

Instrumental Rationality in the Age of Artificial Intelligence: Re-reading Horkheimer and Habermas in the Constellation of Data Capitalism

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ABSTRACT

This article examines how artificial intelligence (AI) within data capitalism intensifies instrumental rationality, as critiqued by Max Horkheimer, while simultaneously distorting communicative rationality in the Habermasian sense. Using a conceptual-analytical qualitative approach, it analyzes how algorithmic systems regulate social action by subordinating subjects to calculation, prediction, and efficiency. The study shows that the algorithmization of social life reduces human experience to units of datafication that can be predicted and modified, thereby deepening forms of technical domination. At the same time, algorithmically mediated digital public spheres are shaped more by platform commercial logics than by dialogic and deliberative norms, undermining conditions for democratic communication. By synthesizing Horkheimer and Habermas, the article proposes a conceptual framework for understanding contemporary forms of domination across technical and communicative domains and argues for the development of critical ethical-normative frameworks and the reconstruction of digital public spaces that support communication free from domination.

INTRODUCTION

The discourse surrounding modern rationality has undergone increasingly complex transformations in line with the growing role of artificial intelligence (AI) in regulating, classifying, and directing human behavior across various social domains. Whereas in the early modern era, rationality was understood as the human capacity to control nature through technical calculation, in the contemporary digital era this rationality has materialized into algorithms that operate automatically, pervasively, and invisibly. In this context, artificial intelligence is not merely a technical tool that facilitates human life, but also constructs new power structures operating through data, behavioral prediction, and affective control.

Horkheimer's critique of instrumental rationality – which reduces reason to a mere tool of efficiency – gains renewed relevance, as AI no longer functions solely as an instrument, but also as a mechanism that regulates the orientation of human actions through recommendation systems, rankings, and optimization processes aligned with the logic of data capitalism. In other words, contemporary social life exists within a configuration where human reason and the digital public sphere are colonized by an algorithmic logic grounded in technical calculation and control.

This transformation becomes even more significant when understood within the framework of data capitalism, wherein data is positioned as the primary commodity. Under this logic, human actions are reified into *behavioral surplus*, exploited by platform companies to predict and shape user preferences, as explored in Zuboff's study on surveillance capitalism (Zuboff, 2019). Digital power structures have thus evolved into systems that organize social experience, the public sphere, and deliberative processes through algorithms that are far from neutral, but instead laden with economic and political interests. In such a condition, Habermas's idea of communicative rationality as the foundation of deliberative action comes under pressure, as the digital public sphere no longer functions as a discursive arena free from distortion. Instead, it is dominated by technical mechanisms prioritizing engagement, monetization, and platform-driven economic growth. Consequently, the epistemological tension between instrumental rationality and communicative rationality emerges as a fundamental philosophical problem for understanding how AI and data capitalism reshape the relationship between human beings, technology, and social space.

Recent studies reveal that digital capitalism has generated new power relations that are structural, systemic, and operate silently through algorithmic infrastructures. Noble demonstrates how algorithmic bias reproduces racial injustice in machine-based search systems (Noble, 2020). Helberger highlights the vulnerability of the digital public sphere to distortion caused by recommendation systems that prioritize engagement over democratic interests (Helberger, 2021). Couldry and Mejias critique data colonialism, which reduces social participation into input for platform-based economic value systems (Couldry & Mejias, 2020). Hagedorff identifies how most AI ethics frameworks remain confined to technocratic approaches, failing to address the critical and structural dimensions

of technology (Hagendorff, 2021). Meanwhile, Kellner emphasizes the growing integration of AI into political and governance processes, potentially leading to new forms of digital authoritarianism (Kellner, 2022).

Other international research points to similar tendencies. Braham asserts that platform capitalism exploits the affective dimensions of human life as a source of economic accumulation (Braham, 2021). Gorwa argues that platform governance remains normatively weak and significantly lags behind the economic power of technology companies (Gorwa, 2020). Richter and Post show that AI has implications for democratic legitimacy crises due to information distortion and algorithm-driven polarization (Richter & Post, 2021). Han draws attention to the emergence of *digital psychopolitics*, which penetrates human subjectivity through subtle surveillance mechanisms (Han, 2022). Striphas uncovers how the myth of algorithmic objectivity creates an illusion of technological neutrality that conceals the ideological structures operating within (Striphas, 2020). Floridi's work underscores the epistemic problems that arise when AI functions as a decision-making agent, producing recommendations that are difficult to justify normatively (Floridi, 2021).

