


Critical Design as Theory, Experiment, and Data: A Sociologically-Informed Approach to Visualizing Networks of Loss

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Abstract

In this paper, I develop an online website that assists users in answering the question, “What do you need to remove in order to erase [thing] from [your life or society]?” through network visualization methods. This project subverts the typical data visualization strategy of working with extant data by encouraging users to produce data, demonstrating how data visualization techniques can constitute a way of thinking and creating rather than just analyzing and representing. However, this tool and its affordances are primarily a case study for a sociological approach to critical design in the Digital Humanities: By critically examining the tool itself (as well as the process that created it), I am able to pose the broader questions of (1) how does the creation of digital tools and projects reflect a theoretical interpretation of the social world and its processes, and (2) how can these interpretations constitute the data of sociological studies? In resolving these questions, I suggest that critical design can be viewed as theory, experiment, and data: designs constitute a social theory, data can be experimentally produced within this social theory, and encouraging reflective design can turn the social theories of design themselves into data.

We shape our tools and thereafter they shape us. —John Culkin (1967, 70)

In reflecting on the fraught disciplinary boundaries of the digital humanities, Lauren Klein and Matthew Gold write, “In what has been called ‘big tent’ DH, it can at times be difficult to determine with any specificity what, precisely, digital humanities work entails” [2016, intro.]^[1]. As with any definitional ambiguity, others have sought to demarcate such boundaries, suggesting models, imperatives, and ontologies for DH work. Some researchers claim that DH is not the “mere use of digital tools for the purpose of humanistic research” or the “study of digital artifacts, new media, or contemporary culture” [Burdick et al. 2012, 122]. Indeed, in positing a “generative humanities” [Burdick et al. 2012, 5] or a “critical digital humanities” [Berry and Fagerford 2017, chap. 8] or any number of distinctions and prerogatives within DH work (while maintaining that the work should be interdisciplinary, collaborative, and exploratory), the field both narrows to fit framed “purposes” and expands with the radical possibilities of productive practices and processes. In their latest reflection on the discipline, Klein and Gold revise their notion of DH as an “expanded field” — “a set of vectors of inquiry that are defined by their tensions, alignments, and oppositions” — in order to argue for a DH “that matters,” one which incorporates “socially oriented work” and translates the “subtleties of our research to others within the expanded field” [Gold and Klein 2019, intro]. My own experience, coming from a background in sociology yet watching the confluence of DH techniques and analyses with once-strictly anthropological or sociological research, is indicative of how fraught any attempt to coherently standardize such work is. And so, without arguing for any authoritative boundaries within DH, it is important to instead characterize the “vector of inquiry” that I engage with, positioning my project within the field by way of useful but ultimately unsustainable distinctions.

This project is rooted in the principles of “critical design;” that is, as a project in which I am producing a digital tool, I am taking a critical, self-reflective approach to my design process that interrogates the theoretical underpinnings of my design decisions, an approach I am terming “reflexive critical design” [Bardzell and Bardzell 2013]. This specific distinction is necessary, as born from this approach is what I term “experimental critical design,” a mode of both sociological and DH research that looks at the potential for interrogating digital tools as theories about the social world. Experimental critical design recognizes the ability of digital tools to do more than just analyze data but to produce data; moreover, it sees these digital tools (and thus the theories underpinning them) to be data. After developing a framework for critical design, firmly positioning this work within a specific vector of inquiry, I will describe the digital project that I have made centered around network visualization and then analyze it through the lens of this critical design framework.

In short, my digital project “Loss” examines how increasingly popular and accessible network visualizations can be used to visualize networks of loss — that is, the networks of things attached to a focal object removed from a system. Leveraging the fundamentals of web design and the data analysis library D3 [Bostock, Heer, and Ogievetsky 2019], I developed an online web interface that asks users to meditate on what loss and removal can mean for their personal lives, history, or society — and then visualize these effects through a series of connected nodes. From the perspective of reflexive critical design, I use this project to examine the question: how does the creation of a digital tool reflect a theoretical interpretation of the social world and its processes? And in developing experimental critical design, I seek to answer the question: how can the interpretive social theories behind this digital tool themselves constitute the data of sociological studies? Both questions call for a sociological analysis of the tools and methods that DH is producing right now, but they also call for a pedagogical and ethical approach to DH work: As the field grows — and interdisciplinary boundaries become even more fraught — DH can provide valuable insight into how digital methods can be leveraged to address social, cultural, and personal issues that extend far beyond the typical “big data” approach to digital tools. DH can work towards an educative, public engagement to collaborate with a general population increasingly engaged with digital media. Together, the two critical design perspectives recognize critical design as theory, experiment, and data: designs constitute a social theory, data can be experimentally produced within this social theory, and encouraging reflective design can turn the social theories of design themselves into data.

Reflexive and Experimental Critical Design: A Sociologically-Informed Approach

David Berry and Anders Fagerjord argue for a “critical reflexivity” [Berry and Fagerford 2017, chap. 8] in DH, one in which researchers treat their work as more than just functional but theoretical as well. As digital methods proliferate, especially in terms of their accessibility, the dangers of a lack of reflexivity are evident in projects — amateurish or professional — that misinterpret the output, logic, or purpose of the digital tools that they wield. Indeed, the fetishization of digital methods — many of which come from or overlap with methods used in the social sciences and corporate sector — has allowed for an overvaluation or misinterpretation of data- and computer-driven analyses [Cheney-Lippold 2017, 80–82]. In some of the most extreme cases, these digital methods have reproduced a digital phrenology, or they have been leveraged by malicious actors such as conspiracy theorists to allow for the “scientization” of misinformation and hate towards harmful political ends [CCT 2020] [Uscinski 2018, 65–66]. This is not to say there has not been reflection on these risks: a recent viral project from science and technologies studies researchers Kate Crawford and Trevor Paglen [2019] blended machine learning and facial recognition software in an attempt to demonstrate the inherent racial biases in datasets, machine vision, and algorithms — digital tools which power commercial products or even the work of police departments and high school administrations [Ferguson 2016] [O’Neil 2016, intro]. Nevertheless, the blind implementation of digital tools means that tools must be understood for their potential consequences, perhaps even designed to prevent abuse by bad actors. DH as a whole can look to engage with and produce work that reimagines digital tools as something less-than-empirical and objective — the product of human impulses and understandings of the world, rooted both in individuals’ biases, motivations, and ideologies. Moreover, these reimagined tools can then be turned inwards, to examine the self rather than the troves of ethically-dubious data now enrapturing researchers and celebrating the eclectic categorization and algorithmic analysis of the “other” [Cheney-Lippold 2017, 80–82].

