions shift. When vibrancy is heightened because of low viscosity, we might register an intensification of affective activation and a higher "circulation of value through human labor and technology" (Clough and Halley 2008, 3). In atmospheric conditions with highly viscous configurations, on the other hand, a prominent affective valence will be exhaustion, as if one were attempting to "push a boulder up a hill" (Perrotta, Selwyn, and Ewin 2024, 16) or, to stay with the viscosity analogy, to wade through molasses.

The Aesthetic Concretization of Atmospheric Analytics

The three optics of density, saturation, and viscosity were devised as heuristic devices to make sense of the atmospheric nature of AI offloading, which emerged at the onset of the 2020s as a mixture of elemental infrastructural conditions. These conditions are diffused, invisible, planetary, and generating a great deal of heat—literally in the sense of energy consumption, and culturally and economically in the sense of hype and investment frenzy (e.g., Crawford 2021; Marres et al. 2025). These conditions also tend to make landfall in concrete situations, understood as local scenes where practical and affective entanglements between people and technology occur.

At this point, we must caution that the three optics are not to be used in the manner of a prescriptive technique. Rather, it is our hope that they act and function as a primer for researchers to further develop (these and other) tools if and as their own specific research projects require. As such, the central aim of the three optics is that they give a rendition of how researching and analyzing situational sensemaking could look like. Indeed, the way we deploy density, saturation, and viscosity is not predicated on a literal allegiance to those specific descriptors, and the potential of our argument lies in a more versatile utilization of the atmospheric lexicon, while remaining committed to the rigorous analysis of the compenetrating

influences of ambient infrastructural logics and affect. In this section, we aim to further concretize this argument, providing observational and analytical anchor points that support our methodological aspirations, and indeed our own future work: if we take shelter under the protection of a heuristic justification, then we owe it to the reader and to ourselves to offer some suggestions as to how a similarly heuristic endeavor could inform actual research.

The first suggestion we wish to put forward is that mobilizing familiar repertoires of ethnographic research such as observations, interviews, and infrastructure analysis is still part of the answer but will not always suffice. To conduct atmospheric analytics, it will be necessary to create an aesthetic and perceptual attunement to ambient and intersubjective conditions that reflect broader capacities and affordances (Brown et al. 2019). Following geographer Derek McCormack (2017), we argue that this attunement should entail a speculative disposition directed at the elemental texture of contemporary infrastructures, as constituted by energetic and material attributes that bond, change state, react, envelop, and overhang. We then extend this insight by suggesting that aesthetic attunement is not accidental but may be practiced and cultivated. For instance, it might be subjective and authorial (Hong 2020), unfolding as the bodily and affective experience of "being" in a situation or living through something which is simultaneously mundane and foreign, shaped by local practices of dwelling and by moods as much as by "stratospheric" infrastructural elements.

This attunement might also be indirect, aided by critical and introspective engagement with artistic and expressive texts or artifacts, which may be treated as proxies for the establishment of the required interpretative attention. Using music, film, and artistic expression in general to achieve aesthetic attunement prior to undertaking atmospheric analytics is productive because it enables a careful interplay between levels of perception, illustrating how broader conditions may interact with the locality of atmospheric landfalls. This aesthetic engagement can be conducive to a form of writing and theorizing that "sticks with something becoming atmospheric, to itself resonate or tweak the force of material-sensory somethings forming up" (Stewart 2011, 452). Through this process of attunement, which is, in other words, a sensitization—a bodily, cognitive, and affective predisposition to paying attention and "taking care" of a situation—it becomes possible to mobilize atmospheric descriptors. These descriptors may be density, saturation, and viscosity but, depending on varying situational and infrastructural conditions, may also include other qualities such as temperature, pressure, heat, composition, and so forth (e.g., Tierens et al. 2025).

Continuing along this aesthetic line of reasoning, one concrete methodological suggestion is to pay close attention to situations in a manner reminiscent of the one-take camera shot. This technique, often used in film to help viewers immerse themselves in an intense and emotionally charged scene, provides an aesthetic framework to concretize our argument, allowing us to operationalize the attentiveness required by atmospheric analytics as an uninterrupted state of aesthetic immersion in a situation, where mundane events unfold until something unusual catches the senses, or when another character in the scene, acting as a bodily and perceptual proxy for the viewer/analyst, registers smells, pressure changes, temperature shifts, and other liminal—indeed atmospheric—situational variations. The one-take shot metaphor has a double analytical and concretizing function: the panning, tracking, and the zooming in/out can be treated as aesthetic (and analytical) sensitizations for attending to the uninterrupted flow of a locally intense atmosphere, leading to a state of protracted sensorial activation and affective build up in the viewer/analyst. All told, it comes down to "paying attention" in a sustained manner to a situational unfolding (Stengers 2015), without averting the gaze and the senses but allowing them to persist and indeed hang in the air, recognizing a scene and picking up moments or episodes that enable a realization that something is going on.