At the national level, several studies also reveal similar structural issues. Pratama investigates how the algorithmization of Indonesia's digital public sphere exacerbates opinion fragmentation and reduces the quality of deliberation (Pratama, 2021). Nugroho highlights how the platformization of media has narrowed the space for critique and encouraged the homogenization of information (Nugroho, 2020). Meanwhile, Putri underscores the impact of algorithmic bias in data-driven decision-making within public service sectors (Putri, 2022).

From these studies, it is evident that most research focuses on the social, political, or ethical effects of artificial intelligence and data capitalism. However, there remains a lack of scholarly work that explicitly revisits Horkheimer's concept of instrumental rationality and Habermas's communicative rationality in a dialectical framework to understand the transformation of algorithmic power structures. There is also a scarcity of studies that critically synthesize these two generations of Critical Theory to formulate a normative framework for analyzing the colonization of social spaces by data-driven logics. Moreover, there is no sufficiently developed conceptual systematization of how AI constitutes a new form of instrumental rationality – embedded both in technical apparatuses and the digital economic structure – thereby demonstrating the urgent need for a new theoretical construction capable of mapping the problems of human emancipation amid algorithmic hegemony.

The urgency of this study lies in the need to understand how the expansion of artificial intelligence within the ecosystem of data capitalism has shifted the structure of modern rationality toward a more pervasive form of instrumentalization. The development of generative AI, recommendation systems, and predictive mechanisms based on machine learning not only introduces new technical possibilities but also fundamentally restructures how human beings interact, communicate, and make decisions. It is within this context that Horkheimer's critique – regarding the reduction of reason into a

mere instrument for achieving efficiency and control—regains its relevance, particularly when algorithms no longer act as passive media but as architects of decision-making that systematically direct social actions.

When such technologies are integrated with the logic of accumulation inherent in data capitalism, the social sphere is transformed into an infrastructure in which human behavior is configured through a series of calculations designed to maximize user engagement and corporate profit (Zuboff, 2019). In this scenario, Habermas's concept of communicative rationality also encounters structural challenges, as the public sphere—originally conceived as a space that enables rational deliberation—becomes distorted by platform designs that prioritize artificial visibility and algorithm-mediated interactions (Helberger, 2021). Therefore, a deep philosophical investigation becomes increasingly urgent to map how these two central theoretical frameworks from the tradition of Critical Theory can be mobilized to reinterpret the new dynamics of power emerging in the AI era.

The research questions are formulated to address the complexity of this phenomenon, focusing on three fundamental inquiries. First, how can Horkheimer's concept of instrumental rationality explain the technical and operational characteristics of AI as a mechanism that regulates social action within data capitalism? Second, how can Habermas's idea of communicative rationality serve as a normative basis to evaluate the domination of technocratic logic within the digital public sphere? Third, how can a critical synthesis of these two frameworks generate a new theoretical model for understanding the problem of human emancipation amid algorithmic hegemony?

The objective of this study is to develop a philosophical analysis capable of explaining the relevance and limitations of both instrumental and communicative rationality within the context of contemporary digital society. In addition, this research aims to construct a theoretical horizon that expands critical understanding of the human-technology relationship in the AI era, through a dialectical reinterpretation of the two central thinkers of Critical Theory.

This study contributes by establishing a conceptual relation between the Frankfurt School's critique and the challenges posed by data capitalism as an emerging social phenomenon. It simultaneously proposes an expanded framework of Critical Theory that is responsive to developments in digital technology, taking into account the epistemological, ethical, and political conditions resulting from the algorithmization of social life. In this regard, the research provides a more comprehensive theoretical foundation for the study of the philosophy of technology and digital ethics, offering a critical perspective that has yet to be adequately addressed in the contemporary literature.

THEORETICAL REVIEW

Instrumental Rationality

The concept of instrumental rationality in Max Horkheimer's thought serves as a critical analytical foundation for understanding the transformation of modern reason in relation to contemporary technological developments. Horkheimer argued that modernity had displaced rationality from a substantive

orientation—namely, reasoning grounded in moral purposes and emancipatory values—towards an instrumental rationality, in which reason is reduced to a technical tool for achieving efficiency, control, and domination (Horkheimer, 2004). The dominance of instrumental rationality renders human activity no longer aimed at the pursuit of meaning, but rather subordinated to mechanistic technical calculations.

Within the digital technology ecosystem, the forms of domination identified by Horkheimer are revitalized through artificial intelligence technologies that operate based on optimization, prediction, and mathematical calculation of human behavior. Contemporary studies have shown that AI algorithms do not merely execute instructions, but actively shape patterns of consumption, attention, and human action through recommendation models and predictive systems that prioritize technical accuracy over normative considerations (Crawford, 2021; O’Neil, 2016). Therefore, Horkheimer’s critique is highly relevant for analyzing how contemporary technological structures intensify modern instrumental logic in ways unprecedented in scope and scale.

