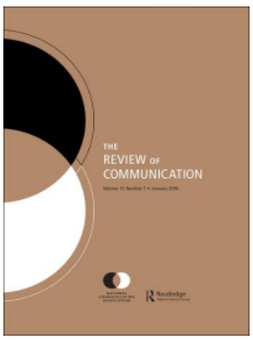

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The unremarked optimum: whiteness, optimization, and control in the database revolution

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ABSTRACT

The 1970s saw major transformations in how computerized databases were conceived, developed, and designed. Part of a broader shift in how software applications were developed, these transformations—sometimes referred to as "the database revolution"—introduced new and then-novel approaches to structuring and arranging digital data, optimizing them for usability and convenience. At the same time, however, the rhetoric of innovation and revolution surrounding this moment in database development obscures the ways it helped concentrate and extend particular kinds of racialized power and, in particular, whiteness (i.e., those norms and values congenial to the reproduction of white racial dominance and the subjugation of blackness). In this article, we revisit key works of the database revolution to show how they encoded whiteness as a kind of unremarked optimum, in both implicit and explicit ways. Finally, we argue that these developments helped to codify and extend a kind of "willful ignorance" that, as scholars of epistemology and justice have shown, is central to the preservation and reproduction of whiteness.

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Introduction

The 1970s saw major transformations in how computerized databases were conceived, developed, and designed. Part of a broader shift in how software applications were developed, these transformations—sometimes referred to as "the database revolution"—introduced new and then-novel approaches to structuring and arranging digital data. Importantly, these innovations helped separate database structures from physical storage configurations, paving the way for more flexible and "natural" representations of data. Now known as "the database approach" to software development, this shift optimized databases for usability and convenience, freeing programmers and system administrators to think about data in terms of general representational models abstracted from the particularities of storage or application.

At the same time, discourses of convenience and usability surrounding the database revolution—as with the broader computing revolution[1]—masked the ways these developments helped concentrate and extend particular social, political, and economic

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arrangements, especially with regard to race and racialized power in the post-Civil Rights era. In this article, we argue that database optimization—a key component of the database revolution—is not distinct from, but continuous with, broader histories of racialized control. In particular, we argue that database optimization efforts helped reproduce and sustain white racial dominance, in part, by making it easier for dominant actors in government and business to both conceive of and organize the social world in ways that served white interests.[2] To that end, we show how some of the most prominent works of the database revolution took up "whiteness" as a kind of unremarked optimum—that is, as the prototype or ideal around which database optimization efforts were (implicitly or explicitly) organized.

We begin by defining optimization as a kind of discursive marker where normative social, political, or other commitments are encoded and expressed. We draw on work in both African American and critical whiteness studies to situate optimization within broader narratives of racialized control and exploitation. Whether present in the dehumanizing practices of the transatlantic slave trade or contemporary forms of racialized surveillance, we show how whiteness functions as a kind of optimum around which social, political, and economic worlds are organized. We then turn our attention to the ways optimization, racialized control, and white racial dominance were reproduced through three key works of the database revolution: Edgar F. Codd's relational model, Jean-Raymond Abrial's data semantics, and Peter Pin-Shan Chen's entity-relationship diagrams. We show how each work helped entrench ways of thinking about and managing data separate from questions of social and political consequence. We argue that this separation lends itself to what Charles W. Mills calls "white ignorance"—that is, a kind of ignorance that normalizes and preserves systematic advantage for white racial subjects.[3] In this way, the database revolution was hardly revolutionary. Rather, it was merely an extension of longer-standing entanglements of optimization and racialized control that —as the Introduction to this themed issue notes—are integral to the production and maintenance of systems of racial capitalism.

Whiteness, optimization, and technologies of control

Most broadly, to optimize is to make the best, most favorable, or most effective use of a thing—to render it optimal.[4] Etymologically, it derives from the Latin *optimus* (best), which itself is likely cognate with *op-* indicating power and ability. It is closely related to words like optimism, opus, and opulent, each of which evokes a kind of control: of goodness over the universe, of the elements of music and composition, or over material resources. In computing and engineering contexts specifically, optimization describes processes for "[obtain]ing the best results under given circumstances" and "[finding] the conditions that give the maximum or minimum value" of a specific task.[5] Common examples include pathfinding algorithms (minimizing time to completion), energy management algorithms (maximizing energy efficiency), and file compression algorithms (minimizing file size while maximizing quality), wherein algorithm authors work to improve a system by minimizing or maximizing relative to some value.

Taking both the broad and computational definitions together, we can define *optimization* as an effort to control and manipulate the description, arrangement, and

management of specified elements so they might (following Michel Foucault) be made to function according to an *optimum*.[6] In this way, optimization necessarily involves normative claims about what is "best," "favorable," or even "better"—it not only *describes a process* (for rendering optimal) but also entails a claim (about that which is optimal, or best). More than an empty or neutral container, optimization necessarily articulates social, political, or other commitments as well as their ideal or maximal expression; as a discursive matter, it is—as the Introduction to this themed issue has it—both world reflecting and world building in ways that exceed the "merely 100 descriptive or calculative."

Accordingly, optimization represents a useful site for studying the historically bound rules and assumptions that shape what people do in practice and how people understand and represent those practices.[7] Many of optimization's most devastating normative expressions are found within histories of European colonialism, the transatlantic slave trade, and the systems of racial capitalism they instantiated. Extensive research on the Middle Passage, for instance, lays bare the multiple ways that kidnapped Africans were stripped of their culture, language, history, and humanity—a process that rendered them, for white purposes, "black"—in order to be optimized for circulation within systems of racial capitalism. The white conception of Africans as existing outside of kinship systems, for example, helped underwrite the forcible separation of those held captive with no regard for familial relations—partners, parents, and children were all separated.[8] This was, as Hortense J. Spillers argues, essential for maximizing the profitability of slavery because "if 'kinship' were possible, then property relations would be undermined, since the offspring would then 'belong' to a mother and a father."[9] Through these and other processes, Africans were "culturally unmade"[10] and optimized for white social, political, and economic exploitation.

