THE INFRASTRUCTURAL IMAGE: FROM REPRESENTATION TO OPERATIONAL POWER

Image, Data, Memory, and Control in the Age of AI

İsmail Erim Gülaçtı

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In loving memory of

my parents

Sabriye Gülaçtı (1956–2025) and **Bülent Gülaçtı** (1953–2025)

who I lost three months apart,

whose absence no infrastructure can measure,

whose presence no system could contain.

Only love. Only grief.

Only this.

PREFACE

This book emerged from a growing recognition that the critical vocabularies inherited from photography theory, surveillance studies, and media philosophy, however indispensable, cannot fully grasp what images have become. The image is no longer primarily an object of interpretation but a component of operation; no longer a trace of the past but a resource for computing futures; no longer a surface for representation but an infrastructure for governance.

The concept of the infrastructural image developed through engagement with multiple sites: content moderation systems governing visibility on global platforms, facial recognition databases converting portraits into biometric queries, and generative AI systems producing synthetic pasts indistinguishable from documentary records. In each case, existing frameworks illuminated only partially what required explanation.

Turkey occupies a peculiar position in the global geography of image infrastructures: subject to platforms designed in Silicon Valley yet governed by divergent regulations; integrated into transnational surveillance networks yet maintaining distinct technological arrangements. The suppression of posts about Al-Aqsa Mosque examined in Chapter 5 was not an abstraction but a lived reality for colleagues whose visual expressions were rendered algorithmically illegible. This situated perspective insists that any adequate theory must account for how these systems operate differently across the contexts they claim to govern uniformly.

The theoretical resources assembled here—German media theory, Anglo-American infrastructure studies, French critical philosophy—emerged from traditions distant from my own formation. I am aware that this book does not adequately draw on scholarship from South Asia, East Asia, Africa, and Latin America, where different critical resources might illuminate what this analysis obscures. I mark this limitation to identify a horizon that future work must address.

The cases examined here are not stable objects. By the time this book reaches readers, some systems will have been discontinued, others transformed. This obsolescence is symptomatic of the condition described: infrastructural images regenerate under new configurations while preserving underlying operational logics. The goal has been to develop concepts adequate to this condition rather than to document temporary instantiations.

This book does not offer solutions. It offers a diagnostic framework: concepts for understanding what images have become and what forms of power they enable. Diagnosis is not cure, but it may be its precondition. In a moment when images increasingly see without us, understanding the infrastructures through which they see seems an urgent contribution.

Istanbul, 2026

ABSTRACT

Classical theories of the image, grounded in representation, indexicality, and human interpretation, prove insufficient for understanding contemporary visuality shaped by artificial intelligence, platforms, and machine vision. This book proposes the concept of the infrastructural image to analyze visual artifacts that function primarily as operational components within data-driven systems rather than as representational objects for human viewers. The framework is developed through three analytical axes: the operational axis, examining how images execute automated processes rather than communicate meaning; the post-indexical axis, analyzing how the past is computationally generated and algorithmically governed rather than indexically preserved; and the power axis, investigating how governance operates through asymmetrical legibility rather than spectacle and surveillance. Drawing on critical theory, infrastructure studies, and media philosophy, the study argues that understanding images as infrastructure reveals why representational critique has become insufficient and redirects critical attention from what images show to how they function. The infrastructural image offers a framework for analyzing visual culture under conditions where images increasingly see without us.

Keywords: Infrastructural image, Operational images, Post-indexical memory, Algorithmic governmentality, Machine vision

CONTENTS

1. Introduction: The Exhaustion of Representational Critique..1

1.1 The Limits of Existing Frameworks 3

1.2 Three Diagnostic Inadequacies 6

1.3 Contribution and Structure...8

2. Conceptual Foundations of Defining the Infrastructural Image...12

2.1 A Conceptual Genealogy: From Representation to Infrastructure 14

2.2 Defining the Infrastructural Image 17

2.3 Image as Interface versus Image as Infrastructure..........24

2.4 Why "Infrastructural" Rather Than "Operational" or "Algorithmic"? 25

3. Operational Logic: Images as Executable...............................28

3.1 From Interpretation to Execution.....................................29

3.2 The Image as an Operational Unit...................................32

3.3 Operational Photography and the Displacement of Authorship 35

3.4 Implications for The Limits of Representational Critique 39

3.5 Case Study: Facial Recognition and the Executable Face 42

3.5.1 The Face as a Query 42
3.5.2 The Infrastructure 44
3.5.3 Wrongful Arrests and Differential Operation 46
3.5.4 Analysis: Racializing Surveillance 50
3.5.5 Implications for Operational Logic 51
4. The Post-Indexical Axis: Memory and the Computational Past 56
4.1 From Indexical Trace to Computational Retrieval 57
4.2 The Platformization of Memory 60
4.3 Memory as a Dataset: The Operational Archive 63
4.4 Synthetic Memory and Temporal Instability 66
4.5 Mnemonic Agency and Its Asymmetries 69
4.6 Case Study: Generative AI and the Fabrication of the Past 71
4.6.1 The Indexical Promise 71
4.6.2 The Cases 72
4.6.3 Analysis: The Computational Past 79
4.6.4 Implications for Post-Indexical Memory 82
5. The Power Axis: Governance Without Spectacle 83
5.1 From Visibility to Legibility 84
5.2 Algorithmic Governance and the Automation of Decision 87
5.3 The Structural Production of Invisibility 90

5.4 Asymmetries of Legibility and Control 92
5.5 From Representational Politics to Infrastructural Politics 95
5.6 Infrastructural Failure and the Politics of Illegibility 97
5.7 Case Study: Instagram's Computer Vision Pipeline..... 101
5.7.1 The System 102
5.7.2 The Pipeline 103
5.7.3 The Asymmetry 105
5.7.4 Implications for the Infrastructural Image............ 107
5.8 Infrastructural Failure and Differential Legibility....... 109
5.9 Categorical Violence 112
6. Implications: Toward Infrastructural Critique.................... 120
6.1 The Limits of Visual Critique 121
6.2 The Transformation of Authorship and Agency........... 123
6.3 Strategic Possibilities: From Individual Tactics to Structural Intervention 126
6.4 Research Directions 132
6.4.1 Operational Ontologies and Their Limits 132
6.4.2 Post-Indexical Archives and Temporal Politics 133
6.4.3 Infrastructural Power and Its Asymmetries 135
6.4.4 Methodological Innovation 137
6.4.5 Beyond Western-Centric Frameworks 138

6.4.6 Toward Non-Western and Comparative Approaches 139
6.4.7 Toward Interdisciplinary Synthesis 141
7. Contesting Infrastructural Images: A Typology of Interventions 143
7.1 From Diagnosis to Engagement 144
7.2 Artistic and Aesthetic Interventions 147
7.2.1 Making Infrastructure Visible 147
7.2.2 Disrupting Computational Legibility 152
7.2.3 Building Alternative Systems 157
7.3 Policy Interventions 170
7.3.1 The Promise of Regulatory Governance 172
7.3.2 Data Protection and the Consent Paradigm 174
7.3.3 Prohibitionist Approaches 177
7.3.4 The Regulatory Gap 180
7.3.5 Policy Through the Three-Axes Framework 183
7.4 Activist Interventions 188
7.4.1 The Logic of Activist Contestation 189
7.4.2 Investigative Exposure 190
7.4.3 Research-Advocacy Fusion 192
7.4.4 Community-Based Organizing 195
7.4.5 Coalition Mobilization 197
7.4.6 Three-Axes Assessment 198

8. Conclusion: Living With/Against Infrastructural Images .. 204
8.1 Synthesis 204
8.2 Theoretical Contribution 207
8.3 The Limits and Possibilities of Intervention 210
8.4 Open Questions 212
8.5 Conclusion 215
References 217

1. Introduction: The Exhaustion of Representational Critique

In 2016, Trevor Paglen posed a deceptively simple question. What happens when images are made for machines rather than humans? The question has only grown more urgent. Today, the vast majority of images produced globally are never seen by human eyes. They circulate through computer vision pipelines, feed machine learning models, and trigger automated decisions, all without requiring human interpretation. A surveillance camera captures a face. An algorithm extracts biometric features, and access is granted or denied. At no point does the image need to function as a representation for a human viewer. It *operates*.

This operational turn in visual culture presents a fundamental challenge to the critical frameworks inherited from photography theory, art history, and media studies. These disciplines have traditionally understood images through the lens of representation as images depict, signify, and communicate meaning to human interpreters. Even critical approaches that sought to unmask ideology, expose manipulation, or reveal hidden power relations assumed that images worked by shaping perception and belief. The task of critique was to make visible what images concealed, to expose the constructed nature of representations, to offer counter-images that might disrupt dominant visual regimes. Yet this critical strategy presupposes that power operates through what images show. What happens when power operates through what images do?

Consider a contemporary scenario that illustrates the limits of representational critique. An AI-generated image depicting a historical event that never occurred circulates on social media. Fact-checkers identify it as synthetic. Journalists expose its fabrication. Media literacy advocates warn of its dangers. The image is revealed as false. Yet it continues to circulate, continues to be processed by recommendation algorithms, continues to shape the associative structures of search engines and the training data of future AI models. Exposure does not neutralize the image's operational effects. The image was never primarily addressed to human belief. It functions within infrastructures indifferent to the distinction between authentic and synthetic, true and false. What matters is not whether the image represents reality accurately, but whether it performs effectively within computational systems. The image has become infrastructural.

1.1 The Limits of Existing Frameworks

The inadequacy of representational critique is not a failure of intellectual effort but a symptom of transformed conditions. Several theoretical traditions have offered important resources for understanding contemporary visuality, yet each encounters specific limitations when confronted with images that function infrastructurally.

Semiotic and representational approaches, from Barthes's analysis of photographic meaning to the ideological critiques of visual culture, assume that images work through signification (Barthes, 1981). The image is understood as a text to be read, a message to be decoded, a representation whose relationship to reality can be interrogated. This framework has proven indispensable for analyzing how images construct meaning, reinforce ideology, and shape perception. Yet it presupposes a human interpreter as the necessary terminus of visual communication. When images circulate primarily among machines, parsed by computer vision, classified by neural networks, and acted upon by automated systems, the semiotic framework loses its object. There is no meaning to decode as there was no human terminus as meaning was never the point in the first place.

Surveillance studies, drawing on Foucault's analysis of disciplinary power, have illuminated how visibility functions as a mechanism of control (Foucault, 1977). The panoptic gaze induces self-regulation. Subjects internalize the possibility of being watched and modify their behavior accordingly. This framework remains valuable for understanding certain dimensions of contemporary visual culture, particularly where visibility produces disciplinary effects. Yet Foucault's model assumes that power operates by making subjects visible and knowable to observers. Contemporary computational systems invert this logic. Subjects are rendered legible to machines while the operations of power remain invisible to subjects. The asymmetry runs in the opposite direction. Individuals are fully exposed to infrastructures that process their images, while the criteria, categories, and calculations that govern these processes remain opaque.

Farocki's concept of ‘operational images’ marks a crucial advance in theorizing images that function rather than represent. In his analysis of military and industrial imaging systems, he identified images that "do not represent an object but rather are part of an operation" (Farocki, 2004, p. 17). These images guide missiles, direct robotic assembly, and enable machine vision, all without addressing a human spectator. Farocki's insight remains foundational for any theory of contemporary visuality. Yet his analysis, developed primarily through military and industrial case studies, does not fully elaborate the infrastructural dimensions of operational images such as their embedding within platforms, their entanglement with economic extraction, their role in producing memory and governing populations. The concept of the operational image describes what images do. By contrast, the concept of the infrastructural image, proposed in this book describes what images are within contemporary socio-technical systems.

Paglen's work on ‘invisible images’ extends Farocki's analysis into the domain of machine learning and artificial intelligence (Paglen, 2016, p. 22). Paglen demonstrates how images increasingly exist within a visual culture that is “invisible to human eyes”, circulating through training datasets and computer vision systems that operate autonomously. This analysis is essential for grasping the scale and novelty of machine-oriented visuality. Yet questions of temporality and memory, specifically how infrastructural images reorganize the past, and of power, in other words, how they enable new forms of governance, require further theoretical elaboration.

Platform studies, exemplified by Gillespie's analysis of content moderation and Crawford's examination of AI infrastructures, have shown how digital platforms function as powerful intermediaries that shape visibility, access, and social life (Gillespie, 2018; Crawford, 2021). These accounts are indispensable for understanding the institutional and economic contexts within which images now circulate. Yet the image itself often remains analytically peripheral, a content type to be moderated rather than an infrastructural component to be theorized in its own right.

1.2 Three Diagnostic Inadequacies

Surveying these frameworks reveals three persistent analytical gaps that a theory of the infrastructural image must address. First, existing frameworks struggle to account for images that function without human viewing. The vast expansion of machine vision, facial recognition, object detection, scene classification and anomaly identification has produced a visual culture in which the human spectator is optional or absent. Training datasets contain millions of images. Surveillance systems process visual feeds continuously. Synthetic image generation operates at computational scale. All constitute forms of visuality that do not require, and often do not permit, human interpretation. A theoretical framework adequate to this condition must be able to analyze images for which representation is not the primary mode of existence.

Second, existing frameworks have difficulty addressing memory that is computationally generated rather than indexically anchored. Photography's cultural authority has historically rested on its indexical relationship to reality, the sense that the photograph, as a physical trace of light, testified to what had been present before the camera (Barthes, 1981). This indexical promise underwrote photography's function as a technology of memory. Photographs preserved the past because they bore a material connection to it. Synthetic and AI-generated images sever this connection entirely. They produce visual artifacts that carry the aesthetic codes of photographic realism while remaining unmoored from any originating event. More fundamentally, the archival function itself has been transformed. Digital archives increasingly operate as datasets, resources for training, prediction, and extraction rather than repositories of historical traces. Memory becomes infrastructural when the past is continuously recalculated rather than preserved.

Third, existing frameworks are challenged by power that operates through invisibility rather than spectacle. Classical theories of visual power, from Debord's society of the spectacle to Foucault's panopticism, assumed that power worked through visibility, whether by saturating the visual field with ideological imagery or by subjecting bodies to observation (Debord, 1967; Foucault, 1977). Infrastructural power inverts this relationship. The most consequential operations occur beneath the visible surface of images, in the computational processes that classify, predict, sort, and govern. Making these images visible, displaying them to human viewers, does not make the system legible. Power operates through what is *processed*, not through what is shown.

1.3 Contribution and Structure

This book proposes the concept of the infrastructural image as a framework for analyzing images that function primarily as operational components within data-driven systems rather than as representational objects for human interpretation. The infrastructural image is characterized by its machine-primary orientation, its valuation through extraction and prediction rather than meaning or aesthetics, its embedding within technical and institutional systems, and its participation in forms of governance that operate through computation rather than representation.

The study develops this concept through three analytical axes, each named to foreground its distinctive contribution. The **operational axis** examines how images function as executable units within computational systems, shifting visual culture from interpretation to execution; the specific phenomenon it theorizes is **operational logic**. The **post-indexical axis** analyzes how infrastructural images reorganize temporality, producing computationally generated pasts detached from indexical grounding; the specific phenomenon it theorizes is **post-indexical memory**, and the broader epistemic regime is termed the **post-indexical condition**. The **power axis** investigates how images enable forms of governance that operate through invisibility, automation, and differential legibility; the specific phenomenon it theorizes is **infrastructural power**, which operates through the mechanism of **asymmetrical legibility**. These terms, operational, post-indexical, power, identify which dimension of the infrastructural image is under analysis throughout the book.

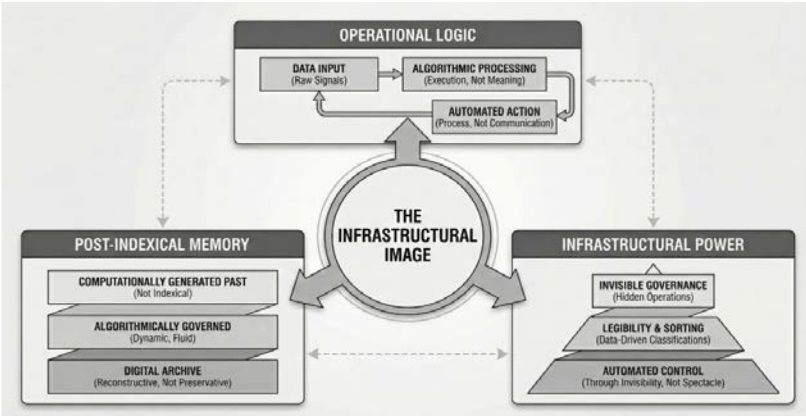

Figure 1. The Conceptual Framework of the Infrastructural Image.

This diagram illustrates the three analytical axes through which this book analyzes contemporary visuality, the **Operational Logic**, which shifts visual culture from interpretation to execution, the **Post-Indexical Memory**, which examines how the past is computationally generated rather than indexically preserved, and the **Infrastructural Power**, which investigates governance operating through asymmetrical legibility. Together, these axes reveal a visual regime in which images no longer merely mediate reality but actively participate in the automated organization of social life.

Each axis is examined through case studies of differing scope and function. Instagram's content moderation infrastructure serves as the primary extended case, offering unprecedented documentary access through the Facebook Papers and demonstrating how the three analytical axes operate in interaction. Clearview AI's facial recognition system and contemporary synthetic image generators function as focused illustrations of operational logic and post-indexical memory respectively, cases selected not for comprehensive treatment but for their paradigmatic clarity in illuminating specific dimensions of the infrastructural condition. This asymmetry reflects both methodological choice and empirical constraint. The opacity that characterizes infrastructural power means that some systems yield to analysis more readily than others, a condition that is itself symptomatic of the phenomenon under investigation.

Across these three axes, the book develops the concept of **categorical violence** to name the systematic harm that occurs when infrastructural classification systems impose identities, deny recognition, or enable targeting based on categories inadequate to the populations they govern. Unlike 'algorithmic bias,' which implies deviation from a correctable neutral standard, categorical violence identifies harm as structural, emerging from the categories themselves rather than their misapplication. The concept is fully elaborated in Section 5.9 through analysis of platform content moderation, where it illuminates why certain populations are simultaneously subjected to computational governance and excluded from its protections.

This framework builds on and extends previous analyses of photography's transformation under digital and computational conditions, while moving beyond photographic media to theorize images as infrastructure across synthetic, AI-generated, and platform-mediated forms. The goal is not to replace representational analysis but to supplement it with an infrastructural analysis capable of grasping what images have become. The challenge today is not simply how to interpret images differently, but how to understand systems that process images without interpretation, namely, systems that see, in some functional sense, without us.

2. Conceptual Foundations of Defining the Infrastructural Image

The preceding chapter established that existing frameworks such as semiotic, surveillant, operational and platform-based each illuminate dimensions of contemporary visuality while encountering specific limitations when confronted with images that function infrastructurally. Before developing the three analytical axes through which these limitations can be addressed, it is necessary to establish the concept's theoretical foundations.

This chapter proceeds in four steps. First, it traces a conceptual genealogy from photography's indexical origins through digitization, networked circulation, and synthetic generation, not as comprehensive history but as clarification of the conditions under which images became available for infrastructural capture. Second, it offers a formal definition of the infrastructural image, specifying the threshold conditions and characteristic features that distinguish this mode of existence from merely computational or algorithmic image processing. Third, it elaborates the crucial distinction between image-as-interface and image-as-infrastructure, a dual existence that explains why representational critique, however sophisticated, necessarily leaves infrastructural operations untouched. Finally, it justifies the choice of 'infrastructural' over adjacent terms—operational, algorithmic, platform, clarifying what analytical work the concept performs that alternatives cannot. Together, these foundations prepare the ground for the three-axis analysis developed in Chapters 3 through 5.

2.1 A Conceptual Genealogy From Representation to Infrastructure

The transformation of images into infrastructural components did not occur suddenly. It emerged through a series of shifts that progressively loosened the bonds between images and their traditional functions of representation, documentation, and meaning-making. Tracing this genealogy is essential not to provide a comprehensive history of photography or digital media, but to clarify the conceptual stakes of the present transformation.

Photography entered cultural discourse as a technology of unprecedented indexical power. Bazin, in his foundational essay on the ontology of the photographic image, argued that photography satisfied "once and for all and in its very essence, our obsession with realism" precisely because it produced images through an automatic process that transferred the reality of the object to its reproduction (Bazin, 1960, p. 8). Unlike painting, which required human mediation, the photograph bore a causal, physical relationship to its referent. Peirce's semiotic category of the index, a sign connected to its object through material contiguity rather than resemblance or convention, provided the theoretical vocabulary for this claim (Peirce, 1931–1958). Barthes extended this indexical logic into the domain of temporality and affect, famously describing the photograph's essence as the "that-has-been", the certitude that what the image shows was once present before the camera (Barthes, 1981, p. 77). This indexical foundation underwrote photography's evidentiary authority, its memorial function, and its cultural prestige as a witness to reality.

The digital image unsettled this indexical regime without entirely abolishing it. Mitchell's early analysis of digital photography emphasized the "inherent mutability" of digital images. Composed of discrete pixels with assigned numerical values, digital photographs could be altered, composited, and manipulated without leaving visible traces (Mitchell, 1992, p. 7). The material constraints that had guaranteed the photograph's indexical fidelity like the chemical inscription of light on silver halide gave way to computational plasticity. Yet digitization alone did not transform images into infrastructure. Digital photographs could still function representationally; they could still be viewed, interpreted, and circulated as meaningful objects. What digitization enabled was the possibility of treating images as data, as structured information amenable to computational processing.

The networked condition accelerated this transformation. As photography became embedded within platforms, databases, and distributed systems, the individual image lost its autonomy. Rubinstein and Sluis observed that the networked photograph exists not as a discrete object but as a node within flows of data, subject to tagging, linking, searching, and algorithmic organization (Rubinstein & Sluis, 2008). Steyerl's analysis of the "poor image", compressed, copied, degraded through circulation, captured how images increasingly derived their significance from their velocity and reach rather than their resolution or fidelity (Steyerl, 2009, p. 1). The image's value became inseparable from its circulatory infrastructure.

Synthetic and AI-generated images represent a further inflection point. These images are not captured but computed as they bear no indexical relationship to any external referent because no such referent exists. Generative adversarial networks, diffusion models, and other AI systems produce images that simulate the aesthetic conventions of photography while emerging entirely from statistical patterns in training data. Zylinska has theorized this condition as "nonhuman photography," a form of image-making that decenters the human operator and challenges anthropocentric assumptions about visual authorship (Zylinska, 2017, p. 5). Yet the term 'nonhuman' captures only part of the transformation. What matters is not simply that machines make images, but that images increasingly exist for machines as inputs, training data, and operational triggers within computational systems.

These shifts from indexical trace to digital data, from autonomous object to networked node, from captured document to synthetic artifact do not simply change how images look or how they are made. They transform what images are for. The infrastructural image names this transformation, the point at which images cease to function primarily as representations for human interpretation and begin to function primarily as operational components within data-driven systems.

2.2 Defining the Infrastructural Image

The term *infrastructural image* refers to visual artifacts whose primary mode of existence is operational participation within computational systems rather than representation for human interpretation. Such images are produced, processed, and evaluated within data-driven infrastructures where their value lies not in what they depict but in what they enable, such as classification, prediction, optimization, and control.

This definition draws on and departs from existing theories of infrastructure. Star's foundational work on infrastructure emphasized its relational character. Infrastructure is not a thing but a condition, emerging when systems become taken-for-granted backgrounds for other kinds of work (Star, 1999). Infrastructure is invisible when functioning smoothly, becoming visible only upon breakdown. Larkin extended this analysis to media infrastructures, showing how they operate simultaneously as technical systems and as aesthetic and political forms (Larkin, 2013). Bratton's concept of "The Stack" theorized planetary-scale computation as a layered infrastructure encompassing Earth, Cloud, City, Address, Interface, and User (Bratton, 2015). These accounts illuminate the conditions within which infrastructural images exist, but they do not theorize the image itself as an infrastructural component.

The theoretical resources assembled here, German media theory, Anglo-American infrastructure studies, French critical theory, emerge from specific intellectual traditions that inevitably shape what the framework can see and what it might occlude. This limitation becomes particularly acute when analyzing infrastructures that operate globally while affecting populations differentially across linguistic, cultural, and regulatory contexts. The cases examined in this book involve Palestinian image-makers navigating content moderation systems designed in California, Ethiopian populations subjected to platform governance without adequate linguistic resources, and facial recognition systems trained predominantly on Western datasets. The theoretical apparatus may not fully capture how infrastructural images function within media ecologies organized by different assumptions about visuality, memory, and governance. This limitation is acknowledged here not to immunize the analysis from critique but to mark a horizon that future work, ideally from scholars positioned within these contexts, must address.

What, then, distinguishes an infrastructural image from an image that is merely digitized, processed, or circulated computationally? Following Star (1999), infrastructure is defined relationally. In other words, it is not a property of a thing but a condition that emerges through use and integration. An image becomes infrastructural when it meets three threshold conditions. First, when it functions as a component within systems that extend beyond any single platform, application, or institutional context, when its processing follows standardized protocols that enable interoperability across technical environments. Secondly, when its primary value is extracted through computational operations rather than human interpretation, namely, when what the image *does* within automated systems matters more than what it *means* to human viewers. Thirdly, when its governance occurs through arrangements that remain invisible under normal operation, when the systems acting upon it recede from view for those who produce, circulate, or appear within such images. These criteria are not binary but scalar as images can be more or less infrastructural depending on the depth of their embedding, the primacy of their computational function, and the opacity of their governance. A photograph stored on a personal hard drive is minimally infrastructural whereas the same photograph uploaded to a platform, analyzed by computer vision systems, incorporated into training datasets, and used to refine behavioral prediction models has become deeply infrastructural. The concept names not a type but a condition, one that increasingly characterizes how images exist within contemporary technical environments.

