Introduction

Dimensional Aesthetics

Dimensions seem like measurable things, even the very measurability of things. But the most common way dimensions are given—height × width × depth—already suggests something stranger. The × symbols that read as "by, by, by" are not additive but transformative, a crisscrossing and compounding. Dimensions are not stable properties of space but, instead, its factors: they produce and multiply. Dimensionality names the relational structure of spatiality, its opening up and holding together, a self-differing or spacing that makes up and takes up space.

Dimensional aesthetics asks how the relational structure of spatiality is mediated and made sensible. It engages aesthetics not merely as a question of art, or "how things look," but also in the broader meaning of sense experience: aesthetics concerns material ways of "making sense." Dimensional aesthetics asks how spatiality is represented in images, and also how images and embodied vision are themselves spatial and spatializing. It asks how spatial relationships that may seem objective or immanent—front and back, surface and depth, foreground and background, here and there—structure formations of power and formulate modes of alterity.

Images can never contain the space of the world they picture; but they produce depth effects that convey, to a viewer, dimensional relationships that are not strictly "in" the image. Art history has examined the depth effects of three-point perspective in drawing and painting. Film and media scholars have traced depth effects from stereoscopic photography through 3D cinema and digital virtual reality (VR). But contemporary techniques of computational imaging complicate how these accounts have understood dimensionality in terms of optical verisimilitude or visceral illusion. The dimensional aesthetics of computational imaging unsettles long-standing norms of visual mediation and the critical frameworks developed around them.

Computational imaging incorporates photography and lens-based imaging; it often involves imagery that has been optically recorded by cameras or sensors. It also relies on digitization—the fact that machines engage images as quantitative information. But it leverages photographic and digital qualities of visual representation into automated processes that aggregate, analyze, and extrapolate visual information through artificial intelligence (AI). More than simply reformatting analog imagery as digital data, these computational processes produce forms of visibility that are based on, and emerge from, the relational, patterned, and probabilistic operations of algorithms. These operations are not just mathematical but also explicitly spatialized because they involve how pixel values are mapped to the coordinate grids of picture planes. Computer vision algorithms analyze numerical expressions about pixels in spatialized arrays; artificial intelligence processes take place through spatialized informatic structures, such as the layered neural networks of deep learning; and spatial information extracted from imagery is used to spatialize images in mutable ways—allowing, for example, depth of field and vantage point to be altered. The dimensional coordinations of these algorithmic processes do not fit the spatial terms of embodied visual experience but reshape those terms as computational imaging techniques become pervasive.[1]

This book examines three spatial techniques of contemporary computational imaging: object recognition in computer vision, depth mapping in computational photography, and computational photogrammetry in mobile mapping apps. These techniques involve photographs and are largely interpreted as photographic in that they seem to record and rearticulate the world's actual visibility. But they incorporate algorithmic processes of extrapolation and interpolation that disrupt how photographs have been understood as isomorphic imprints of whatever they depict. This disruption leverages digitization, but it goes beyond how digitization was understood to undermine the material and semiotic link between image and referent—the visual representation and the actual things it represents. Computational imaging techniques do not just recode this relationship through quantitative logics; they move away from privileging it at all.[2] In computational imaging, representational and referential value is reoriented toward different relationships: patterns seen to relate multiple images and to inflect any single image as internally multiple. To understand this shift—what is new about it and why it might matter—one place we can turn to is the history of photography that computational imaging seems to leave behind.

As computational imaging techniques change what could appear to cohere and take place as visible, both in the world and in images, they revi-

talize questions of dimensional aesthetics that shaped the early history of photography, before its twentieth-century norms were stabilized. Before the spatiotemporal terms of a photograph were fixed by modernist notions of indexicality and medium specificity, nineteenth-century photographic practices often invested ways of seeing relational space within an image and strategies for combining or coordinating images into multidimensional views. Panoramic and stereoscopic formats in photography's first decades did not fit the serial and successive coordination of photographs that became the norm of cinema, and so from a twentieth-century perspective seemed tangential to the through line of media aesthetics.[3] Yet these popular forms suggested ways of relating images that resonate with today's computational practices.