The preservation of white racial dominance often means so thoroughly optimizing social, political, and economic life for white norms that—for whites, at least—the normativity of whiteness "is not even identified as such."[11] The power of whiteness issues, in part, from the ways white people are able to remain ignorant of their own racialized identities—that is, in the "tendency," as Barbara J. Flagg describes it, "of whites not to think about whiteness, or about norms, behaviors, experiences, or perspectives that are white-specific."[12] Relatedly, whiteness is partly produced and maintained through norms and standards that mark off and make visible non-white "Others."[13] As Black intellectuals have long argued, blackness—especially in the United States—serves as the primary boundary object of whiteness, delineating what is included (and excluded) in American ideals of whiteness.[14] As George Yancy put it, "without Black people (without those about whom whites can say, 'I am not that'), what becomes of whiteness? Ontologically, it appears to fall flat."[15] Put another way: for whiteness to function as the optimum towards which progress, development, and history are oriented, the world must also actively produce that which is "not-white."

Contemporary entanglements of whiteness, blackness, and optimization are made explicit in the work of Simone Browne and her concept of *racializing surveillance*.[16] For Browne, racializing surveillance describes the ways technologies and practices of surveillance "reify boundaries, borders, and bodies along racial lines," reproducing ideals of "European colonial expansion and transatlantic slavery that sought to structure social relations and institutions in ways that privilege whiteness."[17] Among her sites of study

are cargo holds of slave ships (which physically arranged bodies in ways that marked Africans as non- or sub-human cargo), New York City's 19th-century lantern laws (which literally illuminated Black subjects so that they could be more readily identified and observed by whites), and contemporary airport security and TSA screening practices (which position certain features of Black travelers—and, in particular, Black women—as "dangerous" and subject to heightened scrutiny). In a particularly revealing example, Browne recounts the case of Hewlett-Packard's MediaSmart webcam, which was designed to automatically identify and focus on human subjects that appeared within the camera's frame. In its early commercial iterations, however, the camera's software failed to recognize and respond to people with dark skin tones, rendering the technology useless for a significant number of Black users. By maximizing for light skin tones, the webcam's failure represented more than a mere design oversight. Rather, it revealed the ways whiteness functions as a kind of optimum—that is, as a "prototype,"[18] "index,"[19] or "default referent" [20]—against which all other differences are "calculated and organized."[21]

Though less spectacularly violent, Browne's work shows how software designs are often optimized in ways that are continuous with white norms and ideals that underwrote European colonial expansion and the horrors of transatlantic slavery. Moreover, efforts to separate the two can obscure more than they reveal; for Browne and others, confronting whiteness means—in part—confronting both the patently horrific and the seemingly benevolent. We must, as Ruha Benjamin puts it, "[trace] links between the … mundane and spectacular, desirable and deadly in a way that troubles easy distinctions."[22] In the next section, we take up a critical reading of three influential works of the so-called database revolution of the 1970s that "troubles easy distinctions" and, following the work of André Brock, thinks holistically about interactions between technology, cultural ideology, and social practice.[23] With these histories and commitments in hand, we offer a counternarrative that resists triumphalist or other accounts that would otherwise situate database optimization efforts apart from legacies racializing violence and "obscure the costs incurred by adopting technological solutions to social problems."[24]

Convenience, formalization, and representation: locating whiteness in database optimization

In the late 1960s, computer programming reached a kind of crisis point. Unmanageable workflows, clunky processes, and unreliable machines led consumers of computing technology such as the military and large corporations to question the sustainability of certain computerized processes. Of particular concern were inflexible and difficult-to-use software applications for controlling data—also known as database management systems. Many technologists pinned the problems of database management systems on what they viewed as software development's more "artistic" and "fuzzy"—as opposed to "rigid" and "scientific"—nature.[25] In response to this crisis, researchers developed new methods that transformed and simplified the ways data were organized, arranged, and managed, optimizing databases for usability and more "natural" representations of data.

Collectively, these efforts helped establish what is known as "the database approach" to software development that is foundational to database development and data modeling today.[26] Exemplified in works by noted computing researchers such as Edgar F. Codd,

Jean-Raymond Abrial, and Peter Pin-Shan Chen, the database approach allowed programmers to think about data in terms of general representational models that could be abstracted from the particularities of storage or application. However, these abstractions also enabled a way of thinking about data and databases that, following Tara McPherson's critical discussions of race and computing, "[separated] object from context" and perpetuated modes of thinking and working congenial to white racial domination.[27] By closely reading these works, tracking terms such as "efficient," "productive," and "natural," and attending to their figures and diagrams, we surface how they preserve whiteness as a kind of unremarked optimum toward which database optimization projects were/are oriented.

Codd's relational model and the reduction of friction

Today, the act of "storing" a file on our desktop or in a "folder" is a symbolic one. Early data storage tasks, by contrast, were more literal—that is, programmers were required to actively account for physical memory locations in their work, managing (for example, on a strip of magnetic tape) the storage location of each item they wanted the computer to remember between program runs or while powered down. Accordingly, the contents of a computer's memory had to be stored according to hierarchical, graph, or network structures designed to accommodate physical storage configurations. However, accounting for physical storage in this way was a time consuming and difficult task, especially for large datasets. Ultimately, this problem represented a point of friction in the development process, slowing the work of programmers and forcing difficult choices about what data were considered "worth" the work of storing.

