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Aesthetics of Boundless Insight: On the Scalar Ideology of the Data Imaginary

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This article explores the ways in which popular cinema contributes to the data imaginary. We engage in a close reading of key data-related scenes in *Minority Report* (2002), *Moneyball* (2011), and *Snowden* (2016), and we examine their extensive reliance on formal means that are deeply entangled with cinema's capacity for scalar distortion. Using critical scholarship on the concept of scale as our interpretative lens, we argue that the distinct aesthetic construction of filmic engagements with data-driven issues is politically performative: The sequences that contribute to the data imaginary evoke what we term the "aesthetics of boundless insight," eminently aligned with the discourse that presents big data as the key to unlimited potential and as a powerful technology without a predetermined agenda.

Keywords: big data, data imaginary, scale, film aesthetics

Once hailed as a revolution, big data and data analytics have been progressively normalized and integrated into many facets of contemporary life. As data-driven systems have become increasingly consequential for society, scholars from various disciplines have explored not only their inner workings but also the wider context and discourse surrounding their ongoing development and use. The concept of data imaginaries has been particularly relevant for understanding these dynamics. Scholarship on the concept has explored how the visions promoted by specific stakeholders—such as policy makers (Leonelli, 2021; Rieder, 2018) or data-analytics companies (Beer, 2019)—discursively predetermine the expectations of data-driven technologies across society, or how the imagery and metaphors used in the media and mainstream press play a significant role in shaping public conceptions of data (Pentzold, Brantner, & Fölsche, 2019; Puschmann & Burgess, 2014). As such, by conveying the dominant ideas, images, and narratives about how data functions and what it can be used for, data imaginaries in turn enable particular processes of datafication.

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In this article, we discuss the ways in which popular cinema contributes to the data imaginary. Cinema has long been considered a powerful medium with a discernible impact on public discourse and on people's understanding of specific topics (Green, 2006; Leiserowitz, 2004), with Kirby (2011) arguing that "film's visually and emotionally immersive environment enables it to dominate our technoscientific imaginary" (p. 40). It has also become common practice to use specific films as cultural references for thinking about AI imaginaries (Cave & Dihal, 2023; Hudson, Finn, & Wylie, 2023), robot imaginaries (Rhee, 2018), and data imaginaries (Benabdallah, Kaneko, & Desjardins, 2023). Our discussion seeks to contribute to this scholarship by focusing on cinematic engagements with data, and exploring in particular *how* specific films contribute to the data imaginary.

We are interested in the aesthetic dimension of how data are imagined in cinema; however, it is not our aim to be exhaustive nor to analyze patterns in a large corpus of films. Instead, we engage in a common film-studies approach of close reading salient sequences, in order to illuminate the films' formal presentation of data. Close analysis, especially of form or style, is considered essential to understanding how cinema conveys meaning because "style constitutes the medium of expression, giving access to the story and simultaneously shaping in a variety of complex ways the film's relationship to its material, its audience and its traditions" (Gibbs & Pye, 2005, p. 10). The close reading of illustrative sequences is typically used to shed light on the complex aesthetic or ideological presentation of an issue (Fabe, 2014) in ways that are pertinent for the film as a whole. Consequently, we sought significant sequences that engage with data analytics, concentrating especially on how their formal presentation (i.e., types of camera shots, editing style, etc.) serves to convey a particular framing of data.

Our analysis focuses on key sequences in three films that are pertinent to discourse around data-analytics technologies. The first film, *Minority Report* (Spielberg, 2002), has featured prominently in journalistic and popular-science discussions of data analytics. The second film, *Moneyball* (Miller, 2011), takes its name from the concept of "moneyball," which has become a common reference point for discussions about the potential of data for informing strategic decisions. Finally, *Snowden* (Stone, 2016) is a biopic centered on the U.S. government's use of a data-analytics system for surveillance and information gathering. In each of these films, we focus on sequences that combine a visual presentation of its central data-analytics technology with a diegetic explanation of its function and logic. We found that the way in which these sequences convey the film's vision of the technologies in question makes extensive use of cinematic techniques that are deeply imbued with the affect of scale, namely rapid shifts in shot size, fast-paced montage, shifts in perspective, and zoom. Reading this in the context of data imaginaries, these particular elements of film form give the impression of providing unprecedented access to information, the scale and speed of which exceed the typical limits of human cognitive and analytic capacities. By drawing on the theory around the cinematic deployment of scale, we interpret these sequences as evoking what we term the "aesthetics of boundless insight," eminently aligned with the sensationalist discourse that presents big data as the key to unlimited knowledge (Anderson, 2008) and as the advent of "the age of insight" (Mayer-Schönberger & Cukier, 2017). Similarly to how the concept of scale is discussed critically in the humanities as discursive and often mobilized to suit a particular agenda (Horton, 2020; Jones, 1998; Marston, 2000; Tsing, 2012), the cinematic deployment of scale performs a comparable function for the data imaginary.

