What Data Does and Does Not Represent: Visualizing the Archive of Slavery

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Abstract—This paper presents a design report on a humanistically-informed data visualization of a dataset related to the trans-Atlantic slave trade. The visualization employs a quantitative dataset of slaving voyages that took place between 1565 and 1858 and uses historical scholarship and humanistic theory in order to call attention to the people behind the data, as well as to what the data does not or cannot represent. In the paper, we summarize the intersecting histories of slavery and data and then outline the theories that inform our design: of the archive of slavery, of the dangers of restaging historical violence, and of visibility, opacity, representation, and resistance. We then describe our design approach and discuss the visualization's ability to honor the lives of the enslaved by calling attention to their acts of resistance, both recorded and unrecorded.

The power of data visualization is generally located in its ability to reveal otherwise imperceptible patterns in complex datasets, enhancing and extending human cognition [49]. Much of this insight-producing power derives from a process of abstraction [43]. However, this reliance on abstraction necessarily comes at the expense of context and specificity, presenting a challenge when details matter for the significance of the visualization and the insight it is intended to produce. This paper presents a design report on a visualization project where the details of the data matter deeply, as the data being visualized derives from the history of slavery (**Figure 1**). In line with this special issue's theme of critical data visualization, we center critical and humanistic perspectives in our project, a set of visualizations of the Trans-Atlantic Slave Trade (TAST) dataset, which contains over 36,000 individual records of slaving voyages. In its final form, this project will become part of *Data by Design*, an interactive history of data visualization. The larger project, viewable on dataxdesign.io, places the emergence of modern data visualization in the broad contexts of capitalism and colonialism [26]. However, in the work we present here, the relationships between visualization, capitalism, and colonialism are more direct: the process of reducing lives to data, as was required for the trade to take place, is directly connected to the violence that the TAST dataset records[1]. Because of this historical confluence, our team was required to directly grapple with the tension between abstraction and specificity in our design process. We also had to confront the limitations of the forms of knowledge that can be derived from data and its visualization. In so doing, we came to recognize the multiple forms of power that are engaged by data visualization [10], and worked to unsettle assumptions of neutrality while providing space for disruption [19].

In the past several years, visualization designers and researchers have turned to the humanities for new forms of data to visualize and new visualization challenges to explore [42], [30]. Much of this work

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[1] Here and throughout this paper, we use the term "trade" to refer to the trans-Atlantic slave trade, in keeping with current best practices for writing about the history of slavery that attempt to minimize the use of the term "slave".
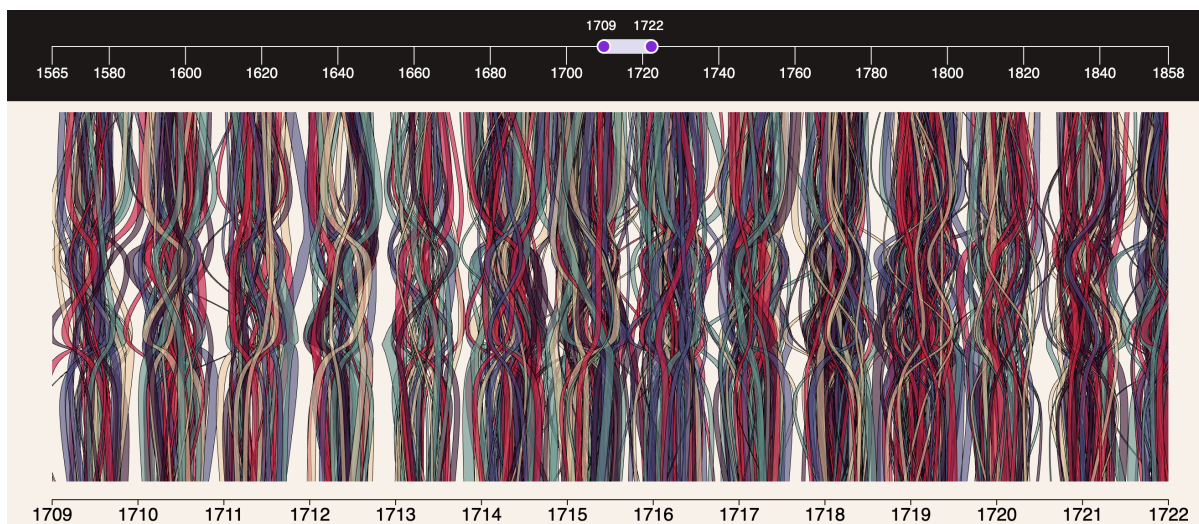
FIGURE 1. A screenshot of the main component of the project team's visualization of the Voyages dataset.

discusses the difficulties of visualizing humanities data, which is often "messy," created by hand, context-dependent, and/or incomplete [29], [28]. Occasionally, such researchers also turn to theories from the humanities in order to inform their design decisions, as we have recently seen with respect to feminism [40], [41]. But there remains more bridging work to be done, particularly with respect to humanistic theories about historical trauma and the harms of restaging the violence of the past, as well as about the limitations of narratives of agency and empowerment as they relate to ideas about visibility, representation, and resistance. In the following sections, we describe our design approach and examine how visualization can honor the lives behind the data by highlighting acts of resistance—both those recorded in the dataset and those that are not. Section 2 outlines the humanities theories that inform our design and discusses their relevance to visualization practice. In Section 3, we compare historical and contemporary examples of data visualizations from the archive of slavery, analyzing how power and abstraction shape their representation. Section 4 explicitly connects these theoretical frameworks to our design decisions, and Section 5 explores the broader implications of this project for the field of visualization. We conclude with a reflection on the possibilities and limitations of visualization in the context of the archive of slavery and humanities data more broadly.