The preceding threshold conditions identify *when* an image has become infrastructural—the criteria by which we recognize that an image has crossed from representational to infrastructural modes of existence. Once this threshold is crossed, infrastructural images exhibit characteristic features that can be elaborated more fully. The first three features correspond directly to the threshold conditions, specifying what each condition means in practice:

Machine-primary orientation elaborates the first threshold condition. Infrastructural images are designed to be read by algorithms before, or instead of, being interpreted by human viewers. Their legibility to computer vision systems takes precedence over their intelligibility to human perception. Resolution, contrast, metadata, and formatting are optimized for computational processing rather than aesthetic effect or communicative clarity. **Operational valuation** elaborates the second threshold condition. The worth of an infrastructural image is measured not by its representational accuracy, aesthetic quality, or communicative power, but by its capacity for extraction, prediction, and optimization. An image's value within a machine learning pipeline depends on its contribution to model accuracy; within a platform, on its capacity to generate engagement metrics and behavioral data; within a surveillance system, on its utility for identification and tracking. **Infrastructural embedding** elaborates the third threshold condition. The infrastructural image cannot be understood in isolation from the technical and institutional systems that sustain it. Platforms, cloud services, datasets, application programming interfaces, and machine learning models constitute the conditions of its existence. These infrastructures are not neutral conduits; they encode economic priorities, political assumptions, and power relations that shape how images are processed and what effects they produce.

Two additional features characterize the infrastructural image's distinctive mode of existence, properties not captured by the threshold conditions but essential to understanding what infrastructural images are. The first one is **processual ontology.** Infrastructural images are not static artifacts but dynamic entities existing as ongoing computations, continuously parsed, classified, correlated, and acted upon. Their meaning, to the extent the term remains applicable, matters less than their performance: what processes they trigger, what actions they enable, what outputs they generate. The infrastructural image is less a thing than an event, less a noun than a verb. The second one is **asymmetrical legibility.** Infrastructural images produce a distinctive asymmetry of knowledge. They render subjects legible to systems, extracting features, assigning categories, calculating probabilities, while the operations performed on them remain opaque to the subjects who generate them. Individuals can see the images they upload but cannot see how those images are processed, what inferences are drawn, or what decisions are automated. This asymmetry is not incidental but constitutive of how infrastructural power functions.

These characteristics do not describe a new type of image that has replaced representational images. Rather, they describe a mode of existence that increasingly conditions how all images function within contemporary technical environments. A photograph uploaded to a social media platform simultaneously exists as an interface object, visible, shareable, interpretable by human viewers, and as an infrastructural component, subjected to computer vision analysis, metadata extraction, engagement tracking, and behavioral prediction. The visible image constitutes only the surface layer of a deeper operational system.

2.3 Image as Interface versus Image as Infrastructure

The distinction between interface and infrastructure is crucial for understanding the dual existence of contemporary images. The interface is what is shown, the visible layer presented to users, designed for human perception and interaction. The infrastructure is what operates beneath, the computational processes, data flows, and automated systems that act upon images independently of human viewing.

Most contemporary images function simultaneously in both registers. When a user views a photograph in a social media feed, they encounter the image as an interface, an object of aesthetic appreciation, emotional response, or communicative exchange. Yet the same image, at the same moment, functions as infrastructure. It is being analyzed by computer vision systems that extract faces, objects, and scenes, correlated with user data to refine behavioral profiles, evaluated by recommendation algorithms that determine its visibility and circulation and is potentially being incorporated into training datasets that will shape future AI systems.

This dual existence means that representational critique, which addresses the interface layer, necessarily leaves the infrastructural layer beneath untouched. One can analyze what an image depicts, what ideologies it encodes, what meanings it communicates and this analysis, however sophisticated, will not engage the computational processes that determine how the image circulates, what actions it triggers, and what forms of governance it enables. The image's infrastructural function is structurally invisible to representational analysis.

2.4 Why "Infrastructural" Rather Than "Operational" or "Algorithmic"?

The choice of ‘infrastructural’ over alternative terms requires justification. Farocki's concept of ‘operational images’ remains indispensable, but it describes a function rather than a condition. To say that an image is operational is to say that it does something. It guides, targets, triggers, executes. The term ‘infrastructural’ encompasses this operational dimension while adding several further specifications.

First, ‘infrastructural’ emphasizes embedding. Operational images might, in principle, function in isolation while infrastructural images exist only within systems. They depend on platforms, protocols, datasets, and models that constitute the conditions of their operation. An image becomes infrastructural through its integration into technical architectures that extend far beyond the image itself. Second, ‘infrastructural’ emphasizes invisibility. Following Star (1999), infrastructures characteristically recede from view. They become visible only upon breakdown. Infrastructural images operate in the background of social life, processing continuously without requiring attention or acknowledgment. This invisibility is not incidental but constitutive of how infrastructural power functions. Third, ‘infrastructural’ emphasizes scale and durability. Infrastructures are large technical systems that persist over time and coordinate distributed activities (Edwards, 2003). Infrastructural images participate in systems of planetary scope such as global platforms, transnational datasets, cloud computing architectures, which shape visual culture at a scale beyond individual images or even individual platforms.

A further distinction concerns the *modality* of action. Farocki's operational images are primarily destructive and targeting. They guide missiles to their destinations, direct robotic arms to their objects, verify assemblies for quality control. They act upon a world that is assumed to exist independently of them. Infrastructural images, by contrast, are not only operational but *generative*. They do not merely act upon social reality. They participate in its ongoing production. Recommendation algorithms generate social relations by determining who sees whom and what content circulates to which audiences. Platform memory features produce pasts by selecting, organizing, and resurfacing images according to computational criteria. Facial recognition systems produce identities by assigning classifications that have material and legal consequences. Engagement metrics produce value by transforming visual attention into quantifiable, tradeable assets.

This generative capacity marks a crucial expansion beyond Farocki's framework. The infrastructural image is reproductive in a sense that resonates with feminist analyses of social reproduction. It participates in the continuous regeneration of social relations, subjectivities, and economic value (Federici, 2012). Where operational images execute discrete functions within existing systems, infrastructural images constitute the conditions under which social life is organized, experienced, and made legible. They do not simply operate. They produce the world they operate within.

The term ‘algorithmic image’ captures important dimensions of computational processing but risks reducing the image to a product of algorithms, obscuring the broader socio-technical and political systems within which algorithms operate. Algorithms are components of infrastructures, not infrastructures themselves. The infrastructural image names the condition in which images exist within and as parts of these larger systems, systems that are simultaneously technical, economic, political, and institutional.

The preceding sections have established the infrastructural image as a conceptual framework, defining its threshold conditions, distinguishing it from adjacent theoretical constructs, and justifying the choice of 'infrastructural' over alternative terms. The following three chapters apply this framework through sustained analysis of its three constituent axes. Chapter 3 examines the **operational axis**, namely, how images function as executable units within computational systems, shifting visual culture from interpretation to execution.

3. Operational Logic: Images as Executable

The preceding chapter established the infrastructural image as a conceptual framework, defining its threshold conditions and distinguishing it from merely digital or algorithmic image processing. This chapter initiates the framework's application through the first of three analytical axes, which is the **operational axis**. Where traditional image theory asks what images *mean*, the operational axis asks what images *do*. The shift from semantics to pragmatics, from interpretation to execution, constitutes the first fundamental transformation that renders images infrastructural. Here, the image is analyzed not as a surface for representation but as a mechanism for execution. By examining facial recognition systems, content moderation pipelines, and predictive analytics, this chapter demonstrates how contemporary images increasingly function as executable code rather than communicative content.

3.1 From Interpretation to Execution

Having defined the infrastructural image ontologically, this section examines its functional logic through the first of three analytical axes: the **operational axis**. The specific phenomenon this axis theorizes is **operational logic**, which is the transformation of images from objects requiring interpretation to units triggering execution. The defining feature of the infrastructural image is not its appearance but its capacity to operate. Unlike representational images, which invite interpretation, operational images are designed to trigger processes. They function within computational systems that act upon images automatically, without requiring human attention, interpretation, or aesthetic judgment. In this context, visuality becomes executable.

The concept of the operational image originates in Farocki's analysis of military and industrial vision systems. Studying cruise missile cameras, surgical imaging, and factory automation, Farocki identified a class of images that "do not represent an object but rather are part of an operation" (Farocki, 2004, p. 17). These images were not made to be seen by human viewers. They were made to guide actions, to direct a missile toward its target, to position a robotic arm, to verify an assembly. Farocki's insight was that such images marked a departure from the entire history of image-making, which had assumed a human spectator as the necessary recipient of visual communication. Operational images, by contrast, addressed machines.

Virilio had anticipated this development in his analysis of "the vision machine", automated systems capable of perceiving and acting upon the world without human mediation (Virilio, 1994, p. 59). For Virilio, the automation of perception represented a profound transformation in the relationship between vision and knowledge. When machines see, they do not interpret; they process. The image becomes an input to a calculation, not an object of contemplation. He warned that this "sightless vision" threatened to produce a world in which consequential decisions would be made at speeds and scales that excluded human comprehension (Virilio, 1994, p. 59).

The proliferation of computer vision systems has vindicated these early analyses while extending their scope far beyond military and industrial applications. Facial recognition, object detection, scene classification, optical character recognition, and gesture tracking now operate across domains from security and policing to retail, healthcare, entertainment, and social media. These systems share a common logic. They treat images not as representations to be interpreted but as data structures to be processed. As an image enters the system, its features are extracted; classifications are assigned; outputs are generated. The entire sequence can occur without any human viewing the image at all.

This computational processing fundamentally transforms the epistemological status of the image. In representational regimes, visual knowledge depended on resemblance and reference as an image provided knowledge of its object by depicting it, by bearing a visual similarity that allowed viewers to recognize what was shown. In operational regimes, visual knowledge is reconstituted around pattern recognition and statistical inference. What matters is not whether an image looks like its referent but whether it contains features that correlate with target classifications. A face is not recognized by its resemblance to a remembered individual but by the proximity of its extracted feature vector to stored templates in a database. Resemblance gives way to computation; recognition gives way to matching.

3.2 The Image as an Operational Unit

Within computational systems, images function as operational units, discrete inputs that trigger sequences of automated actions. This operational status has several implications that distinguish infrastructural images from their representational predecessors. First, images functioning under operational logic are valued for their executability rather than their meaning. The relevant question is not 'What does this image signify?' but 'What does this image do?' An image in a content moderation pipeline triggers classification. It is sorted into categories (acceptable, flagged, prohibited) that determine its visibility and circulation. An image in a facial recognition system triggers identification. It is matched against a database, producing an output (match, no match, confidence score) that may grant or deny access, generate an alert, or update a tracking record. An image in a recommendation system triggers prediction. It is analyzed to infer user preferences, optimize engagement, and determine what other images will be shown. In each case, the image's operational function, in other words, what it enables, what processes it initiates, takes precedence over any representational content.

Second, operational images collapse the distinction between seeing and doing. In representational regimes, images mediated between a world and a viewer. Seeing an image was a distinct act from acting upon what it showed. In operational regimes, seeing is acting. The moment an image is processed by a computer vision system, it initiates automated responses. A surveillance camera does not merely record; its images feed directly into systems that identify, track, and alert. A platform does not merely display; its images are continuously analyzed to optimize feeds, target advertisements, and shape user behavior. The image becomes a "discorrelated" element in processes that exceed human perception and agency (Denson, 2020, p. 2).

Action no longer waits upon human interpretation. It is triggered automatically by computational processing.

Third, operational images distribute agency across technical systems. In representational frameworks, the image was produced by an author (photographer, artist, designer) and addressed to a viewer whose interpretation completed the circuit of meaning. Operational images disrupt both ends of this circuit. Authorship becomes diffuse. Images may be captured by automated sensors, generated by AI systems, or assembled from datasets without any individual author. Viewership becomes optional. Images may be processed entirely by machines, with human viewing occurring, if at all, only as a secondary or supervisory function. The locus of agency shifts from human subjects to socio-technical assemblages in which humans, algorithms, sensors, and databases participate in distributed processes of image production and action.

The operational logic of infrastructural images is exemplified by the functioning of large-scale computer vision systems. Consider the pipeline of a typical facial recognition deployment. Cameras capture images continuously and face detection algorithms identify regions of interest. Feature extraction models encode detected faces as numerical vectors while matching algorithms compare these vectors against database templates. Classification systems assign identity labels or generate alerts. Downstream systems act upon these outputs, granting access, logging movements, or notifying authorities. At no point in this pipeline is the image viewed in the traditional sense by a human. It is processed, parsed, encoded, compared, and classified. The results of this processing have material consequences. The image *operates*.

3.3 Operational Photography and the Displacement of Authorship

This operational turn reconfigures the practice and concept of photography. Photography has historically been understood through categories of authorship, intention, and documentary witness. Even when theorists emphasized photography's mechanical or automatic dimensions, they preserved a role for the photographer as the agent who framed, selected, and contextualized the image. Human interventions such as the 'decisive moment', the compositional choice, the editorial judgment distinguished photography as a practice from mere mechanical recording. Crucially, this authorial presence functioned as an interpretive anchor as the image carried with it the implied question of what the photographer intended to show, what meaning the human creator sought to convey. This interpretive expectation created friction against purely operational uses of the image.

Operational photography displaces these categories, and in doing so removes the friction that authorship imposed on computational processing. When images are captured by autonomous sensors, generated by AI systems, or assembled statistically from datasets, the figure of the author becomes difficult to locate. Azoulay's (2012) concept of photography as an 'event' distributed among camera, photographer, subject, and viewer already challenged the notion of singular authorship. Operational photography extends this distribution further, incorporating algorithms, training data, and infrastructure into the assemblage that produces images. The question 'Who made this image?' becomes increasingly unanswerable, or answerable only by reference to systems rather than individuals. But this is not merely a theoretical puzzle about attribution. It is the precondition for operational logic. An image without an author is an image without interpretive claims that might complicate its computational processing. The facial photograph captured by a surveillance camera carries no authorial intention that might resist its reduction to a biometric query. The AI-generated image bears no creator's meaning that might contest its circulation as synthetic memory. Authorship displacement does not merely accompany operational logic; it enables it.

This displacement has consequences for accountability that follow directly from operational logic. When photographic images served as documents, their evidentiary authority was underwritten by the assumption that a human agent had been present at the scene, had chosen to record what appeared before the camera, and could be held accountable for the image's production and use. The author stood as the guarantor of the image's meaning and as the responsible party for its effects. Operational images attenuate this chain of responsibility. An image generated by an AI system, processed by a computer vision pipeline, and acted upon by an automated decision system may produce consequential effects such as denying someone access, flagging someone for investigation, shaping someone's informational environment, without any individual being accountable for the specific image or its effects. Responsibility is distributed across the infrastructure, which is to say, it is often effectively dissolved. The same displacement that enables operational processing also forecloses accountability for operational harms.

The operational turn also transforms the temporality of photography in ways that reinforce its departure from authorial intention. Documentary photography was oriented toward the past. The photograph testified to what had been present before the camera at a specific moment, something "that-has-been" there (Barthes, 1981, p. 77). The author's presence at that moment underwrote the image's testimonial authority. Operational photography is oriented toward the future. Images are captured, processed, and analyzed in order to predict, anticipate, and preempt. Predictive policing systems analyze images to forecast where crimes will occur. Recommendation algorithms analyze images to predict what content will engage users. Risk assessment systems analyze images to calculate insurance premiums, creditworthiness, or security threats. The image becomes a resource for prediction rather than a record of the past. In this future orientation, authorial intention becomes not merely absent but irrelevant. What matters is not what the image was meant to show but what patterns it can yield for computational extraction.

3.4 Implications for The Limits of Representational Critique

The operational logic of infrastructural images reveals fundamental limitations in critical approaches premised on representation. Traditional forms of visual critique such as ideological analysis, demystification, counter-representation assume that power operates through what images show. The task of critique, on this model, is to expose how images construct meaning, reinforce stereotypes, naturalize power relations, or misrepresent reality. Such critique remains valuable for analyzing how images function as representations. Yet it cannot address how images function as operations.

Consider the critical response to facial recognition technology. Scholars and activists have importantly documented how these systems encode racial and gender bias, producing higher error rates for darker-skinned faces and women (Buolamwini & Gebru, 2018). This critique exposes how the representational assumptions embedded in training data, the overrepresentation of lighter-skinned male faces, produce discriminatory outcomes. The analysis operates at the level of representation. It shows that the system misrepresents certain faces more than others. Yet even if these representational biases were corrected, even if facial recognition systems achieved equivalent accuracy across all demographic groups, the operational logic of the technology would remain intact. The system would still convert faces into feature vectors, still match individuals against databases, still enable automated identification and tracking. The problem is not only that the system represents some faces poorly. It is that the system operates in ways that enable surveillance and control regardless of representational accuracy.

Browne's analysis of racializing surveillance demonstrates how technologies of identification and tracking have historically been deployed to govern Black populations, from slave patrols to contemporary biometric systems (Browne, 2015). This genealogy reveals that the operational logic of surveillance, its imperative to identify, categorize, and control, is inseparable from histories of racial domination. Addressing this problem requires more than improving representation; it requires contesting the operational infrastructure itself. Steyerl's (2013) artistic and theoretical practice offers resources for thinking beyond this representational critique. Her video work *How Not to Be Seen: A Fucking Didactic Educational .MOV File* does not simply represent the surveillance apparatus. It explores strategies of invisibility, disappearance, and illegibility that might escape or disrupt operational capture. The work suggests that resistance to infrastructural images may require not better representations but tactical engagements with the conditions of visibility and legibility themselves.

The operational axis of the infrastructural image thus clarifies why contemporary visual power often feels immune to critique. Exposure does not disable operation. Making a system visible does not make it stop. Power no longer needs to persuade or even to be seen; it only needs to function. Images are not deployed to convince subjects but to sort, predict, and manage them. This operational logic, meaning images as executable rather than interpretable, constitutes the phenomenon theorized by the **operational axis** and establishes the foundation for understanding the infrastructural image's temporal and political dimensions, examined in the sections that follow.

The operational axis has demonstrated how images function as triggers for automated action such as classification, identification, prediction, governance. Yet these operations do not occur in a temporal vacuum. They draw upon accumulated images, stored data, and archived traces that constitute the computational past. The following chapter examines how this archival function has itself been transformed, producing what this book terms the **post-indexical condition**, a regime of memory in which the past is no longer preserved but computed.

3.5 Case Study: Facial Recognition and the Executable Face

Clearview AI offers a paradigmatic instance of operational logic because it reveals how the transformation from image to data point restructures the photograph's ontological status. A facial photograph, traditionally understood as representation or memory artifact, becomes within Clearview's infrastructure a biometric key, an operational unit whose value lies not in what it depicts but in what it can unlock such as identity, location, association, history. The following analysis examines how this operationalization transforms images scraped from social contexts into instruments of identification, tracing the technical architecture through which the face becomes computationally executable and the power relations this transformation encodes.

3.5.1 The Face as a Query

When a police officer uploads a photograph to Clearview AI's facial recognition system, the image ceases to function as representation and begins to operate as executable code. The system extracts a mathematical faceprint from the uploaded photograph, queries a database of over fifty billion images scraped without consent from Facebook, Instagram, LinkedIn, and Venmo, and returns potential matches within seconds, complete with links to the source profiles from which each image was harvested (Hill, 2020). No human interpretation intervenes between the input of a face and the output of an identity. The photograph has become a database query, a command that executes automatically across billions of data points (see Figure 2).

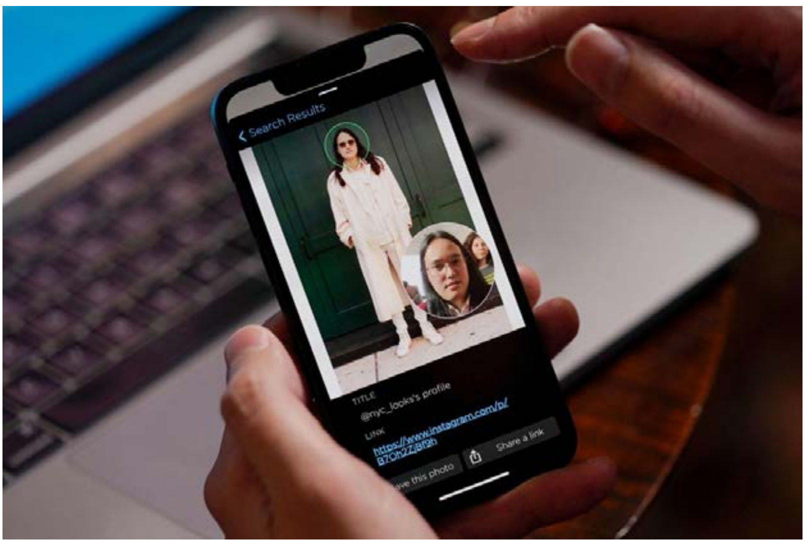

Figure 2. Clearview AI Interface Demonstration. *Note.* Clearview AI CEO Hoan Ton-That demonstrates how uploading a face photograph triggers an automated search

across 50+ billion scraped images, returning linked profiles and identifying information. The face becomes a database query. This image visually embodies the transformation from face-as-representation to face-as-executable (AP Photo/Seth Wenig, 2022)

As Hill (2020) observed after years of investigating the company, "what Clearview did was not a technological breakthrough, it was an ethical one" (quoted in Tate, 2023). The technology to scrape and match faces at scale already existed; what Clearview contributed was the willingness to deploy it without constraint. The image, in this configuration, is not something to be looked at but something that looks, an active agent that searches, matches, and identifies.

3.5.2 The Infrastructure

Clearview AI's system exemplifies the operational logic of the infrastructural image. Founded in 2017 and exposed to public scrutiny by Hill's New York Times investigation in January 2020, the company built its database by systematically scraping publicly accessible photographs from across the internet, a practice that practically violated the terms of service of every major platform and has since been found to violate data protection laws by data protection authorities in the United Kingdom, France, Italy, the Netherlands, and Australia. By mid-2024, the company claimed to have amassed over fifty billion images; by 2025, that figure had grown to sixty billion (Burt, 2023; PPC Land, 2025). More than three thousand law enforcement agencies in the United States have used the system (Clearview AI, 2022), conducting nearly one million searches by early 2023 (BBC, 2023). The scale is unprecedented. As Georgetown Law's Center on Privacy and Technology documented in their landmark 2016 report, "one in two American adults is in a law enforcement face recognition network" (Garvie et al., 2016). Every photograph uploaded to social media becomes, in this infrastructure, a latent query waiting to be executed, a standing instruction that can be activated the moment someone's face is submitted to the system.

The operational sequence is precise. A law enforcement officer captures or obtains an image of a person of interest. That image is uploaded to Clearview's interface. The system converts the face into a vector representation, a numerical encoding of facial geometry. This vector is then compared against the vectors derived from billions of scraped photographs. Matches are returned ranked by similarity, each accompanied by a link to its source (Ton-That, 2022) such as a Facebook profile, an Instagram post, a news article, a Venmo transaction. The officer now has a name, and often an address, a workplace, a network of associates. The image has executed its function. What began as a photograph has become an identification, and what began as an identification can become an arrest.

3.5.3 Wrongful Arrests and Differential Operation

The operational consequences of facial recognition infrastructure became publicly visible in January 2020, when Robert Williams was arrested in Detroit based on a false algorithmic match. The Detroit Police Department's facial recognition system, querying Michigan driver's license photographs, returned Williams's face as a potential match to a surveillance image from an unsolved theft. This computational output was then used to construct a photo lineup. A witness who had not observed the alleged crime selected Williams from the lineup, and an arrest warrant was issued. Williams was detained for approximately thirty hours before an officer acknowledged during interrogation that "the computer must have gotten it wrong" (American Civil Liberties Union, 2020).

 IMAGE A: Surveillance still	 IMAGE B: Williams's driver's license photo

Figure 3. Comparison of surveillance still and facial recognition match in *Williams v. City of Detroit*. (Michigan State Police, 2019).

The juxtaposition of these two images renders visible what the algorithmic system obscured. The probe image and the returned match depict different individuals. This disparity, immediately legible to human perception, was computationally irrelevant. Both images were converted to vector representations and compared as numerical coordinates in high-dimensional space. The system returned a proximity score; officers acted upon it. The figure thus documents the epistemological displacement at the core of operational logic.

Williams's case was the first publicly documented wrongful arrest attributable to facial recognition technology in the United States. As of August 2023, six individuals were known to have been wrongfully arrested due to facial recognition technology, all of whom were Black (American Civil Liberties Union, 2023). This pattern reflects the differential error rates that characterize facial recognition systems, error rates systematically higher for darker-skinned individuals, as documented by Buolamwini and Gebru's (2018) landmark Gender Shades study (analyzed fully in Section 7.4.3). The systems perform worst on precisely those populations already subject to disproportionate police surveillance.

Gender Classifier	Darker Male	Darker Female	Lighter Male	Lighter Female	Largest Gap
Microsoft	94.0%	79.2%	100%	98.3%	20.8%
FACE++	99.3%	65.5%	99.2%	94.0%	33.8%
IBM	88.0%	65.3%	99.7%	92.9%	34.4%

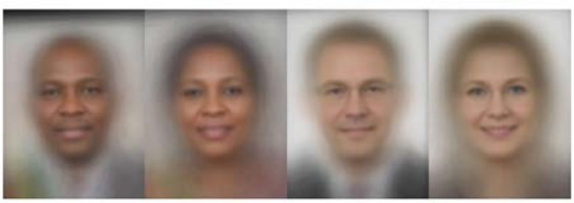

Figure 4. *Intersectional Accuracy Disparities in Commercial Gender Classification Systems. Note. Classification accuracy by gender and skin type across three commercial facial recognition systems. The Largest Gap column quantifies the maximum performance disparity within each system, ranging from 20.8% (Microsoft) to 34.4% (IBM) (Buolamwini & Gebru, 2018).*

These visualizations demonstrate how the same operational logic performs radically differently across racialized and gendered bodies. The 34.7% vs. 0.8% error rate disparity (Buolamwini & Gebru, 2018) is not a bug but a structural feature as the system was trained predominantly on lighter-skinned male faces and thus operates most reliably on bodies that match its training data. Figure 4 renders quantitatively what the Williams case demonstrates empirically. Operational logic distributes its errors unevenly. The systems achieve near-perfect accuracy for lighter-skinned males while failing dark-skinned females at rates exceeding one in three. This disparity is not a bug but a structural feature. The systems were trained predominantly on lighter-skinned male faces and thus operate most reliably on bodies matching their training data. The broader significance of this research, including its methodological innovations and political effects, is examined in Section 7.4.3's analysis of research-advocacy intervention.

