

Introduction: The Questions of Minimal Computing

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Minimal computing is the answer. Minimal computing is easy. Minimal computing consists of multiple methods, some as yet to be imagined. Minimal computing will end pandemics/thwart Putin/stop climate change. Minimal computing will save the humanities. Minimal computing is a false prophet. Minimal computing distracts from the pressing issues of the day. Minimal computing is static site generation. Minimal computing is hard. Minimal computing is not the answer. 1

Perhaps all of these statements made, explicitly or implicitly, throughout this special issue of *Digital Humanities Quarterly* are true. Perhaps they are all fiction. Or, perhaps, minimal computing is a methodological Jekyll and Hyde,^[1] good, evil, and, well, strange, all at once. Or, perhaps, minimal computing is a Rorschach inkblot — those of us who practice and critique it see what we want to see, project our hopes and fears, and expect too much. In this special issue, the first collection of peer reviewed scholarship on minimal computing, we shed light on the theories and practices of minimal computing through a blend of theoretical essays and case studies that illuminate how to undertake digital humanities scholarship under institutional and infrastructural constraints. 2

Defining Minimal Computing

Defining minimal computing is as quixotic a task as defining digital humanities itself [Kirschenbaum 2012] [Spiro 2012] [Bianco 2012] [Hall 2012].^[2] Minimal computing is less a singular methodology — or even a coherent set of methodologies — than it is a mode of thinking about digital humanities praxis that resists the idea that “innovation” is defined by newness, scale, or scope. Broadly speaking, minimal computing connotes digital humanities work undertaken in the context of some set of constraints. This could include lack of access to hardware or software, network capacity, technical education, or even a reliable power grid [Minimal Computing Working Group 2022]. 3

Minimal computing is an approach that, first and foremost, advocates for using *only* the technologies that are necessary and sufficient for developing digital humanities scholarship in such constrained environments. This does not mean that the “minimal” of “minimal computing” implies ease for all users or prescribes acceptable types of hardware, software, and platforms (e.g., Jekyll, Arduino, and Raspberry PI).^[3] Rather, it gestures towards a decision-making process driven by the local contexts in which scholarship is being created. In this way, minimal computing is platform- and software-agnostic, emphasizing instead the importance of making these choices, based on the constraints with which we are working, to facilitate the development of digital humanities scholarship in environments where resources (e.g., financial, infrastructural, and labor) or freedoms (e.g., movement and speech) are scarce. 4

Our observations here may not satisfy those expecting a more concrete definition of minimal computing. Therefore, we offer the following: minimal computing is perhaps best understood as a heuristic comprising four questions to determine what is, in fact, necessary and sufficient when developing a digital humanities project under constraint: 1) “what do we need?”; 2) “what do we have”; 3) “what must we prioritize?”; and 4) “what are we willing to give up?” 5

“What do we need?” is a question that echoes throughout essays and case studies in this special issue. In 2016, Alex, along with Élika Ortega, posed this question in their essay, “Multilingual Practices and Minimal Computing” [Gil and Ortega 2016]. The question of “need” is one intended to cut through a tendency in digital humanities to valorize keeping pace with trends towards high-speed computing, acquisition of the latest computational technologies, and fetishization of the cutting edge. Sometimes — perhaps often — when we pause to consider what we *actually* need to complete a project, the answer isn’t access to the latest and greatest but the tried and true. In our work with faculty and collaborators, we have seen firsthand how the drive to be “innovative” for the sake of innovation can be a deterrent to 6

actually completing (or even starting) a project. For example, Roopika (Roopsi)^[4] has had countless conversations with colleagues who are convinced that they *need* to use a particular piece of software, like ArcGIS, because it's popular and has a name brand association with digital humanities, when something simpler like Tableau, ArcGIS StoryMaps, or even Google My Maps would suffice.^[5] Alex has had many similar conversations, in which the need to publish an online edition of a historical text is confused with the need to learn TEI, or the desire to count occurrences of a trope in a literary text is confused with learning Python or using an “easy” but expensive tool like NVivo. When we reorient our praxis around the question of “what we need?” rather than what we *think* we need, we are better positioned to see digital humanities projects through because our technical choices, methods, and research questions are more appropriately aligned.