Humanities Context

The History of Slavery and the History of Data

The trans-Atlantic slave trade looms large in the history of modernity. Part of this horrific process, which forcibly removed African peoples from their home countries to labor in the Americas, was the torturous journey called the Middle Passage. Over 12.5 million people were kidnapped and forced aboard ships, where the conditions defied humanity [13]. The nineteenth-century anti-slavery activist Olaudah Equiano, who endured this months-long captivity, described how he encountered "a multitude of black people of every description chained together," packed in quarters "so crowded that each had scarcely room to turn himself"[2] [14]. Many contemporary scholars argue that the Middle Passage is a mechanism which concretized modern antiblack racism. Post which skin color became the primary marker by which the enslaver became separated from the enslaved [33]. The violence of chattel slavery normalized whiteness and in turn made blackness deviant, as white people controlled the direction and momentum of ships, the keys to the chains, shackling captives and their descendants to a dehumanizing fate [15], [45], [22].

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[2]While too complicated to summarize in this paper, it is important to note that some scholars have questioned the veracity of Equiano's account of his initial capture, pointing to evidence that he might have been born into slavery in the United States [6].

In addition to the physical violence and psychological trauma brought about by the Middle Passage, there was a conceptual transformation that took place through the process of converting people into commodities. This was also a form of violence, as scholars of slavery have long made clear [45], [21], [31], [24]. These scholars often refer to data tables like **Figure 2** below, which count up profits from goods such as carpets and fruit alongside profits made from selling people, as evidence of how, in Hortense Spillers' words, people were literally "taken into 'account'" [45].

In this data table, the presence of a living person indicates only potential profit, while the presence of a deceased person indicates monetary loss. This is the "mathematics of unliving" given visual form, a phrase Katherine McKittrick employs to describe chattel slavery more broadly [31]. It also supports Jessica Marie Johnson's powerful claim that "there is no bloodless data in slavery's archive," as the data of slavery always points to death [24]. For Johnson, as for others working at the intersection of digital humanities, data science (and data visualization), and the archive of slavery, data itself "is the evidence of terror, and the idea of data as fundamental and objective information… obscures rather than reveals the scene of the crime" [27], [24], [46].

The Dangers of Restaging Historical Violence

Johnson's important claim about the close connection between slavery and data is reinforced by the visual similarity between the historical data tables that reduced people to numbers and contemporary databases like the TAST database, which present the very same data in tabular, machine-readable form (**Figure 3**). While the goals of the creators of the TAST database are far different from those of the enslavers whose actions produced the original data, it is important to frame any digital project involving the data of slavery with a consideration of the theories of the archive of slavery that have to do with the dangers of restaging its original violence. We turn to these theories now.

Due in large part to work by Saidiya Hartman, who famously began *Scenes of Subjection* (1997) with an explicit decision not to restage a violent scene from *The Narrative of the Life of Frederick Douglass* (1845), scholars have become increasingly attuned to the range of harms invoked by reengaging with the archive of slavery. This harm may be retrospective, the result of "the uncertain line between witness and spectator" that scholars of slavery often walk [22].

It may also impact the present in the form of the desensitization brought about by evermore depictions of the "routinized violence of slavery" [22]. For scholars (and readers and viewers) whose own ancestors were enslaved, such depictions can also exacerbate existing intergenerational trauma [32].

These concerns about the dangers of restaging or reawakening historical violence have been renewed as the archive of slavery has begun to be digitized, with many original artifacts and transcribed sources made more easily available online [39]. Not only do many of the original acts of violence associated with the trade "reproduce themselves in digital architecture," per the example of the data table, but as Johnson explains, "there is nothing neutral, even in a digital environment, about doing histories of slavery" [24]. To engage ethically with the archive of slavery today requires a precise accounting of the scholar's aims of reengaging this history of violence, a careful examination of the scholar's own subject position with respect to the historical evidence as well as when deciding upon the appropriate methods of analysis to employ, and finally a full consideration of the impact of making this evidence (or narrative or analysis of same) visible to a broad public, one that includes readers/viewers with and without personal connections to the history of slavery [27], [24], [9]. We touch on how our team decided to navigate these considerations in the next subsection, and explore our design decisions in depth in Section 4.

Power, Recovery, and Resistance in the Archive of Slavery

When working in the archive of slavery, it is also crucial to consider the intensity of the asymmetry of power that it reflects. Most of its contents were created by the enslavers, not the enslaved. This results in what Michel-Rolph Trouillot has characterized as archival "silence" [48]. For many years, scholars of slavery focused on the task of recovery—locating additional documents that could fill in these silences or gaps—with a goal of rebalancing the archive. Without question, this led to the discovery of many important documents, such as the narratives of Harriet Jacobs, Hannah Crafts, and Harriet Wilson.