Communicative Rationality

Jürgen Habermas offers a normative alternative to technocratic tendencies through his concept of communicative rationality, which emphasizes discursive action grounded in validity claims, transparency, and mutual understanding. Habermas distinguishes between instrumental action, which is oriented toward technical success, and communicative action, which aims at achieving consensus through argumentation free from domination (Habermas, 1984).

In the context of contemporary digital society, the concept of communicative rationality faces significant challenges, as the public sphere—the arena for civic deliberation—is increasingly mediated by algorithms that determine information visibility, interaction intensity, and the direction of public discourse (Helberger, 2021). Recent research indicates that digital platforms tend to foster interactions that maximize engagement rather than deliberative dialogue, thereby systematically distorting the communicative structure envisioned by Habermas (Couldry & Mejias, 2020). It is essential to emphasize that the theory of communicative rationality is not merely a theoretical framework for understanding the crisis of digital deliberation, but also provides a normative horizon for evaluating the nature of new forms of domination that emerge through algorithmic interventions in public communication.

Data Capitalism / Surveillance Capitalism

Shoshana Zuboff introduces the concept of *surveillance capitalism* to describe the political-economic transformation wherein human behavioral data is extracted and commodified as a primary source of capital accumulation (Zuboff, 2019). This form of capitalism operates through mechanisms of mass data collection, predictive analytics, and behavioral intervention, enabling platform corporations not only to map user actions but also to shape them through integrated digital infrastructures. Within this framework, artificial intelligence serves as a key apparatus for harvesting and analyzing *behavioral*

surplus—the residual traces of user behavior that are then projected into predictive models.

Contemporary studies affirm that data-driven business models have created new power structures operating through affective manipulation, continuous monitoring, and asymmetrical control over user preferences, where users lack agency over their own digital representations (Richter & Post, 2021; Kellner, 2022). Thus, data capitalism extends Horkheimer's critique of instrumental rationality by revealing that such domination is not confined to technical domains, but penetrates economic, political, and epistemic structures. The logic of data extraction and prediction reconfigures subjectivity, further entrenching systems of control beneath the surface of personalization and convenience.

Platform Society

José van Dijck, Thomas Poell, and Martijn de Waal develop the concept of the *platform society* to illustrate how social life today is increasingly governed by digital platforms, which function as the core infrastructure for communication, the economy, and public activity (van Dijck et al., 2018). Digital platforms do not merely provide services; they restructure the logic of social organization through algorithms that determine who becomes visible, what information circulates, and how interactions unfold.

Within the platform society, social relations are no longer shaped solely by human interaction but are configured by the technical design and governance protocols of platforms grounded in the commercial logic of global tech corporations. Recent studies demonstrate that platform structures exacerbate social and political inequalities, as algorithmic systems distribute information based on commercial interests rather than the public good (Gorwa, 2020; Helberger, 2021).

Consequently, the theory of the platform society offers a robust analytical framework for understanding how data capitalism functions not only through economic mechanisms but also through sociotechnical infrastructures that shape how individuals think, interact, and participate in the digital public sphere. These platforms have become both the medium and the message—remaking civic engagement, communication ethics, and democratic practice in ways that require critical theoretical reflection.

Conceptual Framework of the Study

Conceptually, this study posits an integrated framework in which AI-based algorithmic governance is situated at the intersection of four dimensions: (1) instrumental rationality as the underlying logic embedded in AI design and operation; (2) communicative rationality as the normative horizon for evaluating the quality of public discourse and democratic participation; (3) surveillance/data capitalism as the political-economic structure that drives the use of AI toward extraction, prediction, and behavioral control; and (4) platform society as the sociotechnical infrastructure that mediates everyday communication, interaction, and subject formation. The framework suggests that the algorithmization of social life is best understood as a process in which

instrumental rationality is technologically encoded within AI systems, mobilized by the imperatives of data capitalism, materially instantiated through platform infrastructures, and experienced as distortions of communicative rationality in digital public spheres. This interconnected conceptual model provides the analytical basis for examining the forms of domination, erosion of autonomy, and challenges to human emancipation in the age of artificial intelligence.