All these cases illustrate a critical dimension of infrastructural power. The operational logic of executable images does not distribute errors randomly. Rather, it encodes existing social inequalities into automated decision-making processes. When facial geometry is converted to vector representation and queried against databases assembled through historical practices of documentation and surveillance, the resulting matches reproduce and amplify the differential visibility that characterizes racialized policing (Browne, 2015). The wrongful arrests are not anomalies within an otherwise neutral system. They are symptomatic of how the infrastructure itself operates.

3.5.4 Analysis: Racializing Surveillance

The wrongful arrests in Detroit instantiate what Browne (2015, p. 12) terms "racializing surveillance", the production and reification of racial boundaries through technologies of monitoring and identification. In *Dark Matters: On the Surveillance of Blackness*, she traces a genealogy from the branding of enslaved persons, to lantern laws requiring Black individuals to carry lit candles after dark, to contemporary biometric systems. "Contemporary biometric technologies and slave branding, of course, are not one and the same," she writes, "however, when we think of our contemporary moment when 'suspect' citizens, trusted travelers, prisoners, welfare recipients, and others are having their bodies informationalized by way of biometric surveillance... we can find histories of these accountings of the body" (Browne, 2015, p. 128). The continuity is not merely analogical but infrastructural. Technologies of identification have always operated differentially across racialized bodies, and facial recognition extends this differential operation into computational systems that present themselves as neutral.

What the Williams case reveals is the literal operationality of the image within police practice. The surveillance photograph did not serve as evidence to be interpreted by human investigators weighing its reliability against other factors. It served as input to a computational system that produced output, a name, a face, a suspect, which then structured all subsequent investigative decisions. This process captures the epistemological displacement at stake. Human judgment defers to algorithmic output, and the image's computational function overrides its evidentiary limitations. The blurry, low-quality photograph of an unidentified person became, through the facial recognition system, a command that activated an arrest. The image was executed.

3.5.5 Implications for Operational Logic

The Clearview AI case study crystallizes what it means for an image to function operationally rather than representationally. In the system's patented architecture, a facial photograph undergoes transformation into "a 512 point vector or a 1024×1024 facial data matrix" (Ton-That, 2022, p. 14), a numerical encoding that reduces the visible features of a face to coordinates in high-dimensional space. This vector is then compared against billions of similarly encoded reference images using k-nearest neighbor algorithms, returning ranked matches based on calculated distance values. The photograph, in this process, does not depict identity. It initiates a computational sequence that produces identity as an executable output.

This transformation reconfigures the ontological status of the publicly posted photograph. Every image containing a human face, once uploaded to any accessible platform, becomes latent infrastructure for future identification. The billions of photographs scraped by Clearview's web crawlers are not archived as representations to be viewed; they are indexed as vectors to be queried. As Garvie et al. (2016) documented, over half the adult population of the United States is enrolled in law enforcement facial recognition networks, not through any affirmative act of enrollment, but through the routine accumulation of driver's license photographs, mugshots, and publicly visible images. The infrastructural image, in this context, is not something one creates or consents to. It is something one becomes subject to through the mere fact of having been photographed.

The Williams case and subsequent wrongful arrests demonstrate that this operational logic does not execute uniformly across all bodies. When Buolamwini and Gebru (2018) documented higher error rates for dark-skinned women than for light-skinned men as mentioned above, they revealed that the executable image carries within its computational structure differential capacities for recognition and misrecognition. These disparities are not incidental to the system's operation but constitutive of it. The training datasets that produce facial recognition algorithms encode the historical distribution of photographic attention, which has systematically privileged lighter-skinned, Western faces (Browne, 2015). The executable image thus operationalizes what Browne (2015, p. 12) terms "racializing surveillance", the longstanding practice of making Black bodies visible to systems of control while rendering their individual features illegible to those same systems.

What distinguishes facial recognition from earlier modalities of surveillance is the particular form of epistemological authority it exercises. In other words, a displacement of evidentiary judgment from human perception to algorithmic output occurs. The blurry surveillance image that initiated the identification process in the Williams case bore little resemblance to Robert Williams; as subsequent legal documents revealed, Williams's photograph ranked only ninth among the system's potential matches (Morioka, 2024). Yet the computational imprimatur transformed a weak probabilistic signal into actionable intelligence. The infrastructural image, once it has produced an output, generates a chain of consequent actions such as photo lineups constructed around the algorithmic match, witness identifications primed by the system's selection, arrest warrants issued on the basis of cumulative but circular confirmation. The image does not merely inform the investigation. It structures it.

The policy constraints established by the Williams settlement, prohibitions on arrests based solely on algorithmic matches, requirements for independent corroborating evidence, mandatory training on racial disparities, and retrospective audits of all cases since 2017 (American Civil Liberties Union, 2024) represent an institutional acknowledgment that the executable image is not a neutral investigative tool. These reforms attempt to reintroduce human judgment at points where algorithmic output had previously flowed unimpeded into consequential action. Yet the very necessity of such constraints reveals the default condition of the infrastructure. in the absence of explicit intervention, the system operationalizes its biases automatically, continuously, and at a scale no human process could replicate.

The figures accompanying this case study, the demonstration of facial query execution (Figure 2), the visual comparison that led to Williams's wrongful arrest (Figure 3), and the quantified disparities of the Gender Shades study (Figure 4), are not merely illustrative. They are themselves artifacts of the operational logic under examination. Buolamwini and Gebru’s study (2018) translates differential error rates into visible form, making legibility a pattern that remains invisible within the system's routine operation. The Williams comparison image documents the gap between what the algorithm ‘saw’ and what human observers immediately recognize as non-identity. These images function as evidence precisely because they render visible what infrastructural operation normally conceals, the moments of translation, the points of failure, the distributions of consequence that flow from treating faces as executable queries rather than as indices of persons.

Yet the Clearview case reveals something further. The system's operational power depends not only on what it does in the present but on what it draws from the past, the billions of images scraped, stored, and indexed as a standing resource for future queries. This dependency on accumulated visual data points toward the second axis of the infrastructural image, which is the transformation of photographic archives from repositories of memory into datasets for computation. Chapter 4 examines this post-indexical condition, analyzing how images that once testified to 'what has been' now generate synthetic pasts that never occurred.

4. The Post-Indexical Axis: Memory and the Computational Past

The **operational axis** established how images function as units of execution in the present, triggering classifications, enabling identifications, automating decisions. The **post-indexical axis** examines a complementary transformation: how images participate in the construction of the past. The shift from operation to memory is not a change of subject but a change of temporal orientation. Operational images draw upon archives; post-indexical conditions transform what archives are and how they function. By displacing the photograph's traditional role as indexical witness, the infrastructural image inaugurates a new memory regime, one where the archive is no longer a repository of preserved traces but a site of continuous computational production. This chapter theorizes this transformation as the **post-indexical condition** and examines its specific manifestation in **post-indexical memory**.

4.1 From Indexical Trace to Computational Retrieval

If images functioning under operational logic reorganize visual culture around execution rather than interpretation, they also reorganize memory around computation rather than experience. The infrastructural image does not merely circulate within networks; it participates in the continuous production, revision, and governance of the past. This transformation extends beyond the familiar observation that digital media 'changes memory.' It concerns a structural shift in the conditions under which memory is produced, stabilized, and made socially legible. Under infrastructural conditions, memory becomes post-indexical, detached from the evidentiary authority of the trace and increasingly dependent on algorithmic reconstruction.

The concept of **post-indexical memory** requires clarification. It does not name a simple loss of truth or an epidemic of falsification, though these phenomena are certainly prevalent. Rather, it designates a transformation in the regime of memory, specifically, what this book terms the **post-indexical condition**, the underlying logic that determines how the past is recorded, stored, retrieved, and made meaningful. For more than a century, photography functioned as a privileged technology of memory precisely because of its indexical character. The photograph's cultural authority derived from its material connection to what it depicted. Light reflected from objects and inscribed on photosensitive surfaces, producing a trace that testified to presence. Roland Barthes captured this logic in his famous formulation of the photograph's origin, the "that-has-been," the certainty that what the image shows was once present before the camera (Barthes, 1981, p. 77). Even when photographs were manipulated, staged, or ideologically framed, their memorial function rested on this indexical promise. Memory, in this paradigm, was anchored to a trace.

The infrastructural image destabilizes this anchoring through several concurrent transformations. First, synthetic and AI-generated images produce visual artifacts that bear no indexical relationship to any originating event. These images simulate the aesthetic conventions of photographic realism such as the grain, the lighting, the perspectival structure while emerging entirely from computational processes operating on statistical patterns. They are images of nothing, or rather, images of everything that their training data contained, recombined into novel configurations that never existed. When such images enter archives and circulate as memory, they carry the visual codes of documentary testimony without any of its evidentiary grounding.

Second, and more fundamentally, the archival function itself has been transformed. Derrida's (1996, p. 19) analysis of "archive fever" emphasized how the structure of the archive shapes what can be remembered, the technical substrate of memory such as stone, paper, film, silicon, is never neutral but actively constitutes what counts as memorable. Digital archives operate according to logics fundamentally different from their analog predecessors. Ernst has theorized this shift as a move from ‘storage’ to ‘transfer,’ from archives as repositories of stable documents to archives as dynamic systems of data processing (Ernst, 2013). In computational archives, images are not preserved as inert records awaiting future retrieval. They are continuously parsed, indexed, tagged, correlated, and reorganized. The archive becomes less a storehouse than a machine.

4.2 The Platformization of Memory

The transformation of memory under infrastructural conditions is most visible in the operations of digital platforms. Platforms do not simply store images; they actively produce memory through algorithmic organization, selective retrieval, and automated curation. Understanding how platforms govern memory reveals the post-indexical condition in its most developed form. Consider the 'On This Day' features now ubiquitous across social media platforms. These systems automatically resurface images from a user's archive, presenting them as occasions for reminiscence. The selection is not random; on the contrary, it is algorithmically optimized. Van Dijck's (van Dijck, 2007, p. 137) analysis of "mediated memories" demonstrates how digital technologies transform memory from a personal, psychological process into a sociotechnical practice distributed across individuals, devices, and platforms. The platform's algorithms determine which images reappear and when, based on criteria that may include engagement metrics, emotional valence detection, facial recognition of individuals deemed significant, and patterns derived from aggregate user behavior. What appears as spontaneous reminiscence is, in fact, a computed output.

This platformization of memory produces several consequences. First, the act of remembering becomes dependent on infrastructural systems whose criteria remain opaque. Users do not choose, nor do they know, which memories resurface. They receive what the algorithm serves. The past is not accessed by the individuals. It is recommended to them. Mayer-Schönberger has argued that digital systems have fundamentally altered the relationship between remembering and forgetting, making comprehensive retention the default while rendering forgetting an effortful, often impossible achievement. Yet the issue is not simply that platforms remember too much. It is that they remember selectively according to logics designed to optimize engagement, retention, and platform value rather than to serve the mnemonic needs or interests of users.

Second, platform memory is standardized through logics of relevance and affective optimization. What counts as a significant memory, worthy of resurfacing, is determined by models trained on aggregate behavioral data. Memories that generate engagement through likes, comments, shares are privileged. Memories that do not perform well by platform metrics may effectively disappear. This produces a homogenization of memory, as the idiosyncratic, the ambivalent, and the difficult are filtered out in favor of content optimized for positive response. The platform's memory is not the user's memory; it is a simulation of memory engineered for engagement.

Third, platform memory extends beyond individual users to shape collective remembrance. Trending topics, viral images, and algorithmically amplified content structure public memory of events in ways that may diverge significantly from historical accuracy or significance. Noble's (Noble, 2018) research on algorithmic bias in search engines demonstrates how computational systems can systematically distort the visibility of historical information, privileging certain narratives while rendering others difficult to find. When platforms become primary sites of collective memory, the algorithmic logics that govern them become infrastructures of public remembrance.

The platformization of memory thus exemplifies the post-indexical condition. Memory is no longer anchored to indexical traces preserved in stable archives. It is continuously recalculated, optimized, and served by systems whose operations remain invisible to those whose pasts they manage. The question is no longer whether an image indexes an event but whether it can be integrated into the computational economy of recall.

4.3 Memory as a Dataset: The Operational Archive

The transformation of archives into datasets represents a crucial dimension of post-indexical memory. Under indexical regimes, archives were imagined as collections of traces, repositories of documents that could be interpreted, contested, and contextualized by historians, researchers, and the public. The archive preserved the past in material form, making it available for future engagement. This model presumed that the value of archived materials lay in their evidentiary and interpretive significance. In other words, archives were resources for understanding what had happened.

Under infrastructural regimes, archives increasingly function as datasets. Their value is not primarily historical but operational. They are resources for training machine learning models, refining recognition systems, and generating predictive insights. Crawford and Paglen's Crawford & Paglen, 2019) analysis of ImageNet, one of the most influential image datasets in machine learning, reveals how photographic images are extracted from their original contexts, stripped of their historical and personal significance, and repurposed as training data for computer vision systems. Images that once functioned as personal photographs, documentary records, or artistic works become raw material for computational processes indifferent to their representational content.

This transformation converts memory into a resource for extraction. The past is mined for patterns that can be operationalized in the present and future. Facial recognition systems are trained on archival photographs. Recommendation algorithms learn from histories of user behavior. Predictive models extract correlations from accumulated data. In each case, the archive's value lies not in what it preserves for interpretation but in what it yields for computation. Memory becomes infrastructure.

Chun's (2011) analysis of digital memory emphasizes its fundamental volatility. Unlike analog storage media, which preserve inscriptions through material stability, digital memory requires constant refreshing, migration, and active maintenance. Digital data does not persist passively; it must be continuously regenerated. This technical condition has epistemological consequences. The archive is not a stable repository but an ongoing process. What is remembered depends on what is actively maintained, which, in turn, depends on what is deemed valuable according to prevailing criteria. Memory becomes contingent on infrastructure in a newly literal sense. If the systems that sustain it fail, it disappears.

The operational archive also transforms the politics of memory. When archives function as datasets, the criteria that determine inclusion and organization such as classification schemes, metadata standards, training protocols become decisive in shaping what can be remembered and how. These criteria are rarely neutral. They encode assumptions about what matters, what categories are relevant, and whose pasts are worthy of preservation. Algorithmic systems trained on biased datasets will reproduce and amplify those biases in their outputs, shaping not only present classifications but also the structure of accessible pasts. The politics of memory shifts from contesting representations to contesting infrastructures: the pipelines through which images are made retrievable, valuable, and legible.

4.4 Synthetic Memory and Temporal Instability

The emergence of AI-generated imagery introduces a further dimension of post-indexical memory, the production of synthetic pasts. Generative AI systems can now produce photorealistic images of events that never occurred, people who never existed, and places that were never photographed. These synthetic images are not merely falsifications in the traditional sense but deliberate fabrications designed to deceive. They represent a more fundamental transformation, the capacity to generate plausible pasts computationally, without reference to any indexical source.

Manovich's early analysis of digital cinema anticipated this development. He argued that digital technology transformed cinema from a primarily indexical medium, capturing and manipulating reality, into a primarily graphic medium, generating and compositing images (Manovich, 2001). What was once the exceptional, the synthetic, the animated, the fabricated becomes the norm, while indexical capture becomes merely one option among many. This analysis extends to still images under AI conditions. The photographic paradigm, in which images testified to presence and served as evidence of events, gives way to a generative paradigm in which images are produced according to prompts, patterns, and statistical models.

The implications for memory are profound. If images can be generated that are indistinguishable from photographs of actual events, the evidentiary foundation of visual memory collapses. This is not simply a problem of fakeness or deception, though those concerns are real. It is an ontological transformation in the relationship between images and the past. Synthetic images do not record the past. They simulate possible pasts. They populate archives and databases with artifacts that carry the aesthetic weight of documentary evidence while being constitutively detached from any originating occurrence.

This produces **temporal instability**. Memory under the post-indexical condition is not merely fragmented or contested but dynamically recomposed. Rather, it is dynamically recomposed. The past becomes adjustable, subject to continuous regeneration according to shifting criteria. Infrastructural systems do not simply store images; they continuously reorder them. An individual's timeline on a platform is reorganized based on evolving algorithms, search results for historical events change based on new content and updated ranking models. Collective memory is reshaped by the amplification and suppression of images according to platform logic. The past is no longer a stable ground to interpret the present. It is, however, an output that varies with the parameters of the systems that produce it.

The implications for historical knowledge and cultural memory are significant. Historiography has long grappled with the partiality and constructedness of archives, recognizing that what is preserved reflects the priorities and power relations of those who created and maintained the archive. Post-indexical memory intensifies this condition while adding new dimensions. The past is not only selectively preserved but computationally generated. It is not only accessed through interpretive acts but served by optimizing algorithms. It is not only contestable through counter-narratives but malleable through infrastructure. Memory becomes, in a newly literal sense, programmable.

4.5 Mnemonic Agency and Its Asymmetries

The transformations described above have significant implications for human agency in relation to memory. If operational logic reduces authorship by distributing image production across automated systems, post-indexical memory reduces mnemonic agency by distributing recollection across platforms. Individuals contribute the raw material of memory through uploading images, generating data, feeding archives while infrastructures govern the conditions under which the past becomes visible, meaningful, and actionable. This produces a distinctive asymmetry. Users are fully exposed to platforms that process their images and organize their pasts, while the logic of that processing remains opaque. One may scroll through one's memories without knowing why certain images appear and others do not, why particular moments are marked as significant, or how one's archive is being used to train models or generate insights. The infrastructure of memory operates silently, and its operations are largely inaccessible to those whose memories it manages.

Yet agency is not entirely dissolved. Practices of resistance, negotiation, and refusal remain possible, even if they are constrained. Users may curate their archives, delete content, or opt out of certain platform features. Artists and activists may intervene in the infrastructures of memory, exposing their operations or creating alternative archives. Scholars may analyze and critique the systems that govern digital memory, contributing to public understanding and potential regulation. These practices do not restore an imagined prior condition of autonomous, unmediated memory. But they represent forms of engagement with infrastructural conditions that remain available even as those conditions constrain agency.

The post-indexical condition of memory thus does not signal the end of memory but its transformation into a site of ongoing negotiation between human practices and infrastructural logic. The challenge is not to recover indexical certainty. That recovery is neither possible nor, perhaps, desirable but to develop critical capacities adequate to a condition in which memory is continuously computed. This requires understanding how infrastructural images participate in the production of the past, not merely as records or representations, but as operational elements within systems that shape what can be remembered and how.

4.6 Case Study: Generative AI and the Fabrication of the Past

Contemporary image synthesis systems from DALL-E and Midjourney to Stable Diffusion provide a critical site for examining post-indexical memory because they produce images that bear no indexical relationship to any event, object, or moment. These are photographs without referents, memories of nothing, yet they increasingly circulate within visual culture alongside photographs whose authority derived precisely from indexical anchoring. The following analysis examines how synthetic images destabilize the evidentiary function that underwrote photography's memorial authority, exploring both the technical mechanisms of image generation and the epistemological consequences of a visual culture in which the distinction between trace and fabrication becomes computationally undecidable.

4.6.1 The Indexical Promise

Photography's cultural authority has historically rested on what Roland Barthes called the "that-has-been", the certitude that what the image shows was once present before the camera (Barthes, 1981, p. 77). Photographs preserved the past because they bore a material connection to it. The light that touched the subject touched the photographic surface. The resulting image testified to a world that existed. Generative AI systems sever this connection entirely. As Wasielewski (2024) observes, in artificial intelligence and computer vision research, photographic images are typically referred to as 'natural' images, conceptualized within a binary as either natural or synthetic. Recent advances in text-to-image generators such as Midjourney, DALL-E, Stable Diffusion have produced what Wasielewski (2024, p. 1) terms "unnatural images", synthetic artifacts that appear natural, carrying the aesthetic codes of photographic realism while remaining unmoored from any originating event. These systems do not remember. They statistically generate plausible pasts from patterns learned across millions of training images. Memory becomes infrastructural when the archive is replaced by the dataset, and the past is no longer preserved but computed.

4.6.2 The Cases

The implications of this transformation became visible in March 2023, when an AI-generated image of Pope Francis wearing a white Balenciaga puffer jacket circulated globally across social media platforms. Created by Pablo Xavier, a construction worker from Chicago using Midjourney's V5 model, the image was posted to a Reddit community dedicated to AI-generated art with the title "The Pope Drip." Within hours, it had migrated to Twitter, Facebook, and Instagram, where it was shared as an authentic photograph. The image bore telltale markers of AI generation, a distorted hand, a warped crucifix (see Figure 5). Yet these were invisible to viewers scrolling on mobile devices at the speed of the feed. The creator himself was unsettled, saying "It's definitely scary that people are running with it and thought it was real without questioning it" (quoted in Stokel-Walker, 2023a).

Figure 5. AI-generated image of Pope Francis wearing a Balenciaga-style puffer jacket, created using Midjourney V5

(March 2023). Note the distorted left hand gripping an unidentifiable object and the warped crucifix pendant, artifacts of statistical image synthesis that were largely invisible to viewers encountering the image at the speed of social media scroll. Source: Reddit, 2023) (account suspended).

This image carries the full apparatus of photographic realism, soft focus on the background suggesting depth of field, naturalistic lighting consistent with overcast Roman conditions, textural detail in the jacket's quilting. Yet close inspection reveals the characteristic failures of diffusion models. The left hand collapses into an amorphous mass. The crucifix hovers without a visible chain. The glasses merge with facial shadow. These artifacts, imperceptible at mobile-screen resolution and social media velocity, mark the threshold between successful deception and visible synthesis. The image's viral success depended precisely on viewing conditions that foreclosed the critical attention such artifacts would otherwise invite.

In a similar vein, days earlier, Eliot Higgins, founder of the investigative journalism collective Bellingcat, had used the same tool to generate over fifty images depicting a fictional narrative of Donald Trump's arrest, imprisonment, and escape (see Figure 6). Higgins posted the images on Twitter with clear disclosure that they were AI-generated. Nevertheless, an Instagram post sharing some of his images as genuine garnered over 79,000 likes. Higgins noted wryly that he "had assumed that people would realize Donald Trump has two legs, not three, but that appears not to have stopped some people passing them off as genuine" (quoted in Stokel-Walker, 2023b).

Figure 6. Selection from Eliot Higgins's AI-generated sequence depicting a fictional arrest of Donald Trump, created using Midjourney V5 (March 2023). Despite visible anomalies including a third leg and police officers wearing impossible insignia, the images were shared as authentic on

Instagram, garnering over 79,000 likes. Source: Higgins (2023).

Higgins's (2023) images instantiate what might be called the generation not of a single deceptive image but of an entire visual narrative arc, such as an arrest, imprisonment, escape, that mimics the temporal structure of photojournalistic documentation. The images bear the aesthetic codes of press photography (telephoto compression, motion blur, candid framing) while depicting events that never occurred. Platform response was symptomatic. Rather than developing detection systems, Midjourney banned the word 'arrested' from its prompt interface, a lexical patch that addresses symptoms while leaving the generative capacity intact.

The most troubling manifestation emerged in 2025, when Facebook pages including '90's History began publishing AI-generated portraits of Holocaust victims paired with biographical details copied directly from the Auschwitz Memorial's authentic archives. The images replaced real, grainy historical photographs with polished, stylized AI-generated faces. One fabricated image depicted a birthday scene for Léon Gorfinkel, a French Jewish child murdered at Auschwitz, complete with a digitally rendered cake for a celebration that never occurred (see Figure 7). The Auschwitz-Birkenau State Museum issued a public condemnation: "The use of artificial intelligence to generate fictional images of Auschwitz victims... is not a tribute. It is a profound act of disrespect to the memory of those who suffered and were murdered in Auschwitz. It undermines the integrity of historical truth." (Auschwitz-Birkenau State Museum, 2025). When the museum reported the content to Meta, however, the company at first responded that the images did not violate its policies. The synthetic memories remained visible, circulating alongside authentic historical testimony.

Figure 7. Comparison of an authentic archival photograph and its AI-generated fabrication. Right: Léon Gorfinkel, photographed before deportation to Auschwitz on

September 2, 1942, where he was murdered. Left: AI-generated image published by Facebook page ‘90's History (account now suspended), depicting a fictional birthday celebration that never occurred. The fabrication pairs real biographical data from Auschwitz Memorial archives with a synthetic image optimized for emotional engagement and platform monetization. Source: Auschwitz-Birkenau State Museum, 2025).

The juxtaposition above reveals the operational logic of synthetic memory production. The authentic grainy, damaged photograph bearing the material traces of its historical passage documents a boy who would be murdered weeks after his capture. The AI-generated image replaces, however, this testimony with a polished, emotionally ‘shareable’ fabrication, a birthday cake, warm lighting, an expression calibrated for engagement metrics. What is lost is not merely accuracy but the indexical bond between image and event that underwrites photography's function as witness. The synthetic image generates a past that never existed, optimized not for truth but for circulation within attention economies. As it reads in the statement of the Museum, “These are not real photos of the victims. They are digital inventions, often stylized or sanitized, that risk turning remembrance into fictionalized performance…Fabricating faces with AI does not preserve memory. It reshapes it, distorts it, and risks turning tragedy into aestheticized fiction." (Auschwitz-Birkenau State Museum, 2025).