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In what follows, this study first contextualizes the concepts of "big data" and "data imaginary," and then discusses the rationale for focusing on popular cinema and on *Minority Report* (Spielberg, 2002), *Moneyball* (Miller, 2011), and *Snowden* (Stone, 2016) in particular. Our subsequent close analysis of the selected film sequences centers on the function of the cinematic deployment of scale and its affective and ideological affordances. This article ultimately interrogates the political significance of the aesthetics of boundless insight, reflecting on its role in strengthening the dominant narratives about data analytics.

Big Data and the Data Imaginary

There is no shortage of definitions of "big data," and the exact characteristics and boundaries of the term have been subject to much debate (Kitchin & McArdle, 2016). The term has generally been linked to "data that are generated and processed in real-time and are exhaustive to a system," considered as "central to what has been termed the data revolution" (Kitchin, 2024, p. 20), and was initially popularized as part of a branding exercise pitching new data-processing products and services to potential business clients (Puschmann & Burgess, 2014). While the term has lost its buzzworthy quality over time, it is still often used today (albeit in a nonsensationalist way), and more importantly, "its associated technologies and techniques are an integral part of today's infrastructures" (Pentzold & Knorr, 2024, p. 14). Consequently, even though big data as such is no longer an object of hype, the normalization and widespread adoption of its resulting methods and workflows underscore the lasting impact of the initial traction of the term, and therefore the rhetoric, metaphors, and qualities associated with the concept constitute relevant context for our discussion of data imaginaries.

Big data has often been characterized by qualities such as volume, velocity, variety, and other variable concepts, the list of which expands continuously,[1] and all such characteristics "function as imaginaries that provoke notions of speed, quantity, flexibility, scalability, and extensity" (Ruppert, 2018, p. 15). Consequently, data-analytics tools have been perceived as allowing for instant insights and a depth of analysis superior to previous methods, functioning as an "enhancement of the senses" akin to a microscope enabling access to previously invisible realms (Agostinho, 2019, p. 3). This purported potential has been significantly amplified by big data evangelists, as well as business and tech commentators, with some framing big data as a "revolution" (Mayer-Schönberger & Cukier, 2017), as "a whole new way of understanding the world" (Anderson, 2008, para. 18), or as unlocking previously inaccessible actionable insight (Evans, 2018).

The rhetoric surrounding big data has heavily emphasized the potential increases in efficiency and knowledge that data analytics can provide, suggesting that companies will be able to understand their customers better, to tailor their products more effectively, and to be more adaptive to market conditions. Data-based operations were increasingly presented as "smart," self-improving, and able to adapt to an endless variety of tasks and contexts (Beer, 2019, pp. 29–31). This vision was also seen as promising for making the public sector more efficient: The European Commission, for instance, vaunted big data for its potential to "provide timely, actionable insights" and "generate solutions" (Rieder, 2018, p. 94). The ideas

[1] See Kitchin and McArdle (2016) for a thorough discussion of the limits of these "V" categories and others subsequently used to describe big data.

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emanating from tech companies and their marketing strategies were later propagated by journalists and commentators (Pentzold & Knorr, 2024; Puschmann & Burgess, 2014), while academics, consultancy firms, and lawmakers were soon tapping into the same rhetoric, especially when their political interests aligned with business and tech companies (Rieder, 2018; Ruppert, 2018). Despite numerous concerns being raised with regard to increasing datafication, including state surveillance, challenges to privacy and individual freedoms, and unfettered corporate power (boyd & Crawford, 2012), private consultancies and public organizations played an important role in "rationalising the often contradictory perspectives about data for the general public" (Couldry & Yu, 2018, p. 4475), which allowed for consolidation of the dominant narrative.

Numerous scholars have discussed the dynamics outlined above using the conceptual framing of imaginaries, anchored in a broader scholarly tradition within which McNeil, Arribas-Ayllon, Haran, Mackenzie, and Tutton (2017) identify four main philosophical genealogies: Western philosophy (Jean-Paul Sartre and Michèle Le Dœuff), psychoanalysis (Jacques Lacan), science fiction (Donna Haraway), and late twentieth-century sociopolitical theory (Benedict Anderson, Cornelius Castoriadis, Arjun Appadurai, Charles Taylor, and Sheila Jasanoff). Discussions of science and technology have mostly drawn on the last category, often using the concept of "social imaginaries" (C. Taylor, 2004), to discuss the symbolic expression of complex phenomena that enable common social practices and help bind society together, and "sociotechnical imaginaries" (Jasanoff, 2015), to analyze the narratives told about science and technology through laws, policy, investment strategies, and so forth. Importantly, from these perspectives, imaginaries are understood to be both descriptive and normative, helping us understand both how things are and how they should be; they not only reflect the present but also typically point toward a vision of a desirable future.

The literature on data imaginaries builds on this rich intellectual lineage in order to discuss: the ways in which data-analytics companies present their products to buyers (Beer, 2019), the images used in newspapers to help communicate big data-related news to nonspecialist readers (Pentzold et al., 2019), the different agendas served by the discursive and metaphorical framings of big data (Nolin, 2019; Pentzold & Fischer, 2017; Puschmann & Burgess, 2014), the operative logics behind the data strategies of national governments (Leonelli, 2021) and supranational organizations (Marčetić & Nolin, 2023; Rieder, 2018), and alternative ways of thinking about data outside of the dominant political and economic institutions (Kazansky & Milan, 2021; Marčetić & Nolin, 2023; Ruppert, 2018). What these discussions point to is that the broad set of ideas, metaphors, and imagery attached to data, and the discursive framing of what data are able to do, significantly influence the ongoing development and deployment of data-driven technologies.