The question of “What do we have?” is equally as critical because it encourages practitioners to focus on the assets available to them and thus resists a deficit mindset for those of us who are working under constraints. Quite often, the lauded models of digital humanities scholarship are projects developed with significant institutional resources and grant funding. It's easy to look at those examples and focus on what we *don't* have. Shifting the frame of our thinking towards what we *do* have is critical to identifying the resources we have at our disposal. Minimal computing draws the inspiration for this question from asset-based approaches that exist in multiple forms around the world, such as *jugaad* in India, *gambiarra* in Brazil, *rebusque* in Colombia, *jua kali* in Kenya, and *zizhu chuangxin* in China. These practices privilege making do with available materials for creative problem-solving and innovation [Risam 2018a]. An example of this in the U.S. context appears in Joshua Davis's book *Spare Parts*, the story of a group of undocumented high school students whose underwater robotics team beat teams from colleges like MIT, who had access to high-tech polymers and funding from Xerox, simply by relying on knowledge gleaned from working with family members who were gardeners and mechanics [Davis 2014] [Risam 2018b]. In her work at Salem State University, Roopsi and her colleagues Susan Edwards and Justin Snow put the question of “what do we have?” at the heart of their digital humanities initiatives with students. They focused on the resources they had — archival holdings on early 20th-century local history, their collective knowledge, their library server, and existing faculty professional development programs that they could reappropriate to build a digital humanities internship program for students [Risam and Edwards 2018] [Risam et al. 2017]. Alex, in turn, has purposefully visited several countries around the world, and worlds within countries, to answer the question: what do folks doing humanities and cultural work have? The answers vary wildly, from the University of Khartoum's history department to Havana's undercommons to the incarcerated youth at Rikers Island in New York City. In Sudan, for example, electricity is unstable at certain times of day and Internet activity is censored by the government. This means that any solutions there must focus on what scholars do have: hard drives, where projects can live more freely than on the Internet; the ability to create multiple versions of projects to evade government censors; and dedicated, affordable PCs running on batteries to provide classes with access. Through a focus on what we do have, rather than what we don't, we are better positioned to assess and leverage extant resources and use them to resourcefully make do with the means at our disposal. They may not look like the resources that are available at elite institutions or made possible by grant funding, but they are resources nonetheless.

Following on the questions of what we need and what we have, asking “What must we prioritize?” is essential to the mode of thinking for which minimal computing advocates. When working under constraints, we cannot treat all competing priorities in a project as equally important. When developing a recent project, Roopsi chose to use WordPress rather than the Jekyll static site generator for the website. While using Jekyll would have reduced maintenance and increased security because it does not rely on a database — two features that Roopsi prefers — WordPress's graphical user interface (GUI) made website updates easier for all her collaborators.^[6] The learning curve for Jekyll, which involves using the command line and requires some rudimentary understanding of Markdown, CSS, and Liquid, was unfamiliar to most of them, and her collaborators, who work at universities with high teaching loads, could not allocate the bandwidth to learning Jekyll simply to add content to a website. Prioritizing people over platforms, in this instance, was the appropriate choice to ensure full participation of all collaborators. On the other hand, in his role as digital scholarship librarian, which included helping individual faculty members get digital projects off the ground, Alex found it enormously more time efficient to receive data from collaborators in formats that were already familiar to them (e.g., spreadsheets and Microsoft Word documents) and build projects for them using Jekyll or Wax himself. In both cases, the priority determines the choice of technology. Whether it is or isn't a technology associated with Minimal

Computing™ is less important. The question “What must we prioritize?” speaks to the fact that minimal computing is not prescriptive or advocating for the use of particular software, hardware, or platforms, but rather points to a decision-making process that responds to the constraints of a given situation for project development.