The TV show *Adolescence* offers a suitably aesthetic rendition of what an atmospheric attunement to an educational setting might look like, while also providing an example of how infrastructural governance operates as a generalized milieu that is not immediately present to the senses. When released in 2025, the Netflix-produced drama made headlines for its subject matter: online misogyny and toxic masculinity creeping into young people's daily situations, upending lives in "normal" communities, schools, and households. The location is a generic town in the north of England, and each episode is filmed entirely through a single masterful and exacting 1-hour-long camera take. The show closely follows an ensemble of actors as they move in and out of various locales—including a secondary school—interacting, arguing, fighting, crying, screaming, or just casually passing through. The perceptual persistence and urgency of the camerawork allows local atmospheric conditions to become tangible, while immersing the characters— and by extension the viewers—in an affective present shaped by a seemingly incomprehensible event: the murder of a young girl.

Adolescence's depiction of everyday schooling in the north of England is deliberately extreme for dramatic effect, and the show has been rightfully critiqued for being clunky in its depiction of media use among young people, and overly focused on a visceral and gendered experience of failed fatherhood

(Horeck 2025). Nonetheless, there is something in it which resonates with our experiences as STS researchers, and which is relevant to how we conceptualize atmospheric analytics as the aesthetic mobilization of elemental optics. In particular, *Adolescence*'s "school episode" effectively captures the multifaceted nature of atmospheric attunement. On the one hand, there are the situated attunements of teachers and young people in response to and in cooperation with intersecting cultural and infrastructural conditions: the verbal and physical violence, the teacher burnout, the desire to offload care and responsibility onto tempting technological affordances (screens), the small openings and rapid closures of meaningful human connections enabled or impaired by the built environment, and over-all the "proliferation of little worlds of all kinds, or the explosion of tracks of self-transformation" (Stewart 2011, 449). The way the technology-mediated "manosphere" encroaches unseen on the local microcosm of a school is also interesting and very pertinent to our own argument about AI offloading, which manifests, as we argued previously, in a similarly atmospheric fashion. Indeed, *Adolescence* provides a compelling aesthetic rendering of atmospheric encroachment and saturation through logics of digital governance, by depicting the manosphere as an impalpable influence operating through a sprawling and hyperdense ecology of personal devices and social media, fueled by the algorithmic encoding of mimesis: internet memes, red-pill "manfluencers" advocating for gender hierarchies (Roberts et al. 2025), emojis, sharing and liking, and so forth.

Conclusion

The aim of this article is to offer atmospheric analytics as a conceptual and terminological toolbox—a flexible collection of optics—that can operate as an analytical prism to inquire into and disentangle situated encounters between human and technological (e.g., automated) agents. As such, it enables research into how technologies are increasingly exhibiting atmospheric qualities. Conceived as a heuristic endeavor, atmospheric analytics aim to disentangle the morphologies of these atmospheres. We have proposed that the governance logics that such atmospheres entail are crisscrossing logics of infrastructural imposition and affective enveloping. In establishing a transpersonal and transtechnological middle that transcends both individual perceptions on the one hand, and renditions of technologies operating as megastructure on the other hand, this article concerns situational sensemaking as it emerges *in medias res* (Decuypere and Lewis 2023; Lury 2020). In that respect, and as we argued above, the three pro-posed