It is also important to highlight the heterogeneity of imaginaries related to data, "some rooted in established modes of knowing and doing and existing ideas and concepts, others more speculative, innovative, and fictive" (Kitchin, 2024, p. 77). Different groups in effect compete to "ensure that particular data imaginaries and affordances are realised" (Kitchin, 2022, p. 29), and as with other imaginaries, it is generally "institutions of power" that are able to most forcefully impose their visions by "according them a dominant position for policy purposes" (Jasanoff, 2015, p. 4). It has therefore become standard to distinguish the many alternative imaginaries associated with less-powerful groups from a singular dominant or hegemonic imaginary. In the case of data, this hegemonic imaginary is generally associated with the ideas presented by data-analytics companies and (supra)governmental organizations, and has been discussed as "dominant discourses about datafication" (Couldry & Yu, 2018, p. 4475), "dominant practices

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and perceptions of datafication" (Kazansky & Milan, 2021, p. 364), or simply "the data imaginary" (Beer, 2019). While the multiplicity of imaginaries remains an important aspect of the discourses and practices around data, our discussion in this article primarily engages with the data imaginary. This dominant imaginary typically portrays data analytics as "speedy, accessible, revealing, panoramic, prophetic, and smart" (Beer, 2019, p. 22), and such idealized expectations subsequently orient how companies, users, and policy makers engage with these tools.

Popular Cinema and the Data Imaginary

Popular cinema is often thought to actively contribute to imaginaries of science and technology by shaping and stabilizing public knowledge and expectations (Kirby, 2011; Schmitz, Endres, & Butz, 2008). Science-fiction films in particular are understood to function as cultural narratives contributing to the development of AI and robots (Cave & Dihal, 2023; Hudson et al., 2023), and Rhee (2018) highlights that "it has become almost something of a disciplinary convention for roboticists to open their monographs, and sometimes their scientific papers, with descriptions of early formative encounters with fictional robots, from *2001: A Space Odyssey*'s HAL to *Star Wars*' R2-D2" (p. 8). Elish and boyd (2018) also note that news segments reporting on technology-related events sometimes even invite science-fiction filmmakers to comment on real-world developments. More specifically with regard to data imaginaries, the impact of popular cinema has been demonstrated by Benabdallah et al. (2023) in a study on public perceptions and impressions of data. The interviewees commonly referenced tropes from media franchises such as *The Matrix* and *Star Trek*, and "science fiction," "cyberpunk," and "dystopian" made up half of the fiction genres mentioned. While these examples support the general perception that science-fiction cinema is relevant to nonfictional discourse around technology, the aim of our study is to explore in greater depth *how* data are imagined in cinema and, more concretely, to examine the aesthetics specific films adopt in their engagements with data. Given our focus on close rather than distant reading, we sought a limited number of relevant film sequences, beginning with two films that already function as references within the broader discourse around big data, and using them as a starting point for seeking additional similar material for analysis.

Locating Data Analytics on Screen

Our exploration of popular cinema's engagement with data began with *Minority Report* (Spielberg, 2002) and *Moneyball* (Miller, 2011) because of their importance for discourse around data. *Minority Report*—set in a world where people with extrasensory perception (precogs) produce crime-predicting visions, which, combined with other data, serve to locate the perpetrator—has become a frequent reference point for discussions about predictive policing,[2] with many of these conversations specifically focusing on the big data aspect of such practices (Clegg, 2017; Stephens-Davidowitz, 2017). Mayer-Schönberger and Cukier (2017) also point to the film as portraying an "unsettling future . . . that unchecked big-data analysis threatens to bring about" (p. 158). The second film, *Moneyball*, based on a book by Michael Lewis, tells the story of a baseball team and its general manager, Billy Beane, who use data analysis to pick their team and, despite

[2] Scannell (2019) notes how the film is even mentioned in a report on predictive policing released by the RAND corporation in 2013.

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resistance from many quarters, go on to break the record for consecutive league games won. The narrative emphasizes how data-driven choices can surpass human decision-making, and the film is considered to have had a significant cultural impact on discussions of data science (Sim, 2020); indeed, it is frequently referenced in popular-science and business writing to encapsulate how data-based operations are changing many processes across sectors (e.g., Simon, 2013; Smith & Telang, 2016). O'Neil (2016) observes that the concept of "moneyball" "is now shorthand for any statistical approach in domains long ruled by the gut" (ch. 1, para. 8), and in educational settings, the film is sometimes used as a springboard for conversations about analytics (Soland, 2014).