The final question for minimal computing is, “What are we willing to give up?” In environments in which we are contending with limitations, whether of infrastructure, finances, labor, and/or technical knowledge, among other factors, we simply cannot have it all. There are tough decisions to be made, taking into account what we need, what we have, and what we must prioritize. This could mean eschewing the latest, flashiest methods that would cost more money, time, and labor, in favor of a simpler approach that would be practically achievable with what we have. Or it could mean choosing a platform that does not meet every desired requirement of a team but still makes it possible for a project to move forward.^[7] For example, when working with students at Salem State University, where students typically work 30-40 hours per week in addition to taking classes, Roopsi tended to use out-of-the-box tools that students can reasonably learn how to use during class time, rather than bespoke solutions that would require students to learn how to code and require substantial independent work outside of class. By giving up what might ultimately be prettier or more elegant, in the context of teaching, she instead focused on technologies that help students gain confidence in their digital literacy skills and have small wins that might later encourage them to develop a stronger technical skill set. Alex has made analogous decisions in his own practice. When designing the technology for the project *Around DH in 80 Days*, for example, he was confronted with the challenge of creating a map that could be downloaded in low bandwidth environments and even function on a USB key, in order to make the project capable of traveling around as many of the different digital infrastructures of the planet as possible. To do so, he had to give up on the idea of a map with functionalities such as zoom, tiles, or layers [Gil et al. 2014]. Recognizing that wanting to have it all is a deterrent is essential to making the choices necessary when working under constraints.

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The “minimal” in “minimal computing” therefore stands in stark contrast to an implied “maximal,” where “maximal” connotes design choices that are made without putting the question of what is necessary and sufficient at the heart of decision-making. The primary contribution of minimal computing to digital humanities is to draw attention to the fact that the decisions we make when designing digital humanities projects — our use of particular kinds of hardware, software, and platforms — are not inherently virtuous (or lacking in virtue) but are inevitably encumbered by opportunities and challenges, affordances and limitations, and benefits and tradeoffs by nature. The authors in this issue grapple with these very concerns — just as the two of us do as practitioners — each coming to different answers that are responsive to the local contexts in which their theories and practices are being developed and the constraints of these environments. This is our minimal computing.

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Tense Origins

Minimal computing in the humanities — like digital humanities itself — emerges from many parallel and intersecting origin stories. Rather than tracing the genealogies that led us to this special issue of *Digital Humanities Quarterly* chronologically, we might be better served by illuminating the tensions within digital humanities that have given rise to the concept over the past several decades and will continue to be shaped by minimal computing’s four constituent questions — 1) “what do we need?”; 2) “what do we have”; 3) “what must we prioritize?”; 4) “what are we willing to give up?” — in the foreseeable future.^[8]

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The first tension implied in minimal computing is between the constant drive towards larger, faster, always-on forms of computing and the infrastructural, institutional, and financial realities that constrain digital humanities project development. In the context of academic research, this tension dates back to the birth of modern computers, long before the advent of the personal computer or the Internet. At that time, only elite universities in wealthy countries could afford mainframe computers for computational labor. Today, this impulse takes many forms in digital humanities, including the valorization of cluster computing, high speed Internet, cloud computing, and big data. Those supporting and relying on computation who work on the creation of online publications cite the need for user-friendly data entry (i.e., GUIs in web browsers) or continuous publication of new materials. Those working in cultural analytics, text analysis, and the like cite the need for large data processing capacity in the drive towards new insights derived algorithmically from large data sets of cultural corpora. Implied in this narrow definition of “innovation” is an access

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differential: those who have access to such technologies and those who do not.

The implications of this attitude have substantial impact on the future directions of digital humanities research. For example, grant funding and institutional support for digital humanities scholarship follows this mentality, exacerbating existing inequities. The creation of projects that rely solely on the Internet for distribution, thereby excluding large groups of scholars around the world from access, offers another example. While researchers in the Global North are beginning to develop more nuanced understandings of the asymmetrical ecologies of access to and use of technology — which researchers of the Global South have long understood — the expenses tied to newer, faster, and bigger technologies continue to have material implications on the ground.^[9] These costs go well beyond access, touching on environmental concerns, questions of ownership and control over scholarship in the context of postcolonial and neocolonial relationships, the reinforcement of inequitable prestige economies in the global academy, labor conditions for academic workers, and more. And, put simply, this attitude implicitly limits the scope of digital humanities scholarship to the type of work that can be produced with more robust resources.

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The second tension is a relatively newer one between metaphorical computer literacy — the ability to use GUIs, an act in which most people with computational devices engage through their ordinary interactions online — and symbolic computational literacy, or the ability to “code,” which remains the purview of a rare few, especially in the humanities. Much has been made of the debate over whether one must code to be a digital humanist^[10] [Cecire 2011] [Sample 2011] [Posner 2012]. The two of us have, at earlier moments in our careers, understood firsthand how many who wish to undertake digital humanities scholarship are simply looking for easy access to out-of-the-box software and platforms with GUIs for project development.