METHODOLOGY

This study adopts a qualitative approach with a critical-philosophical orientation, aimed at examining in depth the dynamics of instrumental and communicative rationality within the context of artificial intelligence development and data capitalism. This approach is selected because the research does not focus on empirical measurement but rather on conceptual and critical understanding of power structures operating through algorithmic technologies and the digital public sphere. Within the field of contemporary philosophy, qualitative methods enable researchers to interpretively and reflectively analyze theoretical texts, academic discourses, and relevant social phenomena (Creswell & Poth, 2018). The philosophical orientation allows for the construction of normative and analytical arguments while evaluating knowledge structures and power relations that shape the use of artificial intelligence within digital capitalism.

The type of research employed is conceptual-analytical qualitative research, grounded in the tradition of *critical argumentative analysis*. This type of inquiry is based on the premise that social reality is not only shaped by empirical data but also produced through underlying structures of meaning, ideas, and epistemological frameworks. Conceptual-analytical research enables the researcher to articulate core concepts within critical theory – such as instrumental rationality, communicative rationality, data capitalism, and platform society – and interpret them in the context of contemporary social conditions.

This research model is commonly employed in the fields of philosophy of technology and digital ethics, as it provides the flexibility to conduct in-depth text interpretation and theoretical synthesis in order to develop a critical understanding of the phenomena under investigation (Floridi, 2021).

The data for this study is obtained through library research, focusing on relevant primary and secondary literature in the fields of critical philosophy, philosophy of technology, media studies, and AI ethics. Primary sources include the major works of Max Horkheimer and Jürgen Habermas, while secondary sources consist of peer-reviewed international journal articles addressing algorithmic bias, data capitalism, the digital public sphere, and critiques of technological objectivity.

Source selection is carried out selectively based on thematic relevance, scholarly authority, and publication recency – emphasizing works published within the last ten years to ensure analytical accuracy and validity. Literature study as a data collection technique enables the researcher to systematically examine various arguments, theoretical findings, and critical reflections in order to construct a comprehensive and well-founded analysis (Snyder, 2019).

Data analysis in this study is conducted through three primary stages: textual interpretation, critical-dialectical analysis, and conceptual synthesis. The first stage focuses on a deep understanding of the concepts and arguments articulated in the works of Horkheimer and Habermas. This interpretation is carried out with careful attention to the historical context, theoretical objectives, and argumentative structure of both thinkers.

The critical-dialectical analysis stage is employed to connect these theoretical concepts with the phenomena of data capitalism and the operation of artificial intelligence. The dialectical approach enables the researcher to examine the epistemological and normative tensions between instrumental rationality and communicative rationality, thereby allowing an investigation into how digital technologies shape contemporary power relations (Couldry & Mejias, 2020).

The final stage—conceptual synthesis—produces a new theoretical framework that integrates critical theory perspectives to better understand the dynamics of algorithmic social action under data capitalism. This analysis is carried out iteratively, allowing the researcher to construct a multi-layered and comprehensive philosophical understanding.

In qualitative-philosophical research, data validity is determined by the precision of sources, the consistency of argumentation, and the depth of theoretical analysis. This study adopts a strategy of *theoretical triangulation* by integrating literature from various related disciplines—such as critical philosophy, media studies, platform theory, and AI ethics—to ensure that arguments are built upon a solid theoretical foundation with a diversity of perspectives (Patton, 2015).

Credibility is ensured through the use of valid and up-to-date scholarly sources, including high-impact journals such as *AI & Society*, *Philosophy & Technology*, and *Ethics and Information Technology*, as well as authoritative books on digital capitalism. Reliability is supported by the consistency of the analysis, which adheres to the methodological framework outlined at the outset of the research.

The validity of this study is not only achieved through the accuracy of the literature but also through the coherence of its argumentation and the rigor of its theoretical interpretation—both of which are defining characteristics of critical-philosophical research.

RESULTS

Research Findings

Horkheimer's Concept of Instrumental Rationality in Explaining the Technical and Operational Character of Artificial Intelligence as a Mechanism Regulating Social Action in Data Capitalism

An understanding of how artificial intelligence operates within data capitalism aligns closely with Horkheimer's critique of instrumental rationality. Within Horkheimer's theoretical framework, modern rationality undergoes a reduction to a technical apparatus oriented toward efficiency, control, and calculation, wherein human purposes are subordinated to the operational logic of the technical system itself (Horkheimer, 2004). Artificial intelligence represents

an advanced stage of this rationality, as the algorithms that drive AI no longer merely function as auxiliary tools, but as regulatory structures that mediate user experience, determine visibility, and predict user behavior.

In the ecosystem of data capitalism, algorithms operate through probabilistic predictive models that transform social actions into data sequences – data that can be processed, restructured, and economically exploited (Crawford, 2021). This process exemplifies the logic of instrumental rationality, as algorithms do not aim for dialogue, ethical reflection, or mutual understanding; rather, they pursue the continuous optimization of human behavior based on measurability and profit-driven calculation.