In recent years, however, scholars of slavery have come to recognize that the goal of complete recovery is ultimately impossible [3], [21]. Instead, such scholars have become increasingly interested in indicators of gaps in the archive that appear in the archive itself, peripheral moments that went largely unexplored by the people in power who collated the archival material,

FIGURE 2. René L'Hermitte, detail from "Plan, profil, et distribution du navire La Marie Séraphique de Nantes" (1770). Digitized by the Musée d'Histoire de Nantes. Courtesy of Wikimedia Commons.

FIGURE 3. A screenshot of the web interface for the TAST database.

not to mention subordinated the people recorded in such documents. Examples of these gaps might be asides about a meal made by an enslaved cook [27], passing comments about unnamed girls on a slave ship [21], or, famously, Aunt Hester's scream that marked her nephew, Frederick Douglass, so deeply that he begins his narrative describing how her cries echo in his (and, as consequence, his readers') ears [11]. The goal of focusing on this evidence of gaps or silences is twofold: first, to hold space for what will forever remain unknowable in the archive, and second, to imagine the historical narratives and other stories that a counter-archive might enable to be told. Taking this framework into account, we identified one variable in the TAST database, labeled "Resistance," as analogous to the kind of gap in the archive that might indicate an unrecorded story. Our research question then became: how could we visualize these voyages in a way that honored the captives' resistance, or brought to the fore the fraught notion of what resistance even is, rather than restage the violence that led to their enslavement?

Opacity, Transparency, and the Limits of Resistance

With this question in mind, we engaged one additional set of theories: those of opacity and transparency as conceptualized by the Martinican writer Édouard Glissant, and of the limits of resistance as conceptualized by the literary theorist Kevin Quashie. As Glissant describes, the idea of transparency—of making some person, place, or language seen, clear, or easy to interpret—is aligned with the logic of colonialism, because colonialism (as well as capitalism) depends upon a clear racial hierarchy in order to be sustained [20]. For example, a "transparent" rendering of an enslaved person's death that occurred during the Middle Passage is just so: a statement of death, like so many documents in the archive of slavery indicate, with no information regarding the state, context, or conditions of death—let alone any perspectival information about the person themselves, their intentions, or their feelings. To be made transparent is to be made legible, abstracted, and translated into simplified terms deemed suitable by those in power for their ease of use so that their control can be maintained.

Opacity, on the other hand, rejects this reduction. We all have the "right to opacity" because not every part of ourselves is comprehensible [20]. Unlike transparency, which Glissant likens to a hand that reaches, grasps, and extracts that which it is able to hold, opacity refuses to be captured by the hand at all. In the context of the Middle Passage, opacity would enable the recognition that the enslaved person who passed on board the ship might have been starved, the result of denying themselves food in favor of giving it to another, or the result of being denied medical care after being exposed to an illness one of the sailors brought over from Europe. However, Glissant's idea of opacity does not allow us to write any of this in stone; only to suggest that we do not and will not

know what happened. It is *in* this unknowability that there becomes room for possibility—for the enslaved to become subjects rather than archival objects.

To this conceptual foundation, we add another layer via Kevin Quashie's theorization of the politics of representation. For Quashie, blackness no longer functions as "a marker of the human individuality of the person who is black" [37]. Instead, "blackness is always supposed to tell us something about race or racism, or about America, or violence and struggle and triumph or poverty or hopefulness," thwarting other ("quieter" as Quashie terms it) forms that resistance might take [37]. That Black resistance has been forced to appear public in order to be considered valid is yet another level of exploitation that the (white) public extracts from Black labor. By requiring blackness to function only as symbolic resistance rather than operate through quieter forms, this public, however inadvertently, participates in the further dehumanization of Black people.

Quashie's idea of representation is in line with Glissant's conception of transparency, as both are used for public voyeurism, for the outside to comfortably interpret, that cohere with larger stereotypical narratives founded in antiblack racism. In visualizing the voyages labeled with the outcome of "resistance," our team was required to reckon with the publicity of that term—as in, the public-facing extraction that label itself created and what it thwarted as consequence (i.e., implying there is such a thing as a "non-resistance" voyage). In the next two sections, we show how we applied these ideas to related visualizations as well as our own design decisions, describing our rationale for our choices in depth.

Related Work

We are not the first to have attempted to visualize the TAST database, nor are we the first to have attempted to visualize the data of slavery. Both at the time that the slave trade was still underway and in the present, scholars, journalists, and activists have taken on this weighty task. In this section, we discuss two notable earlier efforts to visualize the data of slavery and how our humanistic framework applies to them before returning to a discussion of our own.

