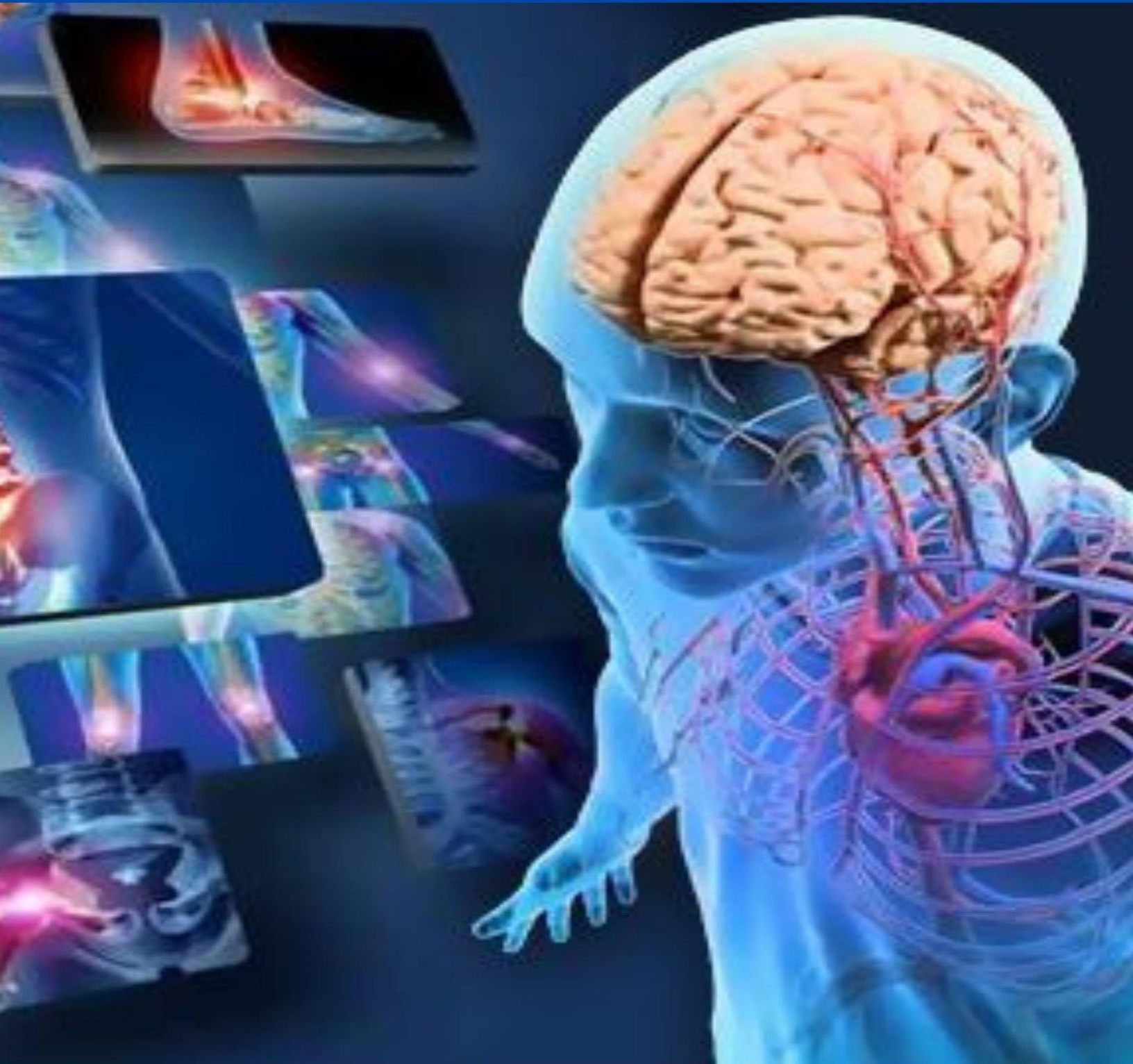


# Journal of Applied Medical sciences

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## **WORKSHOP: LINKED DATA FOR DIGITAL HUMANITIES**

**Annemieke Romein**

Post-doctoral researcher, Ghent University (Belgium)/ KB National Library of the Netherlands

I am immensely grateful for participating in the 2019 version of the Digital Humanities Summer School. I learned a great deal on Digital Humanities over the past year and I am still in awe at the wide range of digital applications that are developed to be applied in the Humanities. These make research more accessible, visible and understandable. As a post-doctoral researcher (ECR) in early modern legal/ political-institutional history, I was 'raised' with traditional methodology. I am currently working on a project at Ghent University, which (manually) categorises the early modern legislation from the province of Flanders and Holland. At the KB National Library of the Netherlands, I am working on a way to apply machine-learning to this categorisation of legislation. Since I use the same categorisation as the Max-Planck-Institute für europäische Rechtsgeschichte (Legal History) it makes sense to look for means to ensure the use of same definitions within our data sets.