It is only with strict interrogation of digital tools and methodologies that DH can move beyond producing “instrumental” tools that say something about inputted data and instead produce tools that say something about the world itself as it is being transformed and interpreted by technology — tools that are, in their own right, theories about the social world [Berry and Fagerford 2017, chap. 8]. Thus, I position myself in a critical DH, one that investigates the theoretical underpinnings of the employed methods and treats digital tools as theories themselves. In this work, the object of my criticism is what digital humanists term “design”:

...design is a creative practice harnessing cultural, social, economic, and technological constraints in order to bring systems and objects into the world. Design in dialogue with research is simply a technique, but when used to pose and frame questions about knowledge, design becomes an intellectual method. In the hundred-plus years during which a self-conscious practice of design has existed, the field has successfully exploited technology for cultural production, either as useful design technologies in and of themselves, or by shaping the culture’s technological imaginary. As Digital Humanities both shapes and interprets this imaginary, its engagement with design as a method of thinking-through-practice is indispensable. Digital Humanities is a production-based endeavor in which theoretical issues get tested in the design of implementations, and implementations are loci of theoretical reflection and elaboration [Burdick et al. 2012, 13].

In short, in the world of DH, design is a technological approach to representations of the world which necessarily implements (and tacitly argues for) a theory about the world. My work here is thus “critical design,” a reflexive interrogation of the theories underpinning the design I am attempting to implement in addition to the design itself as it is used to argue for a particular representation of the world. This reflexive critical design asks the designer to examine their own latent motivations, ideologies, and biases; examine how these have been translated into the design; and examine design itself as an act and as a principle. Reflexivity about research methods and approaches is certainly nothing new in the humanities, especially as critical race theory and gender theory have tasked readers with examining their implicit biases before engaging with literary material [Wernimont and Flanders 2010], or decolonial theories have argued for an archaeology in which researchers examine their position more deeply within field sites [Stobiecka 2020]. Social science’s more explicit historical focus on “methods” adds to this conversation by viewing approaches to research questions and data — such as literary works or archaeological sites — as methods guided by a particular point-of-view and sociological interpretation [Weber 2017, chap. 2]. Further, with the proliferation of media studies in the social sciences, critical voices have asked for a deeper examination of our sudden reification of tools that many people assume to function without the bias of the “old ways” [2].

When working across academic registers, it’s important to establish a shared vocabulary: in this instance, “design” is a capacious term, as it can refer to both the design of a study — from the social scientific lexicon — or the design of a computational tool. In both cases, design is united by its generative *procedures*. That is to say, when approaching a research question with a dataset, both the research design and the computational design are guided by a procedural logic that makes arguments about how the social world functions — but in DH work, research design often *is* computational design, as the research methods are not distinct from the tool itself. Thus, we can enlist “design” as the term capturing the procedural logic of computational tools which themselves constitute the research design. Procedural arguments, or procedural rhetoric, consist of “the art of persuasion through rule-based representations and interactions, rather than the spoken word, writing, images, or moving pictures” [Bogost 2007, ix]. Therefore, to analyze the procedural rhetoric of DH designs is to recognize that systems and processes function as a form of discursive argumentation as much as traditionally understood argumentation in the form of writing and imagery, with computational designs increasingly coming under scrutiny from the “critical coding” perspective — what are the latent arguments built into software’s code [Burdick et al. 2012, 53]? Not only does software’s coded procedures make arguments about the social world, they do so at the behest of programmers and with the illusion of objectivity. In short, this paper views design as a set of theoretically-informed, argumentative procedures built into digital tools. Moreover, because these digital procedures seek to generate, capture, or analyze data, their underlying theories shape *how* data is generated, captured, or analyzed.

An example of how some social science researchers have critically studied their tools to see their latent biases can help

to elucidate the reflexive critical design perspective I've outlined above: In the aforementioned facial recognition project by [Crawford and Paglen 2019], the researchers began with a set of research questions, "What work do images do in AI systems? What are computers meant to recognize in an image and what is misrecognized or even completely invisible?" In their case: what biases are baked into a software's procedures for recognizing faces? Their next step required choosing a dataset to train their AI system, and, when critiquing one dataset representing human emotions, they were aware of the arguments implicitly made by the dataset's taxonomical procedures, writing, "First there's the taxonomy itself: that 'emotions' is a valid set of visual concepts. Then there's a string of additional assumptions: that the concepts within 'emotions' can be applied to photographs of people's faces" [Crawford and Paglen 2019]. When they chose a different dataset for their work, the data's taxonomical procedures allowed them to "see the outlines of a worldview" as it "classifie[d] people into a huge range of types including race, nationality, profession, economic status, behaviour, character, and even morality" [Crawford and Paglen 2019]. That they would create a machine vision tool intended to classify people based on their physical appearances meant that their tool advocated for the worldview tacit to the data; it posited a social theory of what the categories of "people" were, that these were appropriate categories to use, and that a person's categories were latent to their physical appearance — what does it mean to look like a "kleptomaniac" or a "pervert" [Crawford and Paglen 2019]? Crawford and Paglen's work demonstrated that both the dataset and the facial recognition software could not function without tacitly making arguments about how the social world functions — how human biases about physical appearances were translated into computational procedures, argued for by those procedures.

Reflexive critical design allows us to see the latent motivations, ideologies, and biases inherent to the computational processes that constitute DH's research tools. These computational processes work in service of a "worldview," social theory, or, to use the language of computer science, a model of the social world. The procedures that classify images make an argument about essential human traits whereas natural language processing procedures might make an argument about prescriptive grammar or semantics, and GIS procedures might make an argument about national territories or land ownership. In any case, without critical examination, these digital tools simply perpetuate the worldview that constructed them, and so long as they produce data that people find worthwhile, their latent biases can go uninterrogated.