The first visualization, "Plan of an African Slave Ship's Lower Deck with Negroes in the Proportion of Only One to a Ton," dates to 1789, during the height of the trans-Atlantic slave trade. The image (**Figure 12**) was likely created by William Elford, a white British abolitionist, as part of his advocacy work with the Plymouth Committee of the Society for Effecting the Abolition of the Slave Trade (SEASE). It was then

shared with the London Committee of SEASE, where Thomas Clarkson, another white abolitionist, expanded the diagram and circulated it to the members of the British Parliament in advance of their vote to abolish the trade.
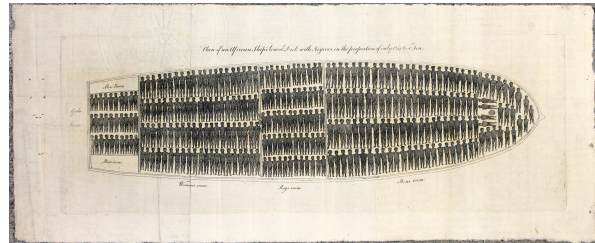

FIGURE 4. Image courtesy of the Library of the Society of Friends, "Plan of an African Slave-Ship's Lower Deck with Negroes in the Proportion of Only One to a Ton," (ca. 1789). © British Yearly Meeting. http://www.quaker.org.uk/library

In this regard, the "Plan" served a specific rhetorical goal: to compel its viewers to join the abolitionist cause. It did so in full awareness of the affective power that its imagery would command. As Thomas Clarkson later explained, his goal was to create an "instantaneous impression" in "all who saw it" and compel them to join the abolitionist cause [7]. Both the creators of the image and its intended viewership were white. While the goal of distributing the visualization—to bring about the end to slavery—was undeniably admirable, there is a tension in the image in how the captives are depicted as abstract figures, shaded monochromatically with their genders and any other indicators of personhood erased. While this abstraction was an effective visual strategy for signaling the horrid conditions aboard a slave ship, it also uncomfortably mirrors the abstraction of slavery itself. People are converted into icons and deployed as evidence of suffering, which contorts obscures the gravity of their real experiences. Put another way: they become objectified representations of a horrific practice, rather than individual people who were subjected to a horrific journey.

In this context, we might consider the unintended implications of the visualizations that accompany the TAST database when it is viewed via its web interface. These lightweight bar charts and time series charts function in an exploratory capacity, allowing users to quickly see the scope and scale of the trade. But they cannot avoid the same tension as the historical "Plan": the second-order violence that comes with once again reducing a group of people to data whose condition of enslavement was enabled by their being reduced to data in their actual lives.

A second visualization of the TAST database—this one which makes use of more sophisticated visualization techniques—also illustrates this uncomfortable tension. "The Atlantic Slave Trade in Two Minutes," designed and built by Andrew Khan for *Slate,* first in 2015 and republished in 2021, animates each of the voyages in the TAST database across a map of the Atlantic (**Figure 5**). The map shows the African and South American continents in their totality, while most of the North American and only a fraction of the European and Asian continents are shown. The animated interactive allows users to pause the time-lapse as black dots, each representing a ship's voyage, rebound across the Atlantic. Each dot's size indicates how many enslaved peoples were onboard the vessel. The accompanying text, written by Jamelle Bouie, shares contextual information found in the TAST database, notably which imperial European powers were dominating the trade and to which countries they were landing over hundreds of years. While intended to "give sense of the scale of the trans-Atlantic slave trade across time, as well as the flow of transport and eventual destinations," the visualization was roundly critiqued by scholars of slavery for the god's eye view that it adopts [25]. As Britt Rusert explains, "It's as if a series of 'invisible hands' operate the trade," rather than specific people who should be condemned for their acts [39]. From this more humanistic perspective, the visualization is seen to eschew the sociopolitical weight and damage of the Middle Passage by reifying the numerical and temporal values included in the database.

While it is not clear from the accompanying article that the intention of "The Atlantic Slave Trade in Two Minutes" was to show the dehumanizing effects of the Middle Passage, it also does not include a reflection about why the data was visualized in the way it was, or for what purpose. This is the gap that a humanistic perspective exposes: when a dataset documents lives that were destroyed in no small part through quantification, decisions of additional quantification and related design processes must be acknowledged. Otherwise, any resultant visualization runs the risk of reifying the guise of objectivity that the original data tables represented. In this case, the absence of discussion results in a chart that once again takes people into account [45], instead of featuring their perspectives or personhood.

Reflecting on our own design decisions in the context of these visualizations led to an important clarification: our project team's goal should not be another attempt to visualize the slave trade itself; rather, our goal should be to visualize the data that the trade left in its wake. Viewed in this way, a crucial aspect of the

dataset became its incompleteness. It could not speak for, let alone resurrect, the dead. With this in mind, a visualization that honored the lives beyond the data would require a strategy that could visualize just how much about these lives the data could not show.
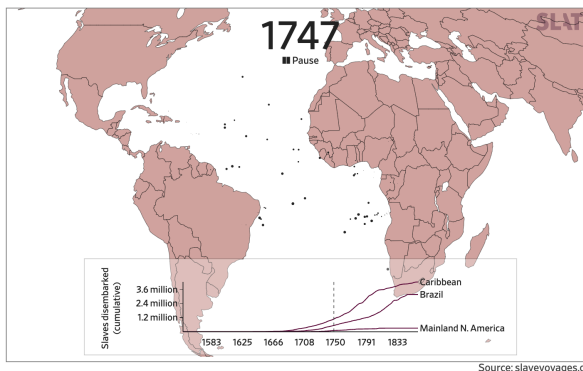

FIGURE 5. A screenshot of "The Atlantic Slave Trade in Two Minutes," which also employs the TAST database to convey the scope and scale of the Trade.