Thus, I attended the workshop Linked Data for Digital Humanities (LD4DH), run by Dr Terhi Nurmikko-Fuller. She is an amazing teacher, with lots of humour (not just in wearing sparkling clothes while discussing SPARQL) and a tremendous amount of experience. She provided us with a step-by-step theoretical background and a lot of chances to get dirty with hands-on experiences. That was not always easy, as Open Source programs make you have a fit – but together with the other teachers, she takes the time to solve our malfunctioning computers.

On Monday, we kicked off with learning the difference between a relational database and Linked (Open) Data, triples, RDF and ontologies. This was somewhat challenging as it feels like learning a whole new language (while English is not my native tongue anyway). We finished our first day with discussing Linked Data in numismatics. It was really useful to have such a practical talk at the end of the day, as it gave some insights into the applicability. Tuesday morning was thought-provoking as we had to write and discuss an ontology for a dataset we were provided with. It was very challenging to think about the data on a meta-level and distinguish between Classes and properties, we had to put this into a tool called Protege (and clean out the given data through OpenRefine). Later on, we learned how this could be applied within Musicology and that entire music pieces can be written using Linked Data. Wednesday had its challenges as many of us struggled to run WebKarma. The program is really useful, as soon as you have your computer run it. When the data is ready, you need to export it to Blazegraph – another interesting program in which you can query your data. I really admire the patience of Terhi, John, and Graham in troubleshooting with many of us, but in the end, managing to solve about every single problem we encountered and – while at it – teach us the use of Web Karma and Blazegraph too! As soon as you have the hang of it, a world of opportunities opens up. An illustration of such an opportunity was given that day by Stephen Downie, with the HathiTrust.

Wearing sparkling trousers (on the hottest day ever), Terhi gave us an introduction to SPARQL querying – through which you can query to find whatever data has been linked within your entire data set. Of course, you can also use other programming languages, but for those who do not know, after having worked with all the other tools SPARQL is very functional to start with. Having ‘survived’ all that, we were presented with many other applications – such as Recogito (to find geographical references and plot these on a map) and Knowledge Graph (linking images from the British Museum). The final lecture dealt with the model of CIDOC-CRM – which helped to understand the logic behind data structuring. This nicely wrapped up the challenge that Linked Data poses.

This workshop is extremely useful and practical for those working with datasets that link to other institutes or datasets that should be versatile in its usage (a lot of data of which you know you will need in various combinations). If you want your computer to just do as you order it, you are in the wrong place because the Open Source tools may need some special attention and care before they work the way you expect.

It was a great week to meet like-minded people from various disciplines, countries, and stages of research. Keble College is a fantastic stage (though our room was ‘somewhat hot’), marvellous lunches, and a wide arrange of optional presentations/ discussion fora to attend. A brilliant place to crash-course your knowledge of Digital Humanities in general, and many topics in specific. There is no doubt in my mind that if you want to learn more about Digital Humanities: this is the place to go.

## SPATIAL DESIGN OF PROTESTS: EXPLORING THE LITERARY LINEAGE OF PROTEST SITES

Apsara Bala<sup>1</sup> and Nirmala Menon<sup>2</sup>

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### ABSTRACT :

*The increasing scale of interest to research in the field of protest has addressed the different aspects of the collective action (social, cultural, political, etc.), but little gained attention to the 'space' in which the materialization and manifestation take place. Public spaces as a practical as well as symbolic place connect citizens and have always been central to social movements and political protests. But the growing hostility and colonial attitude towards protests coupled with the rhetoric of disruption have affected the evolvability of the phenomena. In this way, from Tahrir Square to Occupy Wall Street, Tiananmen Square to Shaheen Bagh, and Farmers' protests, accompanying a multidisciplinary approach the research efforts have involved discussion on protest, public space, people, literature, and architecture. The accessibility of the public in the central space (Delhi) that had the opportunity in holding the state power accountable and respond to their demands became obsolete (Guha, 2007). The displacement of the designated space for protest also distanced the visibility of the dissent from those in power. This unacceptance that the central space possesses has laid bare the socio-spatial inequalities between government and citizens. Thus, with the exploration of the spatial nitty-gritty of protest, this research focuses on securing the availability, accessibility, and reachability of public spaces in the inclusion of all the members of society.*