Further, reflexive critical design allows for experimentation that creates data. For example, in Crawford and Paglen's project, the researchers could leverage the outputs of their facial recognition software, as it was used by people online, to make an argument about racism in digital technology. They made their digital tool accessible, allowing users to submit their own photos and put the machine's social theories to the test. In taking a critical approach to design that gave them an intimate knowledge of their software — and the inherent racial biases it modeled — they were better equipped to critique its output. Crucially, reflexive critical design's capacity for experimentation negotiates between historical modes of criticism and emergent forms of "critical making" [Jagoda 2017] [Ratto 2011]. Crawford and Paglen began with a traditional critique but then put this critique into productive action. This resulted in a project that allowed users to experientially engage with the critique, affectively understanding how technology discriminates when pictures of themselves were labelled with racist and sexist slurs. It was an experiment in digital design which merged criticism with critical making, a merger that is increasingly familiar to social scientists: in sociologist Chris Bail's work on political polarization, his team created a social media app that put two politically-opposed members into a chatroom where they could discuss a given political issue anonymously [Bail 2021, 120–132]. In this case, a social theory about anonymity, discursive identity, and political communication was proffered by the very processes of the app, one that could be tested by the app's output in the form of textual exchanges. Social media apps are infrequently designed with such a sensitivity to social theory — as anthropologist Nick Seaver [2017] discusses, the logic of these platforms often reproduce taken-for-granted cultural norms or are uncritical about the ways their social engineering might affect people's lives.

A disciplinary anxiety emerges: the artistry and accessibility of Crawford and Paglen's work feels different than the social experimentation of Bail's work — indeed, both are framed differently — but at the crux of their digital methods is a recognition that they are perpetuating a model of reality through procedural arguments that will result in some form of data that puts their model to the test, allowing for a deeper reflection on the software itself. These design procedures simultaneously function as research procedures, with designers acting as researchers inviting users (or subjects) to be

subject to the digital design's processes. Reflexive critical design is in direct opposition to the work of the corporate sector, where digital processes are deployed without reflecting on how those processes will affect human behavior, as the software's functionality and profitability are the primary motivators, forcing the software's underlying design logic to remain a trade secret [O'Neil 2016, chap. 8]. What many researchers of media are doing now is seeing the resulting data of the mass social experiment that is the internet: the experimental critical design perspective challenges researchers to directly engage and design the methods that have created that data.

Finally, reflexive critical design itself constitutes data. There are a number of ways of thinking about how design can be used as data: First, the design's procedures themselves, through a close-reading of the software's code and processes [Burdick et al. 2012, 53], allows for an examination that can reveal the researcher or developer's intentions and theoretical framing when they designed the software. This is similar to the work that Crawford and Paglen [2019] did when they critiqued the "emotions" dataset: they drew out the social theories from *others'* procedural arguments. Now with countless computational models available online, systematic critical design is desperately needed to hold other researchers accountable [CCT 2020]. Second, when researchers such as Crawford, Paglen, or Bail make their theoretical framing explicit — a much more common practice in the social sciences, where these authors come from — such justifications can be put in conversation with the software itself to examine how different researchers have theorized and employed models of the social world, as might be done in review papers. This is a challenge, considering how frequently digital tools are distributed with documentation focused solely on how to use the digital tool rather than how to understand the implications of its procedural arguments.

The final way that reflexive critical design can be seen as data is one that has rarely seen use in DH or the social sciences broadly. Researchers can task people with developing their own designs. Researchers can pose design challenges to participants in an attempt to see how they might conceptualize and procedurally argue for a model of the social world, and their procedural arguments constitute data to be analyzed. This sort of thinking has gained popularity in the world of urban planning, where "design challenges" centered around tackling a central problem can be revealing of how participants in the design challenge think through social issues [Münster et al. 2017]. It has also been employed in relation to game design, with researchers and educators collaborating to assist youth in designing games that address salient social problems [Gilliam, Hill, and Jagoda 2016]. These designed games reflect both how the students think about systems functioning in their lives and how the medium — in this case, analog board games — constrain and shape their thinking in procedural ways. How people think about issues through software and digital processes, then, can be investigated, even if their designs are only manifest on paper or in interviews. The goal is not to design software but to understand how people *would* design software — how they procedurally argue for a particular representation of the world. Although, with the increased accessibility of digital tools and increasing digital literacy, some populations might be able to design simple games or programs articulating the dynamics of the social world through limited procedural techniques.

Critical, pedagogical, and generative approaches to game design bring the principles of reflexive and experimental critical design into greater relief. As seen in Gilliam et al.'s [2016] board game design workshops, games have long been theorized to have the capacity to critique extant systems, teach new ways of thinking and acting, and produce information, data, and action [Gee 2003] [McGonigal 2011] [Schrier 2016]. Games are particularly in line with the move towards a DH "that matters," as Karen Schrier advocates for games that are "not just *for* change, they *are* change." [Schrier 2016, 7]. Theorists and researchers tout recurring examples of games that were critically designed and then produced researchable behaviors through their procedures [Schrier 2016]. For example, a non-profit encouraged people to donate to those in financial straits by proceduralizing its worldview in a game: The game forced players into difficult financial decisions where sacrifice was necessary, attempting to demonstrate that poverty was not a fault of character but of oppressive systems [McKinney and Urban Ministries of Durham 2011]. Researchers then studied the emotions and ideas evoked by the game, which showed mixed success [Roussos and Dovidio 2016] [Smith et al. 2016]. The game was reflexively designed — intended to be pedagogical and influence thought under a particular ideology — with experimental capabilities such that people could measure changes in sentiment or money donated. And it is a data point as one of many social change games or games about poverty, one way a theory of poverty has been turned into a digital procedure. It is a game as a theory, an experiment, and as data.

12

13

14

Many of those who advocate for games for social change place a great deal of emphasis on those procedural arguments — fixating on how *processes* and *mechanics* in games can bring people closer to one another, spark emotions that motivate, and literally perform research in the case of citizen scientist projects [Schrier 2016]. However, we know that faith in processes alone is dangerous, as the same processes that produce prosocial multiplayer environments in online games also allow for cultish groupthink and potential political radicalization, or fail to inspire empathy for the impoverished [Robinson and Whittaker 2020] [Roussos and Dovidio 2016]. Ultimately, games represent one end of the design spectrum: As highly interactive, often immersive tools that make arguments about the social world through a battery of argumentative strategies such as narratives or gameplay mechanics, they often unintentionally produce ways for researchers to better understand human social dynamics in games that were designed for play and enjoyment. On the other end of the spectrum might be electronic medical records (EMR) software: while no one would be “playing” on an EMR system, these interfaces have procedures that make arguments about their patients, medical hierarchies, and privacy — the push for health information exchange (HIE) software which allows for the sharing of relevant data across health and non-health entities such as food banks is reflective of a critical approach to health care software design that implicitly argues for health systems which address social determinants of health and gives patients more agency over their data [Kaelber and Bates 2007] [Rudin et al. 2014]. Between the engaging world of games and the bureaucratic world of management software, there are any number of digital tools which can be critically examined and designed to more intentionally engage with the world we live in.