Although it is true that "new media" often resurface whatever has become "old" enough to feel new again, I am not arguing that twenty-first-century computation is the continuation or evolution or return-of-the-repressed of nineteenth-century photography. My approach to media archaeology is more aligned with Michel Foucault's sense of historical reordering and Walter Benjamin's concern that the future rests on continually reframing how past and present seem linked.[4] I am inspired, in particular, by the way Benjamin understood his *Arcades Project* as a "stereoscopic and dimensional seeing into the depths of historical shadows."[5] This metaphor aligns the provisional coordination of a stereoscopic view with the dialectical structure, and political stakes, of what he called historical materialism. To look into the temporal depth between "then" and "now" is to see the contingency and the ongoing, present-tense coordination of that relationship. Benjamin saw this effort as urgent, a way to recognize and grasp possible futures that are presently at stake as past violence bends toward what appears as their inevitable foreclosure. The depth effect of a stereoscopic view—its relational triangulation of a dimensionality that appears self-evident—is both an explicit topic in this book and a heuristic for its overall project.

The comparative approach of this book is reflected in its structure. Rather than proceeding from past to present and from old to new media, its three core chapters cut across different time periods, media technologies, and disciplinary categorizations of images. In each chapter, I introduce a technique of computational imaging through an example of mainstream visual culture; I look back to early photographic practices that deploy a similar spatial strategy; and I take up contemporary art that explores what is at stake in today's changing media and its restagings of dimensional aesthetics. These questions build, asking how the objective contours of things, the subjective depths of personhood, and the expansive dimensions of a

world-in-common are conceived as visible and articulated through visual representation.

The three core chapters of this book do not advance a linear argument as much as articulate related facets of the critical framework that dimensional aesthetics offers. Chapter 1 contextualizes contemporary techniques of computer vision, deep learning, and object recognition in relation to the history of stereoscopic photography. It draws on artworks by Trevor Paglen to show how what seems like the objective shape of things is always related to an embedded point of view. Chapter 2 explores how the computational processes of smartphone photography—especially depth mapping—reinvent, and yet fail to reinvent, photographic aesthetics. It explains how Portrait mode transforms the shallow depth of field it simulates, foregrounding the subject by pushing the world away. The chapter situates this depth effect within the racialized norms of anthropometric and portrait photography, and finds more expansive potentials in recent artworks by Lorna Simpson and LaToya Ruby Frazier. Chapter 3 traces how techniques of computational photogrammetry—used to translate between image space and actual space—developed from embodied, material practices of photographic surveying and stereophotogrammetry. It compares the immersive and augmented reality views of Google Maps with the distanced perspectives of artworks by Andreas Gursky to explore how incompatible vantage points appear reconciled by, and as, the world's own coordination.

These three chapters interrelate and compound, mirroring the computational imaging processes they discuss. Chapter 1 explores how dimensional information is extracted from photographs of objects to train the spatial operations of visual algorithms. Chapter 2 shows how these algorithms then feed back into the spatial operations of contemporary photography. Chapter 3 explains how this interleaving of photographic and computational imaging in photogrammetry now conditions the terms in which spatiality itself is conceived as, and rendered, visible. The sequence of chapters also scales out conceptually to consider how techniques of aesthetic mediation presume and posit the apparent dimensionality of things, people, and the world they add up to. It moves from the challenge of seeing the shape of any one thing when a side of it will always face away; to the challenge of portraying the unpresentable interiority of another person's subjectivity; to the challenge of picturing the whole world, which would necessarily overflow any view.

With the framework of dimensional aesthetics, I show what is at stake in the way depth effects mediate the spatial terms of visibility: the recognition that these terms are provisional, relational, and continually renegotiated.

What appears as the objective shape of things—what holds together, what surfaces, what connects—is contingent on specific ways of rendering dimensional relationships sensible and interpreting them as self-evident. This involves political and ideological operations as much as technical and aesthetic strategies. Depth effects mediate how spatiality seems self-organized—the most basic, relational conditions in which anything could take place and appear.

As dominant aesthetic techniques for mediating dimensionality change, so too do ways that the relational contingencies of dimensionality are conceived and made sensible. As computational imaging inherits and adapts photographic strategies for rendering the world's dimensions fully and objectively visible, this promise of total visibility threatens to carry forward and update a violent, colonial presumption: that everything and—more importantly—how everything interrelates could be made explicit through representation. Imaging advances driven by AI rekindle aspirations entangled with early photography, seeming to promise that everything visible, and all vantage points, could be reconciled and accounted for within a single, overarching systemization. This aligns with capitalist logics of exchangeability and imperialist logics of control by proxy. Current techniques of computational imaging echo with ways that nineteenth-century photography was used in efforts to seize through visual capture and manage through spatial quantification: algorithmic operations used in smartphone cameras and mapping apps inherit and reinvent early photographic techniques that were invented to racially classify bodies of colonized peoples and extract resources from colonized lands.