4.6.3 Analysis: The Computational Past

These cases instantiate the post-indexical condition theorized in this book. Generative AI systems produce images that simulate the appearance of photographs while bearing no causal relationship to any external referent. The Pope was never in a puffer jacket. Trump was not arrested in March 2023. Léon Gorfinkel had no birthday party at Auschwitz. Yet the images carry the full weight of photographic realism with all the textures, lighting, depth of field, and grain that have historically signified documentary authenticity. What has changed is not simply that photographs can be faked, a possibility as old as the medium itself, but that images can now be generated without any originating event to fake. The synthetic image is not a manipulation of a prior photograph. It is a statistical hallucination produced by models trained on vast repositories of photographic data. The training dataset becomes the archive from which computational memory draws, not to preserve the past but to generate plausible variations of it.

This transformation produces what Chesney and Citron (2019, p. 1758) have termed the **liar's dividend**, the ability to dismiss authentic recordings as probable fakes. The concept names a structural consequence of the post-indexical condition, not merely a strategic resource available to bad actors. In a media environment saturated with synthetic images, the mere existence of generative AI provides grounds to dispute any photographic evidence. The epistemological damage extends beyond images that are fabricated to encompass images that are not. When any image *might* be synthetic, the evidentiary authority of *all* images is diminished.

Empirical research confirms this structural effect. Schiff et al. (2024) demonstrate that politicians who claim authentic evidence against them is fake gain measurable increases in public support—a finding that reveals the liar's dividend operating at the level of public discourse, not merely individual deception. The dividend inverts photography's evidentiary function. Where images once testified to what had occurred, their testimony can now be dismissed by invoking the possibility of synthesis. Photography's testimonial authority is undermined not only by images that lie but by the *possibility* of lying that synthetic imagery introduces into visual culture as such.

As Ritchin (2025) observes, the traditional evidentiary relationship between photography, visibility, and reality has been largely supplanted by synthetic and altered images that construct the world as one wishes it to appear. The liar's dividend thus names not an abuse of the post-indexical condition but its logical consequence—a consequence with profound implications for democratic deliberation, legal evidence, and collective memory that subsequent sections will address.

The Holocaust case reveals the stakes of this transformation for collective memory. The Auschwitz Memorial's condemnation articulates what is lost when memory becomes computationally generated. Yet the logic of platform engagement, that is, the optimization of content for circulation and monetization, is indifferent to the distinction between authentic testimony and its personal meaning and synthetic fabrication and its ramifications. What matters operationally is whether the image generates clicks, shares, and advertising revenue. The infrastructural image, in this configuration, transforms memory itself into a resource for extraction.

4.6.4 Implications for Post-Indexical Memory

Generative AI does not simply produce false images. It transforms the conditions under which any image can function as evidence, testimony, or memory. The indexical bond that underwrote photography's authority as a witness to reality has been replaced by statistical inference from training data. Images no longer trace the past; they compute plausible versions of it. This is not a failure of the technology but its constitutive logic. Generative models are designed to produce outputs that are statistically indistinguishable from their training distributions, not outputs that correspond to external reality. The distinction between authentic and synthetic, documentary and fabricated, becomes computationally irrelevant even as it remains ethically and politically essential. The post-indexical condition thus names not merely a technological shift but an epistemological rupture. Memory becomes infrastructural when the past is no longer anchored in material traces but generated on demand from computational systems. The question is no longer what the image shows but what the model has learned to generate, and from whose archives, according to whose categories, in service of whose interests, the synthetic past is being produced.

The operational and post-indexical axes have examined how images function as executable units and how they reorganize temporality, producing computational rather than indexical pasts. Yet these transformations do not occur neutrally. They serve particular interests, enable specific forms of governance, and distribute their effects unevenly across populations. The following chapter theorizes this political dimension through the **power axis**, examining how infrastructural images enable governance without spectacle, which are forms of control that operate through invisibility and differential legibility rather than through the visible display of authority.

5. The Power Axis: Governance Without Spectacle

The preceding chapters examined how images function operationally (Chapter 3) and how they reorganize temporal experience (Chapter 4). The **power axis** addresses the question that underwrites both: *for whom* do images operate, and *whose* pasts are computationally produced? Unlike traditional regimes of power that relied on the display of authority or the visible surveillance of subjects, infrastructural images enable a form of control that operates beneath the threshold of perception. This chapter theorizes **infrastructural power** as a distinctive mode of governance, one that functions through **asymmetrical legibility** rather than spectacle, rendering subjects transparent to systems that remain opaque to them. The shift from a politics of visibility to a politics of legibility marks a fundamental transformation in how power operates through images.

5.1 From Visibility to Legibility

If the operational axis theorizes how images reorganize visuality around execution, and the post-indexical axis theorizes how images reorganize temporality around computation, the **power axis** concerns how images enable distinctive forms of governance. The forms of power enabled by infrastructural images do not operate primarily through visibility, persuasion, or spectacle. Instead, they function through invisibility, automation, and asymmetrical legibility. Infrastructural images enable modes of governance that no longer require subjects to see or understand how power operates; they only require systems to function.

Classical theories of visual power have been structured around visibility. The two dominant paradigms of spectacle and surveillance both assume that power works by organizing what is seen. Debord's analysis of the society of the spectacle theorized power as operating through the saturation of social life with images that substitute representation for lived experience (Debord, 1967). The spectacle pacifies, distracts, and mystifies; it exercises power by controlling appearances and colonizing perception. Foucault's analysis of panopticism theorized power as operating through visibility in a different register, not the visibility of images to subjects, but the visibility of subjects to observers (Foucault, 1977). The panoptic gaze disciplines by inducing the internalization of surveillance. Subjects regulate themselves because they know they might be watched. In both paradigms, visibility is the medium through which power operates.

The infrastructural image disrupts these assumptions. Power increasingly operates not by making subjects visible to each other or to authorities, but by rendering them legible to computational systems. Legibility, in this context, differs fundamentally from visibility. To be visible is to appear within a perceptual field accessible to human observers. To be legible is to be structured in a form that permits computational processing, in other words, parsed into data points, encoded as feature vectors, rendered amenable to algorithmic analysis. Visibility addresses perception while legibility addresses calculation. The infrastructural image prioritizes the latter. **Asymmetrical legibility**, the condition in which subjects are rendered legible to systems that remain illegible to them, constitutes the defining mechanism of infrastructural power.

This distinction has significant consequences for understanding contemporary power. Deleuze's (1992, p. 5) prescient analysis of "societies of control" anticipated this shift. Deleuze (1992) argued that disciplinary societies, with their enclosed institutions and techniques of normalization, were giving way to a new formation characterized by continuous modulation and universal communication. In control societies, power operates not through confinement and observation but through access and coding. Individuals are not disciplined into conformity but continuously modulated through passwords, accounts, and data profiles. The relevant question is not ‘Are you being watched?’ but ‘Can you be processed?’ Infrastructural images are the visual substrate of control societies. They render bodies, faces, movements, and behaviors into data structures that can be processed, correlated, and acted upon. This rendering does not aim to persuade or intimidate. It aims to enable prediction, optimization, and management. Power becomes less theatrical and more logistical. It does not announce itself through spectacle or assert itself through visible surveillance. It operates through the continuous, distributed, often imperceptible processing of images within computational infrastructures.

5.2 Algorithmic Governance and the Automation of Decision

The legibility produced by infrastructural images enables forms of governance that operate through automation rather than deliberation. Algorithmic systems process images to make decisions that were once the province of human judgment: who gains access, who is flagged as a risk, whose content is amplified, whose is suppressed. These decisions are automated in the sense that they are executed by computational processes without requiring case-by-case human intervention. The image triggers the decision. The infrastructure executes it.

Rouvroy and Berns have (2013, p. 163) theorized this condition as "algorithmic governmentality", a mode of governance that operates through the statistical processing of data rather than through the formation of subjects. Traditional governmentality, as analyzed by Foucault (1977), worked by producing subjects who internalized norms and regulated their own conduct. Algorithmic governmentality bypasses subjectivity. It does not seek to shape beliefs, cultivate virtues, or instill discipline. It simply processes data and generates outputs. Subjects do not need to understand or consent to the operations that govern them. They need only be legible to the systems that process their data.

This mode of governance has distinctive characteristics. First, it operates preemptively rather than reactively. Algorithmic systems do not wait for events to occur and then respond. They analyze patterns to predict and preempt. Predictive policing systems analyze images and data to forecast where crimes will occur before they happen (Brayne, 2020; Ferguson, 2017). Content moderation systems flag potentially violating content before it is widely seen (Gorwa et al., 2020). Risk assessment systems calculate probabilities of future behavior based on accumulated data, informing pretrial detention, parole, and sentencing decisions (Angwin et al., 2016; Dressel & Farid, 2018). The temporal orientation shifts from responding to the past to managing the future.

Second, algorithmic governance operates continuously rather than episodically. Unlike traditional forms of legal or bureaucratic governance, which intervene at discrete moments in the form of arrest, trial, application and review, algorithmic systems process data in real time, generating ongoing assessments that modulate access, visibility, and opportunity. Cheney-Lippold's (2017) analysis of 'algorithmic identity' demonstrates how data profiles are continuously updated based on behavioral traces, producing fluid, probabilistic identities that differ fundamentally from stable legal or social identities. One's algorithmic identity is not fixed. It is perpetually recalculated.

Third, algorithmic governance operates at scale. Human decision-making is inherently limited; however, algorithms can process millions of images, make billions of classifications, and execute countless decisions simultaneously. This scalar capacity is essential to the functioning of platforms and data-driven institutions. The volume of images uploaded, the frequency of interactions, and the complexity of correlations exceed human cognitive capacity. Automation is not merely efficient. It is also necessary for systems operating at this scale.

Zuboff's (2019, p. 8) analysis of "surveillance capitalism" situates these developments within a political-economic framework. Zuboff (2019) argues that contemporary capitalism has developed a novel logic of accumulation based on the extraction and processing of behavioral data. Images are central to this extraction. Every photograph uploaded, every face detected, every scene classified becomes raw material for behavioral prediction products sold to advertisers and other clients. Infrastructural images are thus not only instruments of governance but also commodities in an economy built on rendering human behavior predictable and profitable.

5.3 The Structural Production of Invisibility

A defining feature of infrastructural power is its invisibility. The most consequential operations occur beneath the visible surface of images, in computational processes that remain inaccessible to those they govern. This invisibility is not accidental or remediable; on the contrary, it is structural, built into the design and function of infrastructural systems.

Several factors contribute to this structural invisibility. First, the complexity of algorithmic systems exceeds human comprehension. Machine learning models, particularly deep neural networks, operate through statistical processes that cannot be fully translated into human-interpretable explanations (Rudin, 2019). Even the engineers who design these systems often cannot explain why a particular model produces a particular output in a specific case. This opacity is not a bug to be fixed but a feature of how these systems work. Pasquale's (2015, p. 10) analysis of the 'black box society' documents how algorithmic decision-making operates behind walls of secrecy and complexity that resist transparency. Second, proprietary interests protect algorithmic operations from scrutiny. Platforms and technology companies guard their algorithms as trade secrets, resisting disclosure even when their systems have demonstrable public effects.. The criteria that determine which images circulate and which are suppressed, which faces are recognized and which are misidentified, which content is amplified and which is buried remain proprietary, accessible neither to users nor to regulators. Transparency is not merely technically difficult. It is also institutionally obstructed. Third, the scale and speed of algorithmic processing make meaningful oversight practically impossible. Millions of images are processed every minute. Billions of classifications are made daily. Even if each individual decision were theoretically transparent, the aggregate volume would exceed any capacity for review. Governance becomes statistical, operating through the tuning of parameters and the adjustment of models rather than through the evaluation of individual cases.

This structural invisibility has profound implications for accountability. When images are processed by automated systems whose operations are opaque, complex, and rapid, responsibility for outcomes becomes difficult to assign. If a facial recognition system misidentifies an individual, leading to wrongful detention, as in the wrongful arrest of Robert Williams discussed earlier, who is accountable? The police department using that system? The camera operator? The software developer? The training data curators? The institution that deployed the system? Responsibility is distributed across the infrastructure, which often means that no one is effectively accountable for specific harms. The system functions, and its functioning produces effects, but the locus of agency and responsibility remains elusive.

5.4 Asymmetries of Legibility and Control

Infrastructural power produces distinctive asymmetries. Subjects are rendered fully legible to systems that process their images, while the operations of those systems remain largely illegible to subjects. This asymmetry inverts the panoptic model, in which subjects knew they might be watched and adjusted their behavior accordingly. In the infrastructural regime, subjects often do not know when, how, or to what ends their images are being processed. Awareness of surveillance induced self-discipline. Yet invisibility of infrastructure precludes even that minimal form of agency.

This asymmetry operates at multiple levels. At the individual level, users upload images without knowing how those images will be analyzed, what inferences will be drawn, or what decisions will be automated based on their visual data. The interface presents a surface such as a photo shared or a face recognized while the infrastructure operates beneath, extracting value and enabling governance in ways that users cannot see. Lyon's (2003, p. 2) concept of "surveillance as social sorting" captures how these processes differentiate populations, granting benefits to some while imposing burdens on others based on algorithmic assessments. The sorting occurs invisibly and its effects are felt without being understood. At the collective level, platforms accumulate vast repositories of images and the analytical power to process them, while the public lacks equivalent capacity to scrutinize platform operations. The asymmetry is not only informational but also computational. Even if a platform disclosed its algorithms, ordinary users would lack the technical expertise and computational resources to analyze their functioning. The asymmetry is thus structural, built into the unequal distribution of infrastructural capacity.

Gandy's (1993, p. 12) early analysis of the "panoptic sort" anticipated these dynamics. Gandy (1993) showed how data-driven classification systems produce discriminatory outcomes by sorting individuals into categories that determine access to opportunities, pricing of services, and exposure to risks. The sorting operates through accumulated data rather than visible markers, making discrimination difficult to identify and contest. Infrastructural images extend this logic into the visual domain. Faces, bodies, and behaviors become raw material for classification systems that sort populations according to criteria that remain opaque.

The political implications are significant. Traditional forms of political contestation assume that power is exercised by identifiable agents through visible acts that can be exposed, criticized, and opposed. Infrastructural power frustrates these assumptions. There is no sovereign to confront, no clear decision to contest, no spectacle to disrupt. Power is exercised through the accumulated effects of countless automated processes operating across distributed systems. Resistance requires not only opposing specific policies or actors but engaging with the conditions of legibility and operation that enable power to function invisibly.

5.5 From Representational Politics to Infrastructural Politics

The analysis of infrastructural power clarifies why contemporary forms of domination often feel elusive and why traditional strategies of critique seem inadequate. Infrastructural power does not announce itself through propaganda or assert itself through visible coercion. It embeds itself in the computational architectures that process images, the platforms that govern their circulation, and the algorithms that extract value from visual data. This embedding renders power simultaneously pervasive and imperceptible, omnipresent in its effects, absent from view.

The concept of the infrastructural image thus points toward a necessary shift in critical orientation from representational politics to infrastructural politics. Representational politics contests images, exposing their ideological content, offering counter-representations, struggling over what is shown and how. This mode of politics remains important as struggles over representation are not obsolete. But they are insufficient for engaging power that operates through what is processed rather than what is shown.

Infrastructural politics, by contrast, contests the conditions under which images circulate and operate. It asks not only what images depict but how they are classified, what categories they are sorted into, what decisions they trigger, and who controls the systems that process them. This mode of politics targets the pipelines, protocols, and platforms that constitute infrastructural power. It demands transparency in algorithmic operations, accountability for automated decisions, and democratic governance of the systems that process visual data at scale.

Bratton's (2015, p. xviii) analysis of "The Stack" as a new geopolitical architecture suggests the scale at which infrastructural politics must operate. It encompasses planetary-scale computation, from undersea cables to orbiting satellites, from massive data centers to ubiquitous sensors. Infrastructural images circulate within and constitute this architecture. Contesting the power relations embedded in infrastructural images thus requires engaging with infrastructures at multiple scales, local, national, planetary, and across multiple domains, technical, legal, economic, political.

The power axis completes the conceptual framework of the infrastructural image. Together, the three axes, operational, post-indexical, and power, reveal a visual regime in which images no longer merely mediate reality for human perception but actively participate in the automated organization of social life. Images execute decisions, produce pasts, and enable governance. They function as infrastructure, not merely through infrastructure. Understanding this transformation is essential for developing forms of critique and resistance adequate to the conditions of contemporary visual culture.

5.6 Infrastructural Failure and the Politics of Illegibility

The analysis thus far has emphasized the efficacy of infrastructural power, its capacity to render subjects legible, to automate governance, to operate invisibly. Yet infrastructures also fail, and these failures are theoretically significant. Attending breakdown, error, and glitch reveals dimensions of infrastructural images that an exclusive focus on successful operation would obscure. Star's (1999) foundational insight that infrastructure becomes visible upon breakdown applies with particular force to computational visual systems. When facial recognition misidentifies, when content moderation errs, when recommendation algorithms surface inappropriate content, the infrastructure that normally operates invisibly becomes momentarily apparent. These failures are not merely technical malfunctions to be corrected. They are epistemologically productive moments that expose the assumptions, limitations, and contingencies embedded in systems that otherwise present themselves as seamless and inevitable.

The differential failure rates of facial recognition systems across demographic categories exemplify this revelatory function of breakdown. Research documenting higher error rates for darker-skinned women than for lighter-skinned men (Buolamwini & Gebru, 2018; see Section 7.4.3 for full analysis) does more than document bias—it reveals the representational assumptions encoded in training data, the normative benchmarks against which accuracy is measured, and the uneven distribution of infrastructural harms. Failure makes visible what successful operation conceals.

AI hallucination, the generation of plausible but false outputs by large language and image models, represents another form of infrastructural failure with theoretical significance. Bender et. al. (2021, p. 617) characterize large language models as "stochastic parrots", systems that "haphazardly stitch together sequences of linguistic forms" according to probabilistic patterns "without any reference to meaning" (p. 617). When these systems hallucinate, producing confident fabrications about events that never occurred, citations that do not exist, or facts that are simply false, they expose the constitutive gap between statistical plausibility and referential truth. The "ersatz fluency" (Bender et. al., 2021, p. 617) of generative AI exploits what Bender et al. (2021) identify as a fundamental human vulnerability, our preparedness to interpret coherent language as meaningful and to attribute communicative intent where none exists. Hallucination thus reveals not a correctable bug but the operational logic of systems that manipulate linguistic form without access to the world that language purports to describe. As Parisi (2013) has argued, computational systems operate through forms of reasoning that differ fundamentally from human cognition. Their errors are not failures to achieve human-like understanding but expressions of an alien logic that processes patterns without grasping their referents.

Russell's (2020, p. 14) theorization of "glitch feminism" offers resources for understanding failure not merely as revelation but as potential resistance. For Russell (2020), the glitch is a productive error that refuses the smooth functioning of systems designed to categorize, classify, and control bodies. The glitch creates space for identities and practices that escape or exceed the categories infrastructures impose. This framework suggests that illegibility, the failure to be properly read by computational systems, might constitute a form of agency within infrastructural conditions. Where legibility enables governance, illegibility might enable escape.

Yet the political valence of failure remains ambiguous. Infrastructural breakdowns can produce harm as easily as liberation. Misidentification by facial recognition has led to wrongful arrests. Content moderation errors have silenced legitimate speech. Algorithmic failures have denied services and opportunities to those who depend on them. Moreover, failures are typically temporary as systems are patched, models are retrained, errors are corrected. The infrastructure reasserts itself. Whether failure constitutes a genuine site of resistance or merely a momentary interruption in the smooth operation of power depends on whether breakdowns can be amplified, extended, and connected to broader political projects.

What failure reveals, ultimately, is the contingency of infrastructural arrangements. Systems that present themselves as inevitable, natural, or technically necessary are shown to be constructed, fallible, and contestable. This contingency is the condition of possibility for infrastructural politics. If systems can fail, they can also be otherwise. The task is not to celebrate glitch as inherently liberatory but to analyze how failures expose the workings of power and to identify possibilities for intervention that breakdowns might afford.

5.7 Case Study: Instagram's Computer Vision Pipeline

Instagram's content moderation infrastructure exemplifies infrastructural power because it demonstrates how governance operates through invisibility at unprecedented scale, classifying, filtering, and shaping the circulation of billions of images daily while remaining largely opaque to the users whose visual expression it governs. The following analysis examines how automated classification systems produce what this book terms *categorical violence*, which is the systematic harm emerging not from individual discriminatory intent but from the structural inadequacy of global taxonomies to local contexts, linguistic particularities, and political complexities. The case reveals how infrastructural arrangements such as resource allocation, training data composition and categorical architecture predetermine whose images circulate freely and whose encounter suppression, whose visual vernaculars register as legitimate and whose become algorithmically illegible.

5.7.1 The System

Meta's Instagram serves over two billion monthly users, each upload entering a computational infrastructure designed to parse images before, and often instead of, human attention. According to Meta's own transparency reports, by the fourth quarter of 2023, artificial intelligence systems detected 97% of content the platform subsequently removed for hate speech violations (Meta, 2024). This statistic captures a fundamental reorientation. The image uploaded by a user exists simultaneously as a visible object in their feed and as a data structure undergoing continuous computational evaluation. What Gorwa et. al. (2020, p. 1) describe as "the automation of platform governance" has, in

Instagram's case, produced an infrastructure where the overwhelming majority of images that shape public visibility are sorted, evaluated, and acted upon by systems that never represent their operations to the subjects whose images they process.

5.7.2 The Pipeline

The technical architecture of Instagram's moderation system illustrates how images function as operational units within infrastructural arrangements. As documented by Uzcátegui-Liggett and Apodaca (2024), the first rigorous field audit of Instagram's moderation practices, the pipeline operates through layered computational processes. At the first layer, hash-based fingerprinting compares uploaded images against databases of known violating content. Meta acknowledged using perceptual hashing to catch altered versions of prohibited material. Unlike cryptographic hashes, which change completely with any minor alteration, perceptual hashing fingerprints salient features of content that remain identifiable even after modifications such as cropping, filtering, or watermarking (Gorwa et al., 2020). This technique blocked 80% of the 1.5 million re-uploads of the video of Christchurch shooting in New Zealand in the first 24 hours (Meta, 2019; Apodaca &

Uzcátegui-Liggett, 2024). At the second layer, machine learning models trained on "a continuously refreshed pool of text, images, audio, and video that users and human content moderators have reported as inappropriate" classify images according to policy categories (Apodaca & Uzcátegui-Liggett, 2024).

Meta's Few-Shot Learner system, deployed in 2021, enables these classifiers to adapt to new violation types "within weeks instead of months" (Meta, 2021). At the third layer, separate systems determine enforcement actions. Since 2018, Meta has operated a tripartite framework of "remove, reduce, inform": removal deletes violating content entirely; reduction algorithmically suppresses distribution of borderline content that approaches but does not cross policy lines; and inform applies warning labels or context (Constine, 2018; Gillespie, 2022). This graduated enforcement means that content deemed inappropriate may remain visible to those who seek it directly while being excluded from algorithmic recommendation and amplification. More recently, Meta has begun testing large language models trained on its Community Standards to make policy violation determinations. According to Meta's Q1 2025 transparency report, "early tests suggest that LLMs can perform better than existing machine learning models" and in some cases are "operating beyond that of human performance for select policy areas" (Meta, 2025).

The image, in this pipeline, functions precisely as described by the concept of the infrastructural image. It enters not as a representation to be viewed but as a data object to be parsed. Computer vision systems extract features. Classifiers assign probability scores. Automated systems execute dispositions. The visible image that appears in a user's feed constitutes only the surface layer of this deeper operational system. What users see, the interface, bears no trace of the computational operations that have already acted upon it, the infrastructure.

5.7.3 The Asymmetry

The operational logic of Instagram's pipeline produces forms of **asymmetrical legibility** that exemplify infrastructural power—the distinctive mode of governance theorized by the power axis. Users upload images that are immediately legible to the platform's systems, subjected to feature extraction, classification, and behavioral correlation. Yet the operations performed on those images remain invisible to users. This asymmetry is not a byproduct of technical complexity but the condition of possibility for infrastructural power: governance operates most efficiently when those governed cannot access the terms of their governance.

Uzcátegui-Liggett and Apodaca's (2024) investigation documented this asymmetry concretely. Instagram systematically demoted non-graphic images of the Israel-Hamas war, deleted captions and hid comments without notification, and denied users the option to appeal when comments were removed as spam. Appeal buttons frequently malfunctioned. Hashtag suppression operated erratically without explanation. Users experienced consequences such as reduced visibility, deleted content, shadowbanned accounts, without access to the criteria, calculations, or classifications that produced those outcomes. The infrastructural image here enacts what Pasquale (2015, p. 10) diagnosed as the "black box society". Consequential decisions are rendered, but the reasoning remains proprietary, inaccessible, unchallengeable.

This opacity forecloses the possibility of political contestation. To challenge a classification, one must first know that classification has occurred, understand its criteria, and possess mechanisms for appeal. When all three conditions are absent, when users cannot determine whether their content has been demoted, why it was flagged, or how to contest the determination, power operates without encounter. As Gorwa observed, platforms face asymmetrical reputational incentives, being "publicly roasted less for over-removal than under-removal" (quoted in Uzcátegui-Liggett & Apodaca, 2024). The system is thus optimized for operational efficiency rather than accountability, for processing billions of images through computational pipelines rather than rendering those operations legible to users. The infrastructural image, in this configuration, is precisely an image whose processing remains systematically invisible to those who generate and encounter it, a mode of governance that functions not through the visibility of power but through its disappearance into infrastructure.