*The research poses questions on the importance of a particular space for protests and the criticism against the designation of spaces for the same. The aim of the study includes analyzing the spatial aspect of protests and the role of accessible public spaces and governmental interventions in them. As a part of the methodology, the research accommodates textual analysis (literature that has acknowledged/ described/ philosophized the spatial aspect of the protests) while intending to explore all the spatial viewpoints for protests. The simultaneous mapping method helps in visualizing the historical displacement and transformation of accessibility – from Rajpath to Farmers' protest taking place at the edges of the city due to spatial denial (Zuberi, 2020). The paper, therefore, constitutes a two- part analysis – theorizing the public space in relation to protests and the practical part that comes with mapping out public spaces on an urban cityscape. The designation of places for protest, the shrinking of public spaces, and calling upon restrictions can land on monitoring and controlling the designated spaces granting only permissive accessibility (Mantri, 2021). Also, the acceleration of privatized public spaces having the illusion of access has steadily replaced the real public spaces. This study in connecting and analyzing the relation of public spaces with protests, in this way, tries to explore the myriad intricacies growing around the notion.*

*Public space, literature, people, and architecture can be viewed from a wide range of perspectives, but here protest is the key concept to tie them up in one unified whole. This research becomes pertinent for being devoted to a social cause in talking about the accessibility of public spaces through a discussion on protests and providing scope for future research to work on many unpacked/ unheard stories from the protest sites. Again, the multidisciplinary approach running along with a multilingual analysis of literature has doubled up for the inclusion of multiple perspectives in the study.*

**KEYWORDS**

*Occupy Movements, Public space, Accountability and accessibility, Displacement, Protesters, Socio-spatial inequalities, Urban design*

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## WHY MAP LITERATURE? GEOSPATIAL PROTOTYPING FOR LITERARY STUDIES AND DIGITAL HUMANITIES

Randa El Khatib, Marcel Schaeben

Final Authors' copy

### ABSTRACT:

*By focusing on the process of building A Map of Paradise Lost—a geospatial humanities text-to-map project that visualizes the locatable places in John Milton's Paradise Lost— this paper addresses the question “why map literature?” and demonstrates how the process of research prototyping is in itself a form of knowledge production. Through a series of prototyping moments, we address how the different steps involved in building a geospatial humanities project can produce new knowledge about the fields it relates to: literary studies and digital humanities. The prototyping moments make arguments that advance our understanding of Milton's Paradise Lost, approaches to data visualization for cartographic comparison in and beyond DH, and models for interdisciplinary collaboration.*

### KEYWORDS:

*literary mapping, geospatial prototyping, scholarly communication, Paradise Lost Geospatial humanities, literary mapping, research prototyping, scholarly communication, Paradise Lost*

### Introduction

Geospatial humanities is a significant and rapidly growing branch of the digital humanities and constitutes the practice of applying Geographical Information Systems (GIS) and other quantitative technologies to the study of the representation of spatiality in texts, often to literary or historical content. A multitude of geospatial humanities projects involve geovisualizing literary texts. As a fairly recent research area, the contribution of literary mapping is still being established: why do we map literary texts? (Cooper, Donaldson, and Murrieta-Flores 2016, 9). Scholars have questioned the value of geospatial humanities projects for digital humanities and literary studies, often with inconclusive remarks (Piatti, 2016). This uncertainty is understandable in a nascent field that relies so strongly on digital tools and methods that are as diverse as they are rapidly developing; no wonder why it is difficult to single out their contribution to scholarship in an ever-changing medium. Allison Muri (2016) claims that “...in the digital humanities experimental studies are important, valid, and necessary trials as we test new methods in a still nascent field. We cannot proceed without experiments and testing of hypotheses. We also need to ask—and answer—(to recast Alan Liu's (2013) important question about the Digital Humanities), what is the *meaning* of a literary GIS to literary studies and textual scholarship?” (2016, n.p.). Until we can define what geospatial humanities encompasses and set its boundaries in order to make overarching claims about its scholarly landscape, we ought to concentrate on a case-by-case exploration of the significance of individual projects to the research areas they relate to. This very type of examination itself can help define the field's parameters.

We examine the scholarly contribution of geospatial humanities to both fields that are involved in this particular interdisciplinary instance—digital humanities and literary studies—by looking at the prototyping



process of building a literary map of John Milton's *Paradise Lost*. Although research prototyping may have some overlaps with other established forms of knowledge production, such as developing a critical edition of a work or writing an article or monograph, many of the processes, such as data gathering and interpretation, collaboration, and platform design, demand a different way of approaching the text. At the core, the steps necessary for creating any of the above require engaging with the text directly, as well as with the cultural and historical materials surrounding the text. By recasting Alan Galey and Stan Ruecker's (2010) momentous inquiry into "how a prototype argues to "how a *geospatial* prototype argues," we address how the different steps involved in building a geospatial humanities project can produce new knowledge about the fields it relates to: literary studies and digital humanities. This study is carried out by addressing specific prototyping moments—critical decisions about data gathering and structuring, as well as decisions about the features of the app—that demonstrate how the process of building is in itself a form of knowledge production that can grant new ways of engaging the text and imagining technical solutions to collaboratively visualize complex, multilayered, literary space.