While design has always been focused on how best to analyze and represent data, critical design brings latent social and political questions to the forefront of the digital humanities, homing in on a DH “that matters” [Gold and Klein 2019]. Social scientists have long recognized the ways that worldviews and social theories are codified into research methods, and work in the social sciences (like that of Seaver or Bail) demonstrates how recent studies have had to contend with the socio-political implications of technology’s designs and procedures. Reflexive critical design tasks DH researchers and designers to think about how the tools they produce and the tools they use assist in the production of a political reality. Just as Google search indexes perpetuate racist worldviews through their treatment of racial and gender minorities [Noble 2018], DH researchers run the risk of creating tools — for academic or public use — that actively aid in the reification of a particular (and potentially dangerous) social theory. Reflexive critical design also opens up the pathway for experimental critical design: once a social theory has been established in a digital tool, how do the users of that tool engage with it to reproduce or subvert that worldview? Users — be they DH researchers or the public — create data under the framework provided by these tools, so their output enables the interrogation of the kinds of data the tool allows. This also allows reflexive critical design to understand technology *in its use* rather than just in concept. Moreover, by examining others’ computational models addressing shared research questions or by asking users how they would design a computational model to approach a research question, the social theories baked into procedures can themselves become data for comparative analysis. This final form of experimentation rests on the notion that people are innately theoretical beings, and they will try to translate their understanding of the world into procedures, as people do when designing systems in video games [Jagoda 2020, 227–233] or HIEs. Ultimately, this interdisciplinary approach recognizes that digital procedures increasingly govern the way that we interface with reality, and thus we need to critically design digital procedures — in DH tools, social science experiments, social media, games, and even health management software — that are honest about their procedures, allow their procedures to be tested, and look toward others to build better digital systems.

Network Analysis and Data Visualization: Networks of Loss

Recent trends in employment, education, and technology have made the promise of large scale data analysis a reality in a variety of industries and research areas, motivated in part by the profit to be had from data mining (with the oft-repeated assertion that data is the new oil), a budding career-oriented student body well-versed in technical skills, and the proliferation of open-source software that has made mathematically complex and technologically taxing data analysis accessible [Provost and Fawcett 2013]. These innovations have come at a cost: setting aside the perennial fear that data analysis will strip more qualitatively-oriented humanities and social scientist researchers of job security, the acquisition of data for analysis raises ethical questions regarding individual privacy and rule by technology [Cheney-Lippold 2017, chap. 2]. However, while the social harms of data harvesting are not to be downplayed, equally important

is how that data is used. There are obvious cases of data abuse — such as city police departments that deploy racist policing algorithms or search algorithms that reiterate racist stereotypes about Black women — and then there are questions of manipulation, disinformation, and epistemology [Ferguson 2016] [Gottlieb and Dyer 2020] [Noble 2018].

Due to data science’s proliferation, open-access tools are more and more being leveraged by actors who don’t have a deep knowledge of the technology’s operations, let alone the statistical or social sciences background to put their results in context. In a time that has been labelled the “post-truth era” or “the Misinformation Age,” the threats posed by the — sometimes malicious, sometimes innocent — dissemination of false or misleading information can have damaging effects on public discourse, political organization, and national crises, a fact that became exceptionally clear throughout the course of the COVID-19 pandemic [Ågerfalk, Conboy, and Myers 2020] [O’Connor and Weatherall 2019]. Considering how easily convinced people are by blatantly false and easily refutable “science” or news, any additional credibility granted to amateurish data engineers is in itself a heightened risk [Moravec, Minas, and Dennis 2018]. This project embraces and reimagines this criticism: on the one hand, it accepts that the overabundance of amateur data analysis seeking to answer fraught global topics is dangerous and that such tools need to be augmented to prevent faux-empiricist manipulation; on the other hand, it develops a uniquely accessible tool that encourages experimentation with data science techniques from a purely personal perspective, prompting users to recognize the false objectivity that belies data visualization and instead use data visualization as a tool for personal reflection.

18

I chose to engage with network analysis tools because they are among some of the most vague and inscrutable data visualizations, often difficult to program and used for hyper-specific datasets. However, they are increasing in popularity, particularly with analyses of social media, so they are not entirely unfamiliar to a general audience. In the sections that follow, I will first describe the project’s digital technology, laying out what this tool is. Then, I will approach the tool from a reflexive critical design perspective, thinking through network theories, design principles, and design purposes to exhume the logic of this tool. Finally, I will engage with the concept of experimental critical design and demonstrate how this digital tool could be used to facilitate experimentation in a mode that is both sociologically-informed and germane to the digital humanities.

19

The Project: “Loss”

Nothing is something where something is meant to be. —Nick Cave and the Bad Seeds (2019)

“Loss” is a data visualization website^[3] that encourages users to think through the question, “What do you need to remove in order to erase [thing] from [your life or society]?” The website allows users to develop their own network visualization through a hierarchical visualization of HTML elements. By naming, arranging, and adding “nodes” in the HTML document, users are able to seamlessly generate a visualization using the JavaScript library D3 (Data Driven Documents) [Bostock, Heer, and Ogievetsky 2019]. The website subverts the typical employment of D3 as primarily a way of visualizing extant data by inviting users to create their own networks, a task which, while increasingly accessible, is still mostly limited to those who have some knowledge of computer programming and who have access to datasets. By allowing users to create their own visualization — and their own datasets — “Loss” encourages users of the website not to just think with data or to think about data, but to think *through* data, using data visualization strategies not just as a way of representing the world but of actively engaging with it. The fact that network visualization is being used, with its veneer of empiricism, also necessarily interrogates the idea that datasets are always perfect reflections of reality. Moreover, it points to the larger question of what a network visualization even represents, interrogating the taken-for-granted visuals we are increasingly exposed to.