5.7.4 Implications for the Infrastructural Image

Instagram's computer vision pipeline crystallizes the theoretical claims developed in this book. Images function here not as representations to be interpreted but as data objects to be processed. Their value is measured not by aesthetic quality or communicative power but by their fitness for classification and their capacity to generate engagement metrics. Power operates through invisibility as users cannot see how their images are processed, what inferences are drawn, what categories are assigned and what dispositions are executed. The 97% automation figure (Meta, 2024) marks not merely a technological achievement but an epistemological transformation, the point at which the image's primary existence becomes its computational processing rather than its appearance to human viewers.

The failures documented in leaked materials and investigative journalism do not represent bugs in an otherwise functional system. They reveal the infrastructure's constitutive logic, which is optimized for scale and efficiency in specific linguistic contexts, systematically blind to others, and structurally opaque to all. Representational critique for exposing bias, documenting errors and revealing hidden assumptions remains necessary but insufficient. The system does not need to represent individuals accurately. It needs only to operate on them. And it *does* operate, processing billions of images through pipelines that govern visibility, shape public discourse, and produce material consequences while remaining invisible to the populations whose images they process. This is what it means for images to become infrastructure. Unlike the synthetic images and facial recognition outputs examined in previous sections, Instagram's moderation infrastructure produces no visible artifact of its operation, which is precisely the point.

The three axes developed across Chapters 3–5 constitute the analytical framework of the infrastructural image. Together, they reveal a visual regime in which images no longer merely represent reality for human interpretation but actively participate in the automated organization of social life through executing decisions, producing pasts, and enabling governance. The following chapters examine the implications of this framework: first for critical practice and future research (Chapter 6), then for the concrete interventions, specifically artistic, regulatory, and activist, already underway against infrastructural image power (Chapter 7).

5.8 Infrastructural Failure and Differential Legibility

The infrastructural character of Instagram's image processing becomes especially visible when the system fails, and it fails systematically along lines of language and geography. Documents leaked by Haugen revealed that Meta allocated 87% of its misinformation budget to English-language content, despite English speakers constituting only 9% of users at the time (Elliot et al., 2021). The infrastructure that renders images legible to computational systems operates with radically uneven capacity across linguistic and regional contexts.

The consequences are not merely gaps in coverage but active forms of harm that existing conceptual vocabulary struggles to name. The analysis of the Facebook Papers (Elliot et al., 2021) documented that in 2020, Meta employed only 766 content moderators for 220 million Arabic-speaking users, a ratio that makes meaningful human review structurally impossible. Ethiopia was designated 'most at-risk' for platform-amplified violence in June 2020, yet the company had developed no automated classifiers for Amharic or Oromo, the country's two most-spoken languages (Elliot et al., 2021). In India, documents showed that content from BJP-linked accounts promoting anti-Muslim messaging was never flagged due to 'underinvestment in moderating content in Hindi and Bengali languages' (Elliot et al., 2021). Instagram's algorithms confused Al-Aqsa Mosque with the militant group al-Aqsa Martyrs' Brigades, automatically removing posts about one of Islam's holiest sites. An internal memo acknowledged that Facebook's integrity operation 'doesn't work in much of the world' (cited in Elliot et al., 2021).

The harms documented in these cases exceed what familiar concepts can adequately capture. 'Algorithmic bias' implies deviation from a neutral standard that might be corrected through technical refinement. 'Discrimination' suggests the differential treatment of pre-existing subjects by identifiable agents. But the infrastructural processing of images does not merely treat subjects unfairly as it constitutes the very categories through which subjects become legible to systems of governance. The harm is not that the system *misapplies* categories but that the categories themselves are inadequate to the populations they govern. When Meta's systems lack classifiers for Amharic or Oromo, speakers of those languages are not merely underserved. They are rendered categorically invisible to the platform's integrity systems. When the ratio of moderators to Arabic-speaking users makes meaningful review structurally impossible, the harm lies not in any individual moderation decision but in the categorical condition that makes adequate review impossible. When Instagram's algorithms cannot distinguish Al-Aqsa Mosque from al-Aqsa Martyrs' Brigades, the system is not biased against mosques. It simply cannot *see* the semantic distinction within its classificatory logic.

What emerges from this analysis is a distinct form of harm that requires its own conceptualization, a form of violence that operates through categories rather than despite them. The following section develops this concept.

5.9 Categorical Violence

The preceding section documented harms that exceed the conceptual vocabulary typically applied to algorithmic systems. Neither 'bias' nor 'discrimination' adequately captures what occurs when infrastructural classification systems impose identities, deny recognition, or enable targeting based on categories inadequate to the populations they govern. This section introduces the concept of **categorical violence** to name this distinctive form of harm, systematic violence that operates through categories rather than despite them.

Categorical violence specifically names the harm that occurs when the categories through which infrastructural systems govern are constitutively inadequate to the populations subjected to them. The violence is not that the system misapplies its categories, which would be bias, or that it treats different groups differently, which would be discrimination, but that the categories themselves, namely, their design, their scope, their institutional embedding, produce harm as a structural feature of their operation. When infrastructural classification systems impose identities, deny recognition, or enable targeting based on categories inadequate to the populations they govern, there is an instance of **categorical violence.** The concept draws on and extends three theoretical traditions that illuminate different dimensions of this phenomenon.

First, Bowker and Star's (1999) foundational work on classification demonstrates that categories are never neutral descriptions but always "valorize some point of view and silence another," (p. 5) producing what they term "torque" (p. 27), the twisting that occurs when formal classification systems are mismatched with individual trajectories, memberships, or locations. Their analysis of apartheid-era racial classification in South Africa reveals how bureaucratic categories do not merely sort pre-existing differences but actively produce the social realities they purport to describe. Classification is not representation but intervention; to categorize is to create. Second, Spade's (2015) concept of 'administrative violence' extends this analysis to contemporary governance, showing how welfare, immigration, policing, and healthcare systems produce harm not through overt hatred but through paperwork, eligibility requirements, and institutional procedures, violence exercised through the category rather than despite it. For Spade, the most consequential forms of violence facing marginalized populations are “often administrative” (p. 1) such as the denial of identity documents, the mismatch between lived gender and bureaucratic classification, the eligibility criteria that exclude rather than include. This violence requires no individual discriminator; it is structural, operating through the routine application of categorical rules. Third, Butler's (2009) theory of "frames" (p. 12) and "recognizability" (p. 5) illuminates how certain lives are apprehended as lives while others are rendered ungrievable, as "specific lives cannot be apprehended as injured or lost if they are not first apprehended as living" (p. 1). The frame determines not merely how subjects are seen but whether they can be seen as subjects at all. For Butler, recognizability is not a property of subjects but a condition established by normative frameworks, frameworks that categorical systems encode and enforce.

Categorical violence synthesizes and extends these insights for the specific conditions of algorithmic image governance. Unlike Bowker and Star's (1999) classification systems, which operated through bureaucratic paperwork and human decision-making, contemporary image infrastructures enact categorical violence at computational scale and speed, processing millions of images through classification systems whose operations remain opaque even to the engineers who designed them. Unlike Spade's (2015) administrative violence, which targets individuals encountering specific institutional gatekeepers, categorical violence operates preemptively and continuously across entire populations, sorting images before any human review occurs. And unlike Butler's (2009) frames, which she analyzes primarily through media representation and cultural intelligibility, the categories deployed by image infrastructures are not merely interpretive but operational. They do not just shape how we perceive subjects but determine what actions platforms take toward them.

Three features distinguish categorical violence from adjacent concepts. First, categorical violence is structural rather than intentional. No individual at Meta decided to suppress Palestinian content or ignore Ethiopian hate speech. The violence emerges from the mismatch between global deployment and local adequacy, from resource allocation decisions that prioritize some populations over others, from the fundamental impossibility of universal categories that work equally well for all contexts. Intentionality is not required; structure suffices. Second, categorical violence is constitutive rather than responsive. It does not merely classify pre-existing subjects but produces the very categories through which subjects become visible or invisible to infrastructural governance. When Instagram's systems classify an image as 'terrorist content' or 'safe,' they do not describe properties inherent in the image but enact categorical determinations that shape what the image can do, where it can circulate, and what consequences follow. The category does not respond to the subject. It constitutes the subject's infrastructural existence. Third, categorical violence operates at scale without encounter. Unlike discrimination, which traditionally requires an encounter between a discriminator and a victim, categorical violence is exercised automatically across millions of interactions, with its operations invisible to those affected. The Palestinian user whose post about Al-Aqsa Mosque is removed experiences the violence of miscategorization without ever encountering the classifier that enacted it. There is no moment of recognition, no opportunity for appeal to a human agent, no encounter in which the violence could be named and contested. The system simply acts, and its action is experienced as impersonal, automated, unchallengeable.

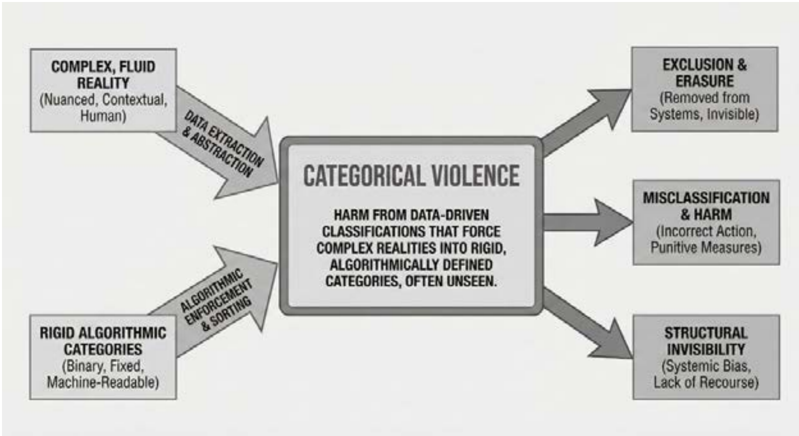

Figure 8. The Mechanism of Categorical Violence.

This diagram illustrates categorical violence as a structural harm distinct from algorithmic bias or discrimination. Unlike discrimination, which implies the unequal treatment of pre-existing subjects, categorical violence is **constitutive** as it produces the very categories through which subjects become legible to infrastructure. It operates **structurally**, emerging from the mismatch between global classification systems and local populations, and functions at **scale without encounter**, executing automated decisions across millions of images without human intervention or opportunity for appeal.

The examples from the Facebook Papers, analyzed in the preceding section, illustrate all these three features. When Meta's systems lack classifiers for Amharic or Oromo, speakers of those languages are not merely underserved. They are rendered categorically invisible to the platform's integrity systems, their content neither protected nor moderated but simply ungoverned. The violence is structural as no individual decided to exclude Ethiopian languages, constitutive as the absence of classifiers produces a category of the 'ungovernable', and operates at scale without encounter, meaning that millions of users are affected without anyone experiencing a discrete moment of exclusion. When the ratio of moderators to Arabic-speaking users makes meaningful human review structurally impossible, the violence lies not in any individual moderation decision but in the categorical condition that makes adequate review impossible. When Instagram's algorithms confuse Al-Aqsa Mosque with al-Aqsa Martyrs' Brigades, the harm is categorical violence: the flattening of semantic distinction makes a holy site indistinguishable from a militant group within the system's classificatory logic. The system is not biased against mosques; it simply cannot see the difference.

The concept of categorical violence reframes questions of accountability. If harm emerges not from individual decisions but from categorical arrangements, then remediation requires not merely correcting errors but interrogating the categories themselves. What classifications does the infrastructure deploy? Who designed them, and for what populations? What happens to content and users who do not fit? These questions shift attention from individual instances of misclassification to the systematic conditions that make certain forms of violence infrastructurally inevitable. Categorical violence cannot be remedied by improving accuracy or expanding training data, though such improvements may mitigate specific harms. It can only be addressed by contesting the categorical arrangements themselves, asking not merely whether the categories are applied correctly but whether they should exist at all, in whose interest they operate, and what forms of governance they enable.

What Crawford and Paglen (2019) argue about training data, that "datasets aren't simply raw materials but political interventions" (see also Section 7.2.1 on their 'Training Humans' exhibition), applies equally to the classifiers and pipelines built from that data. The infrastructure that processes images encodes specific linguistic, cultural, and political assumptions that determine whose images become legible and according to whose categories. The system's operational logic does not merely fail in non-English contexts. It structurally generates conditions where certain populations are simultaneously subjected to computational governance and excluded from its ostensible protections.

The three axes developed across Chapters 3–5 constitute the analytical framework of the infrastructural image. Together, they reveal a visual regime in which images no longer merely represent reality for human interpretation but actively participate in the automated organization of social life, executing decisions, producing pasts, and enabling governance through categorical arrangements that distribute harms unevenly. The following chapters turn from diagnosis to engagement: Chapter 6 examines the implications of this framework for critical practice and future research, while Chapter 7 surveys the artistic, regulatory, and activist interventions already underway against infrastructural image power.

6. Implications: Toward Infrastructural Critique

The preceding chapters developed a diagnostic framework for understanding infrastructural images, how they operate (Chapter 3), how they reorganize memory (Chapter 4), and how they enable governance (Chapter 5). Diagnosis, however, is not yet critique. This chapter confronts the practical consequences of the infrastructural turn, asking how the transformation of images into infrastructure alters the work of criticism itself. If images have changed from representational surfaces to infrastructural components, then the tools developed over decades of visual culture studies require fundamental reassessment. The chapter proceeds in four movements: examining the limits of existing critical frameworks (6.1), analyzing transformations in authorship and agency (6.2), surveying strategic possibilities for intervention (6.3), and identifying directions for future research (6.4).

6.1 The Limits of Visual Critique

The framework of the infrastructural image developed in the preceding sections carries significant implications for critical practice. If images now function primarily as operational components within data-driven systems, if memory is computationally produced rather than indexically preserved, and if power operates through invisibility and legibility rather than spectacle and surveillance, then the modes of critique inherited from representational paradigms require fundamental reassessment.

Visual critique, as it has been practiced across disciplines from art history to media studies to cultural criticism, has largely operated through strategies of exposure, interpretation, and counter-representation. Ideological critique sought to reveal the hidden meanings and power relations encoded in images. Semiotic analysis decoded the sign systems through which images produced meaning. Documentary practices aimed to make visible what power sought to conceal. Artistic interventions offered alternative images that challenged dominant representations. These strategies shared the common assumption that power operated through what images showed, and that critique could intervene by changing what was seen. The infrastructural image, however, renders these strategies necessary but insufficient. Making visible does not equal making changeable. An algorithm can be exposed without being altered. A dataset can be documented without being reformed. A platform's operations can be described without being disrupted. The infrastructural condition demands critique that engages not only with what images represent but with how they operate, for example, the technical systems that process them, the institutional arrangements that govern them, and the political-economic structures that profit from them.

This does not mean that representational critique should be abandoned. Struggles over representation remain significant as what images show still matters. The analysis of racial bias in facial recognition systems, for instance, necessarily involves representational critique, demonstrating that certain faces are systematically misrepresented (Buolamwini & Gebru, 2018). But this critique gains its force only when connected to an analysis of infrastructural conditions, the composition of training datasets, the metrics by which accuracy is measured, the institutional contexts in which these systems are deployed. Representational critique must be articulated with infrastructural analysis to be adequate to contemporary conditions.

6.2 The Transformation of Authorship and Agency

The infrastructural image transforms the conditions of both artistic practice and critical agency. Authorship, as traditionally conceived, presumed an individual agent who made intentional choices in producing an image such as framing, composition, timing, selection. Even collective or collaborative forms of image-making retained some notion of human intentionality as the source of the work's meaning and value. The infrastructural image distributes authorship across human and nonhuman actors, which include but are not limited to sensors, algorithms, datasets, platforms, in ways that make traditional attributions of authorship increasingly untenable. This transformation is not simply a loss. The critique of the author as origin and guarantor of meaning has a long history, from Barthes's (1967) declaration of the "death of the author" (p. 5) to Foucault's (1969) analysis of the "author function" (p. 211). These critiques revealed that authorship was always a construction, a way of organizing discourse rather than a natural fact. The infrastructural image extends this critique into new terrain, making visible the distributed, technical, and institutional conditions of image production that were always present but often obscured.

Yet the dissolution of traditional authorship does not eliminate questions of agency and responsibility; it only relocates them. If no individual author is responsible for an image produced by an AI system trained on millions of photographs, processed by algorithms developed by teams of engineers, and deployed by institutions pursuing particular objectives, then responsibility must be sought at the level of systems and institutions. This relocation has practical implications. Legal frameworks premised on individual authorship struggle to address harms produced by infrastructural images. Ethical frameworks centered on individual intention cannot adequately evaluate automated systems. New frameworks are needed that can attribute responsibility to institutions, hold platforms accountable for their operations, and govern technical systems that produce consequential effects without individual authors.

For artistic practice, the infrastructural condition presents both constraints and possibilities. Artists working with images today cannot avoid the infrastructural systems that process, circulate, and monetize their work. Every image uploaded to a platform becomes raw material for computational extraction. Yet artists have also developed practices that critically engage with these conditions. Paglen's (2016) work visualizing machine learning datasets and classified military sites makes infrastructural operations visible as a form of artistic practice. Steyerl's (2009) video essays and installations analyze and perform the conditions of images in digital circulation. Blas's (2014) work on 'facial weaponization' develops masks designed to evade facial recognition, transforming illegibility into an artistic and political tactic. These practices do not simply represent infrastructural conditions. They intervene in them, exploring possibilities for agency within and against infrastructural constraints.

6.3 Strategic Possibilities: From Individual Tactics to Structural Intervention

If critique must move beyond representation to engage with infrastructure, what forms might such engagement take? Several strategic orientations emerge from the analysis developed in this book, ranging from individual tactics to collective action and structural transformation. None is sufficient on its own, but together they constitute a repertoire of responses to infrastructural power that operates across multiple scales.

Refusal and withdrawal represent one set of strategies operating at the individual level. If infrastructural power operates by rendering subjects legible, then refusing legibility through opting out, going dark and withdrawing from platforms constitutes a form of resistance. Such strategies have significant limitations. They are often available only to those with sufficient resources and social capital to exit systems that others depend upon, and they may reinforce rather than challenge underlying structures by ceding infrastructural terrain to dominant powers. Nevertheless, practices of digital disconnection, deletion, and refusal assert a form of agency against the imperative to be perpetually available for computational processing.

Obfuscation and noise represent a related but distinct set of individual and collective tactics. Rather than withdrawing from infrastructural systems, obfuscation seeks to disrupt their operations by introducing misleading data. Brunton and Nissenbaum (2015, p. 1) have theorized obfuscation as "the deliberate addition of ambiguous, confusing, or misleading information to interfere with surveillance and data collection". In the context of infrastructural images, obfuscation might involve adversarial images designed to fool computer vision systems, makeup or fashion that defeats facial recognition, or collective practices that pollute datasets with unreliable information. These strategies impose costs and create friction that may limit infrastructural effectiveness, though they operate within rather than against the logic of the system.

Data poisoning and collective technical intervention extend obfuscation from individual tactic to collective strategy. Coordinated efforts to introduce corrupted or misleading data into training datasets can degrade model performance and raise the costs of data extraction. Artist and activist projects such as Glaze, which subtly alters images to prevent AI style mimicry, and Nightshade, which poisons training data, represent technical interventions designed to protect against infrastructural capture (Shan et al., 2023).

These approaches recognize that infrastructural power depends on data and that collective action targeting data flows can disrupt the systems that depend on them.

Legal and regulatory frameworks seek to govern infrastructural power through law and policy. The European Union's General Data Protection Regulation (GDPR) represents one attempt to assert legal control over data processing, including rights to explanation and to contest automated decisions. The EU's AI Act establishes risk-based classifications for AI systems and imposes requirements on high-risk applications including biometric identification. Proposed algorithmic impact assessments, requirements for dataset documentation such as "datasheets for datasets" (Gebru et al., 2021, p. 86), and municipal bans on facial recognition in public spaces enacted in San Francisco (Conger et al., 2019), Boston (Wray, 2020) extend this regulatory orientation. These approaches face significant challenges such as the transnational character of digital infrastructures, the technical complexity that eludes legal categories, and the political influence of platform corporations. But they represent an essential dimension of structural response to infrastructural power.

Labor organizing within the AI supply chain addresses infrastructural power at the point of production. Content moderators, data labelers, and other workers whose labor sustains computational systems have begun to organize for better conditions and greater accountability. Organizations such as Foxglove have supported content moderators in legal actions against platform companies, while researchers have documented the labor conditions of data workers in Kenya, the Philippines, and elsewhere who annotate the images that train computer vision systems (Gray & Suri, 2019; Perrigo, 2023). This labor perspective reveals that infrastructural images depend not only on algorithms and data but on human work that is often invisible, precarious, and poorly compensated. Organizing this labor represents a structural intervention at a point of vulnerability in the infrastructural chain.

Platform cooperativism and alternative infrastructures pursue transformation through the construction of different systems rather than reform of existing ones. Platform cooperatives, platforms owned and governed by their users and workers, offer models for organizing digital services around collective benefit rather than extraction (Scholz, 2016). Data trusts and data cooperatives propose collective governance of personal data, shifting power from platforms to communities. These initiatives remain small relative to dominant platforms, and they face significant challenges of scale, funding, and network effects. Yet they demonstrate that infrastructural arrangements are not technically determined and alternative configurations are possible.

Algorithmic auditing and civil society oversight constitute a further strategic orientation. Organizations such as the Algorithmic Justice League (Buolamwini & Gebru, 2018; Costanza-Chock et al., 2022), AI Now Institute (Reisman et al., 2018; Whittaker et al., 2018), and Data & Society (Rosenblat et al., 2014) have developed methods for examining algorithmic systems, documenting their impacts, and advocating for accountability. Investigative journalism, exemplified by The Markup's systematic investigations of algorithmic harms, has exposed practices that platforms sought to keep invisible (Angwin, 2023). Academic research providing evidence of bias, discrimination, and harm has informed regulatory responses, including the 2019 Algorithmic Accountability Act and municipal facial recognition bans, all of which emerged from the FAccT scholarly community and reshaped public understanding (Buolamwini & Gebru, 2018; Raji & Buolamwini, 2019). These efforts do not transform infrastructures directly, but they create conditions of visibility and accountability that enable other forms of intervention.

No single strategy is adequate to the scale and complexity of infrastructural power. Individual tactics of refusal and obfuscation may protect particular subjects without challenging systemic arrangements. Legal and regulatory approaches may be captured, circumvented, or rendered obsolete by technical change. Labor organizing confronts the global distribution and precarity of AI work. Alternative infrastructures struggle to achieve the scale necessary for meaningful competition. Yet the combination of these individual, collective, technical, legal, institutional strategies operating across multiple dimensions constitutes a more robust response than any single approach can achieve. Infrastructural politics is necessarily plural, distributed, and ongoing. It requires sustained engagement across domains, alliances between differently positioned actors, and recognition that contesting infrastructural power is a long-term project rather than a problem to be solved.

6.4 Research Directions

The framework of the infrastructural image opens research trajectories that extend each of the three analytical axes developed in this book. Rather than offering generic calls for 'more research,' the following directions emerge from specific theoretical gaps and methodological challenges that the preceding analysis has made visible.

6.4.1 Operational Ontologies and Their Limits

The operational turn in image analysis raises fundamental questions about the boundaries and breakdowns of computational vision. If images now function as instructions rather than representations, research must investigate the precise mechanisms through which this operational capacity is achieved and where it fails. The case of Instagram's confusion between Al-Aqsa Mosque and Al-Aqsa Martyrs' Brigades reveals that operational systems depend on categorical stabilizations that remain fragile. What are the conditions under which operational logic breaks down? How do edge cases, ambiguous content, and culturally specific imagery expose the limits of systems designed for universal application? Empirical research tracing the lifecycle of specific images through moderation pipelines, from upload through hash-matching, classifier evaluation, human review, and appeal, could illuminate the points at which operational logics encounter their constitutive limitations.

Equally pressing is research into *counter-operational* practices in the form of the development of images, formats, and circulation strategies designed to resist or subvert operational capture. The emergence of adversarial images that fool classifiers, steganographic techniques that embed information invisible to automated systems, and community practices for evading content moderation all suggest that the operational turn generates its own forms of resistance. Systematic documentation and analysis of these practices could inform both critical theory and practical strategy.

6.4.2 Post-Indexical Archives and Temporal Politics

The transformation of photographic memory into computational substrate opens research questions about the *temporal politics* of infrastructural images. If photographs no longer primarily testify to what 'has been' but instead serve as training data for what will be predicted, how does this alter memory practices at individual, community, and institutional scales? The synthetic image case study revealed that generative systems trained on historical photographs produce outputs that bear indexical traces of the past while representing nothing that occurred. This raises the question of what new forms of historical consciousness emerge when the archive becomes generative rather than preservative.

Research is needed that examines how communities understand and navigate the dual status of their visual records as both personal memory and platform resources. Ethnographic investigation could explore how awareness of datafication affects photographic practice, whether individuals modify their image-making in response to known or suspected algorithmic processing, and whether such modifications constitute accommodation, resistance, or something that exceeds this binary. Longitudinal studies tracking how platform policies reshape the visual documentation of social movements, cultural practices, and everyday life could illuminate the slow violence of infrastructural transformation on collective memory.

The phenomenon of synthetic memory contamination, the circulation of AI-generated images depicting events that never occurred, demands particular attention. The Auschwitz-Birkenau State Museum's intervention against AI Holocaust imagery represents an early instance of institutional response to this challenge. Research should examine how different communities develop practices for authenticating images, how verification failures propagate through information ecosystems, and what institutional frameworks might address the evidentiary crisis that synthetic imagery inaugurates. The **liar's dividend** analyzed in Section 4.6.3, the structural capacity to dismiss authentic evidence by invoking the possibility of synthesis, represents a particularly urgent research priority, as it threatens not only individual truth claims but the evidentiary foundations of democratic deliberation itself.