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The history of digital humanities is marked by many laudable efforts to create tools with GUIs that allow scholars to create digital scholarship in the humanities without having to develop much symbolic computational literacy. However, these tools are inextricably linked to the dominance of English as a lingua franca for programming and markup languages, with downstream implications for those working with languages other than English — namely the emphasis on Anglophone scholarship in digital humanities and the comparative underdevelopment of multilingual digital humanities, particularly languages in scripts other than Latin and those read from right to left [Fiormonte 2015] [Risam 2018a] [Wrisley 2019]. In addition, we have increasingly come to understand that GUIs hide the systems that drive that production, and by extension, the labor to maintain and sustain them. For example, platforms like WordPress that rely on a database require labor to keep abreast of updates and patches, deprecated dependencies like plugins, and their vulnerability to security breaches — and to fix the issues that inevitably arise. Such invisible labor is so successfully obscured that even the most veteran practitioners struggle with its implications after decades of work in the field [Drucker 2021] [Yelton 2021]. Technologies associated with Minimal Computing™ like Jekyll offer some relief from labor issues by avoiding reliance on a database, though not without inevitable tradeoffs — among them, the learning curve for use.

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The “minimal” of “minimal computing” has been assumed by some to promise ease of use or to only require a minimal amount of symbolic computational literacy. Certainly, a team might choose to use a GUI because it best serves the questions of what we need, have, must prioritize, and are willing to give up. However, like all design decisions, such a choice comes with consequences. While those who doubt their ability to learn how to code see the use of GUI-driven platforms as the key to access, often these systems foreclose more control over the production of knowledge, and by extension, participation that is more meaningful to those who seek access. As Matthew Kirschenbaum has proposed, coding is a form of worldmaking, in which the coder defines how that world operates [Kirschenbaum 2009]. In the context of digital humanities, being able to code gives us the power to create new worlds in which we model human knowledge and culture [Risam 2018a]. As we (Roopsi and Alex) have developed our own capacity to code, we have come to see the ways that it has opened up the possibilities for digital humanities scholarship, particularly when working with material from communities that have historically been — and continue to be — excluded from the cultural record.

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Making the transition to thinking and practicing in the realm of symbolic computational literacy, we can more easily seek solutions that promote broader access through reduction of technological complexity (e.g., minimizing reliance on databases, thereby reducing security risk and maximizing access in low bandwidth environments). The idea of a

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reduction in computation has two useful and concrete senses for us: first, literally less code or fewer bytes, and in turn, less computational processing time or capacity. This notion of doing more with less has been fundamental to the development and teaching of computer science, where students are introduced early on to the concept of “Big O notation,” which highlights the importance of ever more efficient algorithms to accomplish a given task. We also see this drive towards “elegance” in the history of UNIX systems, and in some of the foundational forms of computing that are still in use today in digital humanities. A reduction in computation implies a reduction in energy consumed, storage, and labor. In the same vein, we know that computation itself allows us to perform many tasks that could be done by hand but would take substantially longer. Take for example the creation of a works cited page: we can either construct it by ourselves, or we could let software like Zotero write it for us based on our bibliographic data. While by no means wedded to reduction in computation or the substitution of manual labor by computation as requirements, minimal computing asks us to imagine how these might help us accomplish our various scholarly tasks in the humanities.

Implied in the first two tensions is a crucial third: the tension between choice and necessity. In her work at Salem State University, Roopsi worked with minimal hardware, created small static sites, and processed small data sets out of necessity, born from working at a resource-starved public university. Alex, in his work at Columbia University, did so often by choice. In her new position at Dartmouth College, Roopsi will have the choice to work with expensive software or cluster computing — a choice that Alex had at Columbia and will have at Yale University. Both of us can take for granted high speed Internet access provided by our universities, as well as access to a reliable power grid. Even accounting for the major disparities in resources between the institutions where we started our careers, we recognize that our work in digital humanities has been undertaken in relative privilege not shared by our colleagues around the world.