In 1970, Edgar F. Codd—then a researcher at IBM—introduced "the relational model" for databases, offering "a means of describing data with its *natural structure only*—that is, without superimposing any additional structure for machine representation purposes."[28] Where earlier paradigms collapsed data's logical and physical storage structures, Codd's model was innovative in that it separated them and gave programmers greater flexibility in structuring and articulating relationships within a dataset. This move spawned a generation of thinking about how to make data models that better capture and mold reality for storage within a database, and the relational model remains foundational for most modern database systems.[29]

More than a technical innovation, however, Codd's model discursively positioned data as having a "natural" structure independent of the material or other conditions of its production. Moreover, by severing data models from problems of storage and retrieval, Codd asserted that "the convenience of the majority of users" was of "absolutely paramount importance" and that data should not be forced to conform to a structure that is counter to its uses so as to "burden the majority of… users with unnecessary complexity."[30] In this way, the relational model not only asserted a fundamental separation between data and their storage media, but also privileged usability over complexity—users "no longer needed to know the physical storage mechanisms employed by a computer in order to query databases."[31]

Codd's writing was agnostic about the kinds of data for which the relational model was best suited. Nonetheless, by divorcing data from problems of storage with the goal of creating generalizable database recommendations, the relational model subtly reinforced

the notion of data as "natural" and corresponding to something prior to or separate from the ways it is collected, labeled, organized, and stored. Such naturalistic conceptions of data also separated them from the social, political, or economic contexts within which they are produced, echoing in some ways the context-stripping horrors of the transatlantic slave trade and subsequent racist projects such as eugenics, phrenology, and predictive policing. Though not itself an expression of racist ideology or white supremacy, the relational model did not work against them. Instead, in Codd's words, it "protect[ed] users" and minimized the potential for material or other realities to "intrude" or cause friction[32]—ensuring that where whiteness is at work, it can proceed uninterrupted.

Abrial's data semantics and the formalization of white heteronormativity

As relational database models gained traction, researchers also sought new ways to represent the world in languages formal enough for a computer to parse, but not so technical as to be wholly inscrutable to users. This work specifically addressed challenges in documenting data processing tasks which, at the time, were often convoluted and required significant technical or mathematical knowledge to understand (see Figure 1). What computing researchers ultimately wanted was a straightforward but structured set of semantic and syntactic rules for communicating about individual pieces of data and their categories.[33] Against this backdrop, Jean-Raymond Abrial published his *Data Semantics* in 1974, advancing a set of symbols and text for explaining some subset of information in order to achieve a set of application goals.[34] Notably, Abrial's approach positioned data as foremost a problem of modeling real worlds as opposed to one of processing data that had already been gathered. Echoing Codd's relational model, he developed a formalism that separated data from their storage and, instead, defined them according to four discrete categories: "elementary facts," "simple rules," "some more elaborated rules," and "rules allowing one to deduce (or to compute) facts from others."[35]

MONTHLY STATEMENT - D-4

Item	Verbal Description	Information Set	Defining Relationship
D4-1	Customer name and address	P10	
D4-2	Date	P1	$10/P_{8E}(D4)/P_{9E}(D4)$ Statements are to be dated the 10th of the month.
D4-3	Customer's (old) balance		D4-8(D4-1, P8⊖ 1) - Σ C41 D3-3(D4-1)
D4-4	Invoice No.	P16	D2-2
D4-5	Date of Invoice	P1	D2-1
D4-6	Amount of Invoice		D2-11
D4-7	Line Item		D4-4,5,6
D4-8	New Balance		D4-3 + Σ D4-6

Figure 1. Early version of abstract notation for the relationships between tracked items in a database, in this case a generic application for customer billing data (John W. Young Jr. and Henry K. Kent, "An Abstract Formulation of Data Processing Problems," in *Preprints of Papers Presented at the 13th National Meeting of the Association for Computing Machinery* [New York: ACM, 1958], 3). All images provided by the authors.

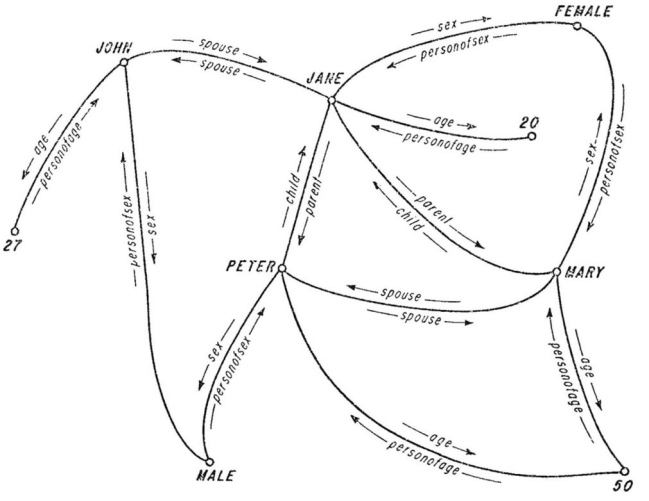

Figure 2. Jean-Raymond Abrial's example for modeling attributes of people and connections between them (Abrial, *Data Semantics*, 5).