When watching these films, two sequences stood out to us due to their relatively explicit role in explaining the internal mechanics and importance of data analysis within their respective narratives. In *Minority Report* (Spielberg, 2002), the sequence occurs early in the film, and shows the protagonist examining the images of the upcoming crime on a large display and comparing them with other information in the police database while a member of the team explains the process to a third-party observer, providing expository detail about the technology that will be central to the film's narrative. In *Moneyball* (Miller, 2011), the key scene takes place halfway through the film and, similarly to *Minority Report*, involves a character explaining the data-analytics system that is key to the narrative. Here specifically, it is a voiceover of the analyst narrating the logic behind the process of determining which players can amount to an effective and affordable team, while images of the players and their performance data are shown on the screen in a montage sequence. Due to their unambiguous diegetic positioning as presentations of the analytics technologies driving their respective film narratives, these two sequences were chosen as the initial material for close analysis.

To find other similar (i.e., mainstream, twenty-first-century) films that engage with data analytics in a significant way, we undertook a filtering process of a large film database, focusing on English-language, big-budget (> $20 million), feature-length (> 90 minutes) films made since 2000.[3] Given that our key focus was on the imaginaries associated with big data and data analytics, the principal aim of our selection process was to find scenes that could serve as material for close analysis alongside *Moneyball* (Miller, 2011) and *Minority Report* (Spielberg, 2002), and this process culminated with five films: *Anon* (Niccol, 2018), *Captain America: The Winter Soldier* (Russo & Russo, 2014), *Elysium* (Blomkamp, 2013), *Snowden* (Stone, 2016), and *Spider-Man: Far From Home* (Watts, 2019). On watching the films, we further excluded two more titles: *Elysium*, set in a futuristic world where drones, medical devices, and security and weapons systems all have real-time analytics functions built in, however, these technologies are not explored in depth, and there is no one particular scene centered on data analytics; and *Spider-Man: Far From Home*, featuring an advanced analytics system, however, the film does not seem invested in specifying the nature of the technology and does not offer much clarity on how it functions (it is at the same time a form of nonsentient AI, a glasses-based augmented reality interface, and later a weaponized holographic projector).

The film that best fit our search criteria was *Snowden* (Stone, 2016), featuring a sequence unambiguously centered on a data-driven technology—the National Security Agency's (NSA) data-analytics

[3] For a detailed description of the film databases used, as well as our selection criteria and filtering methods, see the appendix at https://osf.io/u6tjc/?view_only=70906d10bc4a402884598dcec5c2ffeb.

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and surveillance system—in which a long take ostensibly showing an unending flow of collected and processed data is accompanied by a voiceover of the main character explaining the inner workings of the system. The remaining two films on our list constituted partial matches for our search. *Captain America: The Winter Soldier* (Russo & Russo, 2014) revolves around a military weapon that is explicitly underpinned by large-scale data collection (explained in the film as "your bank records, medical histories, voting patterns, e-mails, phone calls, your damn SAT scores! Zola's algorithm evaluates people's past to predict their future" [1:15:49]); however, there is no distinct sequence in the film centered on the technology both visually and in terms of diegetic explanation of the system. Lastly, *Anon* (Niccol, 2018) is set in a world where everyone is plugged into a giant data-collection system and provided with real-time analysis of everything within their field of vision, and while this is represented visually throughout the film, there is no one clear sequence positioned as an explicit explanation of the technology. Consequently, based on our prioritization of sequences unambiguously centered on visions of data and functioning as explanations of the films' key technology both diegetically and for the viewer, we decided to focus our analysis on the three key sequences from *Minority Report* (Spielberg, 2002), *Moneyball* (Miller, 2011), and *Snowden* (Stone, 2016).

***Moneyball*, *Minority Report*, *Snowden*, and the Cinematic Deployment of Scale**

To explore how our selected films construct their visions of data, we proceeded to engage in close readings of the key sequences. Practically, this meant rewatching the material numerous times and paying close attention to its formal construction (i.e., the use of mise-en-scène, framing, shot size, editing pace, color, movement within the frame, sound, and so on). During that process, it became apparent that despite the difference in the films' genres (science fiction, drama, and biopic), there are clear commonalities in the aesthetics of these sequences, such as the use of rapid montage with shifts in shot size, shifts in perspective, and various forms of zoom. Each of these cinematic techniques has been theorized as entangled with the concept of scale, often dating back to the origins of cinema as a medium. In what follows, we explore how this set of formal means constitutes what we term the "aesthetics of boundless insight," working to convey the scalar affect of data analytics, and significantly contributing to the data imaginary.