### *A Map of Paradise Lost*

*A Map of Paradise Lost* is an open access online project that situates John Milton's *Paradise Lost* in its specific historical moment—the seventeenth century—published in a map-oriented culture that was at the peak of the development of a cartographic consciousness in Europe. In "Milton's Maps," Morgan Ng (2013) argues that there is a "tendency among current literary scholars, despite enormous interest in the 'cartographic imagination' in Renaissance writing, largely to ignore the texts' actual visual counterparts. To explain the textual form of *Paradise Lost* requires equally close attention to the images which permeated Milton's mimetic consciousness, even after the onset of his blindness." (2013, 428). Ng (2013) points beyond the textual references that are typically read alongside *Paradise Lost* to actual maps, such as the map of biblical lands found in the paratext of Milton's own family map, a 1612/13 printing of the King James Bible—one with which Milton would have no doubt been familiar with over the course of his life and that, according to Ng (2013), influenced his spatial thinking about the places mentioned in biblical accounts and depicted in *Paradise Lost*.

*Paradise Lost* creates a rich and complex world that draws on multiple histories, with references to places from classical antiquity, biblical accounts, and Milton's contemporary world, to name a few. Milton's allusions to places are explained in critical notes of some scholarly editions, where editors contextualize and interpret the complex and multilayered references to places and their significance. As a starting point for contextualizing the significance of places mentioned, authors consulted *The Complete Poetry and Essential Prose of John Milton* (2007) edited by William Kerrigan, John Rumrich, and Stephen M. Fallon, and expanded to other editions and critical sources as listed in the bibliography. Still, the superimpositions of multiple allusions upon the terrestrial world of the epic poem is challenging to keep track of, especially when approaching the full work. *A Map of Paradise Lost* is the first project of its kind that grants visual access to the world of "geographical continuity" that permeated Milton's spatial consciousness. This worldview refers to the prevalent notion of historical sequence of a seventeenth-century English audience, namely the conviction that biblical events, like historical ones, progressed on a linear spectrum of geographical continuity, meaning that the land that the Ottoman Empire occupied in the seventeenth century is the same land in which biblical and classical accounts took place



(Ng 2013, 433). In the project, geographical continuity is demarcated by historical maps that are meant to evoke these worlds imagined by Milton.

The project is an application of Geographical Information System (GIS) techniques to the text of *Paradise Lost* that is meant as an exploratory tool for researchers, students, and readers to investigate the complex and multilayered space of the epic poem. The map includes the locatable platial references, or references to places, with explanatory excerpts from editorial notes that describe their significance. Every place name is connected to the passage in *Paradise Lost* in which it appears (see Figure 1), with multiple passages for places that are mentioned more than once. Rather than simply overlaying platial references on a modern map, the project attempts to visualize some of the many temporalities that are merged into the world of *Paradise Lost*, captured in the georectification (matching points on a map image with corresponding points on a map that exists in GIS) of two maps: the “Map of Biblical Lands” from the King James Bible and the map of “The Turkish Empire” by John Speed (1626). The imperfect fit between the historical maps and GIS interface, seen in some stretched out parts of the rectified maps, is a product of the misalignment of underlying map projections, since the Ptolemaic coordinate system does not align neatly with the Mercator projection (Ng 2013, 430).