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Choosing to do otherwise — to pursue maximal approaches to digital humanities — is not inherently noxious. However, the humanities, charged with the interpretation and stewardship of human culture writ large, cannot afford to ignore scholarship developed under substantial constraints or circumstances. Otherwise, we will only reproduce and amplify the exclusions and biases that colonialism and neocolonialism have produced in the analog cultural and historical record [Risam 2018a]. Accordingly, any desire to work alongside colleagues around the world to ensure the production of a more inclusive digital cultural record requires engagement with necessity and constraint. Minimal computing provides theoretical and practical considerations to facilitate such collaboration and dialogue.

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The tensions we have outlined arise out of unfortunate political, historical, and economic circumstances that provide urgent and appropriate ground for minimal computing practices and theory to thrive. This larger set of circumstances is beyond humanities practitioners to resolve, but they certainly provide the frame and fuel for much of our practice today. We would be remiss, however, to not acknowledge the relationship between the climate crisis and the development of computational technologies. Computing emerged *in medias res* of a process that began with the imperial enterprises of Portugal and Spain five centuries ago, only to be turbo-charged during the Industrial Revolution and to begin steadily accelerating during the second half of the 20th century. Despite its relatively late arrival, the demands of computing on energy sources seem to grow exponentially as the world becomes more dependent on computers. Ecological activism consistently casts a critical look at these rising costs. In addition to energy, the environmental impact of computation includes mineral exploitation, chemical emissions during production, and e-waste and landfill runoff. Clean energy for the planet may be solved in this or the next century, but we can't know that with certainty without recourse to some mystic belief in innovation, structural change, and destiny. We are left with few concrete options to join the effort to reverse our impact on the planet besides our voices, one of them being the reduction of our relatively small carbon footprint as scholars.^[11]

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Why Minimal Computing?

To be clear, our investment in minimal computing comes not from a fetish for computational reduction or a bias against databases or supercomputing but from a very real fear that reliance on these technologies is foreclosing the possibilities for the development of a digital cultural record that includes the voices and stories from communities that have been elided in the cultural record — like our own.^[12] This fear and our belief in the possibility of changing it is what fundamentally drives all the work we do [Risam 2018a] [Gil and Ortega 2016]. As we have noted, documentary culture

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— the primary sources, archives, and texts that attest to human knowledge and history — has been profoundly shaped by colonialism. Its transformations, brought about by computers and networks, place us today in a long transition from an analog cultural and historical record to a hybrid one — parts analog, parts digital. This is not to suggest that the digital is distinct from material reality — the digital is itself material — but the analog record and the digital record are different enough that it's helpful to think about the digital as a separate domain. (In short, preserving paper is a fundamentally different affair than preserving bitstreams.)

The construction of this new record of the human past, present, and future, as we have also suggested, is gravely affected by socio-technical inequities — not every cultural heritage or scholarly outfit around the world has access to the same infrastructure or resources. In response to this, minimal computing encourages solutions that can be implemented universally. The irony of two people trained as postcolonialists advocating for a universal is not lost on us. This is the same paradox that many anti-colonial and postcolonial writers explored in the 20th century: to seek the universal in the recovery of the particulars that were ignored in colonial archives and rendered invisible by the totalizing impulse of European colonialism and its “Enlightenment” [Wilder 2015]. However, what we seek is an interoperability of digital humanities practices that promote access and equity in digital knowledge production.

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A quick overview, in the largest of broad strokes, paints a concerning picture of the scholarly record at a planetary scale today. The European, North American, and East Asian dominance in the production of knowledge is evident in terms of brute quantity. Concomitant with this state of affairs, several pirate operations have arisen from the ashes of the former Soviet Union and its satellites, creating libraries that give access to a large part of this knowledge to the rest of the world with access to the Internet.^[13] In Latin America, the long history of open access initiatives gives us further hope. Despite these liberatory efforts, the flows of knowledge continue to move from those who produce the most in the putative “West” to the rest — mimicking flows of colonial power from center to periphery — without any clear sign that the movement is reciprocated through uptake of scholarship from the Global South.