In describing these categories, Abrial notably uses a person's sex as an example of what he calls a more elaborated rule, noting that a person "has exactly one sex" and that a person's sex "is not subject to any change."[36] He then uses marriage to further illustrate how data objects can interact and be constrained. Ultimately, he combines these examples—along with a person's age—and uses them to illustrate several functions that can be used to set (i.e., assign) and get (i.e., return) attributes of a given data object (Figure 2). Using Abrial's hypothetical, we could retrieve information about John's (apparently immutable) sex using the function sex(Person)—here the syntax sex (John) would return "male."[37] He also uses this example to show how the system could fail in response to certain kinds of commands, noting that when two individuals are of the same sex, any attempt to update their marital status—that is, to join the objects according to the "spouse" relationship—should issue a failure (see Figure 3).

The goal here is not to interrogate the anti-transgender or anti-gay formulations in early data modeling texts, though doing so is an important task. Rather, we use Abrial's own examples to show how data modeling documents represent more than a means to communicate the structures and expectations of a database—they also show how background assumptions about the social world shape database designs. The terms Abrial employed throughout his work center an archetypal example of whiteness: the straight, cisgender, and married middle-class white man. In that sense, Abrial's data

suppose we wish to express that the semantics of "spouse" is such that two married persons are of different sex. We write the following :

```
updater(spouse) ← prog(x,y)
                  if sex(x) = sex(y)
                     then failure
                     else std(x,y) end
```

Figure 3. Abrial's semantic rules for a spouse updater (Abrial, *Data Semantics*, 18).

semantics are representative of "larger [bodies of work] that traffic in the cultural construction of gender binarism and heteronormativity and that willfully simplify racial formations into manageable units."[38] At a more fundamental level, however, Abrial's discrete categories of information reproduced at the level of the database hierarchical orderings that, as scholars of Native American and Indigenous knowledge practices have shown, are not "natural" but, rather, are particular to white, European ideals of knowledge organization.[39] Instead of being resistant to the operation(s) of whiteness, Abrial's data semantics offer an approach that not only minimizes processing errors and maximizes data fidelity, but also is congenial to consuming and managing data in ways that conform to white, Eurocentric social norms and modes of knowledge organization.

Chen's entity-relationships and encoding representational power

Along with representations of data objects and their relationships, visualizing the interactions between computing systems or subsystems has long been a challenge for computer research. This problem became particularly acute as data storage needs matured throughout the first half of the 20th century and organizations required formalized best practices for diagramming data structures. In 1977, Peter Pin-Shan Chen introduced the entity-relationship diagram (ERD) as a new way to visualize data models. As with Codd's relational model, Chen's diagram sought separation between the data model and physical storage concerns by instead organizing data around their "natural" structures.

Importantly, ERDs required programmers and administrators to explicitly articulate these "natural" structures in a series of "real world" entities and relationships, or "associations between entities"—what Chen called "a more natural view."[40] Ultimately, this gave programmers and administrators tremendous autonomy in developing enterprise schemas that Chen described as "a 'pure' representation of the real world … independent of storage and efficiency considerations."[41] Here, Chen's use of words such as "pure" and "natural" position data, and perhaps even the world, as having a pure or ontologically "true" form. ERDs, then, are positioned as a set of tools to get at these direct representations, helping programmers and administrators turn "conceptual objects in [their] minds" into "representations of conceptual objects" in the system.[42] Where Codd separated data's logical and physical structures, Chen gave it visual expression (see Figure 4).

Despite his claim that ERD schemas offer a "pure" representation of data, Chen concedes that decisions about how "real world" entities or relationships are defined are nonetheless subject to practical constraints. As Chen argues, the system administrator "should define what are entities and what are relationships so that the distinction is suitable for [their] environment."[43] Here, Chen subtly introduces and grants to administrators the power to convert their situated needs and subjective evaluations into "real world" entities and relationships, empowering programmers to transform the world into discrete boxes connected by lines, neatly converting their subjective evaluations into objective, rationalized schema. In doing so, Chen codifies administrators' power to represent—that is, the power to decide what gets promoted to an entity, what is relegated to connective tissue, and what gets left out altogether. Further, Chen's account also routes the task of representation back through the technical demands of the database itself ("suitable for [their] environment"), limiting representational possibilities by subjecting them to a kind of

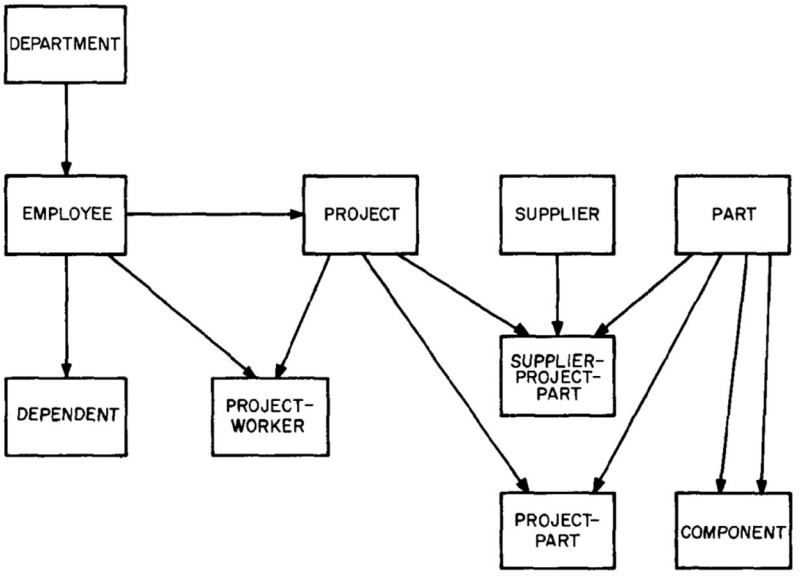

Figure 4. An entity-relationship diagram showing linkages between employees, departments, projects, parts, suppliers, and components (Chen, "The Entity—Relationship Model—toward a Unified View of Data," 19).

computational rationality that is actively hostile toward other ways of thinking or knowing.