Methodology

In the fields of visualization research and HCI, there exist numerous established design processes for the development of data visualizations. One leading approach is user-centered design, or UCD, which focuses on creating visualizations with effective data abstractions that viewers can intuitively interpret with minimal effort [1]. While this method facilitates rapid information decoding through abstractions, it fails to capture the context and details of the data, a key factor in visualization design for the humanities. It has been argued that humanities researchers require a wholly new set of design processes [35] and visual typologies [12] in order to account for the range of methods that humanities scholars bring to their digital work, as well as to express concepts such as temporality and transparency as they are understood in those fields. In this section, we document our design choices so as to be conscious of the potential effects of our decisions, as well as to invite the viewer into a dialogue with us as designers, reflecting on our visualization and the critical perspectives we sought to introduce. In so doing, we also follow Dörk et al. [10] in "establish[ing] trust between visualization creators and viewers."

Data Source and Variables

The TAST database is one of two databases created by the Voyages project, which has been in existence since the 1960s [13]. The current version of the TAST database, released in 2019, contains data on 36,079 trans-Atlantic voyages. Each record consists of 293 variables, of which seven are marked as "imputed" variables [13]. The inclusion of imputed variables, which are derived from documented data, allow for more complete recognition of the number of overall captives [13].

When selecting the variables for our visualization, we focused on the variables that could provide a basic picture of each voyage: its start date, its end date, the total number of individuals who embarked on the voyage, and the total number of the individuals who disembarked. We also included the "resistance" variable, for reasons described above. **Table 1** summarizes these variables along with two additional variables that we derived for our visualization.

Ideation of the Visual Model

We followed a reflective approach in our design of the visual model[3] [17]. Because our primary motivation was to visualize the Voyages data in a way that honored the lives of the enslaved, our design departed from an observation about the lived experience of the Middle Passage: that the captives did not experience time as linear while in the hold of the ship [20], [45]. Drawing visual inspiration from Morrison's analysis of Harold Fisk's 1944 alluvial pattern of the Mississippi River (**Figure 4**), which "deemphasizes the linearity of the river" in favor of showing a comparative view of its various paths over time, we began with a similar idea to use bends and turns to symbolize the non-linearity of the Middle Passage.

Visualizing the voyages as a stream graph Our initial design concept (**Figure 7**) adapted the color palette of the Fisk diagram to a stream graph form, furthering the water metaphor. However, we quickly realized that our vision would not align with the realities of the dataset. Even isolating the 572 resistance voyages, there would be too many "streams" to stack. While we considered aggregating the voyages by decade, it seemed important to us to honor the legacy of each voyage, and not further participate in the reduction of people to abstract representations.

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[3]All code relating to our visualizations can be found at: https://github.com/EmoryDHLab/data-by-design/tree/main/public/prototypes/voyages/conceptual_map
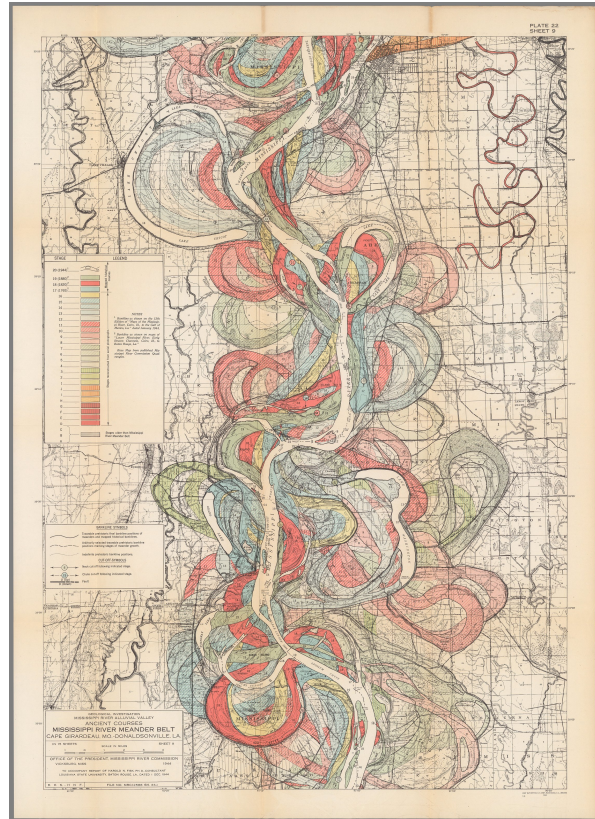

FIGURE 6. One of fifteen maps of the Mississippi River created by cartographer and geologist Dr. Harold N. Fisk in 1944. Courtesy of the US Army Corps of Engineers.
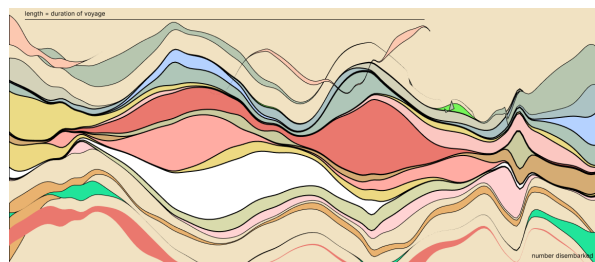

FIGURE 7. The project team's initial design concept, adapting the color palette of the Fisk diagram to a stream graph form.