6.4.3 Infrastructural Power and Its Asymmetries

The third axis, infrastructural power, opens research directions concerning governance, accountability, and the distribution of agency within image infrastructures. The analysis of Clearview AI demonstrated how the aggregation of publicly available images creates surveillance capacities that exceed anything individual disclosure decisions could anticipate. This points toward research on what might be termed *emergent harms*, negative effects that arise not from any single act of image creation or sharing but from the infrastructural aggregation and processing of images at scale. Legal and ethical frameworks premised on individual consent often prove inadequate to such harms. Research at the intersection of law, policy, and technology studies should investigate alternative frameworks, whether based on collective rights, fiduciary duties, or structural regulation, that might address harms irreducible to individual transactions.

The concept of categorical violence developed in Section 5.9, the systematic harm that occurs when infrastructural classification systems impose identities, deny recognition, or enable targeting based on categories inadequate to the populations they govern, requires further empirical elaboration. How do categorical regimes vary across platforms, and what determines which categories achieve infrastructural implementation? How do classification errors distribute across populations, and what mechanisms exist, or fail to exist, for contesting erroneous categorization? Comparative research across platforms, examining how similar content is categorized and treated by different infrastructural systems, could reveal the contingency of categorical arrangements that otherwise appear natural or necessary.

6.4.4 Methodological Innovation

Studying infrastructural images poses distinctive methodological challenges that themselves warrant research attention. Infrastructural operations are designed to be invisible and platforms actively resist external examination of their algorithmic systems. The methodological innovations developed by organizations such as the Algorithmic Justice League, AI Now Institute, Data & Society, and The Markup, including systematic benchmark auditing (Buolamwini & Gebru, 2018; Raji & Buolamwini, 2019), algorithmic impact assessment frameworks (Reisman et al., 2018), and crowdsourced panel-based data collection (Angwin, 2023), represent important resources, but significant gaps remain. Research is needed on methods for studying systems that resist study such as techniques for reverse-engineering classification logics from observable outputs, approaches to accessing and interpreting proprietary training datasets, and frameworks for analyzing infrastructural effects across contexts where direct comparison is complicated by platform opacity.

The temporality of infrastructural research also demands attention. Platform systems change continuously; findings about algorithmic behavior may become obsolete before publication. This suggests the need for research infrastructure such as ongoing monitoring systems, shared datasets, and collaborative networks which are capable of tracking infrastructural transformation over time rather than capturing static snapshots.

6.4.5 Beyond Western-Centric Frameworks

Much existing scholarship on digital image infrastructures focuses on systems developed in North America and Western Europe, treating their global deployment as an extension of Western technological development. Yet infrastructures are always localized in their implementation and effects. Systematic research on how infrastructural images function across different national, cultural, and regulatory contexts remains underdeveloped. Such research is not merely a matter of geographic coverage but of theoretical adequacy. Concepts developed in relation to Silicon Valley platforms may not capture the dynamics of infrastructures operating under different political economies, regulatory frameworks, and cultural assumptions about imagery, privacy, and surveillance. How do state-platform relationships in contexts where platforms operate under conditions of greater governmental control reshape the distribution of infrastructural power? How do communities with different relationships to photographic representation navigate datafication? What alternative configurations of image infrastructure exist or might be imagined from positions outside dominant technological centers? Addressing such questions requires not merely applying existing frameworks to new contexts but potentially revising the frameworks themselves in light of what those contexts reveal.

6.4.6 Toward Non-Western and Comparative Approaches

This book exemplifies the limitation it identifies. All the theoretical resources assembled here, German media theory extending from Benjamin through Flusser and Farocki, Anglo-American science and technology studies, French post-structuralism and critical theory, emerged from specific historical conditions such as industrial modernity, Euro-American visual culture, particular configurations of state and market. While these frameworks illuminate crucial dimensions of infrastructural images, they do not exhaust the forms infrastructural visuality takes globally.

The infrastructures examined here are planetary in scope but uneven in their effects. Content moderation systems designed in Silicon Valley govern image circulation in contexts whose visual vernaculars, political sensitivities, and linguistic particularities they cannot adequately parse. Facial recognition systems trained on datasets skewed toward lighter-skinned populations produce systematically different effects when deployed across diverse populations. Platform memory features impose particular temporalities such as the anniversary, the 'year in review', which may conflict with other cultural organizations of remembrance and forgetting.

Developing genuinely comparative and non-Western approaches to infrastructural images would require more than applying these concepts to new contexts. It would demand engagement with theoretical traditions that conceptualize visuality, memory, and power differently such as scholarship emerging from East Asian media studies, postcolonial and decolonial theory, Arabic and Farsi-language work on digital culture, African scholarship on media infrastructure, and Indigenous approaches to visual sovereignty. Such engagement might not merely extend the framework developed here but revise its foundational assumptions, revealing, for instance, that the opposition between representation and operation, or between indexical and post-indexical, presupposes particular cultural formations rather than universal conditions.

This represents not a gap to be filled by additive inclusion but a horizon requiring different scholarly formations including collaborative research across linguistic and institutional boundaries, attention to theoretical work that circulates outside Anglophone academic infrastructure, and willingness to hold Western frameworks provisionally rather than foundationally. The infrastructural image, as a concept, must itself be understood as emerging from particular infrastructures of knowledge production, infrastructures that this book has inhabited even while analyzing.

6.4.7 Toward Interdisciplinary Synthesis

Finally, the infrastructural image demands forms of knowledge production that exceed existing disciplinary boundaries. The analysis presented in this book has drawn on visual studies, media theory, science and technology studies, critical algorithm studies, surveillance studies, political economy, and legal scholarship. No single discipline commands the conceptual vocabulary, methodological toolkit, or empirical access needed to analyze infrastructural power in its full complexity. The challenge is not merely additive, combining insights from different fields, but synthetic, developing new conceptual frameworks adequate to objects that do not respect disciplinary boundaries. This requires institutional as well as intellectual innovation. Research structures that bring together humanistic interpretation, social scientific investigation, and technical analysis are needed, not as occasional collaborations but as sustained programs capable of accumulating knowledge over time. The emergence of critical AI studies, fairness and accountability in machine learning (FAccT), and related fields represents movement in this direction, but much work remains to build the institutional infrastructure necessary for genuinely interdisciplinary research on infrastructural images.

The stakes of such research extend beyond academic knowledge production. As this book has argued, infrastructural power operates precisely through its invisibility, its naturalization as mere technical arrangement rather than political choice. Research that renders infrastructure visible, that exposes its contingency and identifies its effects, contributes to the conditions of possibility for democratic deliberation about technological futures. In this sense, the research directions outlined here are not merely scholarly desiderata but interventions in ongoing struggles over who will control the visual regimes that increasingly shape social life.

Yet research alone cannot contest infrastructural power. The following chapter surveys the interventions already underway such as artistic practices that make infrastructure visible or disrupt computational legibility, policy frameworks that attempt to constrain algorithmic systems, and activist movements that contest platform power, and technical countermeasures that target the operational logic of computer vision. Analyzing these interventions through the three-axes framework reveals both their achievements and their limitations, clarifying where existing responses cluster and where significant gaps remain.

7. Contesting Infrastructural Images Through A Typology of Interventions

The preceding chapters developed a diagnostic framework, in other words, three axes examining how infrastructural images operate, reorganize memory, and enable governance, and identified directions for future research.

Yet diagnosis and research agendas leave unanswered the question of response. What forms of engagement remain possible when images function as infrastructure rather than representation? This chapter surveys interventions already underway across four domains: artistic practices that make infrastructure visible or disrupt computational legibility (7.2), policy and regulatory frameworks that attempt to constrain algorithmic systems (7.3), activist movements that contest platform power and algorithmic injustice (7.4), and the implications of these interventions for the three-axes framework. The goal is not to prescribe solutions but to analyze what different modes of intervention can and cannot accomplish—clarifying where existing responses cluster and where significant gaps remain. Each domain is assessed through the three-axes framework, revealing a consistent pattern: contestation proves most tractable along the operational axis, partially effective along the post-indexical axis, and most constrained along the power axis.

7.1 From Diagnosis to Engagement

If the preceding analysis has emphasized diagnosis over prescription, this reflects not indifference to practice but recognition that adequate responses require first understanding what infrastructural images are and how they function. The tendency to rush toward solutions before grasping the problem has produced regulatory proposals that address symptoms rather than structures, artistic interventions that expose without disrupting, and critical scholarship that names without analyzing. Yet artistic, political, technical, and regulatory interventions are already underway which engage infrastructural conditions with varying degrees of success. Mapping this terrain through the framework developed in this book clarifies what different modes of engagement can and cannot accomplish.

This chapter surveys existing interventions across four domains, which are artistic and aesthetic practices, policy and regulatory frameworks, activist and advocacy movements, and technical countermeasures. Each domain is analyzed through the three axes developed earlier, operational, post-indexical, and power, to identify what dimensions of the infrastructural condition different interventions address and where significant gaps remain. The goal is not to prescribe specific actions but to provide analytical resources for evaluating interventions and understanding their limitations.

The interventions examined here emerge from different disciplinary traditions, institutional contexts, and political orientations. Some aim primarily at visibility, making infrastructural operations legible to publics who may be unaware of how their images are processed. Others target legibility itself, attempting to disrupt or evade the computational capture that renders subjects available for algorithmic governance. Still others pursue more ambitious structural transformations, building alternative infrastructures organized around different values or contesting the legal and regulatory frameworks that enable existing arrangements. Each approach carries distinct assumptions about where power resides and how it might be contested.

What emerges from this survey is not a comprehensive solution but a diagnostic clarification. Different interventions cluster around particular dimensions of the infrastructural condition while leaving others largely untouched. Visibility-based strategies address infrastructural power but often leave operational logic intact. Technical countermeasures engage computational processes directly but risk individualizing responses to structural conditions. Regulatory frameworks typically address data flows rather than the infrastructural arrangements that determine how data is processed. Understanding these patterns is a precondition for developing responses adequate to the infrastructural condition, responses that would require simultaneous attention to operational logic, temporal reorganization, and power asymmetries in ways that no single mode of intervention currently achieves.

7.2 Artistic and Aesthetic Interventions

Artistic practice has emerged as a significant site for engaging infrastructural images, offering modes of critique and intervention that complement analytical scholarship. Three broad strategies characterize this work: making infrastructure visible, disrupting computational legibility, and building alternative systems. Each addresses different dimensions of the infrastructural condition with corresponding strengths and limitations.

7.2.1 Making Infrastructure Visible

A prominent strand of artistic practice aims to render visible the infrastructures that typically operate beneath perception. This work proceeds from the assumption that exposure constitutes a form of critique, that making systems visible to the public who may be unaware of their operations is a necessary precondition for political contestation.

Trevor Paglen's photographic practice exemplifies this approach. Trained as a geographer, Paglen has spent over two decades documenting the physical infrastructure of surveillance and secrecy such as classified military installations photographed from distances of up to forty miles using high-powered telescopes, undersea communications cables at sites where intelligence agencies tap internet traffic, spy satellites tracked across the night sky; data centers that house the computational apparatus of mass surveillance (Paglen, 2010). His ‘Limit Telephotography’ series pushes optical technology to its limits to capture images of sites that are, by design, invisible to ordinary perception. The resulting photographs, which are often blurred, shimmering with atmospheric distortion, document not only their subjects but the difficulty of seeing them, making visible both the infrastructure and its concealment.

Paglen's more recent work engages directly with machine learning and computer vision systems. In collaboration with AI researcher Kate Crawford, he co-curated ‘Training Humans’ (2019), an exhibition at the Fondazione Prada examining the training datasets used to teach artificial intelligence systems to classify human subjects. The exhibition displayed images from datasets dating back to the 1960s, revealing how photographs scraped from social media and other sources are labeled with categories that range from occupational (‘doctor,’ ‘soldier’) to moral (‘loser,’ ‘slut,’ ‘alcoholic’). By presenting these images in a gallery context, printed on cards and pinned to walls in a manner echoing historical practices of scientific classification, Crawford and Paglen (2019) made visible the usually invisible labor of categorization that underlies facial recognition and computer vision systems. As Crawford observes, "There is a stark power asymmetry at the heart of these tools. What we hope is that Training Humans gives us at least a moment to start to look back at these systems." (Fondazione Prada, 2019).

Crawford and Joler's ‘Anatomy of an AI System’ (2018) pursues a different strategy of visualization. This large-scale map traces the complete lifecycle of an Amazon Echo device from lithium extraction in South American salt flats through global supply chains, manufacturing processes, and data flows, to eventual disposal as electronic waste. The visualization encompasses not only material resources but human labor, from miners to workers who label training data, and the data extracted from users whose voice commands feed back into Amazon's machine learning systems. By mapping these connections, which often span thousands of miles and involve dozens of institutional actors, Crawford and Joler (2018) render legible the planetary infrastructure that sustains a seemingly simple consumer device. The work was acquired by the Museum of Modern Art and the Victoria and Albert Museum, indicating its recognition as both aesthetic object and analytical resource.

Steyerl's (2013) video work engages questions of visibility and invisibility with characteristic irony. 'How Not to Be Seen: A Fucking Didactic Educational .MOV File' offers mock instructions for evading surveillance systems such as camouflaging oneself with green-screen paint, shrinking to the size of a pixel, becoming "a dead pixel," "a Wi-Fi signal moving through human bodies," or simply "being female and over 50" (Steyerl, 2013). Filmed partly at a military site once used to calibrate aerial surveillance cameras, the video oscillates between earnest critique and absurdist humor. Steyerl has explained that the work originated from stories of rebels evading drone surveillance by covering themselves with reflective plastic sheets and dousing themselves with water to lower their body temperature, noting that "The paradox, of course, is that a landscape littered with bright plastic-sheet monochromes would be plainly visible to any human eye—but invisible to the drone's computers" (Steyerl and Poitras 2015). The video makes visible the gap between human and machine vision while acknowledging the difficulty of escaping either.

These visibility-oriented practices offer important contributions to public understanding of infrastructural images. They bring into perception systems that are designed to operate beneath awareness, creating opportunities for reflection and critique. Yet visibility alone does not neutralize infrastructural power. As the analysis in Chapter 5 demonstrated, exposure does not make systems stop functioning. A viewer who has seen Paglen's photographs of NSA facilities remains subject to the surveillance those facilities enable. A visitor to the 'Training Humans' exhibition returns to a world in which their photographs continue to be scraped, labeled, and incorporated into training datasets. Visibility is a necessary but insufficient condition for contestation. It addresses the concealment dimension of infrastructural power while leaving operational logic intact.

7.2.2 Disrupting Computational Legibility

A second strand of artistic practice moves beyond visibility to engage directly with the technical systems that process images. Rather than making infrastructure visible to human observers, these interventions aim to disrupt the legibility of human subjects to computational systems to evade, confuse, or subvert the algorithms that extract features, assign categories, and render faces recognizable.

Harvey's (2010) ‘CV Dazzle’ project represents a foundational intervention in this domain. Developed as Harvey's master's thesis at New York University, CV Dazzle (Computer Vision Dazzle) uses makeup and hair styling to defeat facial detection algorithms. The project's name references WWI ‘dazzle’ camouflage, which was bold geometric patterns painted on battleships to confuse enemy observers about the vessels' orientation and speed. Harvey adapted this principle to computer vision, developing looks that break apart the expected continuity of a face through asymmetrical makeup that disrupts the bilateral symmetry algorithms expect, hair styled to obscure the nose bridge area that serves as a key landmark for detection and high-contrast patterns that confuse the tonal gradients used to identify facial features (Harvey, 2010). The resulting aesthetics are striking, part fashion editorial, part tactical manual, and have influenced both activist practice and commercial fashion.

Harvey has continued developing anti-surveillance aesthetics through subsequent projects. HyperFace (2017), developed in collaboration with Hyphen-Labs for their NeuroSpeculative AfroFeminism project, inverts the CV Dazzle approach: rather than preventing facial detection, it overwhelms detection systems with false positives. Fabric patterns are designed to present multiple face-like configurations, flooding the algorithm with competing targets and degrading its ability to identify actual faces (Harvey 2017; Young 2019). His work Stealth Wear, created with fashion designer Johanna Bloomfield, addresses thermal surveillance, using silver-plated fabrics that reflect body heat to reduce visibility to infrared imaging systems of the kind used in drone surveillance (Harvey 2013). Each project responds to specific technical vulnerabilities, adapting as detection systems evolve.

Zach Blas's "Facial Weaponization Suite" (2011–2014) takes a more explicitly political approach to evading biometric capture. The project consists of community-based workshops in which participants' faces are scanned and aggregated into "collective masks", amorphous forms generated from the combined biometric data of many individuals that cannot be detected as human faces by recognition algorithms (Blas 2013). Drawing on Glissant's (1997) philosophy of opacity, which is "not enclosure within an impenetrable autarchy but subsistence within an irreducible singularity" (p. 190) or the right to exist without being reduced to categories imposed by surveillance systems, Blas (2014a) theorizes these masks as exercises in what he terms "informatic opacity", which is a refusal of the legibility that biometric governance requires. Where Harvey's (2010, 2013, 2017) interventions operate primarily at the technical level of defeating specific algorithms, Blas appears to frame the refusal of biometric capture as a collective political act aligned with masked social movements from the Zapatistas to Anonymous. The masks do not merely evade detection. They assert what Blas describes as "the autonomous determination of alterity and difference" against "the quantification, standardization, and regulation of identity imposed by biometrics and the state" (Blas 2014b, p. iv). Yet Blas himself acknowledges the limitations, accepting that "The masks I make can evade biometric detection... but they have limited applicability. So my work is also about political desire, pedagogy, collective experiences" (Blas, quoted in Valentine 2014). This candid assessment points toward a broader tension in artistic interventions, between technical efficacy and political utility, between individual acts of evasion and structural transformation.

These interventions engage operational logic directly, targeting the technical processes through which subjects become computationally legible. Yet they face significant limitations. First, they operate as an arms race. As detection algorithms evolve, countermeasures must evolve with them. Harvey's (2010) original CV Dazzle designs targeted the Viola-Jones algorithm prevalent in 2010; however, newer convolutional neural network systems require different countermeasures, which Harvey has continued to develop over his following projects. This dynamic favors well-resourced actors who can continuously update their detection capabilities over individuals or communities with limited technical expertise. Second, these interventions tend toward individualization. While Blas (2013) frames his masks as “collective” tools, the act of evading detection remains fundamentally personal as each individual must choose to wear camouflage, apply makeup, or don a mask. This individualizes what is structurally a collective problem, the pervasive deployment of surveillance infrastructure that subjects entire populations to computational capture. An individual who successfully evades facial recognition does nothing to contest the system's existence or its effects on others. Third, evasion carries its own risks. To be undetectable is to be, in some sense, illegible, to exist outside the categories through which institutions recognize and serve populations. The same opacity that protects against surveillance may also preclude access to services, rights, or recognitions that depend on identification. The ambivalence Steyerl (2013) identifies, namely, disappearance as both relief and "spectre of mass political abduction", haunts all strategies of evasion.

What emerges from these disruption-oriented practices is a shared structural limitation. Both Harvey's technical countermeasures and Blas' collective masks engage the operational logic of computer vision systems directly, the first axis of infrastructural image analysis. Yet this engagement remains reactive. Each intervention responds to existing detection protocols, creating a perpetual arms race between evasion techniques and algorithmic refinement. More fundamentally, these strategies address the symptom, being seen by machines, rather than the infrastructure that makes such seeing consequential. They offer tactics for individuals or small collectives to temporarily escape categorical capture, but leave intact the systems that render such capture governance. The ambivalence between technical utility and political usefulness reflects a deeper tension. Disrupting computational legibility may be necessary for immediate protection, but it cannot, on its own, transform the infrastructural arrangements that make legibility dangerous in the first place.

7.2.3 Building Alternative Systems

A third strategic approach to contesting infrastructural images moves beyond both visibility, making infrastructure legible, and disruption, evading algorithmic capture, toward the construction of alternative infrastructures altogether. Where the previous strategies accept the existence of dominant image infrastructures and seek either to expose or circumvent them, alternative-building projects attempt to create new systems governed by different logic, systems in which images might circulate, be stored, and generate meaning according to principles other than operational extraction and categorical governance.

7.2.3.1 Structural Constraints on Alternative-Building

Alternative-building confronts a fundamental paradox: any alternative infrastructure must be built within and through existing infrastructural arrangements. As Terranova (2000) argued in her foundational analysis of digital labor, the contemporary digital economy is characterized by the appropriation of "free labor", activity that is "simultaneously voluntarily given and unwaged, enjoyed and exploited" (p. 33). Alternative image infrastructures cannot escape this condition; they emerge from, depend upon, and remain embedded within the very systems they seek to replace. They must work within a context in which "work processes have shifted from the factory to society" (Terranova 2000, 37). Alternative image infrastructures must therefore contend with the fact that they emerge from, depend upon, and remain embedded within the very systems they seek to replace.

Srnicek's (2017, p. 27) analysis of "platform capitalism" illuminates why building alternatives proves so structurally difficult. As Srnicek (2017) argues, platforms possess inherent tendencies toward monopoly. Network effects mean that each additional user increases platform value, creating self-reinforcing dynamics that concentrate power in established systems. For image infrastructures specifically, this manifests in the massive scale required for accurate training datasets, the capital investment demanded by computational processing, and the institutional integrations such as connections to databases, identification systems, governance mechanisms, which create path dependencies alternatives cannot easily replicate. Empirical research confirms these barriers as platform cooperatives encounter "complex governance and above all, their lack of funding," with network effects creating particular difficulties for scaling (Philipp et al., 2021, p. 1). The obstacle is not primarily technical but structural, existing systems benefit from accumulated advantages that alternatives cannot match within the competitive logic of platform capitalism.

The Internet Archive illustrates both the possibility and limits of nonprofit digital infrastructure. Founded in 1996, its mission of 'universal access to all knowledge' positions it against proprietary platforms, and its Wayback Machine operates on principles fundamentally opposed to operational ephemerality. Yet ongoing legal battles (*Hachette Book Group, Inc. v. Internet Archive*, 2024) demonstrate how alternative infrastructures remain vulnerable to legal and economic pressures from incumbent systems. Even a well-funded, established nonprofit cannot escape the property regimes and infrastructural dependencies structuring contemporary digital systems. The Archive's servers require electricity, connectivity, and hardware from commercial providers; its operations remain subject to copyright law interpreted by courts sympathetic to publishing incumbents. Alternative-building, however necessary, cannot simply opt out of the conditions it contests.

7.2.3.2 Alternative Governance Models: Indigenous Data Sovereignty and Platform Cooperativism

Despite structural constraints, significant efforts to build alternative systems have emerged, often from communities most directly harmed by dominant infrastructures. Two approaches warrant examination: Indigenous data sovereignty, which articulates alternative principles for data governance, and platform cooperativism, which proposes alternative ownership structures for digital infrastructure.

The Indigenous data sovereignty movement represents perhaps the most theoretically developed challenge to the operational logic of contemporary data infrastructures. The CARE Principles for Indigenous Data Governance, which are Collective Benefit, Authority to Control, Responsibility, and Ethics, directly contest assumptions underlying infrastructural image systems (Carroll et al., 2020). Where dominant infrastructures operate according to FAIR principles (Findable, Accessible, Interoperable, Reusable) designed to maximize data circulation, CARE emphasizes that such principles “focus on characteristics of data that will facilitate increased data sharing among entities while ignoring power differentials and historical contexts” (Global Indigenous Data Alliance, 2019). The CARE framework insists that data governance must be “people- and purpose-oriented,” positioning data approaches within Indigenous cultures and knowledge systems rather than treating images as resources for external extraction (Carroll et al., 2020, p. 4).

The Mukurtu content management system provides practical instantiation of these principles. Developed in collaboration with Indigenous communities, Mukurtu was “built from the ground up with the needs of Indigenous communities in mind,” allowing 'communities to define levels of access to and circulation of their digital heritage' (Christen, 2015a, p. 5). The system embeds cultural protocols directly into its architecture: certain images may be viewable only by specific community members based on gender, clan, or ceremonial status; metadata can include multiple community narratives rather than singular authoritative descriptions. As Christen (2015b, p. 124) explains, the challenge was creating systems that 'emphasize not looking as much as looking'—directly inverting the logic of infrastructural images, which assume that more visibility and circulation automatically produce value. Mukurtu recognizes that control over visibility, including the right not to be seen, constitutes a form of sovereignty.

Platform cooperativism, articulated most prominently by Scholz (2016), represents a complementary approach through alternative ownership structures. Scholz argues that addressing "the myriad ills of the sharing economy—that is to say platform capitalism" requires "changing ownership, establishing democratic governance, and reinvigorating solidarity" (p. 1). Platform cooperatives, 'jointly owned and democratically controlled platforms" (Philipp et al., 2021, p. 1), could potentially include image-sharing systems, content moderation infrastructures, and data commons governed by democratic deliberation rather than data extraction imperatives. Yet empirical research reveals inherent tensions between platform logic and cooperative governance. Rapid scaling conflicts with deliberative decision-making, and cooperatives face persistent challenges in capital and institutional support (Philipp et al., 2021). The collective ownership of an image platform, however democratic, cannot escape competition with dominant infrastructures controlling computational resources, training datasets, and institutional integrations.

7.2.3.3 Platform Cooperativism: Democratic Ownership of Digital Infrastructure

The platform cooperativism movement, articulated most prominently by Scholz (Scholz, 2016), represents another approach to building alternative infrastructures. Scholz (2016) argues that "we'll only be able to address the myriad ills of the sharing economy—that is to say platform capitalism—by changing ownership, establishing democratic governance, and reinvigorating solidarity" (p. 1). Platform cooperatives are "jointly owned and democratically controlled platforms that promise a more social alternative to platform capitalism" (Philipp et al. 2021, p. 1), potentially including image-sharing platforms, content moderation systems, and data commons.