"A more natural view": optimizing for whiteness in database design

In many ways, the works of Codd, Abrial, and Chen are paradigmatic of what McPherson calls computing's "lenticular approach to the world"—that is, "an approach which separates object from context, cause from effect."[44] As Chris Gilliard notes of discriminatory algorithms today, when such separations render racism at the level of computer code, "certain users can feel innocent and not complicit in it."[45] They ultimately conceal the structuring role of race while simultaneously encoding and automating configurations of the world predicated on racial structures. Against this separation, we note that—like many of the foundational elements of contemporary computing—the "database revolution" emerged alongside the broader social and political upheavals of the post-Civil Rights era.[46] To this end, it is worth pointing out that the database revolution was concurrent with the emergence of "colorblindness" as a predominant racial discourse in the United States—a discourse that, as McPherson notes, suffuses modes of knowledge organization that are foundational to modern computing.[47] Importantly, colorblindness valorizes the idea of "not seeing race," thereby conflating the achievement of equality with the erasure of difference. While colorblindness does little to ameliorate racial inequalities, it greatly diminishes the discursive space for naming and challenging racism and helps further obscure white norms and interests.[48]

As with colorblind discourses, database technologies conceal the role of race in structuring our social world in various ways. Just as colorblindness discursively obscures racial

oppression, the database approach to software development abstracts data and assigns it new meaning in ways that reproduce or extend whiteness as prototypical—that is, as a kind of unremarked optimum towards which social, political, and even technical processes are oriented. Consider, for instance, the seemingly innocuous commitment to the *reduction of friction* afforded by the separation of data's logical and physical structures, as exemplified by Codd. Notably, the commitment to reducing friction is not a general one. Rather, he specifically orients it toward "the majority of users"—that is, those institutions and people already defined as users and already positioned to leverage data for social, political, or financial gain. For example, among the primary consumers of advanced computational and data technologies were military, intelligence, and other state institutions that, in the United States, have largely been synonymous with projects of racialized surveillance, sorting, and tracking in the United States and abroad. Domestically, computerized databases developed by IBM and others were central to expansions and intensifications of policing in Black communities by state and federal agencies, especially from the 1960s onwards.[49] Abroad, Cold War anxieties fueled the development of data projects centered on controlling specific populations and manipulating foreign affairs—as with automated riot prediction and "pacification programs" in Vietnam and the Defense Department's Crisis Early Warning and Monitoring System.[50] By privileging the seemingly universal good of "usability," the relational model seamlessly lent itself to the furthering of white American interests, U.S. state power, and a broader technological project that Gilliard refers to as "friction-free racism."[51]

Less subtly, Abrial's data semantics show us how the formalization of categories and links within data structures can—at the level of the database itself—explicitly encode relationships congenial to white social and political norms. For Abrial, semantic definitions of objects and relationships in data mapped seamlessly onto a white (and heteronormative) social landscape, lending itself to the reproduction of whiteness at a foundational level by formalizing categories of information that facilitated capturing and encoding white social norms and expectations. More than a mere reflection of Abrial's social position, this move discursively positioned whiteness as the optimum against which all subsequent data inputs would be defined and organized. In this way, Abrial's data semantics supported the reproduction of whiteness by specifying and encoding baseline expectations and relationships that were continuous with white normativity.[52] Recalling Browne's discussion of racializing surveillance, such a baseline expectation shapes "how things get ordered racially" and, moreover, generates the potential for violent and discriminatory outcomes for those "negatively racialized by such surveillance."[53]

Similarly, Chen's ERDs show us how the power to represent oneself and others—a power long wielded by whites to mark and arrange others according to their interests—is not merely incidental, but central, to the work of database optimization. Chen's system makes this power explicit and codifies it in ways that support, rather than resist, existing power structures. By specifying and delegating representational power to system administrators without reference to the people, things, or social worlds being represented, the diagramming process grants administrators a far-reaching power to convert their situated and subjective evaluations of the world into "pure" or objective schema. In this way, Chen's administrators are representative of what Wendy Hui Kyong Chun calls the "sovereign programmer," who magically converts

the world to things.[54] Importantly for Chen, however, the problem of abstraction and representation is ultimately not political or epistemological, but practical. He notes elsewhere that

> it is impossible (and, perhaps, unnecessary) to record every potentially available piece of information about entities and relationships. From now on, we shall consider only the entities and relationships (and the information concerning them) which are to enter into the design of a database.[55]

Here, Chen responds to the impossibility of exhaustive description not by directing us back to the entities and relationships being represented, but by routing the task through the technical demands of the database itself. As David Golumbia has argued, this kind of computational rationalism entails "the application of the rules of formal logic … to symbols whose meaning is, in an important sense, irrelevant to the question of whether our reasoning is valid."[56] Conceptually, then, Chen's move to subordinate representations to the technical demands of the database is hardly innocuous, as it sidesteps questions of social or political consequence.