20

Today, I want to remove a **thing** ^ from **society** ^

next

Figure 1. The Guided Tutorial

From a user experience standpoint, the design interface is rather simplistic. At this point, it may be helpful to navigate to the website and access the page labelled “tutorial,” as I’ll be walking through the site’s functionality. The tutorial begins with an interactive statement seen in Figure 1: “Today, I want to remove a thing from society.” In the tool, the terms “thing” and “society” are actually dropdown menus which allow the user to produce different statements, such as “Today I want to remove a person from my life” or “a concept from history.” Based on the user’s selections, the program asks follow-up questions which lay the foundation for their network. Thus, someone who decides to remove another person from their life will be asked about what the two people share together, which will later be turned into a node. Once the questions have been answered, the user is presented with the full tool and a preliminary version of their network of loss. An example of what this looks like is seen in Figure 2: On the left-hand side, there is a hierarchical interface akin to an ontology or file management system where users can add nodes to the network and give them names, sizes, and colors. This hierarchical structure can be manipulated, with nodes rearranged or deleted. On the right-hand side, we see the results of this hierarchy: when the “generate” button is pressed, the network is constructed and visualized for the user as a series of connected nodes which can then be dragged around. If the user wanted to save their network to be used in a different visualization software, that option is made available to them with the “export” button.

21

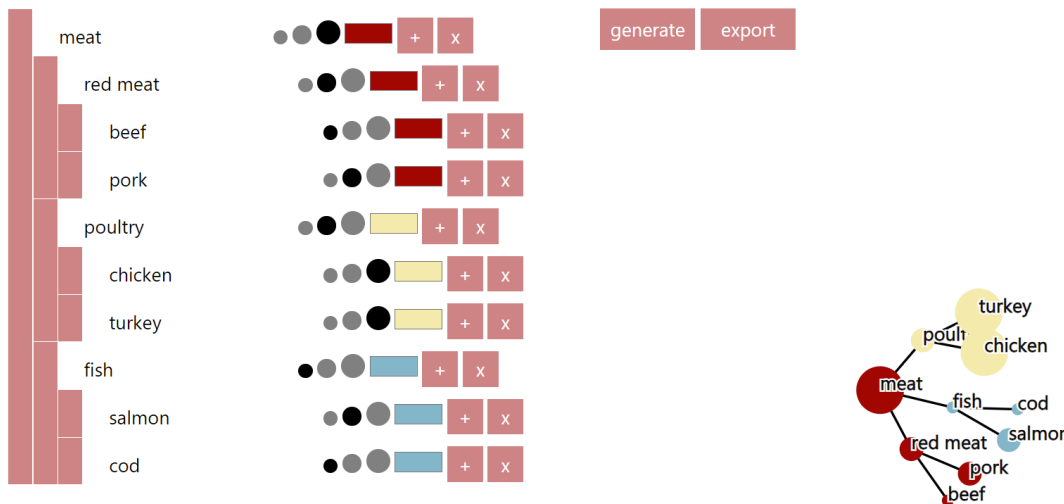


Figure 2. Example Network Built Using the Tool

The example shown in the Figure 2 is taken from prototyping the tool with colleagues and friends who eat meat. They were prompted with the statement, “Today, I want to remove meat from my life.” The networks developed by users in response included everything from restaurants to holiday traditions. This use case resonated differently for different people: for some the tool provided a visualization of just how much they would lose by going vegetarian, while for others it enabled the construction of a thorough and strategic plan for going meatless. In testing, people were asked to design

22

networks that touched upon deeply personal systems — such as removing a loved one from one’s life — or systems that, while personally resonant, aren’t always easy to fully imagine — such as removing the institution of policing from society. Even in these use cases, the tool doesn’t make any assertion about whether loss is a good thing or a bad thing, nor does it set parameters for what should or should not be included in the network. It simply allows for these networks to be built and visualized. This is a decision that I made as the administrator of these use cases: it would be entirely possible for the tool to be used to ask the same questions, with different framing, in order to produce networks that were critical of meat consumption or policing and posed questions to guide network construction and interrogate people’s relationships to these systems. Such uses are discussed more in the later section “Critical Design as Experiment.”

While “Loss” doesn’t take a stand on whether any given loss is good or bad, it is still explicit about its pedagogical design and how the project is intended to be used. The landing page text reads, “...there is no amount of ‘big data’ that can be visualized to explain the very personal, individual experiences we have with systems and ideas. So instead of using data visualizations for rigorous science, we’ll leverage these tools to think through how we are implicated in systems.” The aforementioned guided tutorial facilitates the “thinking through” that the landing page requests. The tutorial is not an explanation of the tool itself but a line of questioning that is supposed to be evocative of different forms of thinking. These questions ask users to think more deeply about their engagement with systems and contingencies, and in this way, the website continues to make clear the designer’s motivations for its creation and the worldview it seeks to present. Should users skip the tutorial, the main tool still contains a rotating series of prompts that reiterate systems-level thinking, with pointed questions that provide pathways for expanding the network they’re creating to include things like historical structures or emotions. There is also a brief explanation of the tool’s features, but once again, users aren’t instructed to visualize certain topics or assume certain political positions. All of this is done to intentionally be content-neutral: the tool prepares them for *how* to think about any topic of their choosing, not what to think about it.

23

On the technical side, the program’s functionality is fairly straightforward: users are essentially adding, deleting, and rearranging HTML elements using the hierarchy. These div — or content division — elements are comprised of two main components: their location and their customization. Each div — which we can understand as a node in the network — is placed within an HTML hierarchy, wrapped within other divs. A child div is located inside of a parent div. The child div knows the name of its parent based on its location, and this HTML information is converted into network data — the links between nodes — using JavaScript. The parent div knows how many children it has, which is only used to make sure users do not accidentally delete the entire graph. Each div also has customizable features — name, size, and color — that make it unique. These features are also translated into network data using JavaScript and used to style the nodes in the graph. It might be helpful to imagine the computational logic as akin to a giant matryoshka doll: each interior doll knows which doll it is inside, and each doll has unique features. Each div knows which div it is inside, and each div has unique features. Because the network is generated on the basis of unique names for divs, users can enter the same name multiple times to give a div multiple connections. D3, a data analysis library for JavaScript that can turn JavaScript data into charts and graphs, is used to convert the network data produced by the collaborating HTML and JavaScript in order to visualize the nodes.^[4]

24

Before moving to the theoretical reasons for the project’s design, I want to explain why the tool’s UI and code are the way they are. First, the user interface was designed to be simplistic and approachable, with only a few variables (size, color, name, and position) that allowed for maximum creativity. In the design phase, there were other ideas for how the UI could look: for example, it was considered that the tool could begin with a monochrome screen, and as objects were removed (by being added to the network), the color, too, would be removed. This prototype would have more closely mirrored the actual process of loss, of things being taken away, but it wouldn’t have produced network visualizations that are familiar and easily introduced into other contexts. The design process included toying with other interfaces and features through an iterative engagement (initial designs were shared with colleagues and friends for feedback), but it ultimately settled on the one here for its ease of use, resemblance to other network visualization software, and technical simplicity — some features, like adding nodes via interaction with the generated network, were technically resource consumptive or difficult to use.