Visualizing the voyages to emphasize scale We then turned to a different design inspiration that offered a model of how to spatially represent individual records within a large dataset: Martin Wattenberg and Fernanda Viegas's 2012 *Wind Map*. We appreciated how the design of the *Wind Map* retained the legibility of each air flow while also conveying the larger patterns in the dataset. (**Figure 8**).

For our adaptation of this design (**Figure 7**), we

Variable name	Description	Derivation (if applicable)
Start Date	The date that the voyage began.	
End Date	The date when the vessel arrived at its destination.	
Total Embarked [IMP]	The total number of enslaved individuals who embarked on the voyage. This variable is an imputed variable.	
Total Disembarked [IMP]	The total number of enslaved individuals who disembarked at the conclusion of the voyage. This variable is also an imputed variable.	
Resistance	A binary variable indicating whether or not a documented act of resistance was recorded, with "1" indicating a record of resistance.	
Mortality Rate	The percentage of individuals who did not survive the voyage.	*Derived by subtracting Total Disembarked from Total Embarked and dividing the result by the Total Embarked.*
Duration	The duration of a voyage in days	*Derived by calculating the number of days between Start Date and End Date.*

TABLE 1. The variables of the encoded Voyages data in our visual model design. Variables that were imputed by the Voyages team are indicated by the notation [IMP].
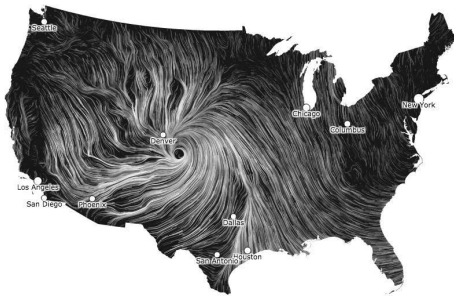

FIGURE 8. Fernanda Bertini Viégas, Martin Wattenberg. Wind Map. 2012. Screenshot from the project website.
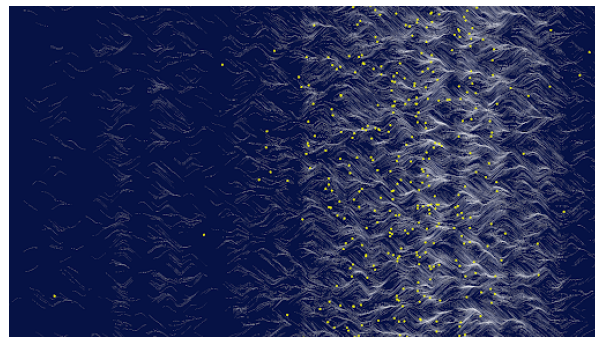

FIGURE 9. A prototype of our second design concept intended to emphasize the scale of the number of voyages while also not abstracting away the individual lives attested to by the data. Interactive demo at: https://shiyaol.github.io/conceptual_map/index.html

also used a thin stroke to represent each voyage. Our visualization was also animated (here we shifted from D3.js to p5.js). Each voyage began as a small white dot, and gradually morphed into a line resembling a river. The length of each "river" represented the normalized duration of the voyage. The rivers were plotted chronologically from left to right, but randomly spaced along the vertical axis. Voyages with documented acts of resistance were indicated by spinning yellow star shapes, a reference to the North Star that served as guide to those escaping slavery—like a beacon in the sea; a sign of human life in need of attention.

While this design captured several additional project goals—conveying the immense scale of the trade and calling attention to the voyages with documented acts of resistance—we could not escape a fundamental fact: it was too beautiful for a dataset that documented such trauma. Though this project does not concentrate explicitly on aesthetics of visualization, we were wary of depicting the "evidence of terror" in the TAST database through a beautiful representation that could obscure the presence of that evidence even further. We also felt that there was too much visual similarity between our visualization and the actual ocean. If we were to enact our claim of honoring the people behind the data, we could not map these data on a site resembling where their lives were violently, fundamentally changed. As a project team which consisted of majority non-Black members, we had frequent conversations about the dangers of restaging the violence of the trade as well as about the limits of our authority to manipulate the data it
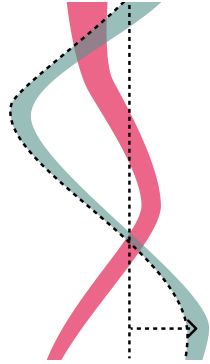
FIGURE 10. A explainer diagram for the amplitude: the overall length indicates duration of voyage, Amplitude increases as the voyages get longer.

produced.

While we experimented with several additional color palettes as well as the use of angular rather than smooth lines, we could not make the visualization less beautiful; nor could we find a way of plotting the data that made us feel that we were not in some way restaging the violence of the Middle Passage through our actions.

These observations prompted a second realization about our project: our goal was not to shed additional light on slavery itself, but rather, to shed light on its data—which also necessarily included a consideration of what was represented in the data and what was not. With this goal articulated, our first major change was to rotate the orientation of the visualization so as to ensure that the viewer could not interpret the voyages as being plotted on any form of geographical map. We also returned to the color palette of the Fisk diagram, and, in keeping with our caution of beautifying violent data, decided to mute the colors so as to further de-aestheticize the visualization.