While these three features evoke whiteness in specific ways, they also collectively work to perpetuate what has elsewhere been called the "willful ignorance" of whiteness[57]—that is, a kind of ignorance predicated on the persistent and systematic exclusion of information, ideas, or perspectives that might challenge whiteness's claims on the world. As Sara Ahmed notes, whiteness is contingent on the arrangement of objects (including, but not limited to, not-white bodies and people) in ways that are optimal for its functioning, reproduction, and dominance.[58] As critical discussions of whiteness show, the willful ignorance of whiteness hinges on, among other things, careful arrangements of objects so as to insulate whiteness from critique, only making race visible when it works to mark off and objectify non-white "Others." As Mills puts it, whiteness inheres "in a white refusal to recognize the long history of structural discrimination that has left whites with the differential resources they have today, and all of its consequent advantages in negotiating opportunity structures."[59]

Importantly, however, the willful ignorance of whiteness is not simply volitional—that is, it is not reducible to a conscious dismissal or active refusal. Rather, as Erinn Gilson notes, white ignorance is a kind of ready-made disavowal.[60] This disavowal is grounded in the systematic exclusion of certain considerations or knowledges, as when standardized curricula teach a white-friendly version of history that omits the voices, struggles, and perspectives of the racially oppressed. Systematically excluding particular kinds of inputs from one's knowing allows us to commit to their rejection without ever having to actually consider whether or not they are valid or otherwise meaningful.[61] Similarly, by conceptualizing data as "natural" and representations of the world as "pure" and separate from the conditions of their production, database optimization efforts systematically preempt questions of social or political consequence. By framing problems of data as solely technical or practical matters, these works position as irrelevant or beside the point oppressive and violent realities that might be inconvenient, disadvantageous, or uncomfortable. Further, by placing questions or knowledges that might be disadvantageous or inconvenient beyond or out of reach of the system, they insulate systems from certain kinds of critique. In this way, the database revolution exhibits what Chun calls "the blind belief in and desire for invulnerability" that marks much technological

development—a "belief and desire [that blinds] us to the ways in which we too are implicated, to the ways in which technology increasingly seems to leave no outsides."[62]

Conclusion: whiteness as/and optimization

In 1981, Codd received the Association of Computing Machinery's A. M. Turing Award, sometimes called the "Nobel Prize of Computing." In the accompanying lecture, Codd measured his success in terms of not only the conveniences and productivity gains afforded by his relational model, but also its reliability—it, importantly, helped keep "programs viable in the face of [corporate or technical] changes."[63] For Codd, the relational model had clearly demonstrated its value in practice; its utility and value had, he argued, "been proven by the test and production installations … already in operation."[64] Absent from Codd's speech, of course, was any reference to any of the specific kinds of programs or projects his work helped to "keep viable." Instead, Codd's remarks maintained a kind of conceptual distance between data technologies and their applications and uses.

Codd's speech is typical of the database revolution and its broader discursive and ideological separation between digital data and the material conditions of their storage—a separation that, importantly, also freed up data to be represented in more flexible and "natural" ways. But the severing of data from their container was hardly inconsequential. Instead, it helped entrench ever more abstract and naturalistic ideals of data as "objective and independent unit[s] of knowledge"[65] distinct from their social and political context. In particular, by naturalizing data and arranging, describing, and visualizing them in ways that made their use more frictionless and convenient, database optimization efforts helped make database systems more usable for powerful institutional actors dominated by white political and economic interests, In that way, the database revolution was hardly a revolution at all—rather, it only served to extend and make more efficient tools that have long been particularly well suited to the project of constructing, fixing, and policing blackness—the very boundary object that marks off and preserves whiteness in the first place. More perniciously, the data revolution helped to further perpetuate the idea that one could simply work and innovate technically or in the abstract, outside of or apart from questions of use or application. As an epistemic consequence, these innovations contributed more broadly to the cultivation of a willful ignorance that encodes whiteness as a kind of optimum while simultaneously insulating systems from scrutiny.

To be sure, some might object that our analysis overreaches and that it is, indeed, possible to *optimize* for other norms or ideals. To that charge, we say, "sure." But this objection slightly misses the point. Rather than claiming that optimization could never—in some other place, in some other time—be a good thing, we have tried to show that optimization—in this place, in this time—is not extricable from broader logics of whiteness and the realities of racial subjugation. Again, to return to Browne, it is not that optimization—as she notes of surveillance—is a static or fixed set of practices, but rather that it tends to reproduce conditions and strategies that maintain and prioritize (aka, maximize) white values and interests, regardless of its instantiation. Consequently, we question the possibilities for deploying optimization as a liberating or progressive force in technological contexts—and in the context of database optimization in

particular. Such a possibility would require a radical shift in the background conditions against which we deploy and make sense of "optimization" in the first place.

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Notes

1. David Golumbia, *The Cultural Logic of Computation* (Cambridge, MA: Harvard University Press, 2009), 154.
2. Here, we note a distinction between "blackness" and "Blackness." For present purposes, "blackness" refers to a designated position within the social order, while "Blackness" refers to the lives, cultures, histories, and identities of Black people. This distinction follows Robert Gooding-Williams's work distinguishing "being black" from "being a black person," where the former is "to be subject to a practice of racial classification that counts one as black" (24) while the latter is when "one begins to make choices, to formulate plans, to express concerns. . . in light of one's identification of oneself as black" (23). The present analysis is largely confined to the former, especially against and within social orders structured by white normativity and violence. See Robert Gooding-Williams, "Race, Multiculturalism, and Democracy," *Constellations* 5, no. 1 (1998): 18–41.
3. Anna Lauren Hoffmann, "Where Fairness Fails: Data, Algorithms, and the Limits of Anti-discrimination Discourse," *Information, Communication & Society* 22, no. 7 (2019): 910.
4. *OED Online*, s.v. "optimize, v.," Oxford University Press, accessed September 2020 (accessed September 2020).
5. Singiresu S. Rao, *Engineering Optimization: Theory and Practice*, 5th ed. (West Sussex, U.K.: Wiley, 2019), 1.
6. Michel Foucault, *The History of Sexuality: Volume I: An Introduction*, trans. Robert Hurley (New York: Vintage, 1978), 24.
7. Theo van Leeuwen, *Discourse and Practice: New Tools for Critical Analysis* (Oxford: Oxford University Press, 2008).
8. Frank B. Wilderson III, *Red, White, and Black: Cinema and the Structure of U.S. Antagonisms* (Durham, NC: Duke University Press, 2010); Hortense J. Spillers, "Mama's Baby, Papa's Maybe: An American Grammar Book," *Diacritics* 17, no. 2 (1987): 70.
9. Spillers, "Mama's Baby, Papa's Maybe," 75.
10. Ibid., 72.
11. Charles W. Mills, *Blackness Visible: Essays on Philosophy and Race* (Ithaca, NY: Cornell University Press, 1998), 10.
12. Barbara J. Flagg, "'Was Blind, but Now I See': White Race Consciousness and the Requirement of Discriminatory Intent," *Michigan Law Review* 91, no. 5 (1993): 957.
13. Frantz Fanon, *Black Skin, White Masks*, trans. Charles Lam Markmann (London: Pluto Press, 1986).
14. David R. Roediger, *The Wages of Whiteness: Race and the Making of the American Working Class* (New York: Verso, 1991), 165–66. Of course, this is also true of other non-white