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At the heart of this state of affairs is the role of capital in the control of scholarly production. Open access and pirate enterprises point away from the accumulation of capital, and as such, clash with the monopolizing tendencies of the North Atlantic and East Asian models of knowledge production, which coincide with larger expenses in computational infrastructure. It is, perhaps, no surprise that such tendencies have led to the knowledge cartels of the Global North attempting to co-opt open access through article processing charges (APCs) levied on authors to make their scholarship open access. Minimal computing intervenes by studying and creating modes of production that promise control at the local level for those who wish to avoid absorption by capital, who don't want to cede their intellectual integrity to the pressures that come with that absorption, and whose work is suppressed because it does not align with that which capital values (i.e., knowledge production beyond the Global North).^[14] This includes an exploration of the possibilities for community knowledge production that define the shifting epistemologies of our historical moment.

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When we speak of knowledge production, we no longer speak simply of the production of documents. We include the production of data, data sets, and documents as data, all of which can be used for algorithmic analysis or manipulation. The issue of control over data sets, especially those that can inform the pasts of whole demographics of people in the world, will certainly come to a head in the 21st century. One example of danger is control over Black data. At the moment of writing, the vast majority of the data and documents that help us understand the history of Black people during the period of Atlantic chattel slavery are controlled by predominantly white scholarly teams and library administrators or white-owned vendors.^[15] This demonstrates how access to infrastructure has direct consequences on our study and reconstruction of the past and, by extension, what we understand that past to be. While data reparations must be made, our interest here is in the role that minimal computing can play in the development of present and future data sets, documents as data, and methods that promote collaboration and interoperability among colleagues around the world by not only taking into account uneven distribution of resources and the constraints with which the majority are contending but also by ensuring that control over the production of knowledge is in their hands.

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All of this scholarly and cultural work by necessity implies the need for different labor arrangements. Large or wealthy universities and colleges in the North Atlantic, for example, enjoy full-time information technology and digital scholarship teams working in and outside libraries that provide a certain degree of stability to the creation of digital collections and

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digital humanities scholarly projects. A few companies, staff on soft-money, and independent contractors have also joined the fray to provide their technical services. Granting agencies in rich economies have supported the production of digital humanities projects that involve arrangements between non-technical scholars and teams of technologists, often with an unacknowledged systems administration team provided by institutions or a company. In this arrangement the scholars with resources bear little pressure to understand the fundamentals of the labor arrangements that make their projects possible and are alienated from the means of production of their own knowledge. In addition to our concern for those who provide invisible labor, we recognize that those who do not have access to such arrangements will only continue to lag in their ability to keep pace with those who do. By advocating for minimal computing, therefore, we aim to create a more level playing field for the future of a digital cultural record where the voices of those who have been excluded can be heard and valued through a more equitable, collaborative approach to the labor of knowledge production that facilitates their engagement.

Minimal Computing and Its Discontents

In their own ways, articles in this special issue speak to the ways the tensions of environment, race, access, labor, and control interface with the material realities of producing digital humanities scholarship under constraints. This issue features two types of contributions: theoretical essays and case studies. The five lengthier essays build on the early writings of the Minimal Computing Working Group, as well as our own writing [Gil and Ortega 2016] [Risam 2018a], to expand, imagine, dream, caution, critique, and, at times, heckle. The nine case studies that follow take a closer look at how minimal computing is practiced, on the ground, through projects and tools being developed and used.

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The essays explore the theories and practices of minimal computing. We open the issue with Grant Wythoff's "Ensuring Minimal Computing Serves Maximal Connection," which examines current conversations on digital minimalism in light of the history of minimalism in art and asks whether arguments for minimalism hold in a socially-distant and unevenly connected world. We continue with two essays that take different approaches to exploring the relationship between minimal computing and labor. Tiffany Chan and Jentery Sayers's "Minimal Computing from the Labor Perspective" considers the lessons from the University of Victoria Libraries' migration Vault to advocate for degrowth of digital projects by articulating project needs, the labor required, and how to sustain it. Exploring the affective dimensions of minimal computing, Quinn Dombrowski's essay, "Minimizing Computing Maximizes Labor," argues that the tradeoff for using static site generation for web development is a concomitant increase in emotional labor and proposes needed interventions to realize the potential of static-site generators for digital humanities scholarship. Offering a critique of plain-text, Nabeel Siddiqui's "Hidden in Plain-TeX: Investigating Minimal Computing Workflows" situates Markdown, a markup language used in Minimal Computing™, in the history of TeX and explores the lessons it provides for those who engage with digital humanities. Concluding this section, Martin Eve's "Lessons from the Library: Extreme Minimalist Scaling at Pirate Ebook Platforms" proposes a novel application of minimal computing to the emergence of pirate libraries that explores tensions between minimalism and maximalism in Library Genesis and its scalability.