25

It should be noted that the code itself is not well-optimized, nor does it leverage advanced JavaScript libraries (aside

26

from D3) to perform computations. There are a number of reasons for this: First, the goal was to program something with few dependences so that people with only an intermediate knowledge of the main web languages would be able to read its code. Second, as a fairly lightweight application, there was no need to optimize performance as ultimately, the code works. Finally, aspects of the code that are repetitive or mathematically simple better articulate the theory behind the code. For example, there are plenty of other ways to create a web app in which the hierarchy which generates the network leverages math to build out the network, but in this version, what happens computationally is what is envisioned theoretically: a parent node is known to be a parent because it quite literally contains its child node. They have a direct, computational relationship such that the computer “thinks” about the relationship the way we think about the relationship. Moreover, the computer “thinks” about the relationship the way network data represents those relationships, which is why the user can export the graph to a network data format. There’s a one-to-one relationship between computational representation, network theoretical representation, and the actual network relationships being represented. Thus, this software privileges simple, theoretically-driven computation to assist users in thinking through data, so the theory driving its design is what I’ll discuss next.

Critical Design as Theory

The data visualizations that led to the creation of this project are largely rooted in the theories of network analysis. Network analysis has enjoyed widespread adoption in the social sciences as a way of structurally examining the relationships between different entities [Wasserman and Faust 1994, 4]. In contemporary uses of network analysis, it can be employed to better understand patterns of viral spread, social networks of support, or online networks of political actors [5]. Beyond statistical and theoretical implementations, network analysis has been translated into a robust form of data visualization that — for all of its popular uses — remains less employed if only because the data for network visualization is not always easy to attain and is rarely bundled together with other data. Due to the diversity of network visualization’s applications, it is at times difficult to know what precisely is being represented with a given network. The “nodes” of the network are often straightforward — representing human agents, organizations, or creatures — but the links between each of these nodes can represent a variety of relationships. Some links are clearly defined: they might show the transmission of diseases or check to see if two nodes are “friends” on a social media platform. Other network visualizations strategies actively delineate the changing definitions of links and nodes in the visualization, such as in the project “Anatomy of an AI System” which sketches out the various international relationships required for the production of an Amazon Echo [Crawford and Joler 2018]. This non-computational network visualization ambivalently defines the relationships between a variety of types of nodes which range from actors such as “companies” to concepts such as “geological processes.” These two drastically different approaches to network visualization — one with very clearly defined sets of nodes and links, computationally generated, and one with ambiguous categories of nodes and links, qualitatively designed — demonstrate the potential for network visualizations to be used for projects that go beyond limited datasets and ask us more broadly to interpret the relationships presented in visualizations. Indeed, many visualizations fall somewhere in the middle, simply showing “relationships” between nodes, a term which can take on a multiplicity of meanings.

While network theory and network analysis remain useful backdrops to network visualization, they are intimately focused on *structure* and regularity, embracing an empiricism that might distinguish itself from the Amazon Echo approach, which engages with networks in all of their shifting complexity. “Loss” embraces this ambiguity of links, nodes, and networks to take a figurational sociology approach to network visualization which recognizes that attempts at structured analysis might fall short of capturing the complexities of networks by focusing on a more limited notion of what belongs in the network. Figural sociology, developed by Norbert Elias, recognizes the risks of empiricism in representing complex human behaviors: In response, the figurational approach criticizes the move towards social scientific essentialism that “...blurs the procedural character of social phenomena by presupposing the existence of permanent structures subjacent to change” [Quintaneiro 2006, 55]. Adopting a perspective that recognizes historical contexts, power, and the need for multi-level analysis, figurational sociology benefits from its focus, “...on the understanding of the structures that mutually dependent human beings establish, and the transformations they suffer, both individually and in groups, due to the increase or reduction of their interdependencies and gradients of power” [Quintaneiro 2006, 56]. Elias’s framework was mostly concerned with how to negotiate the chasm between analysis of

individuals as people subordinate to a large social system and as the very agents who worked to construct those social systems, superordinate to their forces. While it too has a penchant for structuralism, in modern applications, figurational sociology wraps in a constellatory logic that attempts to capture a more robust picture of systems by drawing out the idiosyncrasies of social dynamics that pure structuralism would flaunt. This negotiation between structure and adaptation, between individual experiences and social systems, between history and anachronism, makes figurational sociology a more appealing approach. At its core, it is about the configuration of individuals and structures as they collectively produce the social world in dialogue rather than as one determines the other.

The language of figurational sociology is suited for network visualizations — often referring to “webs,” “linkages,” “dependencies,” and “networks” — and a revival of figurational sociology has come about in conversation with network analysis, which means that there are visualizations that describe the relationships between actors in social configurations [Baur and Ernst 2011]. Adding to figurational sociology’s lexicon, it is important to imagine both individual and social experiences and structures as being “encounters,” “assemblages,” and “precarious” [Tsing 2015]. Anthropologist Anna Tsing’s wide-ranging work on the global networks of the *matsutake* mushroom trade develops in language what this project would aim to develop in network visualizations, as she discusses “encounters” — sometimes fleeting but still important — between unexpected actors, “assemblages” of perhaps apparently unrelated systems and events, and the general precarity of the social world in a changing economy and ecology. She, too, employs a constellatory logic that lets disparate subjects converge to create something in their relationships to one another — in their configurations.