We held on to the idea of representing each voyage as a curved line, with the width of each river, or "bind," as we came to call them, determined by the number of people on that particular voyage. More precisely, the width at the top of each bind corresponds to the number of individuals who embarked on the voyage, and the width at the bottom corresponds to the number who disembarked. Within each bind, the width is determined randomly from within a range bounded by the minimum and maximum number of captives on the voyage. The duration of each voyage is conveyed by adjusting the amplitude of each bind; thus, the binds symbolizing longer voyages are expressed by wider curves (See **Figure 10**). While Fisk's original design superimposes the floodplains of the Mississippi from

all points in time on a single image, we chose to retain the start date of each voyage, since the rise and fall of the Trade seemed central to the overall goals of the visualization. With this in mind, we arranged the binds chronologically. Since the majority of the voyages lacked data on the month or day of departure, we grouped the voyages by year. Voyages with documented acts of resistance have a color fill, while the others are clear as illustrated in **Figure 11**.
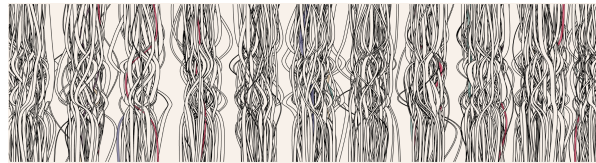

FIGURE 11. The final static visualization of the Voyages dataset, before integrating interaction.

Design the user interface Having arrived at a final design for the visualization, we then turned to the project's interactive components and descriptive apparatus. We had three main goals with this phase of the design: first, and most basically, to explain to the viewer how to interpret the visualization; second, to remind the viewer of the lives behind the data; and third, to underscore the point that while the TAST database and its visualization can show us certain things about the slave trade, there are other things that it cannot—and can never—reveal.

The first goal was the most straightforward to address. We decided to embed the visualization in a scrollytell-style interface, beginning with several static visualizations accompanied by text that gave a basic overview of the visualization, its data source, and how it was arranged. We begin by plotting only the voyages with acts of resistance documented in the database (**Figure 12**), both because the plot is the most logical representation of the cumulative acts of recorded resistance that took place during the Middle Passage, and because their smaller number (in comparison to the entire dataset) makes them easier to view individually.
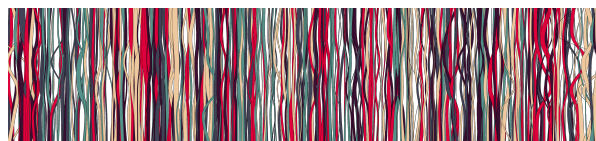

FIGURE 12. The static visualization of the voyages with documented acts of resistance.

To address the second goal, we decided to introduce the story of Olaudah Equiano, mentioned above, who survived the Middle Passage and wrote about his experience in his *Narrative*. After the basic features of the visualization are explained, we present the same set of visualizations adjusted for the ten-year period during which Equiano was enslaved (**Figure 13**). We also draw from his narrative in order to explore the idea of resistance. For example, Equiano references certain acts of resistance that were "prevented by the ship's crew," and so went unrecorded in the dataset [14]. He also describes additional forms of more "quiet" resistance, as when he refuses to eat or when he is given a new name by his enslaver but "refused to be called" by it [14]. After illustrating via Equiano's writing how many forms of resistance go unrepresented in data, we then plot all of the voyages, showing how there were almost certainly acts of resistance aboard all of the ships, even if they were not counted as such.

We address our last goal—about the importance of recognizing what can be captured by data and what cannot—in two ways. At the level of visualization, we present a final image that does not distinguish between voyages with documented acts of resistance and those without; all are plotted with a color fill (**Figure 14**). At the level of interaction, we enforce this argument with the progression of the explanation. Whereas best practice [43] might direct us to present greater and greater granularity—and therefore clarity—as the visualization progresses, we decided to reverse that path. As the user layers in additional voyages using an interactive slider, the binds begin to overlap with each other and become occluded. The user can no longer take away information about specific voyages, even as they can take away the more conceptual point that there are certain phenomena, such as the trans-Atlantic slave trade, for which more data does not and can never lead to more clarity such as their duration and the changes in passenger numbers throughout the journey. Rather, the more the viewer contemplates the visualization, the more they come to realize just how little about the trade its data can ever truly reveal.

Discussion and Conclusion

Data and Storytelling
Although not the central focus of this paper, the final visualization is accompanied by a substantial amount of text. This is consistent with one of the larger tenets of *Data by Design*, which is that visualization and narrative function as "natural symbionts." This phrase originates with media theorist N. Katherine Hayles,

who uses it to explain the symbiotic relationship between data and narrative [23]. Similarly, while much of the power of visualization resides in its ability to distill insight from complexity, this distillation often comes at the expense of context and detail. Narrative, on the other hand, can enrich data (or evidence more broadly) with context, and uses detail in order to convey meaning. Throughout the project, we employ visualization in order to convey what narrative cannot, and the other way around. The result is a more complete picture of the data at hand, one that places visualizations past and present in a context enriched by individual stories and by a broader historical frame.