In the operational context of AI, the principles of instrumental rationality manifest through mechanisms such as content personalization, recommendation systems, and behavioral optimization. Recommendation algorithms used across digital platforms are engineered to maximize engagement – meaning they are designed to increase users' attention spans and interaction intensity, without regard for the moral or social consequences of the content presented. Recent studies indicate that this technical logic fuels polarization and reinforces bias, as algorithms privilege emotionally charged content in order to drive screen time and user interaction (Bakshy et al., 2015; Helberger, 2021).

This phenomenon is consistent with Horkheimer's prediction that when rationality is reduced to a technical means, human expression becomes subordinate to narrowly defined parameters of efficiency. In the context of data capitalism, efficiency is translated into the ability of algorithms to mobilize human attention and behavior in alignment with platform economic interests.

Artificial intelligence also reinforces the logic of domination through processes of *datafication*. Every action performed in digital spaces is reduced to a data point, which is then analyzed and fed into predictive models to understand and modify user behavior. Zuboff explains how platform companies extract *behavioral surplus* to develop predictive products that are subsequently sold to third parties, thereby rendering human action a commodified outcome of algorithmic interpretation (Zuboff, 2019). This model reflects instrumental rationality in its most extreme form, as human beings are no longer treated as moral subjects, but as calculable and manipulable sources of data.

When human behavior becomes the object of algorithmic calculation, the boundary between individual freedom and technical control becomes increasingly blurred, leading to a social structure increasingly governed by predictive logic. The algorithmic hegemony embedded in digital environments further affirms Horkheimer's critique of technological domination as a form of rationality that inhibits the human capacity for critical thought.

Jason Read and other scholars emphasize that predictive systems modeling user behavior create conditions in which individual choices are heavily structured by digital contexts – contexts intentionally designed to elicit specific responses (Read, 2020). In other words, AI does not merely represent the world; it actively shapes it through micro-level, ongoing interventions. These interventions demonstrate how instrumental rationality has evolved from a

conceptual tool into a social infrastructure that influences action patterns on a massive scale.

The increasing use of machine learning in risk management, performance evaluation systems, and public decision-making processes further indicates how the calculative logic of AI has permeated nearly all domains of social and political life (Kellner, 2022).

Accordingly, this study finds that artificial intelligence within data capitalism operationalizes instrumental rationality through technical calculation, behavioral prediction, data commodification, and algorithmic control that functions systematically and imperceptibly. The structure of AI not only reflects instrumental rationality as critiqued by Horkheimer but also expands its reach and intensity into every aspect of digital life through automated mechanisms that reorder human actions within the technical logic of data capitalism.

Communicative Rationality as a Normative Basis for Evaluating Algorithmic Domination in the Digital Public Sphere

An analysis of Jürgen Habermas's theory of communicative rationality offers a vital normative foundation for assessing how the digital public sphere undergoes structural distortion under conditions of algorithmic domination. Habermas contends that communicative action is oriented toward mutual understanding, achieved through dialogue free from coercion, manipulation, or systemic distortion—an ideal that presupposes transparency and openness to rational argumentation (Habermas, 1984). Within this framework, the public sphere is conceived as a discursive arena in which individuals participate as citizens, rather than as consumers or objects of commodification. However, the architecture of digital communication governed by algorithmic systems is primarily geared toward engagement and content performance, not mutual understanding or rational deliberation, thereby generating a fundamental imbalance between communicative logic and the systemic logic that underpins digital platforms.

The algorithmic nature of information distribution has profoundly reshaped the structure of the public sphere. Helberger (2021) demonstrates that recommendation algorithms prioritize content with high engagement potential, rather than content with epistemic relevance or democratic value (Helberger, 2021). This creates a situation in which public discourse is filtered through commercial, rather than communicative, criteria—thereby impeding equal participation. From a Habermasian perspective, this can be interpreted as a form of *lifeworld colonization* by technical systems, wherein technocratic structures infiltrate and dominate social interactions that ought to be governed by autonomous norms of communication, free from strategic interests (Habermas, 1987). Digital platforms manifest this colonization by determining what is considered worth discussing, who gains visibility, and how public discourse is steered by invisible algorithmic mechanisms.