29

The figurational approach, especially as it recognizes the strength of phenomenology, tries to unpack these assemblages, encounters, and systems for what they are, revealing their role in our daily lives and applying structure and systematic analysis where there once was story, but Tsing’s work is evidence for how we tend to mask these analyses with a deeply individual narrativization of complex systems. Reflexive critical design, especially for a DH “that matters,” tasks designers with self-reflection not just because reflexivity helps explain the analytical framing of their work, but also because it elucidates the political procedures of their work — as evidenced by the ways that authors have demonstrated their desire to alter social behavior or critique racist technology. Certainly, this project’s procedures are grounded in assisting users to unpack their tendency towards individual narratives and think in terms of configurations and systems, networks of related and contingent subjects who might sometimes be invisible to individuals. The theoretical framing of figurational sociology is employed procedurally, in the design of the website, to accomplish a goal that has political implications. Imagine that this tool was employed not in its currently content-neutral format but instead in a format that asked users to imagine a world without policing, Amazon, or sexism: what would we need to remove to take down these institutions, corporations, and prejudices? A simple alteration of the website’s language, with a little more background provided on each subject, can quickly turn “Loss” into an explicitly political project. Indeed, the project was designed to be employed in such a way, so this is no stretch of the imagination.

30

The procedures of a digital tool, especially when used to educate and allow users to produce more content, thus become an ethical and pedagogical practice. Historian Joan Wallach Scott characterizes ethical practices as those in which people strive to reduce the gap between reality as it is and reality as it ought to be [Scott 2019, 15–20]. “Loss” asks people to imagine a world of social consequences and contingencies, thinking through the responsibilities of an interconnected world in which the loss of something — such as a person, institution, or idea — has effects that ripple out. In other words, it aims to instill an ethical practice, asking users to think about the world *as it is* and then how it *might or ought to be* following a change in its configuration. This is inherently pedagogical, especially considering the way that the tutorial and guiding questions are framed. Not all digital tools take a pedagogical or ethical approach: they present the world as it is, or they experiment on people without revealing the purpose for the experimentation, but in order to establish a DH that matters, we need to recognize that procedures, in representing a worldview, can also represent an imaginary that is to be resolved with a new way of thinking — one that the tools can hope to instill. If John Culkin’s summation of Marshall McLuhan’s work is correct — “We shape our tools and thereafter they shape us” [Culkin 1967, 70] — then we need to recognize how these tools can be used to educate for social change.

31

Critical Design as Experiment

In the current design of the website, a small “About” page invites users who have made a network that they enjoy to submit it. One can imagine how a tool like this can be used to produce data that can be recirculated and analyzed, recognizing the data for how it was produced. If the tool was to be introduced in a classroom environment with a specific prompt, such as “What does it take to remove policing from society?”, then students could think through the various ways that policing is implicated in their lives, and each student’s developed network would represent a valuable data point in a larger narrative about policing. Computationally, the tool is simple enough to edit that one could port it to their own website and alter the tutorial such that the tutorial prompts become a research question: one could code the prompt to state “Today, I want to remove social media from my life,” edit the follow-up questions, and distribute the website to people as part of a research study on social media use. As experiment — and perhaps as experimental pedagogy — “Loss” allows for the production of more data that can be used to interrogate such questions across different topics. This speaks directly to the fact that network data is often difficult to come by — but that is a fundamentally different type of network data. The data used in large scale analysis seeks statistical rigor through uniform structure. This data would reflect very different types of networks that can be leveraged in different ways, analyzed qualitatively in addition to quantitatively: why did people choose to include certain items in their network, why were certain items connected, what do these connections represent, has the use of this tool changed the way that they were thinking about a given issue? Each of these questions becomes another entry point for data analysis when examined through this lens.

This pathway might seem circuitous — arriving at qualitative data analysis through the techniques of quantitative, “big data” approaches — and that’s because it is. Approaches designed for large scale analysis can be applied to other settings, and the development of these quantitative techniques can make qualitative analysis more robust. If a large enough group of people use this tool to respond to the same prompt, then it is entirely possible that that data could be collected and analyzed. Through data cleaning and natural language processing techniques, the various individual networks could be concatenated to make one larger network, and it would be possible to ask new questions: what nodes appear across participants, what nodes receive the largest size, are nodes consistently connected to the same central node across participants, and were most participants thinking more about their own lives or about wider society? Of course, such analysis needs perpetually to return to the data’s source and thus the theoretical framework of the tool: it was a tool designed to produce data under a specific framing, and so all data should be treated in relation to that framing. Here, a convergence of research techniques seeks to break interdisciplinary boundaries: with qualitatively generated data designed in such a way as to be able to be analyzed quantitatively, we can further dismantle the distinction between these techniques and see the possibilities for arguments that leverage multiple forms of analysis to demonstrate their claims. Further, by anticipating “big data” through a qualitative design, this skirts the ethical dilemmas that accompany “data-mining.” If data is to become more restricted to protect privacy, then now is the time to start imagining alternative — perhaps more traditionally experimental — ways to ethically source data. As an experiment, “Loss” allows for the customizable generation of network data that can be employed in research settings to produce quantitative and qualitative analyses that speak to one another.

Critical Design as Data

Finally, the reflexive, critical interrogation of the design of “Loss” allows for three different types of data. First, “Loss” itself is data. As a freely available, publicly hosted platform accessible on GitHub and with annotated code, researchers who are reviewing network visualization strategies can do critical readings of the code that comprises “Loss.” In the same way that mathematicians have scrutinized digital tools to see how they run statistical analyses or computer scientists have critiqued different programs to see which ones most effectively complete a given task, DH researchers can critically compare the code of a program like “Loss” to see how it posits and procedurally argues for a social theory [Burdick et al. 2012, 53]. Comparative critical coding is not only valuable to researchers seeking to understand the social ramifications of code, but it can assist designers in producing better coded tools. And analysis of “Loss” as a digital tool doesn’t have to be confined to its code: a vital component of software is its other aesthetics, such as data visualization’s visual repertoires, which work in tandem with procedural arguments to facilitate argumentation through multiple rhetorical vectors [Burdick et al. 2012, 42–43].