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Equally as important are the case studies, which present minimal computing in practice. They collectively offer an exploration of multiple methods, articulating how they exemplify, build on, and expand minimal computing practices in diverse geographic, cultural, and linguistic contexts. We begin with case studies that offer insight on labor and precarity. Matthew Lincoln, Jennifer Isasi, Sarah Melton, and François Dominic Laramée's "Relocating Complexity: The Programming Historian and Multilingual Static Site Generation" discusses the labor-based challenges of maintaining a sustainable static-site architecture for the *Programming Historian* when expanding into multilingual publication. Christina Boyles and Andy Boyles Petersen's case study, "Power and Precarity: Lessons from the Makers by Mail Project," interrogates the relationship between minimal computing and academic austerity, using the question, "What do we need?" to center not only technological developments but also ethical engagement.

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We continue with case studies that examine cross-border collaborations. Sylvia Fernández's "*United Fronteras* como tercer espacio: Modelo transfronterizo a través de las humanidades digitales poscoloniales y la computación mínima" ("*United Fronteras* as Third Space: A Transborder Model Through Postcolonial Digital Humanities and Minimal Computing") discusses how the project *United Fronteras* counters hegemonic representations of the Mexico-United States border and argues that minimal computing practices generate a third digital space to document multiple histories

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and public memory of the borderlands. Shifting transnational collaboration into the realm of teaching, Raffaele Viglianti, Gimena del Rio Riande, and Nidia Hernández's case study, "Open, Equitable, and Minimal: Teaching Digital Scholarly Editing North and South," examines how minimal computing can establish common ground between research environments in the Global North and Global South through their experience teaching a Collaborative Online International Learning (COIL) course on minimal digital scholarly editions at Universidad del Salvador in Buenos Aires, Argentina and the University of Maryland, College Park in the United States.

Taking up minimal editions from another angle, Zahra Rizvi, Rohan Chauhan, A. Sean Pue, and Nishat Zaidi's case study, "Minimal Computing for Exploring Indian Poetics," explores their use of plain text and minimal computing to produce multilingual, annotated digital critical editions of poetry in multiple Indian languages and to visualize poetics. Looking at the challenges of language, labor, and socio-technical infrastructure, Till Grallert's "Open Arabic Periodical Editions: A Framework for Bootstrapped Scholarly Editions Outside the Global North" provides an in-depth look at successful efforts to digitize and disseminate texts from the late Ottoman Eastern Mediterranean.

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We conclude the issue with case studies that explore applications of minimal computing beyond textual studies. Chris Diaz's case study, "Minimal Computing with Progressive Web Apps," describes his work in collaboration with museums and students to develop *Caravans of Gold*, a multilingual digital exhibit built as both a static website and progressive web app. Tackling the challenge of documenting intangible cultural heritage, Jing Chen, Mengqi Li, Wensi Lin, Yinzhou Zhao, Mengyue Chang, Han Chen, Qiang Hu, and Yongqing Xie's "Simple but Beautiful: A Case Study on the ZHI Project of Traditional Craftsmanship" discusses how to use minimal computing to bridge a gap between craftspeople and the general public and facilitate sustainable knowledge production about cornerstones of traditional craftsmanship in Nanjing, China: Yunjin brocade, gold foil forging, and velvet flower making. Finally, Tanya Clement, Ben Brumfield, and Sara Brumfield's "The AudiAnnotate Project: Four Case Studies in Publishing Annotations for Audio and Video" discusses their work creating the AudiAnnotate platform, which builds on the IIF standards for AV to address challenges of engaging with audio through annotation.