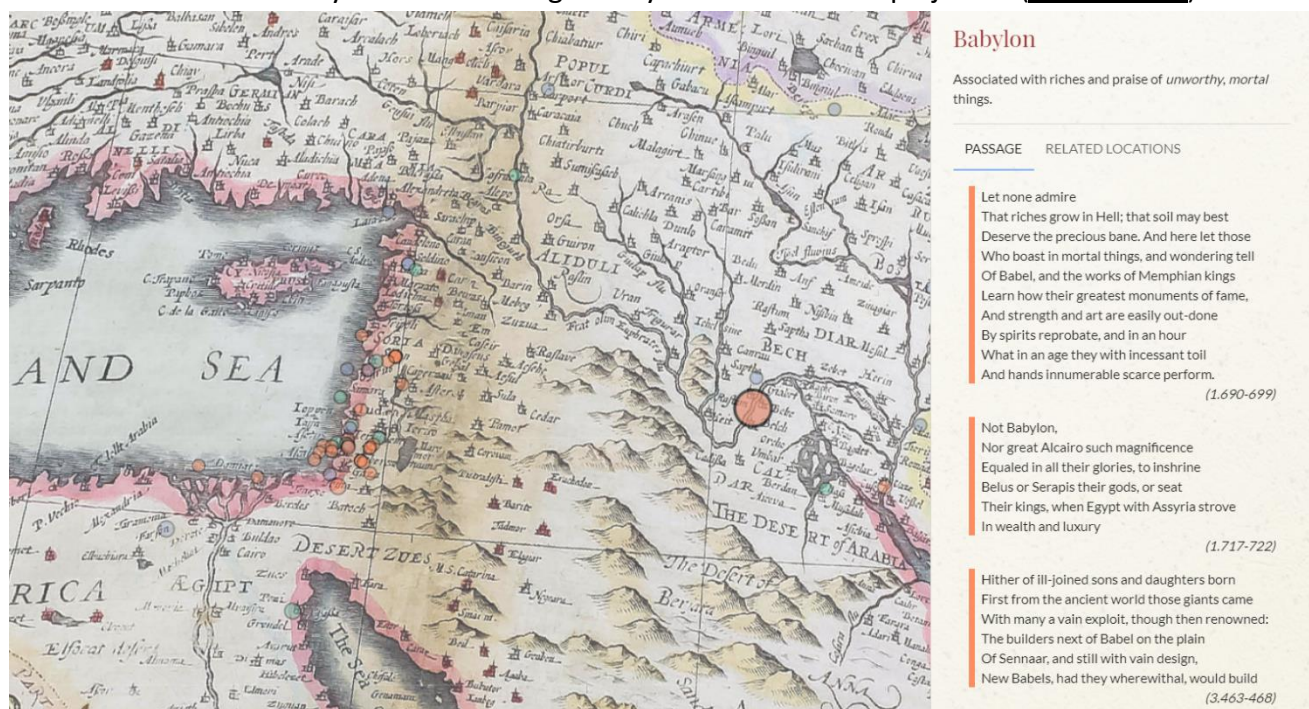


Figure 1

A Map of *Paradise Lost*: selection of Babylon shows the multiple passages and description of its significance in *Paradise Lost*.

Digital projects reflect the data that fuels them. For example, *The Atlas of Early Printing* (Prickman et al. 2013) traces the development of print in fifteenth-century Europe with respect to other variables such as trade routes, universities, and paper mills by demarcating each variable with its own color on the map alongside a timeline—a simple and effective solution for its purpose—with additional information about the city, year of first printing, name of printer, first work printed, and the *Incunabula Short Title Catalogue* (ISTC) entry. Likewise, Stanford University’s *Authorial London* (Evans et al. 2011), a literary geography project that maps

references to London in the works and biographies of notable authors who lived in, travelled to, or wrote about London, includes the title, author, and year of publication of works that refer to places in London. *Authorial London* also features options such as word searches in the corpus or by region, and, like *A Map of Paradise Lost*, includes the passages that refer to those places. Unlike other types of geospatial projects in which references to places alone might be enough to communicate a purpose, such as the movement of wind currents in a region, the humanistic representation of place in literary maps almost always requires contextualization. A point on a map that virtually means “this is Paris” for Paris may not tell us much. In a humanistic context, we often engage with place rather than space. Tim Cresswell defines place as “how we make the world meaningful and the way we experience the world. Place, at a basic level, is space invested with meaning in the context of power. This process of investing space with meaning happens across the globe at all scales and has done throughout human history” (2015, 19). This definition could be extended to literary maps by focusing on the different narratives that give place meaning, of which there are manifold in *Paradise Lost*, where layered allusions work to contextualize the platial references across multiple temporalities at once. For example, Ormus and Ind are grouped together as sites of wealth and associated with Satan’s seat in Hell (PL 2.1–5), first assimilated with Islamic Empires, and, by virtue of extension, with Catholic Rome (Quint, 2014; Lim 2010).

#### Scholarly communication and literary mapping

The digital medium has ushered an age of experimentation with forms of scholarly communication, from research to dissemination. In the digital humanities, this experimentation has taken many forms, including digital editions, online journals and encyclopaedias, dynamic databases, and software prototypes. Digital editions generally provide content in more accessible and networked ways. Hyperlinked information, different media affordances, zooming options, and other features of the digital augment the reading experience. Created for different purposes, digital editions can grant the public and scholars access to rare or brittle manuscripts; advance knowledge and understanding of a work; and experiment with alternative forms of reading and knowledge production. Patrick Sahle (2016) differentiates scholarly digital editions from non-scholarly and print scholarly editions. Some of the primary differences, according to Sahle (2016), are a result of the affordances of the different mediums and the changing scholarly values that they supply; one of the results is that instead of editions claiming their primary purpose to be an authoritative reading and final statement on a subject, the moment of publication of a digital edition is quite fluid since it can be published iteratively rather than finally, in contrast to print editions. Namely, it “becomes a permanent but potentially always changing documentation of an ongoing examination and processing of the objects in question. In this way, the edition as a publication is a process rather than a product.” [emphasis added] (n.p.). An example of a scholarly digital edition is *The Grub Street Project*, a social edition of eighteenth-century London that, through the mapping of literature, trade, and print culture of the time, aims to “create both a historically accurate visualization of the city’s commerce and communications, and a record of how its authors and artists portrayed it.” (*The Grub Street Project*, Home Page). *The Grub Street Project*, like many other digital humanities projects, has continued expanding over the years, with more recent additions, such as a new interface for the maps and some new editions. This iterative element is also true for other types of digital projects; for example, *Authorial London* is