Scalar Disorientation: Shot Size and Montage

In *Moneyball* (Miller, 2011), the selected sequence starts with the analyst and the manager in front of a whiteboard, discussing end-of-season statistics. The analyst then proceeds to explain how the code he has written will enable them to optimize their strategy and help secure the most wins in a cost-effective way. The explanation of the data-driven strategy then takes the form of a voiceover paired with an unpredictable succession of shots varied in composition and size, showing computer code, database tables, statistics, and pixelated images of the players, rapidly moving between medium shots and close-ups. At times, the curve of a single letter becomes so big as to completely fill the screen, while at other moments, the screen is awash with hundreds of lines of code. The transitions between shots of different sizes are abrupt, resulting in an overwhelming and disorienting effect. In the middle of the sequence, there is a series of brief zoom shots centered on textbook paragraphs, equations, and graphs, giving the impression of moving progressively closer to the displayed information, yet in an erratic rocking motion. This is followed by player stats cards shown one after another, with the speed of editing accelerating until they turn into a blur of faces and numbers. Throughout the sequence, there is significant movement within

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the frame, with database columns and rows scrolling vertically and horizontally across the screen. At the end of the sequence, these scrolling shots are edited together in a fast-paced montage to dizzying effect before coming to an abrupt stop, signaled by a loud mouse click and a static medium shot of the analyst sitting at his computer.

The visual style of this sequence is not accidental: The editor of the film once remarked that his aim was to "make it feel like you're inside this world of information, this new way of looking at things" (Murphy, 2012, para. 15). Such an effect was made possible by cinema's capacity for scalar transformation. As noted by Doane (2022), cinema "shatter[s] conventional scale . . . [by] construct[ing] a space and a world to its own measure" (p. 3). This capacity for altering scalar relations is particularly clearly observed in the multiplicity of shot sizes used in cinema (long shots, medium shots, close-ups), which allows for effects such as insects seeming gigantic and planets tiny. The scalar distortion is most effectively performed by the close-up, which in early cinema served to give the impression of the object on the screen spatially dominating the diegetic world, but later became codified in narrative cinema as communicating closeness and intimacy (Doane, 2022, p. 72). The close-up has fascinated many filmmakers and theorists throughout film history, with Jean Epstein (1977) calling it an "intensifying agent" that "acts on one's feelings more to transform than to confirm them" (p. 13). As Doane (2022) points out, the impact of the close-up on the viewer is tied to its fragmentation of the human scale: The close-up has an inherently destabilizing effect on the human scale's "anchoring function as the image of psychic wholeness and identity," and results in "an anxiety of scale, of monstrosity, giganticism, and disproportion, and consequently of a perversion of space" (p. 59). The use of the close-up is considered particularly spatially disorienting when it is abruptly placed within a sequence composed of shots of different sizes. Continuity editing typically provides the spectator with a means to orient themselves by establishing conventions for achieving a smooth progression of shots; however, when these conventions are not adhered to, the progression of different shot sizes can act as an agent of disorientation. As Lukinbeal (2012) explains:

> Positioning an image against a logical scalar flow (i.e., cutting abruptly from long to close or vice versa) or against the logical speed of transitions (moving from slow to fast cuts and then pausing for a long time on one image) disrupts spatial unity and indexical realism. (p. 9)

In the sequence discussed above, *Moneyball* (Miller, 2011) mobilizes the disorienting power of varying shot sizes and their progression in a way that evokes the inhuman speeds at which data analysis can be performed, and echoes the discourse about data analytics' "disruptive" impact on information processes. The "revolutionary" impact of data analytics conveyed in this sequence becomes especially clear in comparison with an earlier scene that depicts the traditional method for evaluating players: a group of men sitting around a table and commenting on the players' appearances, characters, and personal lives. While the earlier scene is filmed in a classical manner and follows standard continuity-editing rules, the data-oriented sequence mobilizes cinema's scalar apparatus to point to data analytics' radically different approach. The groundbreaking potential of data is further emphasized by the unorthodox use of the close-up in the data-analytics scene. Rather than following the typical use of the close-up, as either altering the scale of objects on screen or conveying the interiority of particular characters, the close-up here results in an intentional illegibility of the content of the shot. The extreme close-up of the various statistics analyzed

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by the characters in the scene results in a completely pixelated image, making it impossible for the viewer to grasp what exactly the numbers refer to. The close-up works here as an "intensifying agent" (drawing on Epstein's parlance), emphasizing the depth of insight enabled by data analytics, far exceeding human capabilities. Throughout the sequence, cinema's capacity for scalar disorientation is mobilized to induce the impression of being caught up in a whirlwind of data. Nevertheless, any disorientation is controlled through punctuating cuts to more slowly edited shots of the characters, through a reassuring voiceover that explains the logic behind the process of analytics, through very calm atmospheric music, and ultimately through the reduction of the cacophony of numbers to simple actionable outputs: the selected players and the price to be paid for them, shown on screen. Overall, the formal and aesthetic choices made in this sequence align with the dominant rhetoric of big data, which evokes revolutionary potential that can lead to stable and measured benefits when adequately exploited.

A similar mobilization of film form and its scalar affordances can be observed in *Minority Report* (Spielberg, 2002). The film's key sequence shows the lead detective examining precogs' visions, which are received as video recordings and displayed on a large transparent screenlike interface, together with a constantly moving torrent of official information (drivers' licenses, mug shots, architectural records, statistics). This constant flow of data is inspected on the screen using a pair of specialized gloves, with images rotated and magnified many times, and videos looped and played back and forth. Shifting between close-ups of various objects, people's faces, and visual details of the location, as well as wider shots of the scene taking place in the precog visions, the vast array of differently sized shots creates a disorienting and overwhelming effect. Nevertheless, the dizzying speed at which elements appear on screen, and the abrupt transitions between the different scales they adopt, is ultimately stabilized by the dialogue, which explains the different aspects of the analysis taking place, and by the use of lyrical classical music on the soundtrack, giving a sense of calm and controlled flow.