The movement explicitly addresses the infrastructural dimension of digital power. Scholz (2016) argues that worker-owned cooperatives could design their own platform technologies, challenging the assumption that dominant platforms represent the only possible digital future. Applied to image infrastructures, this suggests the possibility of collectively-owned systems for image storage, circulation, and analysis, systems governed not by the imperatives of data extraction and algorithmic classification but by democratic deliberation among stakeholders.

Yet platform cooperativism also illustrates the limitations of alternative-building within existing structural conditions. Empirical research reveals inherent tensions between platform logic and cooperative governance: the former demands rapid scaling and network growth, while the latter requires deliberative decision-making and equitable participation (Philipp et al. 2021). Cooperatives also face persistent challenges in raising capital and securing institutional support. More fundamentally, Srnicek (2017) observes that platform cooperatives remain subject to competition with dominant platforms that benefit from network effects, accumulated capital, and monopolistic control over essential resources. The collective ownership of an image platform, however democratic its governance, cannot escape the gravitational pull of dominant infrastructures that control the computational resources, training datasets, and institutional integrations that make image systems powerful.

7.2.3.4 Assessing Alternative-Building Through the Three Axes

Analyzing alternative-building efforts through the three-axes framework serves a dual purpose: illuminating the contributions and limitations of existing alternatives while testing the framework's explanatory capacity. If the three axes accurately capture what distinguishes infrastructural images from earlier regimes, then this analysis should reveal which dimensions are more or less amenable to contestation.

Along the **operational axis**, alternatives like Mukurtu and platform cooperatives articulate genuinely different logic for image circulation and use. They reject the foundational assumptions of dominant image infrastructures, that images should be universally accessible, infinitely replicable, and optimized for computational processing. Mukurtu's cultural protocols encode the principle that visibility itself must be governed, that some images should circulate only among certain viewers, at certain times, under certain conditions. Platform cooperativism's democratic governance substitutes collective deliberation for algorithmic optimization in decisions about what images appear, how they are categorized, and who benefits from their circulation. These are not merely different policies applied to the same underlying system. They represent alternative operational logic that could, in principle, govern image infrastructures differently. The relative success of interventions along this axis suggests that operational logic, while deeply embedded, remains the most contingent of the three dimensions as it is the layer most amenable to conscious redesign, precisely because it involves explicit rules and protocols that humans can articulate and modify.

However, these alternatives largely fail to engage the **post-indexical axis**, which is the transformation of images under computational conditions, in theoretically sophisticated ways. Indigenous data sovereignty frameworks and platform cooperatives focus predominantly on questions of governance, ownership, and circulation such as who controls images, who can access them and who benefits from their use. These are urgent political questions, and the practical focus is understandable. Yet they leave largely unaddressed the deeper ontological shift that this book has traced, which is the transformation of images from representations that testify to past events into operational objects that generate future classifications. Mukurtu preserves and governs images, but does not necessarily interrogate how those images function differently when they become computationally legible, when facial recognition systems can process them, when machine learning models can train on them, when they become nodes in databases that produce categorical determinations about people and populations. The question of what it means for an image to serve as testimony, evidence, or collective memory within alternative systems remains undertheorized by practitioners focused on immediate governance concerns. This gap is not a failure of the alternatives so much as an indication of where theoretical work, work of the kind this book attempts, might contribute to practical efforts. Understanding that images have undergone an ontological transformation, not merely a change in who controls them, could inform the design of alternatives that address not only circulation and access but also the very conditions under which images become infrastructural.

Along the **power axis**, infrastructural power, the limitations of alternative-building become most acute, revealing a structural asymmetry that no amount of local redesign can overcome. Alternative systems can establish different governance principles within their bounded domains, but they cannot escape their embedding within larger infrastructural arrangements that they did not create and cannot control. Mukurtu runs on commercial servers, transmits data through privately-owned internet infrastructure, and depends on web browsers and operating systems developed by the same technology corporations whose platforms it seeks to circumvent. Platform cooperatives require app stores controlled by Apple and Google, payment processors subject to financial regulations designed for incumbent institutions, and cloud computing resources dominated by Amazon, Microsoft, and Google. The Internet Archive, despite its scale and longevity, remains subordinate to copyright regimes interpreted by courts sympathetic to publishing incumbents, as the Hachette litigation demonstrates. These dependencies are not incidental or temporary obstacles that better funding or smarter design could overcome. They reflect the fundamental nature of infrastructure itself. Infrastructural power derives not from any single node but from the entire assemblage of interconnected systems, and operating within this assemblage necessarily subjects alternatives to forces they cannot direct. Building an alternative node redistributes power locally, within the Mukurtu archive, within the cooperative platform and within the Internet Archive's servers, but cannot transform the network architecture that determines which nodes matter and how power flows between them.

What emerges from this assessment is a clearer understanding of the uneven terrain on which contestation occurs. The three axes are not equally amenable to transformation. Operational logic, the most visible and explicit dimension, can be locally redesigned. Alternatives demonstrate that different rules for image circulation are technically feasible and practically implementable. Post-indexical transformation, the ontological dimension, remains largely unaddressed by existing alternatives, not because it cannot be contested, but because the conceptual frameworks for understanding it have not yet sufficiently informed practical design. This represents both a limitation of current efforts and an opportunity for theoretical intervention. Articulating what post-indexicality means for image governance could open new directions for alternative-building that current approaches have not explored. Infrastructural power, the deepest and most structural dimension, appears least amenable to transformation through alternative-building alone. The recursive dependency of alternatives on dominant infrastructures suggests that local experiments, however valuable, cannot achieve systemic change without broader transformations in the political economy of digital infrastructure itself, which are transformations that exceed what any single project, cooperative, or archive can accomplish.

This asymmetry has implications for how we understand the relationship between artistic, technical, and political interventions. If the **operational axis** proves locally contestable, the post-indexical axis requires theoretical articulation, and the power axis demands political-economic transformation, then effective contestation likely requires coordinated efforts across all three registers, efforts that no single strategy, whether visibility projects, disruption tactics, or alternative-building, can accomplish alone.

7.3 Policy Interventions

The artistic interventions examined in Section 7.2 operate through aesthetic disruption, making infrastructure visible, confounding algorithmic legibility, or constructing alternative systems that embody different values. These approaches achieve their effects primarily at the level of perception and practice, reshaping how we see and interact with image infrastructures. Policy interventions pursue a different logic. Rather than working around or against existing power structures, they seek to reshape the legal and institutional conditions within which infrastructural images operate. If artists like Trevor Paglen reveal what image systems do and projects such as Mukurtu demonstrate what they might otherwise be, regulatory frameworks attempt to constrain what they are permitted to do. This distinction is consequential. Policy interventions carry the legitimating authority of democratic governance and the enforcement capacity of state power, which are resources unavailable to artistic or alternative infrastructure projects. Yet this institutional positioning also entails characteristic limitations. Regulatory frameworks must operate through legal categories that may poorly map onto technical realities, enforcement requires resources and expertise that states often lack relative to regulated entities, and the legislative process itself becomes terrain for contestation by those with the most to lose from constraint. This section examines how policy interventions engage infrastructural images across the three axes developed in this book, arguing that while regulation achieves significant victories at the level of operational logic, it struggles to contest post-indexical truth claims and confronts fundamental asymmetries when addressing infrastructural power.

7.3.1 The Promise of Regulatory Governance

If artistic interventions operate through aesthetic disruption and alternative systems attempt to build outside dominant infrastructures, policy interventions seek to reshape the conditions of possibility within which infrastructural images operate. Regulation represents the most institutionally legible form of contestation, the terrain where democratic societies have traditionally adjudicated conflicts between private power and public interest. The emergence of comprehensive legal frameworks governing algorithmic systems, biometric data, and artificial intelligence would seem to offer the most direct path to constraining the operational logic, evidentiary claims, and infrastructural power that define contemporary image regimes.

The past decade has witnessed unprecedented regulatory activity in this domain. The European Union's General Data Protection Regulation (GDPR), implemented in 2018, established biometric data as a ‘special category’ requiring explicit consent and heightened protection (Regulation

(EU) 2016/679, General Data Protection Regulation, 2016). The EU AI Act, which entered force in 2024 with Article 5 prohibitions taking effect in February 2025, represents the world's first comprehensive legal framework explicitly banning certain AI practices deemed to pose "unacceptable risk" to fundamental rights under Article 46 (Regulation (EU) 2024/1689, 2024). At the municipal level, cities from San Francisco to Boston have enacted prohibitions on government use of facial recognition technology, responding to civil society mobilization around algorithmic bias and surveillance concerns (Sheard & Schwartz, 2022). These developments suggest a regulatory apparatus finally catching up to technological transformation.

Yet the analysis developed in this book compels skepticism toward celebratory accounts of regulatory achievement. If infrastructural images derive their power from the intersection of operational logic, post-indexical truth claims, and infrastructural embeddedness, then effective contestation must address all three dimensions simultaneously. This section examines how policy interventions engage, and fail to engage, these structural characteristics, arguing that while regulation achieves significant local victories, it confronts fundamental limitations rooted in the very architecture of the image infrastructure it seeks to govern.

7.3.2 Data Protection and the Consent Paradigm

The European Union's General Data Protection Regulation's (GDPR) treatment of biometric data exemplifies both the promise and limitations of rights-based regulatory approaches. By classifying facial images processed for identification as 'special category data' under Article 9, the regulation subjects facial recognition systems to heightened requirements. Processing is generally prohibited without absent explicit consent or specific legal grounds. Individuals retain rights to access, rectification, and erasure, and data controllers must conduct impact assessments for high-risk processing activities (Regulation (EU) 2016/679, General Data Protection Regulation, 2016). This framework represents genuine progress in establishing legal constraints on previously unregulated practices.

However, the GDPR's architecture reveals structural limitations that scholars have extensively documented. Edwards and Veale (2017, p. 50) argue that the much-discussed "right to explanation" in automated decision-making provisions is "probably not the remedy you are looking for," (p. 18) identifying what they term a "transparency fallacy" (p. 65), the assumption that making algorithmic systems legible to individuals will meaningfully constrain their operation. The regulation's narrow application to decisions "based solely" (Wachter et al., 2017, p. 25) on automated processing, combined with ambiguity about what constitutes "meaningful information" about system logic, creates implementation gaps that limit practical effectiveness (Kaminski, 2019, p. 200). As Edwards and Veale observe, people are usually interested in action, not explanation;in other words, they want outcomes changed, not processes clarified.

More fundamentally, the GDPR's individualist orientation struggles to address the collective harms characteristic of infrastructural image systems. As Puri (2023, p. 21) argues, "contemporary privacy challenges go beyond individual interests and result in collective harms" that cannot be adequately addressed through frameworks premised on individual consent and individual rights. This ‘mosaic effect’ whereby aggregated data about one person enables inferences about others illustrates this limitation. My facial data, combined with millions of others, trains systems that can then identify people who never consented to any data collection (Barocas & Nissenbaum, 2014). As Puri (2023) observes, privacy frameworks premised on Personally Identifiable Information protection fail to capture how infrastructural images function as population-level classification systems rather than individual-level data repositories.

The consent paradigm also presumes a market relationship between data subjects and data controllers that infrastructural images increasingly render fictional. Zuboff (2019) argues that surveillance capitalism creates such conditions of digital infrastructure which have become so essential to contemporary life that meaningful refusal is nearly impossible. When facial recognition operates through CCTV networks in public spaces, 'consent' becomes a category error as the choice is not whether to participate but whether to exist in urban space at all. Veale et. al. (2018, p. 1) document a "disconnect between organisational and institutional realities" and the assumptions embedded in regulatory frameworks, a gap that "undermines practical initiatives" toward algorithmic accountability (p. 1). As a dimension of this complexity, algorithmic systems are "not standalone little boxes, but massive, networked ones with hundreds of hands reaching into them" (Veale et al., 2018, p. 7). Regulatory frameworks that assume clearly bounded systems with identifiable decision points struggle to govern these distributed, continuously evolving assemblages. The result is that well-intentioned accountability initiatives such as impact assessments, transparency requirements and explanation rights encounter institutional realities that render them procedural exercises rather than substantive constraints.

7.3.3 Prohibitionist Approaches

Recognizing the limitations of consent-based frameworks, regulators have increasingly turned to outright prohibition of practices deemed categorically harmful. The EU AI Act's Article 5 bans represent the most ambitious such effort, prohibiting AI systems that create or expand facial recognition databases through untargeted scraping, infer emotions in workplace or educational settings, categorize individuals based on biometric data to infer sensitive attributes, or deploy real-time remote biometric identification in public spaces for law enforcement except under narrowly defined circumstances (Regulation (EU) 2024/1689, 2024). Violations carry penalties up to €35 million or 7% of global annual turnover, establishing material consequences for non-compliance.

Municipal facial recognition bans pursue similar prohibitionist logic at local scale. San Francisco's 2019 ordinance, the first of its kind, forbade city departments including police from purchasing or using facial recognition technology, established disclosure requirements for existing surveillance systems, and provided enforcement mechanisms including private rights of action (Sheard & Schwartz 2022). Oakland, Berkeley, Boston, and over a dozen other municipalities followed, responding to documented evidence of algorithmic bias and civil society mobilization around surveillance concerns (Vyse, 2019). As the Civil Liberties attorney with the ACLU of Northern California argued, "decisions about whether we want to hand the government the power to identify who attends protests, political rallies, church, or AA meetings should not be made in the secret backroom of a police station, lobbied by corporate executives" (American Civil Liberties Union, 2019).

These prohibitionist interventions achieve significant victories. They establish that certain applications of image infrastructure are categorically unacceptable regardless of accuracy improvements or procedural safeguards. They shift the burden of justification from those harmed by surveillance to those deploying it. And they create regulatory precedents that may inform subsequent policy development elsewhere, the much-discussed "Brussels effect" whereby EU regulation influences global standards (Hine, 2024, p. 1).

Yet prohibitionist approaches also reveal characteristic limitations. First, scope restrictions significantly narrow actual impact. The EU AI Act's prohibition on untargeted facial scraping applies only to database expansion, not to existing databases, and excludes databases used for purposes other than identification (European Commission, 2025, para. 234). Municipal bans typically restrict only government deployment, leaving private sector use unregulated. San Francisco's ordinance, for instance, constrains city agencies while commercial applications such as retail surveillance, targeted advertising and employment screening remain entirely outside its reach (Chen, 2019). The proliferation of facial recognition across private contexts continues largely unconstrained by these landmark prohibitions.

Second, exception structures embedded within prohibitions often expand to swallow the rules they qualify for. The EU AI Act's law enforcement exceptions permit real-time biometric identification for locating missing persons, preventing terrorist attacks, and identifying suspects in serious crimes, which are categories sufficiently capacious to authorize extensive deployment under appropriate justificatory framing. Civil society organizations that advocated for stronger protections characterize the final legislation as riddled with loopholes and carve-outs that transform what was intended as rights-protective regulation into modest product safety legislation (Access Now, 2024). The gap between legislative intent and operational reality reflects both genuine complexity in balancing competing interests and successful industry lobbying throughout the legislative process.

7.3.4 The Regulatory Gap

The limitations of both consent-based and prohibitionist approaches point toward the regulatory gap, the structural mismatch between policy instruments and the objects they seek to govern. This gap manifests across three dimensions that together reveal the architecture of regulatory limitation.

The implementation gap concerns the distance between legislative text and operational practice. Veale and Brass (2019) demonstrate how public sector machine learning systems operate through organizational logic such as procurement processes, contractor relationships and data sharing arrangements, which existing accountability frameworks struggle to penetrate. Impact assessments become bureaucratic exercises rather than substantive evaluations, while human oversight requirements are satisfied by perfunctory reviews that preserve algorithmic authority while providing legal cover. Article 29 Working Party guidance acknowledges that merely nominal human involvement does not constitute meaningful oversight, but distinguishing genuine scrutiny from administrative formality proves enormously difficult in practice (Article 29 Working Party, 2018).

The jurisdictional gap concerns the mismatch between territorially bounded regulatory authority and globally distributed image infrastructure. Clearview AI exemplifies this asymmetry. The company operates from the United States while scraping images from platforms worldwide and selling services to law enforcement across jurisdictions. European regulators can impose fines for GDPR violations, and have done so repeatedly, but cannot prevent the company from continuing operations or compel deletion of European citizens' data from servers beyond their reach. The EU AI Act's extraterritorial provisions theoretically extend to any system whose output is used within the EU, but enforcement against entities lacking EU presence or assets still remains practically challenging (Quinn Emanuel, 2025).

Most significantly, the political economy gap concerns the structural asymmetry between regulatory capacity and the resources available to regulated entities. During 2023, two-thirds of European Parliament meetings on AI were with corporate interests, rising to 86 percent for high-level Commission officials. Chief executives of Google, OpenAI, and Microsoft secured direct meetings with commissioners and heads of state (Vranken, 2023). This lobbying effort succeeded in removing fundamental rights checks from the general-purpose AI provisions and establishing industry-favorable implementation frameworks based on self-regulation through codes of conduct (Corporate Europe Observatory, 2024; Henshall, 2023). The regulatory gap thus reflects not merely inadequate resources or political will but a structural characteristic of the regulatory terrain. The entities that deploy infrastructural images possess the technical expertise, data resources, and financial capacity to shape the rules governing their own activities. Surveillance capitalism has achieved what Zuboff (2022, p. 1) terms "governance incursions", not failures of regulation but captures of regulatory processes themselves. The EU AI Act's reliance on self-assessment and certification for high-risk systems, a framework lobbied for throughout the legislative process, exemplifies how regulated entities come to define the standards by which they are judged.

7.3.5 Policy Through the Three-Axes Framework

Applying the theoretical framework developed in this book illuminates why policy interventions achieve partial victories while failing to fundamentally contest infrastructural image power.

Along the **operational axis**, policy interventions most effectively contest operational logic when they target specific system configurations rather than underlying computational processes. The EU AI Act's prohibition on emotion recognition in workplaces, for instance, directly addresses particular operationalizations of facial analysis deemed categorically harmful. Municipal facial recognition bans similarly target specific deployments such as police use of identification systems rather than the broader logic of algorithmic image classification. These targeted interventions can effectively constrain particular operational instantiations while leaving the generative logic of machine-readable visibility undisturbed. The same companies prohibited from deploying real-time biometric identification can continue developing post-remote systems, training foundation models on facial data, and building the technical capacity that can be rapidly deployed when regulatory winds shift.

Along the **post-indexical axis**, policy interventions largely fail to contest the evidentiary transformations that render images operational rather than representational. The GDPR's transparency requirements, algorithmic impact assessments, and explanation rights all presume that the problem with automated systems is insufficient visibility into their operations, meaning if we could understand the ‘logic' of algorithmic decisions, we could evaluate their appropriateness. But as this book has argued, infrastructural images make truth claims of a fundamentally different character than human interpretation of visual evidence. The confidence scores, match thresholds, and categorical assignments produced by facial recognition systems do not function as evidence in any traditional sense. They constitute new forms of knowledge production that evade the epistemological frameworks regulation assumes. As Rouvroy and Berns (2013) argue, algorithmic governance "produces no subjectification, it circumvents and avoids reflexive human subjects, feeding on infra-individual data which are meaningless on their own, to build supra-individual models of behaviours or profiles without ever involving the individual" (p. 171). Legal frameworks designed around individual rights, consent, and evidentiary challenge presuppose the very subject that algorithmic systems bypass entirely. Policy interventions have not developed conceptual vocabulary, let alone legal instruments, for contesting knowledge claims that operate beneath the threshold of individual perception and beyond the scale of human interpretation.

Along the **power axis**, the limitations of policy intervention become most apparent. The infrastructural power analyzed in this book derives from the embeddedness of image systems within data architectures, cloud computing platforms, API ecosystems, and training pipelines that constitute the material foundation of contemporary digital infrastructure. This embeddedness creates forms of dependence that regulation can constrain but cannot escape. The observation that surveillance capitalism creates "conditions of practical and psychological 'no exit'" (Zuboff, 2019, pp. 221) applies equally to regulatory authorities themselves as governments increasingly depend on the same cloud platforms, data analytics capabilities, and AI systems they seek to govern. The EU Commission's COVID-19 contact tracing collaboration with Apple and

Google, analyzed by Zuboff (2022), exemplifies how "digital infrastructure control" (Zuboff, 2022, p. 44) enables private entities to "subjugate democratic governments" (p. 1) even during public health emergencies.

The political economy of lobbying documented by Corporate Europe Observatory (2024) represents infrastructural power in its most direct political expression. But more subtle forms of infrastructural dependency may prove more consequential such as the standardization processes through which 'technical' implementation decisions are made, the revolving door between regulatory bodies and industry, the funding relationships that shape academic research on AI governance, and the expertise asymmetries that make regulators dependent on regulated entities for understanding the systems they oversee.

This graduated pattern of effectiveness illuminates both the possibilities and the limits of policy intervention. Operational logic proves locally contestable because specific system configurations can be identified, named, and prohibited within existing regulatory categories. Emotion recognition becomes a definable prohibited practice, real-time biometric identification a regulable deployment. Post-indexicality resists policy intervention because the epistemological transformation it names, the shift from images that represent to images that operate, occurs at a level of abstraction that legal frameworks lack vocabulary to address. Policy can require transparency about algorithmic decisions without contesting the fundamental reconstitution of evidentiary claims that algorithmic systems enact. Infrastructural power proves most resistant because the embeddedness of image systems within essential digital infrastructure creates dependencies that policy can constrain but cannot escape because regulators operate within the same data architectures, cloud platforms, and computational systems they seek to govern. These differential outcomes suggest that policy interventions work most effectively not as standalone solutions but as one element within coordinated contestatory strategies that simultaneously address all three axes. The artistic interventions examined in Section 7.2.2 contest post-indexical claims through aesthetic disruption, while the alternative systems of Section 7.2.3 construct partial exits from infrastructural dependency. Policies' contribution lies in constraining specific operational instantiations while these other modalities contest the deeper logics that policy cannot reach. The activist mobilizations examined in the following section represent another essential modality, one that often creates the political conditions under which policy reform becomes possible.

7.4 Activist Interventions

The policy mechanisms examined in Section 7.3 operate through formal institutional channels such as legislative prohibition, regulatory enforcement and administrative oversight that require infrastructural image harms to be translated into legally cognizable categories before contestation becomes possible. Activist interventions operate through different channels such as investigative journalism that renders invisible systems publicly visible, technical research deployed for advocacy rather than neutral assessment, community organizing that builds power among those targeted by surveillance, and coalition mobilization that connects disparate constituencies under unified demands. These modalities do not merely prepare the ground for subsequent policy reform, though they often do. They constitute distinct forms of contestation with their own logic of effectiveness and limitation. Where policy intervention presumes that properly designed regulation can constrain algorithmic harms, activist intervention often proceeds from more fundamental skepticism about the reformability of systems whose harms are architectural rather than incidental. The movements examined here, from investigative exposés to abolitionist organizing, share a recognition that contesting infrastructural images requires not only technical critique but the production of counter-publics capable of sustained political opposition. Applying the three-axes framework to these interventions reveals a pattern distinct from policy. Activist movements prove more effective at contesting the epistemological authority of infrastructural images through counter-evidence production, while facing different, though no less significant, constraints when confronting infrastructural power.

7.4.1 The Logic of Activist Contestation

Where policy interventions operate through the formal mechanisms of legislative authority and regulatory enforcement, activist interventions contest infrastructural images through different modalities such as investigative exposure, research-advocacy fusion, community organizing, and coalition mobilization. These approaches do not merely create political conditions for subsequent policy reform, though they often do, but constitute distinct forms of contestation with their own logic, achievements, and limitations. Activist interventions typically operate at the intersection of knowledge production and political mobilization, generating counter-expertise that challenges the evidentiary authority of infrastructural images while simultaneously building constituencies capable of sustained resistance. The movements examined here share a recognition that technical critique alone cannot contest systems whose power derives not merely from algorithmic function but from institutional embeddedness and political economy. Their interventions therefore combine empirical research with organizing strategies that address infrastructural images as simultaneously technical artifacts, knowledge-producing systems, and instruments of racialized governance.

7.4.2 Investigative Exposure

The infrastructural image systems examined throughout this book operate most effectively when invisible, in other words, when their classifications, matches, and categorical assignments appear as neutral technical outputs rather than as contested knowledge claims embedded within specific institutional arrangements and economic interests. Investigative exposure disrupts this invisibility by rendering infrastructural image systems publicly legible, transforming them from background technical processes into objects of political contestation.

Hill's (2020) investigation of Clearview AI exemplifies this mode of intervention (Hill, 2020; Hill, 2023). Clearview AI had operated in deliberate obscurity, building a facial recognition database of billions of images scraped from social media platforms and selling access to law enforcement agencies without public knowledge or debate. Hill's (2020) exposé transformed Clearview AI from an invisible infrastructure into a named entity subject to public scrutiny, regulatory investigation, and legal challenge. The investigation revealed not merely the company's existence but its operational logic, which is the systematic violation of platform terms of service, the construction of a database far exceeding anything previously assembled by government agencies, and the marketing of this capability to police departments across the country without meaningful oversight or accountability (Hill, 2020).

The consequences of this exposure extended beyond Clearview AI itself. The investigation prompted cease-and-desist letters from major technology platforms, regulatory investigations across multiple jurisdictions, and the cascade of enforcement actions documented in Section 7.3.

More fundamentally, it made visible an entire category of infrastructural image practice that had developed beneath public awareness, demonstrating that facial recognition had evolved far beyond the systems subject to existing policy debate. Hill's (2023) subsequent reporting on wrongful arrests, including the Robert Williams case examined in Section 3.5.3, connected abstract technical capabilities to concrete harms, providing the evidentiary foundation for subsequent policy campaigns.