groups. For example, Edward Said's examination of Orientalism demonstrated how Western conceptions of the Middle East and Asia served to construct "the orient" as Europe's Other. See Edward Said, *Orientalism* (New York: Pantheon, 1978). For present purposes, however, we will be focusing on blackness, whiteness, and racial formations of the United States.

15. George Yancy, *Look, a White! Philosophical Essays on Whiteness* (Philadelphia, PA: Temple University Press, 2012), 106.
16. Simone Browne, *Dark Matters: On the Surveillance of Blackness* (Durham, NC: Duke University Press, 2015), 16.
17. Ibid., 17.
18. Ibid. 26–27; see also Lewis Gordon, "Is the Human a Teleological Suspension of Man? Phenomenological Exploration of Sylvia Wynter's Fanonian and Biodicean Reflections," in *After Man, Towards the Human: Critical Essays on the Thought of Sylvia Winter*, ed. Anthony Bogues (Kingston, Jamaica: Ian Randle Publishers, 2006).
19. David Lloyd, "Race Under Representation," *Oxford Literary Review* 13, nos. 1/2 (1991): 74.
20. Alka Menon, "Reconstructing Race and Gender in American Cosmetic Surgery," *Ethnic and Racial Studies* 40, no. 4 (2017): 597, 604.
21. Thomas Nakayama and Robert L. Krizek, "Whiteness: A Strategic Rhetoric," *Quarterly Journal of Speech* 81, no. 3 (1995): 297.
22. Benjamin, Ruha. *Race after Technology: Abolitionist Tools for the New Jim Code* (Medford, MA: John Wiley & Sons, 2019), 46.
23. André Brock, "Critical Technocultural Discourse Analysis," *New Media and Society* 20, no. 3 (2016): 1012–30.
24. Ibid., 1027.
25. Robert W. Gehl and Sarah A. Bell, "Heterogeneous Software Engineering: Garmisch 1968, Microsoft Vista, and a Methodology for Software Studies," *Computational Culture* 2 (September 28, 2012): http://computationalculture.net/heterogeneous-software-engineering-garmisch-1968-microsoft-vista-and-a-methodology-for-software-studies/.
26. Niels Kerssens, "The Database 'Revolution': The Technological and Cultural Origins of the Big-Data-Based Mindset in American Management, 1970s–1980s," *TMG Journal for Media History* 21, no. 2 (2018): 7–29.
27. Tara McPherson, "U.S. Operating Systems at Mid-Century," in *Race After the Internet*, ed. Peter Chow-White and Lisa Nakamura (London: Routledge, 2013), 27.
28. Edgar F. Codd, "A Relational Model of Data for Large Shared Data Banks," *Communications of the ACM* 13, no. 6 (1970): 377 emphasis added.
29. See Thomas Haigh, "'A Veritable Bucket of Facts': Origins of the Data Base Management System," *ACM SIGMOD Record* 35, no. 2 (2006): 33–49. Though now dominant, the relational model represents only one way that this technology could have evolved. See Paul Dourish, "No SQL: The Shifting Materialities of Database Technology," *Computational Culture*, no. 4 (2014): http://computationalculture.net/no-sql-the-shifting-materialities-of-database-technology/.
30. Edgar F. Codd, "Normalized Data Base Structure: A Brief Tutorial," in *Proceedings of the 1971 ACM SIGFIDET (Now SIGMOD) Workshop on Data Description, Access and Control* (New York: Association for Computing Machinery, 1971), 3, https://doi.org/10.1145/1734714.1734716.
31. Kerssens, "The Database 'Revolution,'" 10.
32. Codd, "Normalized Data Base Structure."
33. International Organization for Standardization, *Technical Report 9007: Information Processing Systems—Concepts and Terminology for the Conceptual Schema and the Information Base* (n.p.: 1987), https://www.iso.org/standard/16549.html.
34. William Kent and Steve Hoberman, *Data and Reality: A Timeless Perspective on Perceiving and Managing Information in Our Imprecise World*, 3rd ed. (Westfield, NJ: Technics Publications, 2012), 28; Jean-Raymond Abrial, *Data Semantics* (Grenoble: Université Scientifique et Médicale, 1974).