By drawing connections between the dimensional aesthetics of "new" media in the nineteenth and twenty-first centuries, I am not simply tracing a lineage of ongoing violence. I am asking how we might rethink the relationship between photographic and algorithmic techniques of mediating spatiality, in order to envision alternative through lines and trajectories and to reopen more capacious potentials of dimensional aesthetics. I move across different registers of visual culture—utilitarian and scientific practices, popular and commercial media, and fine art—to consider how different depth effects stage a paradox that can only be restaged without being resolved. Dimensional aesthetics prompts us to encounter relational contingencies that both open and limit our look, weaving us into a visible world that is held in common through, rather than despite, irreducible articulations of difference.

To imagine forms of coordination that would emerge from and through differentiation rather than foreclosing it, I turn to aesthetic mediation to

explore the relational terms of experience—its dimensional facets and hinges. Dimensional aesthetics responds to a demand to conceive of coordinations that may not be fully visible—a thing "in itself," subjectivity, the whole world—in ways that are not founded on the stability or completeness of an image, and that exceed any externalized logic of spatial representation. Instead of positing fixed forms for coordinations that could only be contingent, aesthetic mediation could articulate and rearticulate the facets and dimensions that allow the same things to appear to cohere and make sense in different ways.

The way I make sense of visual culture follows a long line of media theory and philosophy invested in the phenomenological implications of aesthetic experience.[6] My conception of dimensionality and depth, in particular, draws directly on the work of mid-twentieth-century French philosopher Maurice Merleau-Ponty. For him, depth names a structure of ontological relation, a way that Being self-articulates. It describes a nonoppositional form of difference, in which singular aspects open dimensions of a whole that does not reduce them. Depth, then, is a condition of visibility that co-constitutes seer and seen, disclosing the contingency of how something is visible to someone from somewhere. It is also a condition of spatiality: depth co-constitutes the relative position of everything that exists relative to everything else in a shared world that holds itself together through holding everything apart.

Inspired by Merleau-Ponty's description of dimensionality as jointed or hinged and mutually enveloping, I have chosen to interleave the book's three chapters with shorter, more conceptual interchapters. I call these *entrelacs,* the French word that Merleau-Ponty uses to describe the structure of depth, which is usually translated into English as *interlacing, interweaving,* or *intertwining.* Taken together, these interchapters could be thought of as a single chapter that might have been placed first or last in the book, but which has instead been spaced out and interwoven between the others. This spacing works to surface, at the joints of the book, the phenomenological framework that subtends and relates the arguments in each chapter but is not explicitly argued within them. It discloses how my way of reading Merleau-Ponty has shaped what I say about depth in the rest of the book, but also, I hope, brings forward his thought on its own terms, for other readings. One reason I return repeatedly to his work to interrupt or intervene between the other chapters is to show how his language pushes past mine to unravel distinctions between objects, subjects, and the world that my chapters might seem to maintain. His metaphors and redefinitions—especially his concept of "flesh"—undermine the most

common terms that I felt unable to avoid when talking about the "objects" of object recognition, the "subject" of portraiture, and the "world" shown on a world map.

This book's interwoven structure also reflects my interest in avoiding any explicit adequation between sensuous objects and abstract ideas, historical examples and philosophical problems. In the three central chapters, I trace a history of dimensional aesthetics through specific technologies, artworks, and examples of visual culture. In the interstitial sections where I conceptualize dimensionality, Merleau-Ponty's writing about depth becomes my object: I quote from his texts and engage with his ideas in readings that are as fine-grained—and also perhaps as idiosyncratic—as the archival work and formal analysis of the chapters. These are two sides of the same inquiry, but each offers its own rich details. Artworks and visual media are not illustrations of philosophical concepts, as if this is "what they mean." They speak in historically situated and material ways that cannot be translated beyond their thingliness. Likewise, abstract ideas are not concretized in or by specific things, as if this is "how they matter." Keeping more concrete and abstract approaches separate allows me to engage related aspects of dimensional aesthetics without attempting to fuse them. It admits that my object of inquiry is an idea that could not, itself, be posited as a thing that my inquiry completely constitutes. I hope that structuring the project this way helps leave room for readers and for other work, opening space like the two perspectives of a stereoscopic view to enable and invite the kind of depth effects that this book explores.