Second, this paper is in itself a datapoint in a larger conversation about network analysis and another conversation about the use of digital tools for ethical and pedagogical practices. Most network analysis tools are developed from

purely mathematical perspectives, and theory is then applied to the results of that math by outside researchers who had no hand in shaping how the tool functions. This paper is different in that the data — “Loss” itself — comes from a theoretical interpretation of what networks mean. As a case study in the design of digital tools, this is something of an auto-ethnographic understanding of how it is that I, as a designer of network software, translated my social theories into a tool designed for network analysis. This is different from saying that this is a theory paper: this is a design paper, a design document the likes of which are rarely circulated because most digital tools are not developed under specific, self-critical theoretical frameworks. Perhaps it is reductive to call this “data,” but in the under-utilized world of critical design, researchers are often looking for interlocutors whose work they can examine for its handling of biases and latent assumptions [Bardzell and Bardzell 2013]. Quite literally, the process of design becomes data for investigation.

Finally, “Loss” offers one way of employing data visualization techniques to grapple with the questions of loss, removal, and figurational thinking. It is a specific strategy for both analyzing and communicating people’s experiences of loss and removal, but it is certainly one of many ways to procedurally address systems. The website recognizes this, writing, “We are increasingly able to recognize systems for what they are, but they remain difficult to capture in their entirety. Moreover, each person experiences these systems differently. This is an open question: how would you think through loss and removal? How would you visualize it, communicate it to others?” It then gives users the space to express their strategies for visualizing loss, though this information is not collected, merely used as a primer for the tool to come. Under the framework of experimental critical design, one could imagine asking participants to design an online tool that imagines loss — while I was building this tool, people who I shared my prototypes with had their own ideas for how one could go about visualizing and playing with the concept of removal. The divergent perspectives on how to procedurally represent loss are a final way in which critical design can constitute data; the process of design, opened up to many interlocutors, becomes a way of getting at people’s social theories of the world.

36

It’s important to reiterate that under the “critical design as data” perspective, it is the design itself that is data: the design of “Loss,” the design-document and theory behind “Loss,” and the ways that “Loss” could be leveraged to access other people’s design ideas, which then become data. In recognizing that designs are social theories, we can use “designs” to access theoretical dialogues — among designers or any group of people. This is inherently sociological: by using the design frameworks offered by digital humanities, researchers can obtain data about people’s understanding of the social world.

37

Conclusion

This paper has precariously moved across an assortment of disciplines, leveraging theory, methods, and designs from anthropology, sociology, digital humanities, science and technology studies, history, and data science to evaluate a tool designed with no definitive disciplinary home. One could imagine going to the website and posing the question, “What would it take to remove critical design from academia?” The resulting network would likely reveal the disciplinary anxieties that the turn to the digital has allowed to foment. As digital tools become ubiquitous across fields of study, it is not the job of the DH researcher or the sociologist or the computer scientist alone to critically examine the tools that they use and produce (though they should), but it is the job of the entire academic community to have a critical eye for the social ramifications of technology that is found in classrooms, corporations, and people’s personal devices.

38

“Loss” is an articulation of how a sociological theory can be implemented in a digital tool. The joint resources of digital humanities’ emphasis on design and the social science’s emphasis on theoretical frameworks allowed for a self-critical examination of how “Loss” attempts to implement its social theory through procedural argumentation. And as a tool for experimentation, “Loss” could be leveraged to produce new data that would challenge the theory presented in its original design. Critical design allows for a deeper interrogation of the theories that structure our digital designs, the data they produce, and how both the designs and their theories become data for investigation as we strive to develop better tools — in viewing “Loss” through this lens, its design must become defensible so as to justify the arguments it procedurally makes and the data it procedurally produces. Where this paper diverges from other perspectives is in its leveraging of digital humanities design ideas — like procedural rhetoric — to approach sociological questions. As a sociologist, I’ve often compared the work of interviewing and content analysis to the work of a critical close-reader — in each case, the sociologist extracts social meaning by examining the rhetorical strategies of language or visualization

39

found in interview transcripts or online posts. Now, it is the same — social meaning is extracted from a close-reading of procedure and procedural rhetoric to understand how social understandings are systematized.

While there are prominent examples of digital tools that are designed with a critical reflexivity, standard practice in the digital humanities, as well as data science and the social sciences, is to employ tools that go uninterrogated. Further, DH has stayed closer to “critique” than to design, typically employing tools designed for other fields or general use. This has limited how DH is able to be productive: both how it is able to produce theoretically-rigorous, content-specific tools and how it is able to produce its own data for investigation. “Loss” is certainly not pathbreaking in its design nor its theory, but it is a proposition for both DH and sociology, a proposition for productively designing tools that are made to generate data not available elsewhere, data that springs from a robust design intentions.

40

Corporate tools face the scrutiny of the market to establish themselves, but academia is not gifted with a talent for creating viral, widely-used digital platforms. Tools are used for hyper-specific purposes, they become obsolete or unsupported, or they’re designed without a strong enough team from different fields. For a DH that matters, academia must recognize the necessity of interdisciplinary collaboration as opposed to market competition, the collective power of designing socially-empowering and productive digital tools. And academia shouldn’t forget its place in education: As the digital divide in businesses and schools grow, DH can more concretely position itself as public discipline engaged in digital pedagogy and committed to digital literacy that can overcome the tendency of technology to further segregate people based on class, race, and education [Henderson 2011]. DH can seek a mutually-beneficial relationship with the public: designing tools for public use that can be leveraged by researchers to collect ethical and unique data while also remaining engaging and educative, tools that people would enjoy using and might even find useful and instructive.

41

Design as a whole needs to rethink its approaches to data, ethics, and education. If digital tools are reshaping society, we need to be critical in our design of tools. If data is the new oil, then we shouldn’t become the new oil barons, chasing data at any cost. This is not to limit the work of researchers but to suggest that there are productive affordances of digital design that can open up new methods and strategies for analyzing and producing data while effecting social change.

42

Notes

[1] Many of these cited works are from online articles or books which do not include page numbers for quotations.

[2] See for example: [Cheney-Lippold 2017] [Seaver 2017]

[3] It is currently available online at the author’s website here: <https://loss.peterforberg.com/>.

[4] The source code and documentation — available online using most web browsers’ “inspect” feature — walks through how the code works, though it expects some background knowledge in the basics of both HTML and JavaScript. For a more detailed explanation of the website’s code, visit its public GitHub repository here: <https://github.com/peterforberg/loss>

[5] see for example: [Bail 2021] [Luke and Harris 2007] [Wasserman and Faust 1994]

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