planning on releasing its underlying infrastructure, *Authorial {x}*, in open source —not for adding new editions like *The Grub Street Project*—but rather to allow users to create similar projects for other cities.

Digital projects can blur the boundaries that separate different scholarly genres and produce hybrids that amalgamate different elements. Thinking about the distinction that Sahle (2016) makes between scholarly digital editions as final words in their fields and non-scholarly digital editions that encourage creativity and iterative development, *A Map of Paradise Lost* is essentially a text to map project that visualizes and interprets the spatiality of *Paradise Lost*. In doing so, we ask ourselves whether this is a step towards what we may call a geo-edition, namely, a thematic geo-edition that, instead of taking the text as a whole, visually reconstructs the spatiality of the text—in this case, *Paradise Lost*—by focusing on spatial data, close reading, and editorial context. The process of building the project relies on gathering the data within specific parameters while consulting the primary text and secondary works on the one hand, and thinking critically about questions concerning access and readability through its functionalities, design, and visualizations on the other. In all stages of this collaboration, we were considering what the prototyping process yields in terms of scholarly knowledge, building on the notion of prototyping as a way of thinking, not unlike the well-established and accepted practice of writing as a way of thinking (Ruecker 2015, 3). The resulting project is a hybrid that draws on some editorial practices, such as transmediating the text, framing it, and offering critical insight; however, instead of providing a diplomatic transcription of *Paradise Lost*, it draws on content that is specifically related to platial references and is meant to facilitate a deeper understanding of the spatiality of *Paradise Lost*.

How a geospatial prototype argues

*A Map of Paradise Lost* is both a prototype and an app; this is not to say that it is not in a fully developed state in its current form, but rather that it has an in-built capacity to continue expanding and to support additional layers that offer different interpretations of *Paradise Lost*'s spatiality. We framed the building process in accordance with Alan Galey and Stan Ruecker's approach by questioning, from the beginning, "how the process of designing may be used simultaneously for creating an artifact and as a process of critical interpretation, and whether new form of digital objects, such as interface components and visualization tools, contain arguments that advance knowledge about the world" (2010, 406). The map itself is the result of the critical inquiries that shaped it, centered around three main prototyping moments that seek to advance our understanding of Milton's *Paradise Lost*, approaches to data visualization for cartographic comparison in and beyond DH, and models for interdisciplinary collaboration, respectively corresponding to arguments: 1) that Milton often imposes moral categories onto place names at use, and that this framework, arrived at through close reading, can be visualized and expanded, 2) that parallel, synchronized maps offer a more intuitive and productive way to compare across maps, broad temporal categories, and data layers, and 3) that platforms can be prototyped to enhance interdisciplinary collaborative practices by minimizing labour for humanists and developers, and maximizing productivity and accessibility. In all three cases, the prototyping moments demonstrated here can be reproduced in other contexts and for other projects.

Let us return to our borrowed question at the outset: "Why map?" (Cooper et al. 2016, 9). As Sebastián Caquard (2011) points out, "Neither cartography nor narrative on their own can capture the essence of place: both are required to get a better sense of it" (224). Especially for works that rely on some understanding of spatial movement and change over time, there is an interdependence between narratives and cartography in

representing place; together, they can provide a more thorough understanding. According to Barbara Piatti and Lorenz Hurni (2011, 222), “Through literary geography, we learn more about the production of places, their historical layers, their meanings, functions and symbolic values. If places emerge from a combination of real elements and fictional accounts, then literary geography and literary cartography can work as a very effective eyeopener.” Building on Cooper and Gregory’s (2011, 90) take, we “use GIS technology as a tool for critical interpretation rather than mere spatial visualization.” Together, the project is meant to offer visual access to the different worlds on the imagined surface of the Earth in *Paradise Lost* in order to provide a contextualization of the historical and biblical framing of the work, and beyond that to serve as an exploratory tool for users to generate their own questions about the spatiality of the epic poem.