Algorithmic domination also disrupts the integrity of deliberative processes by generating fragmentation within the public sphere. Couldry and Mejias (2020) reveal that the logic of datafication fosters the emergence of "personalized public spheres," where individuals receive information tailored to

their data profiles rather than on the basis of public relevance (Couldry & Mejias, 2020). This leads to a fragmentation of the digital public sphere into isolated informational enclaves, obstructing the possibility of cross-cutting dialogue among citizens—a prerequisite for democratic deliberation. This fragmentation further fuels polarization, as algorithms tend to reinforce existing preferences, producing echo chamber effects that narrow users' cognitive horizons (Bakshy et al., 2015). From a Habermasian standpoint, such conditions clearly constitute communicative distortion, as the public sphere ceases to be open and instead becomes governed by technical mechanisms that reproduce preferences without allowing space for rational critique.

Beyond fragmentation, the monetization of information also intensifies distortions within the digital public sphere. Richter and Post (2021) show that platform logics oriented toward maximizing engagement amplify emotional and sensational content at the expense of informative or rational discourse (Richter & Post, 2021). Within the framework of communicative rationality, this marks a shift from argumentative discourse to *performative discourse*, wherein the value of a statement is no longer assessed based on the strength of its argument but on its appeal within algorithmic systems. This undermines the foundation of the public sphere, as public discourse transitions from a truth-oriented to an effect-oriented logic—directly at odds with Habermas's communicative ideal.

The epistemic dimension of algorithmic power further highlights emerging forms of domination. Noble (2020) argues that algorithms not only distribute information but also shape what is considered worth knowing (Noble, 2020). When algorithms determine which results appear first in search engines or social media feeds, they implicitly set the epistemic standards of the public sphere. From Habermas's perspective, this poses a significant threat to the validity of knowledge claims, as truth is no longer evaluated through rational argumentation, but through the technical structuring of information visibility.

The findings of this study suggest that communicative rationality provides a powerful normative framework for evaluating the algorithmic restructuring of the digital public sphere. The concept of communicative action allows us to identify the distortions that occur when algorithmic technical structures displace deliberative principles as the primary mechanism through which public discourse is shaped. The digital public sphere, which ideally should serve as a space for dialogical equality, has been transformed into a realm wholly mediated by technical calculations driven by commercial imperatives—creating a communicative configuration that fundamentally conflicts with Habermas's ideals of mutual understanding and freedom from domination.

Synthesizing Horkheimer and Habermas as a New Theoretical Framework for Understanding the Problem of Human Emancipation in the Algorithmic Age

A dialectical reading of the thought of Horkheimer and Habermas enables the construction of a new theoretical framework capable of mapping the contemporary challenges of human emancipation in an age increasingly dominated by algorithmic systems. Although the two thinkers represent different generations within the tradition of Critical Theory, both articulate

profound critiques of how modern rationality can give rise to forms of domination that reduce human autonomy.

On the one hand, Horkheimer emphasizes that instrumental rationality leads to the erosion of reflective and critical human capacities, as reason is reduced to a tool for achieving technical efficiency, ultimately subordinating the subject to systemic mechanisms beyond their control (Horkheimer, 2004). On the other hand, Habermas offers the concept of communicative rationality as a normative alternative to technocratic tendencies, stressing the importance of domination-free communication as the foundation for a rational and emancipatory public sphere (Habermas, 1984).

In the context of the algorithmization of social life, these two frameworks must not be treated in isolation. Algorithmic domination is simultaneously technical and communicative, penetrating both the structures of data production and the architecture of digital interaction.

A synthesis of their positions begins with recognizing AI as an advanced manifestation of instrumental rationality—one that functions not merely as a technical tool, but as a sub-structural force that governs the horizon of human experience. AI processes data at massive scale and constructs behavioral prediction models that subtly yet systematically guide user actions. This process reflects Horkheimer's concern that domination has shifted from physical instruments and industrial systems to algorithms that operate automatically and invisibly within digital architectures.

Recent studies show that users are increasingly unable to distinguish between choices made autonomously and those directed by algorithmic systems—especially when content is presented in real time through constantly updated predictive models (Crawford, 2021; Floridi, 2021). Here, instrumental rationality has evolved into a technical infrastructure that governs human social participation.

Habermas's framework complements this analysis by providing tools to assess how technical domination transforms the structure of public communication. In the digital age, the public sphere no longer functions as an open arena for democratic discourse, but as a tightly mediated space where algorithms determine who gets to speak, what becomes visible, and how public opinion is shaped. The resulting *communicative distortions* are manifestations of what Habermas described as the *colonization of the lifeworld* by technical systems—instances where communicative structures are replaced by instrumental logic, which is unresponsive to validity claims and rational dialogue (Habermas, 1987).