The aesthetic construction of both sequences discussed above echoes the frequently discussed characteristics of big data: velocity (evoked by the rapid flow of elements within the frame, as well as the rapid montage), volume (the abrupt shifts between different types of shots creates the overwhelming impression of a deluge of information), and variety (different shot sizes and different cinematic techniques combined in an unpredictable way, giving the impression of variety and complexity). Just as the close-up has been perceived throughout cinema history as a uniquely impactful technique, distorting scalar orientation by cutting off access to what is positioned outside of the object filling the frame, the use of the full spectrum of shot sizes, edited abruptly in rapid succession, performs a similar yet inverse function: It is impactful due to the excess of insight it implies. In each of the scenes analyzed here, the aesthetics of boundless insight works to induce scalar disorientation, which is ultimately stabilized by the film's narrative and the use of sound.

Scalar Collapse: Perspective and Zoom

Aside from shot size and montage, cinema's capacity for scalar distortion is also frequently exercised by the use of perspective (such as point-of-view shots and god's-eye-view shots) and zoom. Both of these techniques can be mobilized for what Horton (2020) terms "scalar collapse": "the conflation of two or more scales through a media technology that speculatively rescales them into the same visual or

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conceptual plane, replacing the dynamics of one with the dynamics of the other" (p. 81). In the case of a god's-eye-view shot, this dynamic is enabled by the flattening of vertical scale. As noted by Castro (2013), who locates the origins of the aerial view shot in early cinema's fascination with aeronautics, "contemplating the world from above enables an unprecedented expansion of the field of vision . . . a kind of unique fusion of macroscopic vision and microscopic observation" (p. 119). Looking vertically downward from a height, the aerial view erases contextualizing features such as the horizon, and combines the all-encompassing view of an entire landscape with the sense of peering down a microscope at a single cell. The use of this type of perspective is noteworthy not just in terms of its distinct aesthetics, but also with regard to its epistemically colonizing power: Claiming access to different scalar domains and erasing their local differences creates a sense of domination over the space being viewed.

A similarly contentious scalar distortion is often associated with the zoom, which is the "attempt to combine all cinematic scales—from the telephoto view to the extreme wide-angle view—in a single, continuous shot" (Doane, 2022, p. 4). The most famous example of scalar collapse enacted by the zoom is *Powers of Ten* (Eames & Eames, 1977), which ostensibly depicts a zoom-out from the scale of the human to the scale of the known universe, and then a zoom-in to the scale of subatomic particles. Despite the film being appreciated for its technical ingenuity and didactic function, the zoom in *Powers of Ten* has been widely criticized for issues such as its scientific inaccuracies or its crowd-pleasing illusion of movement. Most importantly with regard to the politics of scale, the film drew criticism for eliding the differences among scales, and for presenting a totalizing yet still highly anthropocentric vision of the universe (Woods, 2017). Horton (2020) argues that the film's "primary legacy" is the idea that "this world can be navigated at will by the human observer" (p. 121), an ideological position that has been profoundly influential. Overall, both the zoom and the god's-eye view in cinema are frequently complicit in what Haraway (1988) terms "the god trick of seeing everything from nowhere" (p. 581), that is, the claim of producing universally applicable knowledge without any subjective specificity (which she discusses in the context of scientific claims of objectivity). Scalar collapse, with its claim of cross-scalar access without local differentiation, can be seen as a similarly ideologically driven assertion of objectivity.

In *Minority Report* (Spielberg, 2002) and *Snowden* (Stone, 2016), perspective shots and zoom are mobilized toward evoking similarly all-encompassing access and insight, which on its own does not take a particular position; any specific intentionality or agenda is always attributed to particular characters and resolved by the narrative. When the *Minority Report* protagonist conducts his analysis, the key interface—a large transparent display showing fast-moving information—is filmed from a number of angles, sometimes filling the screen in a way that resembles a view from above, other times enveloping the characters or being shot over the analyst's shoulder in a way that blurs the line between the character's viewpoint and the depersonalized overview perspective. This stylistic choice mobilizes perspective in a manner that collapses the traditional point-of-view shot with a god's-eye-view perspective, giving the impression of potential access to unfiltered information, which is then only actualized by the analyst, who can rapidly zoom in and out of specific elements. This performs a variation of the "god trick": It reduces the nuances of the different contexts being analyzed by the characters to one flat display, and leaves the exact positionality of the resulting perspective as unspecified.