35. Abrial, *Data Semantics*.
36. Abrial, *Data Semantics*, 3–10.
37. Abrial's text includes assigning and retrieving the "sex" of people in the format sex(x) = masculine. The word "feminine" does not appear.
38. Brian Beaton, "How to Respond to Data Science: Early Data Criticism by Lionel Trilling," *Information & Culture* 51, no. 3 (2016): 365–66.
39. Sandra Littletree, Miranda Belarde-Lewis, and Marisa Duarte, "Centering Relationality: A Conceptual Model to Advance Indigenous Knowledge Organization Practices," *Knowledge Organization* 47, no. 5 (2020): 410–26. For more on the relationship between Black and Indigenous studies, see Tiffany Lethabo King, *The Black Shoals: Offshore Formations of Black and Native studies* (Durham, NC: Duke University Press, 2019).
40. Peter Pin-Shan Chen, "The Entity-Relationship Model—toward a Unified View of Data," *ACM Transactions on Database Systems* 1, no. 1 (1976): 10.
41. Peter Pin-Shan Chen, "The Entity-Relationship Model: A Basis for the Enterprise View of Data," *Proceedings of the June 13–16, 1977, National Computer Conference* (1977): 77–84.
42. Chen, "The Entity-Relationship Model—toward a Unified View of Data," 14.
43. Ibid., 10n1.
44. McPherson, "U.S. Operating Systems at Mid-Century," 27.
45. Chris Gilliard, "Friction-Free Racism" *Real Life*, October 15, 2018, https://reallifemag.com/friction-free-racism/.
46. Though not a primary focus of this paper, it is worth noting that this period also saw heightened political and social scrutiny of databases, especially in the United States. Driven by concerns over privacy and due process, policy and other discussions often elided issues of race and ethnicity or actively exhibited racist attitudes. For example, in 1966 (just two years after passage of the Civil Rights Act) congressional hearings on computers and privacy were framed in white hegemonic terms, only referencing African Americans when noting the potential utility of computation to address pressing problems such as "urban blight, the transportation tangle, the integration of the Negro into American society, and the continuing spread of crime" (Committee on Government Operations, *The Computer and Invasion of Privacy* [Washington, DC: GPO, 1966], 303). Five years later, discussions of the influential Secretary's Advisory Committee on Automated Personal Data Systems showed committee members preoccupied with threats of Stasi-style secret police while also advocating for surveillance to prevent "Mexican immigrants" from obtaining certain social services (April 17–18, 1972, transcripts at Chris Hoofnagle, "Archive of the Meetings of the Secretary's Advisory Committee on Automated Personal Data Systems (SACAPDS): The Origin of Fair Information Practices," Berkeley Center for Law and Technology, 2015, https://www.law.berkeley.edu/research/bclt/research/privacy-at-bclt/archive-of-the-meetings-of-the-secretarys-advisory-committee-on-automated-personal-data-systems-sacapds/).
47. McPherson, "U.S. Operating Systems at Mid-Century."
48. Eduardo Bonilla-Silva, *Racism without Racists: Color-Blind Racism and Racial Inequality in Contemporary America*, 3rd ed. (New York: Rowman & Littlefield, 2010).
49. Thomas J. Hrach, "An Incitement to Riot: Television's Role in the Civil Disorders in the Summer of 1967," *Journalism History* 37, no. 3 (2011): 163–71; Charlton D. McIlwain, *Black Software: The Internet and Racial Justice, from the AfroNet to Black Lives Matter* (Oxford: Oxford University Press, 2019).
50. Oliver Belcher, "Sensing, Territory, Population: Computation, Embodied Sensors, and Hamlet Control in the Vietnam War," *Security Dialogues* 50, no. 5 (2019): 416–36; Joy Rohde, "Pax Technologica: Computers, International Affairs, and Human Reason in the Cold War," *Isis* 108, no. 4 (2017): 792–813.
51. Gilliard, "Friction-Free Racism."
52. It is worth noting, that this move was not exclusive to Abrial (though his work was particularly influential). For example, earlier work by Woody Bledsoe—considered by many to be the "father" of facial recognition technology—advanced similar formalisms in the context of

phrenological research using computer vision to detect whether a person is white or Black. As with Abrial's work, Bledsoe's models uncritically took up whiteness as a baseline, as they were explicitly designed to detect deviance from the (white) norm (an explicit codification of the "white" / "not-white" binary). See Woody Bledsoe letter to Dr. Samuel Koslov, ARPA, March 25, 1965.

53. Browne, *Dark Matters*, 16–17.
54. Wendy Hui Kyong Chun, *Programmed Visions: Software and Memory* (Cambridge, MA: MIT Press, 2013).
55. Chen, "The Entity-Relationship Model—toward a Unified View of Data," 11.
56. Golumbia, *The Cultural Logic of Computation*, 191.
57. Erinn Gilson, "Vulnerability, Ignorance, and Oppression," *Hypatia* 26, no. 2 (2011): 308–32.
58. Sara Ahmed, "A Phenomenology of Whiteness," *Feminist Theory* 8, no. 2 (2007): 149–68.
59. Charles W. Mills, "White Ignorance," in *Race and Epistemologies of Ignorance*, ed. Shannon Sullivan and Nancy Tuana (Albany: State University of New York Press, 2007), 28.
60. Gilson, "Vulnerability, Ignorance, and Oppression."
61. Elizabeth V. Spelman, "Managing Ignorance," in *Race and Epistemologies of Ignorance*, ed. Shannon Sullivan and Nancy Tuana (Albany: State University of New York Press, 2007), 119–31.
62. Chun, *Control and Freedom*, 30.
63. Edgar F. Codd, "Relational Database: A Practical Foundation for Productivity," in *Readings in Artificial Intelligence and Databases*, ed. John Mylopolous and Michael Brodie (San Mateo, CA: Morgan Kaufmann, 1989), 67.
64. Ibid., 68.
65. Jessica Marie Johnson, "Markup Bodies: Black [Life] Studies and Slavery [Death] Studies at the Digital Crossroads," *Social Text* 36, no. 4 (137) (2018): 58.