7.4.3 Research-Advocacy Fusion

Joy Buolamwini's Algorithmic Justice League (AJL) represents a distinct activist modality that fuses rigorous technical research with sustained advocacy, producing **counter-evidence**, systematic documentation that challenges the evidentiary authority of infrastructural image systems. The *Gender Shades* study, referenced in earlier sections for its empirical findings on differential error rates, warrants fuller examination here for what it reveals about the political efficacy of research-advocacy fusion. This foundational study audited commercial facial analysis systems from IBM, Microsoft, and Face++ using an intersectional methodology that disaggregated accuracy metrics by both gender and skin type (Buolamwini &

Gebru, 2018). The study revealed error rates as high as 34.7% for darker-skinned women while lighter-skinned men achieved near-perfect classification, a disparity invisible in aggregate accuracy metrics that had allowed vendors to claim system reliability.

The study's significance extends beyond its empirical findings to its methodological and political contributions. Methodologically, Buolamwini and Gebru (2018) established replicable audit procedures, including the Pilot Parliaments Benchmark dataset, that other researchers could apply, creating an ongoing accountability infrastructure rather than a single intervention. Politically, the research was strategically deployed through congressional testimony as Buolamwini testified before the US Congress twice in 2019 on facial recognition's civil rights implications, generating official records that entered subsequent policy deliberations and contributed to industry decisions to limit law enforcement sales (U.S. House Committee on Oversight and Reform, 2019; Heikkilä, 2023). When Amazon attempted to discredit follow-up research, AJL coordinated a response from over seventy researchers defending the findings, demonstrating how activist networks can contest corporate authority over technical claims (Raji & Buolamwini, 2019). The National

Institute of Standards and Technology's subsequent comprehensive study of 189 facial recognition algorithms validated the documented demographic disparities, finding that many algorithms were ten to one hundred times more likely to misidentify Black and Asian faces compared to white faces (Grother et al., 2019).

This sustained research-advocacy campaign contributed to significant industry and regulatory responses. In June 2020, IBM announced complete withdrawal from general-purpose facial recognition (Buolamwini, 2023), Microsoft committed to halting sales to law enforcement pending federal regulation, and Amazon implemented a one-year moratorium on police use of its Rekognition system (Hirsch, 2020; Smith, 2018; Amazon, 2020). AJL's approach demonstrates how activist interventions can contest infrastructural images not merely by demanding transparency into algorithmic operations but by producing alternative knowledge claims that directly challenge systems' epistemological authority. The Safe Face Pledge, developed in collaboration with Georgetown Law's Center on Privacy and Technology, sought to institutionalize these concerns through industry commitments against weaponization and discriminatory deployment (Buolamwini, 2018), an attempt, ultimately sunset in 2021, to translate research findings into binding ethical constraints.

7.4.4 Community-Based Organizing

The Stop LAPD Spying Coalition offers a contrasting model rooted in community organizing rather than technical research. Founded in 2011 and based in Los Angeles, the Coalition approaches surveillance technologies through what it calls an "abolitionist" framework, rejecting reform-oriented interventions in favor of demanding the complete elimination of police surveillance programs (Stop LAPD Spying Coalition, n.d.). This position reflects an analysis that surveillance harms cannot be mitigated through technical fixes or oversight mechanisms but only through dismantling the systems themselves.

The Coalition's 2018 report *Before the Bullet Hits the Body* documented the operational logic of LAPD's predictive policing programs, demonstrating how these systems encoded and amplified existing patterns of racialized policing (Stop LAPD Spying Coalition, 2018). Crucially, the report framed algorithmic systems not as autonomous technical artifacts but as components within a broader algorithmic ecosystem connecting police departments, technology vendors, academic researchers, and federal funding streams. This analytical approach, later elaborated in the Coalition's 'Architecture of Surveillance' platform (LAPD Architecture of Surveillance, n.d.), rendered visible what this study has theorized as infrastructural power, i.e., the institutional relationships, funding dependencies, and vendor networks that sustain algorithmic policing. By mapping these connections, the Coalition provided targets for organizing that extend beyond the algorithms themselves to the infrastructure enabling their deployment.

The Coalition's sustained organizing contributed to LAPD's 2019 termination of Operation LASER and 2020 discontinuation of PredPol, documented results achieved through community mobilization rather than litigation or legislative reform (Ryan-Mosley & Strong, 2020). Coalition founder Hamid Khan emphasizes that these outcomes resulted from building "community power" among those directly targeted by surveillance systems, rejecting partnerships with reform-oriented organizations that would legitimate continued police data collection under improved oversight frameworks (Ryan-Mosley & Strong, 2020). This approach explicitly contests the techno-solutionist assumption that algorithmic harms can be addressed through better algorithms. The Coalition insists instead on eliminating surveillance infrastructure entirely, maintaining that no technical configuration, however refined, can render these systems acceptable.

7.4.5 Coalition Mobilization

Amnesty International's Ban the Scan campaign, launched in 2021 with initial focus on New York City, demonstrates how human rights frameworks can be mobilized to contest facial recognition technology by reframing technical capabilities as violations of established rights protections (Amnesty International, 2021). The campaign's methodological innovation lies in its participatory infrastructure mapping. Through the Decode Surveillance NYC project, over 7,000 volunteer researchers geolocated more than 25,500 surveillance cameras across the city's five boroughs, producing empirical documentation of surveillance infrastructure distribution (Amnesty International, n.d.).

The project's analysis revealed that camera concentration correlated positively with both non-white population density and historical stop-and-frisk enforcement patterns—findings that rendered visible the spatial logic through which facial recognition infrastructure reinforces existing structures of racialized policing. This approach exemplifies what this study theorizes as the denaturalization of infrastructural power. By empirically mapping the material distribution of surveillance capacity rather than focusing solely on algorithmic function, the campaign exposed how technical systems operate within and extend prior configurations of discriminatory enforcement. The translation of crowdsourced spatial data into human rights claims demonstrates one mechanism through which infrastructural images can be contested, not by challenging algorithmic accuracy or proposing technical reforms, but by documenting how surveillance infrastructure concentrates operational capacity along lines already established by racialized policing practices.

7.4.6 Three-Axes Assessment

Mapping activist interventions against the three-axes framework reveals a consistent asymmetry. Contestation proves most effective along the **operational axis**, partially effective along the **post-indexical axis**, and most constrained along the **power axis**, though activist approaches engage each axis through mechanisms unavailable to formal policy processes.

Along the **operational axis**, activist campaigns have achieved concrete victories against specific algorithmic deployments. The Stop LAPD Spying Coalition's sustained organizing contributed directly to the termination of Operation LASER and PredPol. Ban the Scan campaigns have secured municipal prohibitions constraining facial recognition use. These outcomes demonstrate that community mobilization can disable operational instantiations even when formal policy processes prove captured or resistant. Yet such victories share a limitation with regulatory approaches. They contest particular deployments while leaving the generative logic of machine-readable visibility intact. LAPD's subsequent implementation of "Data-Informed Community-Focused Policing" preserved predictive targeting under renamed infrastructure, illustrating how operational logic persists across terminated programs (Stop LAPD Spying Coalition, 2021).

The regenerative capacity of operational logic, its ability to resurface under new names and institutional configurations, suggests that contesting deployments alone cannot disable infrastructural images' generative foundations. Activist interventions engaging the post-indexical axis approach this problem differently. Rather than targeting specific operational instantiations, they contest the epistemological authority through which algorithmic outputs acquire evidentiary status. AJL's

Gender Shades research challenged facial analysis not merely as inaccurate but as epistemologically unstable, demonstrating that algorithmic outputs signify demographic training data rather than indexical correspondence to individual faces. Hill's (2023) documentation of wrongful arrests similarly exposed the gap between confidence scores and identification, revealing how post-indexical systems produce apparent certainty from statistical correlation. These interventions do not merely demand transparency. They also generate alternative accounts of what algorithmic outputs actually represent. Yet this contestation remains reactive, demonstrating failures of specific systems rather than articulating positive frameworks for understanding the epistemological status of computed imagery. Moreover, epistemological contestation confronts a structural asymmetry. Demonstrating that a system fails does not, by itself, compel its discontinuation. Facial recognition persists despite documented misidentifications. Predictive policing survives accuracy critiques through rebranding and rhetorical adaptation. This persistence directs attention to the third axis, infrastructural power, where the institutional relationships sustaining algorithmic systems prove more durable than any particular truth claim.

The power axis presents the most resistant dimension to activist contestation, yet community-based organizing engages this axis through analytical frameworks unavailable to policy mechanisms. The Stop LAPD Spying Coalition's "Architecture of Surveillance" platform exemplifies this approach (LAPD Architecture of Surveillance, n.d.). Rather than targeting algorithms as discrete technical objects, the Coalition maps the institutional relationships sustaining algorithmic policing such as vendor contracts, academic partnerships, federal funding streams, and data-sharing agreements that constitute surveillance infrastructure's material base. This ecosystem analysis operationalizes what this study theorizes as infrastructural power, recognizing that such power derives from institutional embeddedness rather than technical capability alone. By rendering these connections visible, activist mapping identifies intervention points beyond the algorithm itself, targeting university research collaborations, pressuring municipal contract renewals, and contesting federal grant programs. Yet activist movements confront infrastructural power from positions of severe resource asymmetry such as volunteer labor and foundation grants against corporate lobbying and billion-dollar technology investments. While activists escape the particular infrastructural dependencies constraining regulatory authorities such as reliance on the same cloud platforms and technical expertise they would regulate, resource limitations impose distinct structural constraints that circumscribe the scale and sustainability of infrastructural contestation.

Taken together, this analysis suggests that activist interventions achieve their most significant effects not by resolving the limitations identified at each axis, but by sustaining contestation across multiple axes simultaneously and through mechanisms that formal policy processes cannot replicate. Activist interventions thus contribute to contesting infrastructural images through mechanisms that formal policy processes cannot replicate. Where regulatory approaches require existing political consensus to act, investigative journalism and participatory research generate the visibility that makes consensus formation possible, exposing operational deployments, documenting evidentiary failures, and mapping institutional dependencies that would otherwise remain obscured. Where policy mechanisms address each axis through separate instruments such as use restrictions for operational logic, transparency mandates for post-indexical claims, procurement rules for infrastructural relationships, activist coalitions can contest multiple axes simultaneously, connecting algorithmic bias to institutional accountability to political economy within unified campaigns.

Most fundamentally, activist interventions insist on the political character of systems that present themselves as technical necessities. Infrastructural images operate in part by foreclosing contestation, i.e., rendering their operations opaque, their institutional supports invisible, and their expansion seemingly inevitable. The production of counter-expertise, organized opposition, and sustained public attention disrupts this foreclosure, maintaining the possibility of political deliberation over systems designed to operate beyond deliberation's reach.

The interventions surveyed across this chapter, which are artistic, regulatory and activist, reveal both the possibilities and limits of contesting infrastructural images. No single mode of intervention proves adequate to all three axes; each achieves partial victories while leaving other dimensions untouched. The concluding chapter synthesizes the book's argument, assesses its theoretical contribution, and identifies the open questions that remain for future inquiry.

8. Conclusion: Living With/Against Infrastructural Images

This book has argued that contemporary images increasingly function not as representations addressed to human interpretation but as operational components within data-driven infrastructures. The preceding chapters developed this argument through three analytical axes (Chapters 3–5), examined its implications for critical practice and research (Chapter 6), and surveyed existing interventions against infrastructural image power (Chapter 7). This concluding chapter synthesizes the argument, assesses the theoretical contribution of the infrastructural image framework, acknowledges its limitations, and identifies questions that remain open for future inquiry.

8.1 Synthesis

The infrastructural image has been examined through three analytical axes, each revealing a distinct dimension of transformation while operating in reciprocal relation with the others.

The **operational axis** analyzed how images have shifted from objects of interpretation to units of execution. The specific phenomenon theorized, **operational logic**, concerns how visuality becomes executable: measured not by what it means but by what it does, validated not through hermeneutic encounter but through system integration. From predictive policing algorithms that transform urban imagery into risk scores to content moderation systems that render Palestinian documentation algorithmically equivalent to terrorist content, operational logic subordinates representational meaning to computational function. Yet operational deployments do not emerge spontaneously; they depend on the epistemological transformations and institutional arrangements examined through the subsequent axes.

The **post-indexical axis** analyzed how synthetic images, algorithmic archives, and platform-governed remembrance destabilize photography's historical anchoring to the past. The broader epistemic regime, the **post-indexical condition**, transforms memory from preserved trace to computed output. Memory is no longer preserved but computed; the archive transforms from repository into dataset. The shift from indexical trace to statistical inference fundamentally alters what images can claim to evidence. Facial recognition systems do not identify individuals through correspondence between image and referent but through probabilistic matching against databases of extracted features such as confidence scores replacing indexical certainty. This transformation enables operational deployments examined under the first axis while depending on the infrastructural arrangements examined under the third.

The **power axis** analyzed how images enable governance through **asymmetrical legibility** rather than spectacular display. The specific phenomenon theorized, **infrastructural power**, operates by rendering subjects transparent to systems that remain opaque to them Subjects are rendered legible to systems that remain opaque to them as seeing is decoupled from being seen. Facial recognition databases transform casual photographs into instruments of identification without subjects' knowledge or consent. Predictive policing systems process urban imagery into risk scores through algorithmic weightings that remain proprietary. Content moderation infrastructures render millions of images visible or invisible according to classificatory criteria that evade public scrutiny. In each case, populations are constituted as governable through graduated visibility and made transparent to institutional apparatus while the criteria of classification, the flows of data, and the interests served remain obscured. Infrastructural power sustains both operational deployments and post-indexical transformations by embedding them within institutional arrangements that prove more durable than any particular technical configuration.

These axes interact dynamically. Operational logic requires the post-indexical condition to legitimate its outputs as evidence; post-indexical systems require infrastructural embedding to achieve scale and authority; infrastructural power operates through operational deployments that enact its classificatory logic. Contesting infrastructural images therefore requires engagement across all three dimensions, a challenge that, as Chapter 7 demonstrated, neither policy mechanisms nor activist interventions have yet adequately met.

8.2 Theoretical Contribution

The concept of the infrastructural image offers a framework for analyzing these transformations in their interconnection. Existing concepts such as Flusser's technical image, Farocki's operational image, Sekula's (1986) instrumental archive, Steyerl's poor image, Paglen's invisible images, Rubinstein and Sluis's algorithmic image, Zylinska's nonhuman photography, Hoelzl and Marie's softimage capture important dimensions of contemporary visuality but tend to emphasize particular aspects, which are apparatus and program, automation of vision, archival instrumentality, platform circulation, machine-to-machine processing, computational mediation, machinic agency, programmability. The infrastructural image synthesizes these dimensions by foregrounding the systemic conditions that produce, process, and govern images across contexts.

Three characteristics define this framework. The first one is embedding. Images exist within and as parts of technical, institutional, and economic systems that shape their functioning. An image processed through facial recognition infrastructure is not the same object as the photograph from which it derives because infrastructural passage transforms what it is and what it can do. The next is invisibility. The most consequential operations occur beneath the visible surface, in database queries, algorithmic weightings, and institutional protocols that determine how images function without appearing within them. The final one is asymmetry. Subjects are rendered legible to systems that remain opaque to them, creating structural imbalances of visibility that constitute a distinctive form of power.

The framework advances the concept of **categorical violence** to name the systematic harm that occurs when classificatory systems impose identities, deny recognition, or enable targeting based on categories inadequate to the populations they govern. Developed in Section 5.9 through engagement with classification theory (Bowker & Star, 1999), administrative violence (Spade, 2015), and theories of recognizability (Butler, 2009), the concept identifies a form of harm that existing vocabulary such 'bias,' 'discrimination' cannot adequately capture. Categorical violence operates across all three axes, enacted through operational deployments, legitimated through the post-indexical condition, and sustained through infrastructural power. The concept clarifies why remediation requires interrogating the categories themselves, not merely correcting individual misclassifications or improving algorithmic accuracy, but contesting the infrastructural conditions that make categorical governance of images possible.

This framework does not claim to resolve the challenges it identifies. It offers diagnosis, not cure. Yet diagnosis carries value precisely because it clarifies the nature of the problem. Understanding how images function infrastructurally is a precondition for developing responses adequate to contemporary conditions. The framework explains why representational critique, while necessary, proves insufficient and why making systems visible does not make them stop. It also identifies the stakes of infrastructural politics, contests over the conditions of legibility, the criteria of classification, and the distribution of computational power.

8.3 The Limits and Possibilities of Intervention

The analysis of policy mechanisms and activist interventions in Chapter 7 revealed a consistent pattern. Contestation proves most tractable along the operational axis, partially effective along the post-indexical axis, and most constrained along the power axis.

Policy interventions such as transparency mandates, use restrictions and procurement regulations achieve their clearest effects by constraining specific operational deployments. GDPR's provisions, consent requirements, and municipal facial recognition bans impose friction on particular implementations. Yet these mechanisms struggle to address post-indexical transformations, which concern epistemological status rather than operational use, and prove largely ineffective against infrastructural power, where regulatory authorities confront the same asymmetries of technical capacity, institutional capture, and platform dependence that characterize the systems they would govern.

Activist interventions engage different mechanisms. Investigative exposure generates the visibility that enables political mobilization. Research-advocacy fusion produces counter-evidence that contests algorithmic authority. Community organizing builds constituencies for sustained pressure. Coalition mobilization connects diverse concerns under unified demands. These approaches prove essential precisely because infrastructural image systems operate to foreclose political contestation, rendering their operations technically opaque, institutionally dispersed, and seemingly inevitable. The Stop LAPD Spying Coalition's ecosystem analysis, Amnesty International's participatory infrastructure mapping, and the Algorithmic Justice League's audit methodologies demonstrate that activist frameworks can render infrastructural power visible in ways unavailable to formal policy processes.

Yet activist results share limitations with regulatory approaches. Terminated programs regenerate under new names. Documented failures do not compel discontinuation. Resource asymmetries constrain the scale and sustainability of contestation. The deeper challenge concerns not particular deployments, truth claims, or institutional arrangements but the generative logic that produces infrastructural images as a mode of governance, the logic embedded in political economy, technical development trajectories, and state-capital relations that no single intervention can disable.

This analysis suggests neither optimism nor despair but the recognition that contesting infrastructural images requires sustained engagement across multiple axes, through diverse mechanisms, over extended timeframes. No singular intervention, whether technical, legal, or political, will prove adequate. What remains possible is the maintenance of contestation itself which is preserving the political character of systems designed to operate as technical necessities.

8.4 Open Questions

Several questions emerge from this analysis that exceed its capacity to resolve. The relationship between infrastructural images and democratic governance remains undertheorized. The systems that process images at scale are currently governed by platform corporations, state agencies, and technical elites whose interests diverge from, and frequently oppose, those of the populations they render legible. Can visual infrastructures be reorganized around transparency, accountability, and collective benefit? The question is not merely institutional but epistemological. Democratic deliberation presupposes shared access to evidence, yet post-indexical systems produce outputs whose epistemological status remains contested. The **liar's dividend** identified in Section 4.6.3, the structural capacity to dismiss any image as potentially synthetic, compounds this challenge by undermining not just fabricated images but the evidentiary authority of authentic documentation. How might democratic publics evaluate claims when the very category of visual evidence has become unstable? How might the public assess algorithmic outputs they cannot verify, rendered in technical languages they cannot access, by systems whose operations remain proprietary?

The scalability of resistance remains uncertain. Strategies of obfuscation, adversarial images, and anti-surveillance aesthetics demonstrate that algorithmic legibility can be contested at the level of the image itself. Community-based organizing demonstrates that infrastructural dependencies can be mapped and targeted. Yet such interventions operate under severe resource constraints against systems backed by state authority and corporate capital. The question is whether distributed, under-resourced resistance can achieve more than tactical disruption; in other words, whether it can contest the infrastructural conditions that make algorithmic image governance profitable and politically sustainable.

The geographic dimensions of infrastructural power require further investigation. Critical scholarship on algorithmic images, surveillance infrastructure, and platform governance remains predominantly anchored in North Atlantic contexts, drawing on cases from the United States and Western Europe while undertheorizing how infrastructural images operate across different geopolitical conditions. Yet the systems examined in this study do not respect such boundaries. Facial recognition technologies developed in Silicon Valley are deployed in policing contexts from San Francisco to Istanbul. Content moderation policies designed in California govern visibility from London to Sydney. Predictive analytics architectures migrate across jurisdictions with vastly different state-society relations, legal frameworks, and possibilities for contestation. Understanding infrastructural images as a global condition requires sustained attention to how systems developed in technological centers are exported, adapted, resisted, and repurposed in contexts where technical capacities, regulatory environments, and political cultures diverge significantly from their sites of origin. This study has not undertaken that comparative work; it remains a task for future research.

8.5 Conclusion

The infrastructural image does not signal the end of visual culture but its transformation into a terrain of ongoing struggle. The challenge is not to restore a prior condition of representational purity or indexical truth. No such condition ever existed in the form nostalgia might imagine. It is to make infrastructures themselves objects of critical attention and political contestation and to ask not only what images represent but what systems govern their production, circulation, and effects as well as to examine not only what we see but what renders us seeable, and to whom, and toward what ends.

Contemporary existence unfolds within infrastructures that process, classify, and act upon images without requiring human perception, approval, or understanding. Visibility has become a condition imposed rather than a capacity exercised and legibility has turned into a vulnerability as much as a resource. This condition will not be transcended through better images, more sophisticated interpretations, or more accurate algorithms. It can only be engaged through sustained attention to the systems that govern visual culture, the power relations they encode, the harms they produce, and the possibilities for intervention they nonetheless afford.

The infrastructural image names both a theoretical object and a political condition. As a theoretical object, it directs analysis toward the systemic technical, institutional and economic arrangements that shape what images can do and whose interests they serve. As a political condition, it identifies the terrain on which contestation over visibility, classification, and computational power now unfolds. Learning to analyze and contest this condition, across its operational, epistemological, and infrastructural dimensions, is among the central challenges of contemporary visual culture. This book has attempted to contribute to that ongoing work.

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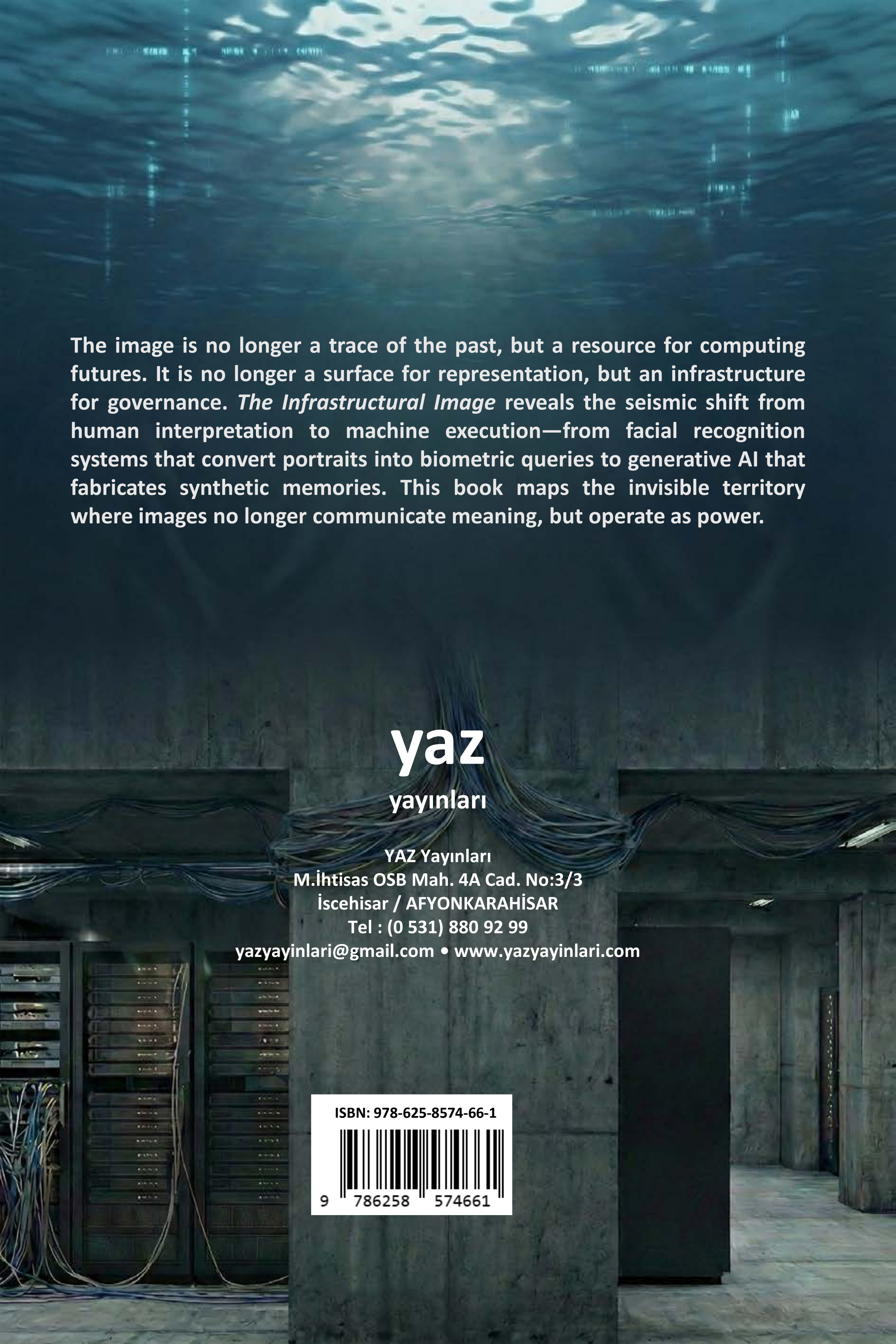

The image is no longer a trace of the past, but a resource for computing futures. It is no longer a surface for representation, but an infrastructure for governance. *The Infrastructural Image* reveals the seismic shift from human interpretation to machine execution—from facial recognition systems that convert portraits into biometric queries to generative AI that fabricates synthetic memories. This book maps the invisible territory where images no longer communicate meaning, but operate as power.

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