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Another form of scalar collapse can be found in *Snowden* (Stone, 2016), which mobilizes the totalizing perspective of the cinematic zoom. The key sequence begins from a position seemingly inside a computer within the network, with Snowden's face visible on the other side of a translucent screen. As Snowden's voiceover explains the NSA's approach to tracking and analyzing data, beams of light stream off from a list of email addresses on the screen, prompting a camera pan that follows the path of these beams, gradually revealed as consisting of incessant streams of innumerable photos. For the rest of the sequence, the camera gives the impression of constant movement by panning, tilting, or zooming in or out, sometimes focusing in on specific details of the network space, other times adopting a cartographic view to show the geographic locations of users and their interconnecting lines. At one point, a deluge of photos fills the frame, and as the camera moves up, Snowden's face appears in the background, with beams of light continuing to flow across the frame. We then see a quick succession of brief, stylized, and glitchy webcam-like videos filling the frame, followed by a series of increasingly abstract superimposed images, and concluding in a zoom-out to show an enormous black hole into which all the beams of light seem to be drawn. A further zoom-out to an extreme long shot makes the hole resemble an eye, which ultimately dissolves into an extreme close-up of Snowden's eye at the end of the sequence. Altogether, the sequence presents an overwhelming volume of constantly flowing images; however, the music is calm and steady, and the voiceover explains how all of these elements are being made sense of in the process of analysis.

The aesthetic construction of this sequence gives the impression of constant zooming in and out, with rapid shifts between detailed photos of faces, clusters and streams of discordant images, and restless universes of connections, all constantly moving and overwhelming the visual field. Nevertheless, at the same time, the shifts between each of the implied scales (individual, global, universal) seem smooth and frictionless, implying an interconnectedness and constant access to any and all scales, from the microscopic detail of individual data points and faces, through to a cartographic overview of networked connections across the world, and culminating in a black hole of data. Snowden here appears to adopt a form of "view from nowhere," shifting easily between different focal points and overview perspectives. Enacting another variation of the god trick, the analyst is able to access any scalar domain without occupying a fixed position. At one point during the sequence, the voiceover even comments on this endless data-enabled access by saying, "The scale of it hits you" (Stone, 2016, 1:00:35).

The smoothness and ease with which the zoom moves between the different elements on the screen are reminiscent both of critiques of the zoom in *Powers of Ten* (Eames & Eames, 1977)—critiques that highlight the erasure of differences among different scale domains—and of narratives that frame big data as a new type of scientific instrument that enables access to an expanded scalar spectrum. Big data is also often framed as comprehensive and able to "capture the whole of a domain and provide full resolution" (Kitchin, 2022, p. 116), with Mayer-Schönberger and Cukier (2017) even stating that "just as the telescope enabled us to comprehend the universe and the microscope allowed us to understand germs, the new techniques for collecting and analyzing huge bodies of data will help us make sense of our world" (p. 7). Consequently, unlike the restricted view of the human, the data imaginary is associated with a "vision of unbounded observation and an unconstrained ability to capture and describe" (Beer, 2019, p. 128). Similarly, central to the cinematic contribution to the data imaginary is the mobilization of the aesthetics of boundless insight: the impression of reaching beyond the limits of human analytic capacities, and of gaining

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actionable insight into new domains. In the sequences discussed above, the scalar collapse enacted formally by way of zoom and perspective contributes to presenting data-analytics systems as uniquely powerful tools for navigating vast quantities of data, eliding scalar differences and scale-specific concerns.

Scalar Ideology of the Data Imaginary

An analysis of the aesthetic construction of visions of data in the three films discussed above revealed deep resonances between the dominant discourse around data, and cinema's inherent capacity for scalar distortion. Furthermore, this entanglement with scale also points to a wider set of possible implications. The concept of scale, with its representational and rhetorical affordances, has been commented on by numerous critical scholars as inherently political and laden with implicit agendas.

Humanities scholars often point out that the term "scale" is increasingly used as a verb, signaling the business imperative of scaling up to generate more profit. As Doane (2022) notes, "scale in this scenario facilitates the transformation of everything into a commodity for everyone" (p. 280), and Tsing (2012) similarly points out that the term "scalability" ("the ability to expand—and expand and expand—without rethinking basic elements" [p. 505]) originates in the business sector and goes hand in hand with economies of scale. Pfotenhauer, Laurent, Papageorgiou, and Stilgoe (2022) call this commitment to continuous expansion a "scalability zeitgeist," and trace its prominence in the discourse and policy around technological innovation. The data-analytics sector follows a similar trend, highlighting the continuously expanding scale of data as the source of potential gains and efficiencies, and focusing on qualities such as speed, depth, or breadth, all of which evoke scalar ambitions of constantly going beyond the previously established limits. As demonstrated by Beer, data-analytics companies often emphasize scale in their marketing materials (with Interana claiming to provide "speed at scale" and Palantir using "scale, speed, agility" as its slogan [Beer, 2019, p. 45]), and such visions are then mobilized to sell the possibility of scaling up businesses in new and innovative ways. In this way, the data imaginary can be considered an example of what Tsing (2012) calls "scale-making projects," i.e., projects that actively conjure up particular scales to project a vision of success.