optics of density, saturation, and viscosity are merely a first step in enabling an account of atmospheric morphologies, and do not delimit *a priori* the exact qualities that would need to be researched. As a toolbox concerned with investigating the morphology of situated encounters, atmospheric analytics differ from conventional approaches that define technologies in general, and generative AI applications in particular, as "things out there" or as instrumental "tools to use." By being specifically interested in the situational dimension, it also avoids making atomistic claims that concern the alleged dehumanizing and/or anthropomorphic effects of said tools (Katzenbach and Pentzold 2024). Even though the automated capacities of generative AI applications are clearly exposing changes in how knowledge is produced and at times offloaded, atmospheric analytics do not see this phenomenon through a deterministic lens, but as an agential, affective, and indeed situational redistribution of capacities between human and nonhuman actors. As such, the methodological focus on situational encounters alters what we count as "data" and how we inventively examine such encounters (Lury and Wakeford 2012). From a morphological perspective, this development requires revising the descriptive protocols of data collection and analysis on which ethnographic studies of technologies traditionally rely. In that sense, atmospheric analytics seek to deviate from approaching emerging technologies as a "type" of tool that would be "inserted" in already existing practices, and that can and should be critically analyzed (Bruyns, Higgins, and Nell 2021, 937; Pink 2022). At the same time, it equally seeks to avoid a stringent *a priori* approach to its multifarious functions, for these functions are only enacted by, with, and in situational unfolding. Instead, it is open to analyzing how things, people, environments, processes, and technologies (could) become endowed with atmospheric qualities, even as a purely aesthetic apprehension. Moreover, it seeks to place technologies (and the humans using them) in a broader context, and hence "not separate from the worlds we have previously researched or even as if it was added onto or into them" (Pink 2022, 749). Finally, this effort requires that we pay attention to the historicity and genealogy of technology, as much as it necessitates analyzing the imagined futures that are always part of any new technological development (Bareis and Katzenbach 2022; Morozov 2024).

We believe that the operationalization of this analytical gaze provides a flexible framework for the cross-disciplinary analysis of the "eventification" of AI, and other technologies more generally, as they ongoingly reach into social life—from a broad atmospheric layer to the situational level where societal moods and infrastructural conditions land and take form. For

instance, a focus on density productively interfaces with a political-economical perspective, by viewing the current proliferation of AI tools and affordances as the continuation of a well-documented platformization trend, which reinforces monopolistic control over algorithmic and datafied assets as "something that can be owned or controlled, traded, and capitalized as a revenue stream" in the future (Birch and Muniesa 2020, 2). At the same time, our framework extends this political-economic and infrastructural argument by directing our gaze to the affectual instantiation and conditioning of desire and enticement induced by, for instance, the overabundance (and overpromising) nature of hyperdense AI conditions.

Crucially, though, the work of atmospheric analytics does not stop there. By adding a saturation lens to our stock of conceptual resources, we bring into view phase changes with different velocities that reflect virtually endless contextual variance and are indeed situational: moments or occasions that require inventively adapting the most classic ethnomethodological question—*What is going on here?*—as atmospheric conditions shift and evolve rapidly. In that regard, our brief detour into the aesthetic nature of atmospheric apprehension is an invitation—and a proposal for a future program of work—centered around the twin notions of attunement and attentiveness, both contributing to a form of affective and cognitive predisposition to sensing the atmospheric qualities of contemporary infrastructures, ideally conducive to a more effective deployment of the atmospheric lexicon as a flexible collection of optics.

Last but not least, the analytical endeavor proposed in this article ultimately leads to the most consequential issue of all: the extent to which variable technology-induced atmospheric and situational conditions support or impede movement, dynamism, and—ultimately—life. As such, the analysis of viscosity offers an empirical anchor-point that gives atmospheric analytics both a clear sense of purpose and an overarching axiological (ethical and aesthetic) research question: are technologies making our lives—in this specific and empirically investigated situation—better? This is the ultimate political project of atmospheric analytics, which seeks to better understand the infrastructural-affective ordering of the world, showing and problematizing relations of power, inequalities, and unwanted side-effects (Jaton and Sormani 2023; Pink 2022). Such rationales invariably open questions of for whom: for whom are infrastructural and situational atmospheres harmful, disruptive, beneficial, or utterly inconsequential (Jue and Ruiz 2021)?

To conclude, atmospheric analytics constitutes only the first venture of a future research agenda into the atmospheric qualities of emerging technologies (e.g., generative AI), as empirical investigations at the level of situated encounters—the local events and affects that follow atmospheric landfalls—are urgently needed. Moreover, even though the focus of this article was on what exceeds singular individual interaction and/or global structuration, atmospheric analytics lay the foundation to probe into the tentacular reach and ramifications of technologies stretching outward, both into the realms of individual cognition and of planetary resources (Andrejevic and Volcic 2024). Indeed, it cannot be forgotten that technological atmospheres are always engineered with interests and purposes in mind. The current fully recursive atmosphere—where user input and feedback are continuously fed back into infrastructural systems, shaping future technological outputs—demands inventive methods. These methods must be both reflexive about this entanglement, and aimed at introducing questions of accountability into the evolving, situated experiences of these systems as they unfold within cultures, economies, and the world writ large.

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