Studies by Helberger (2021) and Couldry & Mejias (2020) support this view, demonstrating how platform algorithms intervene in public communication by prioritizing content according to commercial metrics rather than deliberative relevance (Helberger, 2021; Couldry & Mejias, 2020). Human emancipation in the algorithmic age is thus obstructed not only by technical domination, but also by distortions in communicative structures that directly affect how opinions are formed and collective decisions are made.

The theoretical framework emerging from this synthesis highlights the dual nature of the emancipation problem in the algorithmic era: first, technical domination that renders individuals into objects of calculation through datafication and behavioral prediction; second, communicative distortion that undermines the preconditions for rational deliberation and democratic participation. These two forms of domination are deeply intertwined, mutually reinforcing conditions under which digital subjects are not only monitored by technology but also directed within public discourse via algorithmic structures that determine how information circulates and how social meaning is produced.

Zuboff's theory of *surveillance capitalism* (2019) and van Dijck et al.'s concept of the *platform society* (2018) provide additional layers to this synthesis, demonstrating that the commercial logic of platform-based data exploitation constitutes the core mechanism through which digital power structures are formed (Zuboff, 2019; van Dijck et al., 2018).

Thus, the synthesis of Horkheimer and Habermas yields a new critical framework that integrates analyses of both technical and communicative domination. It provides a powerful theoretical lens to map how algorithmization threatens human autonomy, blurs the line between free choice and technical intervention, and destabilizes the foundations of deliberative democracy in digital spaces. This framework is not only relevant for diagnosing contemporary digital power structures, but also offers a conceptual basis for the normative reconstruction required to defend zones of human freedom amid the hegemony of algorithmic technologies.

DISCUSSION

The findings of this study demonstrate that the relationship between instrumental rationality and communicative rationality reflects a dialectical structure that underpins the configuration of power in the algorithmic era. Artificial intelligence, embedded within the architecture of data capitalism, exhibits an intensification of instrumental logic that processes social life through calculative mechanisms, while the digital public sphere—governed by algorithms—undergoes structural distortions that undermine the preconditions for domination-free communication as formulated by Habermas.

The dialectic between these two forms of rationality has created a condition in which social action is no longer the outcome of deliberative processes between equal subjects, but rather the result of technocratic calculations dictated by the economic logic of platform capitalism.

The analysis of instrumental rationality reveals that AI functions as a device that reduces human action into patterns that can be measured, predicted, and modified. Horkheimer anticipated the danger of modern rationality becoming detached from substantive ends and transforming into a technical tool aimed at controlling the world through calculation—a transformation made even more complex as algorithms increasingly take over processes of social decision-making (Horkheimer, 2004).

Recent studies show that recommendation algorithms on digital platforms do not merely present content; they determine dominant narratives that guide

users' thoughts and actions through opaque and automated information filtering (Crawford, 2021). The technical structure of algorithms thus represents an advanced form of instrumental rationality—one that operates through mechanisms far more difficult to identify, interrogate, or resist.

As algorithmization becomes the foundation for organizing social action, the public sphere—once conceived as a discursive arena—is restructured into a space for commodifying attention. According to Habermas, the quality of the public sphere is determined by citizens' ability to articulate critique and participate in rational dialogue free from domination. However, recent research indicates that platform algorithmic structures undermine this ideal by distributing information according to commercial logics that prioritize engagement and monetization (Helberger, 2021).

When algorithms filter content based on commercial value rather than deliberative relevance, communication is no longer governed by validity claims but by performativity and emotional appeal. Consequently, the structure of the digital public sphere becomes significantly distorted.

This distortion reflects a colonization of the *lifeworld* by technical systems, wherein users' social experiences are organized through mechanisms that exclude the discursive processes central to Habermas's communicative ideal. In algorithmic communication models, truthfulness, accuracy, and sincerity no longer determine whether an argument gains public visibility. Instead, what matters is how well content aligns with algorithmic prediction models measuring potential user interaction.

This condition renders communicative rationality increasingly vulnerable, as technical mechanisms erode users' capacities to participate in rational discourse by manipulating the informational structure itself. Bakshy et al. (2015) reinforce this finding, showing how algorithms narrow the informational diversity users are exposed to—intensifying echo chambers and impeding dialogical engagement across different perspectives (Bakshy et al., 2015).

The discussion becomes more complex when both theories are examined dialectically. Instrumental rationality does not operate independently of communicative structures; rather, it colonizes communication through the algorithmic infrastructures of platforms. From Horkheimer's perspective, this constitutes a form of domination in which reason is reduced to a mere technical instrument. From Habermas's point of view, it represents a form of communicative distortion that undermines the very conditions of deliberation.