Moreover, as pointed out by critical scholars, practices that mobilize various scales to serve particular agendas are a testament to the discursive nature of scale itself. Critical geographers have long contested efforts to ontologize scale or take it for granted (particularly in the context of human geography or cartography), arguing that the concept of scale is socially constructed (Marston, 2000) and an "outcome of socio-spatial processes that regulate and organise social power relations" (Swyngedouw, 2004, p. 26). Jones (1998) also discusses scale as a "representational trope," which "may be implicated in enabling particular relationships of power" given that "the rules of social order and the practices of representation go hand in hand, and scale is an element of both" (p. 28). We find this instructive for exploring the broader consequences of popular cinema's engagement with data.

Firstly, the aesthetic mobilization of scale in the films discussed in this article resonates with the rhetoric of scale mobilized by data-analytics companies, portraying data as awe-inspiring and overwhelming, but without a predetermined agenda. The formal construction of the analyzed sequences relies on scale as a disorienting and intensifying agent, creating the affect of tapping into some unique

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potential; however, it is only through the narrative and characters' actions that this potential gets utilized for either good or evil. Secondly, while data-driven technologies are central to each film's premise, they effectively form an ambient background to the narrative, rather than its focal point. *Minority Report* (Spielberg, 2002) foregrounds the protagonist's journey from being a dedicated enforcer of the law, to becoming a fugitive, to ultimately taking down the unjust precrime system; *Snowden* (Stone, 2016) focuses on the eponymous whistleblower's life story; and *Moneyball* (Miller, 2011) primarily functions as an inspiring story of a remarkable baseball manager and his team. In this way, the disjunction between the affective intensity of the data-focused sequences and the unobtrusiveness of data within the films as a whole is implicitly aligned with the agenda of the data-driven tech sector: promoting the perception of data as a taken-for-granted yet powerful resource underlying many crucial technologies, and broadly accepted as an integral part of contemporary society. The cinematic contribution to the data imaginary therefore implicitly reinforces the normalization of widespread datafication, while at the same time preserving the aura of exceptionality and the magic of big data. Importantly, these visions are politically consequential given that, as highlighted by critical geographers, "it is scale's taken-for-granted quality that provides its power" (Jones, 1998, p. 28), and "scalar stories, frames and metaphors . . . produce 'worldmaking' epistemologies" (Moore, 2008, p. 221). As such, being attentive to how popular cinema takes part in (re)producing "worldmaking epistemologies" of data plays an important role in challenging the ideology of scale and the data-analytics sector's pursuit of continuous expansion.

Conclusion

This article has argued that popular cinema's engagements with data mobilize what we term the "aesthetics of boundless insight," contributing in this way to the hegemonic data imaginary. Our analysis of selected film sequences from *Minority Report* (Spielberg, 2002), *Moneyball* (Miller, 2011), and *Snowden* (Stone, 2016) has revealed the films' extensive use of cinematic techniques such as the zoom, point-of-view shots, god's-eye-view shots, close-ups, abrupt shifts in shot size, and rapid movement within the frame, resulting in a dizzying and disorienting effect, rooted in cinema's capacity for scalar distortion. Drawing on critical literature devoted to the concept of scale and its capacity for worldmaking and advancing implicit agendas, we interrogated the ideological underpinning of the rhetoric of scale utilized by the data-analytics sector and aesthetically echoed in the films' key sequences. We found that the general decentering of data by the film narrative is symptomatic of the broader normalization of the widespread use of data analytics. Moreover, the aesthetics of boundless insight serves to present data as a context-agnostic and unbiased reservoir of insight, without its own agenda, which only becomes a nefarious or problematic tool when used by bad actors. As explained by Horton (2020), scalar media such as cinema have been effective at stabilizing scalar dynamics, predetermining how we engage with trans-scalar phenomena (p. 26), which is why film is a powerful conduit for the scalar rhetoric of the data imaginary.

As a result of our decision to pursue an in-depth analysis of the aesthetic construction of cinematic visions of data, our discussion was necessarily limited to a few select films. Future work could expand this by adopting different methods (e.g., distant instead of close reading), which could provide the basis for identifying broader patterns across a larger corpus of films. Moreover, broadening the focus beyond feature films (to include, for example, documentaries such as *The Great Hack* [Amer & Noujaim, 2019] or series such as *Person of Interest* [Nolan, 2011–2016]) offers another possible avenue for a future investigation of

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how the visual representation of data analytics on screen contributes to broader imaginaries and discourse around data.

While this article has sought to examine the aesthetic dimension of mainstream cinema's engagements with data, and has analyzed its broader implications for the data imaginary, our hope is that our approach can also serve as a springboard for exploring nonhegemonic data imaginaries[4] and the possible political performativity of their associated aesthetics.

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[4] Alternative data imaginaries have in particular been explored in relation to Indigenous thought (e.g., Kukutai & Taylor, 2016), decolonial scholarship (e.g., Ricaurte, 2019; Valente & Grohmann, 2024), feminism (e.g., D'Ignazio & Klein, 2020; Marčetić & Nolin, 2023), or concepts such as "data justice" (e.g., Heeks, 2017; L. Taylor, 2017). In each case, these scholars call for a rethinking of the epistemological and methodological foundations of data science and data-analytics practices, aiming to construct an imaginary that starts from fundamentally different premises than those of the dominant data imaginary.

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