Limitations
To those in the field of visualization research, it may seem counterintuitive to create a visualization that intentionally occludes data points, and that requires textual explanation in order to be most fully understood. But from the perspective of the humanities, our design more fully aligns with the theories of the archive of slavery that inform it. These theories hold that data that derives from this archive is best presented in ways that challenge its evidentiary status, and that push back against the one-sided power that this particular archive represents. Our visualization prompts insight, but only when the user participates actively in its production. To obfuscate the TAST data completely would impede the production of knowledge. But so too would making the data fully visible, as it would strip the data its complexity; it would reduce the purpose of the visualization to one that prompts insight only through what is presented rather than also what is *not*. Our visualization requires relinquishing some of the power of sight, since this same power was used to reduce the people whose lives are documented in the dataset to quantifiable objects in the first place.

Conclusion
In this paper, we have presented a visualization project informed by humanities scholarship that connects the history of slavery to the history of data, that contends with the ethical ramifications of restaging the violence of slavery, that attends to the weighty silences in the archive of slavery, and that considers the limits of visualization, and visibility, with respect to the history of slavery and representations of Black people more broadly. We place our visualization in the context of other projects, both historical and contemporary, that have also attempted to visualize the data of slavery. Our methodology section explores our takeaways from this analysis, as well as additional considerations that
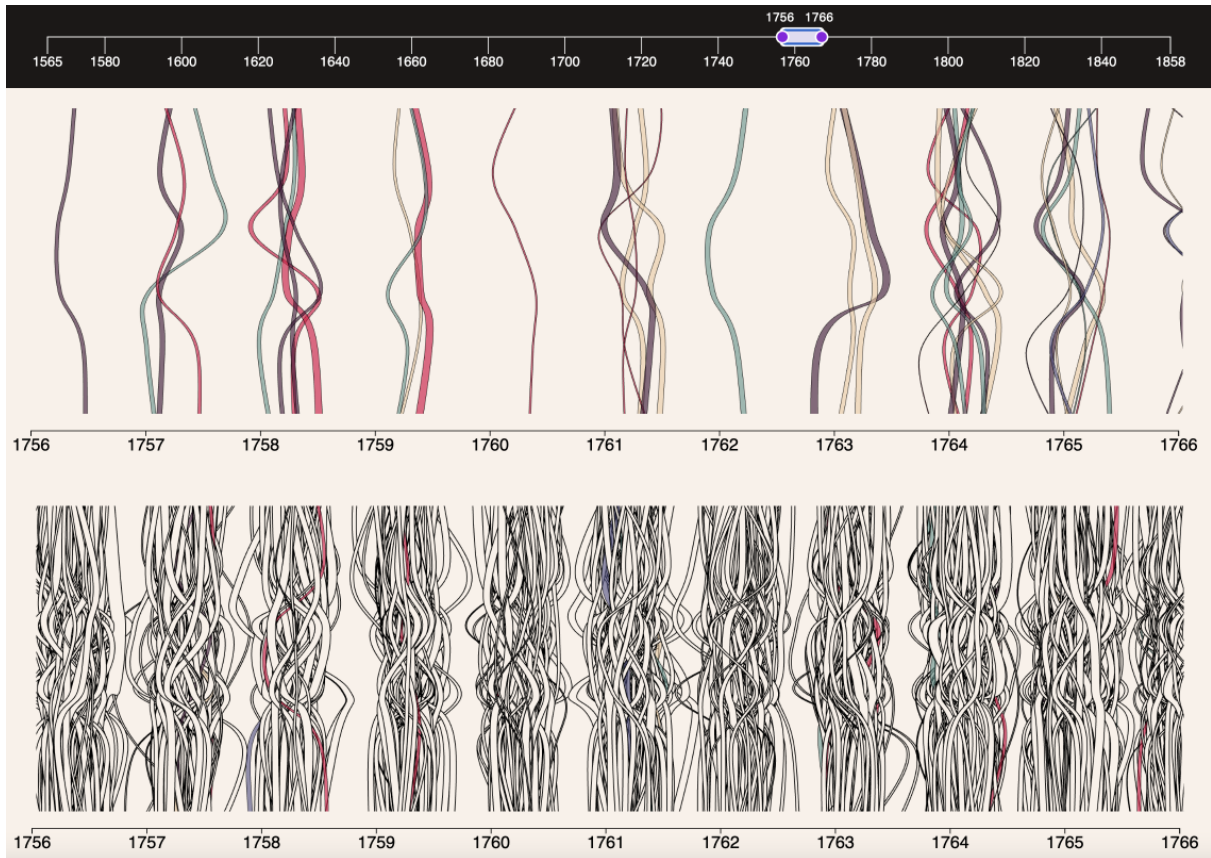
FIGURE 13. A visualization of the voyages with documented acts of resistance (above) and all of the voyages (bottom) within the ten-year (1756-1766) period during which Equiano was enslaved.

FIGURE 14. A visualization of all the voyages within the ten-year (1756-1766) period during which Equiano was enslaved, not distinguishing between documented and undocumented acts of resistance.

influenced our ultimate choice of design. We do not present this project as an unequivocal "solution" to this complicated dataset, as it fails in as many areas as it succeeds. Instead, we offer our work as an example of how a humanistic approach to data visualization might unfold. This approach places best practices from the field of visualization research in dialogue with humanistic theories, and explores both the tensions and the possibilities that result.

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