Combined, these phenomena create a scenario in which the digital subject loses both key emancipatory capacities: the capacity for critical thought and the capacity for deliberative communication. In other words, technical domination and communicative distortion operate simultaneously to shape deeply embedded structures of digital power.

Zuboff's theory of *surveillance capitalism* (2019) further supports the argument that algorithms do not merely process data, but actively construct new power relations through behavioral prediction and affective intervention (Zuboff, 2019). Data capitalism transforms human behavior into a commodity to be sold and exploited via predictive systems. This structure not only affirms Horkheimer's

analysis of instrumental rationality but also reveals how such domination occurs within a political-economic context marked by the intensive exploitation of personal data.

Van Dijck et al.'s (2018) *platform society* framework complements this analysis by demonstrating how platforms govern the entirety of social infrastructure and how algorithmic control becomes embedded within institutional systems, digital bureaucracies, and everyday interaction (Van Dijck et al., 2018).

This discussion suggests that only a dialectical synthesis of critiques of instrumental and communicative rationality can adequately explain the emergence of the human emancipation problem in the algorithmic age. When social life is managed through rationalities oriented toward technical calculation and when the discursive structure of the public sphere is manipulated by algorithms, the forms of freedom presumed in democratic societies are fundamentally constrained.

Digital literacy, normative critique, and the reconstruction of the digital public sphere thus emerge as theoretical imperatives from this dialectic – affirming that the problem of emancipation cannot be understood from a singular perspective, whether technical or communicative, but must be approached through their interrelation, which now constitutes the fundamental structure of the digital world.

CONCLUSIONS AND RECOMMENDATIONS

This study has demonstrated that artificial intelligence within the context of data capitalism represents an intensification of instrumental rationality, as critiqued by Horkheimer. Algorithms function not merely as technical tools, but as regulatory structures that reduce human experience into data that can be predicted, modified, and commodified. Within this framework, human actions are no longer understood as expressions of autonomy, but as objects of calculation driven by the logic of efficiency and control embedded in AI's operational mechanisms. This analysis confirms that the fundamental problem identified by Horkheimer – namely, technical domination – has found a more subtle yet more powerful contemporary form through algorithmic infrastructures.

Moreover, the study shows that Habermas's concept of communicative rationality provides a highly relevant normative framework for evaluating how the digital public sphere is structurally distorted under algorithmic domination. Digital communication, as mediated by algorithms, has replaced deliberative values with the commercial logic of attention economies, producing fragmentation, polarization, and the subordination of validity claims to opaque technical mechanisms. In such conditions, the public sphere loses its critical function, and citizens' capacities to participate in rational communication are undermined by digital structures that privilege performativity and user engagement.

The synthesis of Horkheimer's and Habermas's critiques has yielded a new theoretical framework capable of explaining the contemporary problem of human emancipation in the algorithmic age. When read dialectically, both theories reveal

that technical domination and communicative distortion are two interrelated dimensions of digital power structures operating simultaneously to shape social and political experience. This framework affirms that the central challenge of the algorithmic era lies not merely in the technologies themselves, but in the underlying rationality structures that sustain them and the ways these technologies reshape human communicative relations.

Recommendations

This study recommends the urgent development of more critical ethical and regulatory frameworks concerning the design and implementation of algorithms—especially those deployed in digital platforms that significantly affect public life. Such efforts must be accompanied by the reconstruction of the digital public sphere in ways that enable deliberative dialogue and resist full subordination to commercial logic.

In addition, critical digital literacy must be strengthened to equip society with the analytical tools necessary to recognize the hidden power structures embedded in algorithmic operations. The development of a new generation of Critical Theory—one that integrates both technical and normative analysis—is also essential to confront the philosophical, ethical, and political challenges posed by the growing dominance of algorithmic technologies.

FURTHER STUDY

Future research can extend this study in several important directions. First, the conceptual framework proposed here warrants empirical elaboration through case studies of specific platforms, sectors, or policy regimes, to examine how instrumental rationality and communicative distortion are concretely manifested in particular socio-political contexts. Second, comparative research across different cultural, legal, and technological environments could illuminate how variations in regulatory frameworks, media systems, and civic traditions mediate the forms and intensity of algorithmic domination. Third, further theoretical work is needed to integrate this critique with emerging perspectives in non-Western critical thought, decolonial theory, and feminist technoscience, thereby broadening the normative horizon of critical theory in the digital age. Finally, interdisciplinary studies that bring together philosophy, computer science, law, and communication studies could explore concrete design principles, institutional arrangements, and governance models that operationalize emancipatory and communicative ideals within AI systems and digital infrastructures.

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