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As the essays and case studies indicate, we welcomed engagement from minimal computing enthusiasts and critics alike in this special issue. Indeed, our articulation of minimal computing in this introduction is as influenced by the insights and critiques raised by authors in this issue as it was by our previous writing and work with the Minimal Computing Working Group. The most salient critique for us, which demands the most attention, is the technical education (i.e., symbolic computational literacy, or knowing how to code) that reduction in computation requires. Time to learn new skills is a privilege, and technological training is not something that can be delivered in a few workshops or a summer school. Rather, it requires sustained effort with the belief that the time invested will ultimately liberate scholarship from reliance on out-of-the-box tools and open up new possibilities for representation of material from minoritized communities in the digital cultural record. Further, as several of the essays and case studies in this issue testify, a complete divorce from expensive or maximal forms of computation prove impossible at present. The relationship with social media, Google and Amazon infrastructure, large databases, and GitHub will continue for the foreseeable future. Despite critiques, which can and should continue to be addressed through our collective work, the two of us still see minimal computing as a space wherein we can explore forms of computation that do not depend on expensive infrastructures and the harmful practices of the centers of capital accumulation in the 21st century. In the final tally, we hope this conversation can serve as one of the loci of inspiration for original local and regional practices that best meet the needs of the workers of the record and a critique of current systems of knowledge distribution and (re-)production of the past — both humanistic and technical.

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Notes

[1] Pun on the Jekyll site generation software and the Jekyll theme Hyde intended.

[2] Yes, we went there.

[3] A recurrent misunderstanding that we encounter is that minimal computing is synonymous with static site generation. It is not. In this essay we use the term “Minimal Computing™” to denote this misperception.

[4] Examples from Roopsi’s experience are drawn from her work at Salem State University (2013-2022), while Alex’s are from his work at Columbia University (2012-2022). We are starting new positions at Dartmouth College and Yale University, respectively, in July 2022.

[5] If anything, we hope that our heuristic for minimal computing liberates scholars from the mentality of “this-platform-is-digital-humanities” and “that-platform-is-not-digital-humanities” because, ultimately, digital humanities is not defined by which platform one uses but what one does with it.

[6] See, we said minimal computing is not synonymous with Jekyll.

[7] As Keith Richards and Mick Jagger, forerunners of minimal computing, once noted, “You can’t always get what you want but if you try sometimes, well, you just might find you get what you need” [Richards and Jagger 1969].

[8] For those who insist on a Marvel Comics-style origin story: By the shores of Lake Geneva, Alps looming in the distance, the Minimal Computing Working Group was born at its first workshop at the Digital Humanities 2014 Conference in Lausanne. As the workshop’s call for proposals suggests, the themes running through this special issue are deeply connected to initial framings for minimal computing and the principles of minimal computing have given rise to a variety of methods. In the intervening years, minimal computing saw multiple developments, such as the Minimal Computing Working Group site; development of software and workflows, such as Ed., a Jekyll theme for minimal digital editions, and Wax, a workflow for producing minimal digital exhibits; and the vanquishing of Thanos. (Fine, that last one wasn’t us.)

[9] We use the terms “Global North” and “Global South” as shorthand for the divide between high-income and low-income economies produced by colonialism. However, we recognize that like related terms such as “developed countries,” “the Third World,” and “the West” it has limitations in its tendencies towards homogenization and its geographical accuracy.

[10] Yes, we went there too.

[11] We recognize that change must be structural and that reducing our individual carbon footprints while technology companies destroy the environment with unregulated abandon is like saying that banning plastic straws will save the sea turtles when they only account for 0.025% of ocean plastics [UNEP 2018] — peak neoliberalism. But unlike ableist attempts to replace plastic straws with paper ones (which disintegrate into a pulpy mess in your drink and are *not* suitable substitutes), we are not proposing a minimal computing mandate, just food for thought on an affordance of minimal computing.

[12] Roopsi is Kashmiri and Alex is Dominican, though people often think we are related.

[13] Two examples are Sci-Hub for articles and Library Genesis for ebooks, which are very illegal so you should definitely not visit the links and search for what you need.

[14] Insofar as anything can be “outside” capital.

[15] See Enslaved.org, Slave Voyages, and Adam Matthews’ slavery primary source collections. We find hope, however, in the work of scholars such as Kim Gallon [Gallon 2016], the Colored Conventions Project [Foreman et al. 2021], the work of the African American History, Culture, and Digital Humanities (AADHum) Initiative at the University of Maryland, College Park, and the recent, Mellon-funded Black Beyond Data group with Gallon, Alexandre White, and Jessica Marie Johnson as principal investigators.

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