During the course of development, it has become a general approach in our design decisions to include many variables in visualizing the data and give the user a choice to switch between different versions or to turn them off altogether. According to Luchetta (2018), the option to switch between project features leads to an experimental, iterative development process that could pose new questions about the visualization of multivariable spatial data and might lead to some new insights. But above all, it also puts users in the position to use the tool in ways and for purposes that we have not envisioned yet.

Prototyping moment 1: Close reading meets map visualization

A generic distinction of sixteenth- and seventeenth-century works that describe places, such as travelogues or chorographies, is their insistent contextualization of place names at use. Scholars have traced many works from which Milton draws spatial references and the ideological connotations with which they are associated. Some main references are from Peter Heylyn’s (1657) *Cosmographie in Four Books*, George Sandys’ *Relation of a Journey* (1610) and Thomas Fuller’s *Pisgah-Sight of Palestine* (1662). At the same time, Grant McColley (1937) demonstrates how Milton consulted one of the most widely-read books of his time, the *Pansebeia: or, A View of all Religions in the World* by Alexander Ross, when writing the demons and their followers in Book I. McColley (1937) identifies how both works follow the pattern of the epic catalogue, in which “the heathen deities are named, their characteristics identified, the places of their worship given, and the practices of their followers described and condemned” (181). The similarities between the language, when placed side-by-side, is striking. One of many examples provided by McColley (183) is when Milton describes Dagon:

*Dagon his name, sea-monster, upward Man  
And downward Fish: yet had his Temple high  
Rear’d in Azotus, dreaded through the Coast  
Of Palestine, in Gath and Ascalon,  
And Accaron and Gaza’s frontier bounds  
—(Paradise Lost 1.462–466).*

*Dagon from Dag a Fish, because  
from the navel downward he  
was made in the form of a fish,  
but upward like a man this  
was a great idol among the*

*Philistines*

—(*Pansea* 66; McColley 183).

A glaring reality of the seventeenth century is that places of biblical accounts and classical antiquity were under Islamic rule, primarily occupied by the Ottoman Empire, at that time a power that posed the biggest threat to Christian England and Europe. Drawing a connection between Satan and an Ottoman sultan is Walter Lim, who cites descriptions of Satan as the “mighty Chief” (PL 10.455) of his “great consulting Peers” (10.456) and compares this group to the “dark Divan” (10.457), a reference that evokes the Turkish council of state (213). As Lim continues: “By portraying hell as the infernal archetype of the Turkish political economy, Milton demonizes the Ottoman Empire and the Muslim faith that it practices, defends, and seeks to disseminate by the point of the sword” (213). However, the fear of the Ottoman Empire lay beyond just military power and religious difference, but in the fear of actual conversion. As Campbell puts it:

*Muslims were people that Christians could become; good angels, as in Paradise Lost, could fall into apostasy and become bad angels, just as Christian captives could become Muslims. This was phrased not in terms of “embracing Islam” as it would be now, but rather in terms of “turning Turk.” The phrase is telling, because it defers not to religious authority but to the dominant political power. Christians converted because Islam was stronger. (2007, 18)*

The anxiety of conversion was a well-founded fear echoed by Daniel Viktus in *Turning Turk* (2003), where he insists that English anxiety about the Ottoman Empire was pushed even further by witnessing the inclusive social system that was adopted by the Turks that had resulted in mass conversion of English Protestants to Islam, and reached its peak when the Ottoman Empire started exponentially advancing its territories towards Hungary, Poland and even Germany (17). By extension, this anxiety of conversion is echoed in much of literature of the early modern period, including in *Paradise Lost*, where, as Campbell puts it, Milton’s epic “focuses on the horror of angels and our first parents converting from innocence to guilt, in effect enacting the spiritual equivalent of turning Turk” (19). It is convenient then, that notable landmarks of the Ottoman Empire are so directly linked to pagan worship; places that, in *Paradise Lost*, symbolize the postlapsarian world and the straying away from the “true” path.

By visualizing the spatiality of *Paradise Lost*, Milton’s geographical critique becomes more apparent. Not only do places carry a moral connotation, but they are also often grouped together under the same moral category. By extracting data from *Paradise Lost* with attention to moral collocations with place name references, their significance, and how they are grouped together, our first prototyping moment geovisualizes a close reading of *Paradise Lost*. Grouped into broad categories under negative, positive, and neutral, corresponding to orange, green, and blue, these colors are meant as an invitation to the epic poem’s more complex context through the passages and editorial comment (see a more detailed explanation of this process in “Mapping the Moralized Geography of *Paradise Lost*” by El Khatib and Currell, 2018). One thing that becomes apparent, even at a glance, is that most places are, in fact, collocated with moralizing content. For example, Rabba, Argob, Basan, and Arnon (see Figure 2) are all grouped together in the same passage, described in Book I as places of pagan worship, followers of Moloch:

*First, Moloch, horrid King, besmeared with blood  
Of human sacrifice, and parents’ tears;*



*Though, for the noise of drums and timbrels loud,  
Their children's cries unheard that passed through fire  
To his grim idol. Him the Ammonite  
Worshiped in Rabba and her watery plain,  
In Argob and in Basan, to the stream  
Of utmost Arnon. Nor content with such  
Audacious neighbourhood, the wisest heart  
Of Solomon he led by fraud to build  
His temple right against the temple of God  
On that opprobrious hill, and made his grove  
The pleasant valley of Hinnom, Tophet thence  
And black Gehenna called, the type of Hell.*  
—(Paradise Lost, l. 391–405).

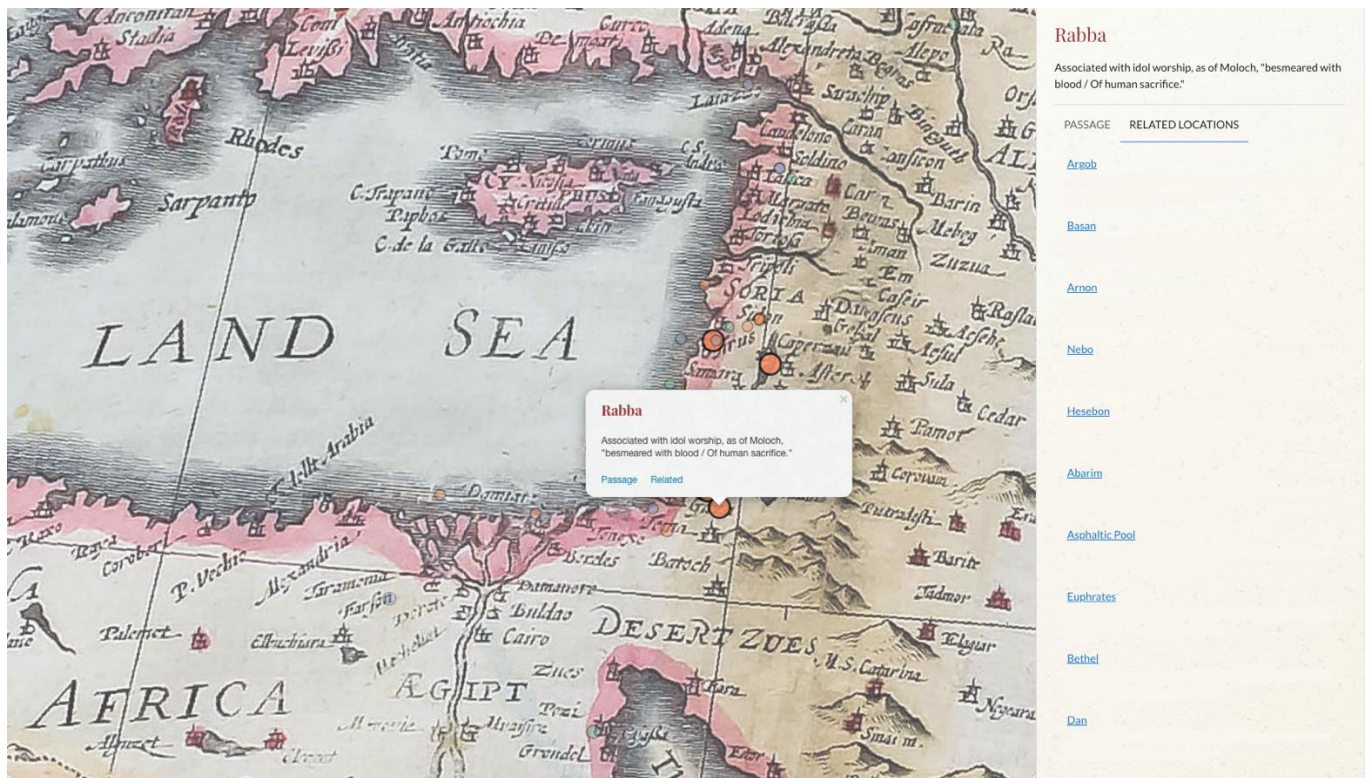


Figure 2

A Map of Paradise Lost: spatial grouping of related places (in this case Rabba with places associated with idol worship).

The spatial grouping itself happens across all places related to the broader category, and therefore references all places associated with idol worship and pagan cults, like Nebo, Hesebon, Abarim, the Asphaltic Pool (grouped together as worshipers of Chemos) and Euphrates, Bethel, and Dan (collocated with the Hebrews' worship of the golden calf). In cases where the place appears more than once in the text of the epic poem, each mention is treated separately and has a passage extract and moral collocation (Figure 3).

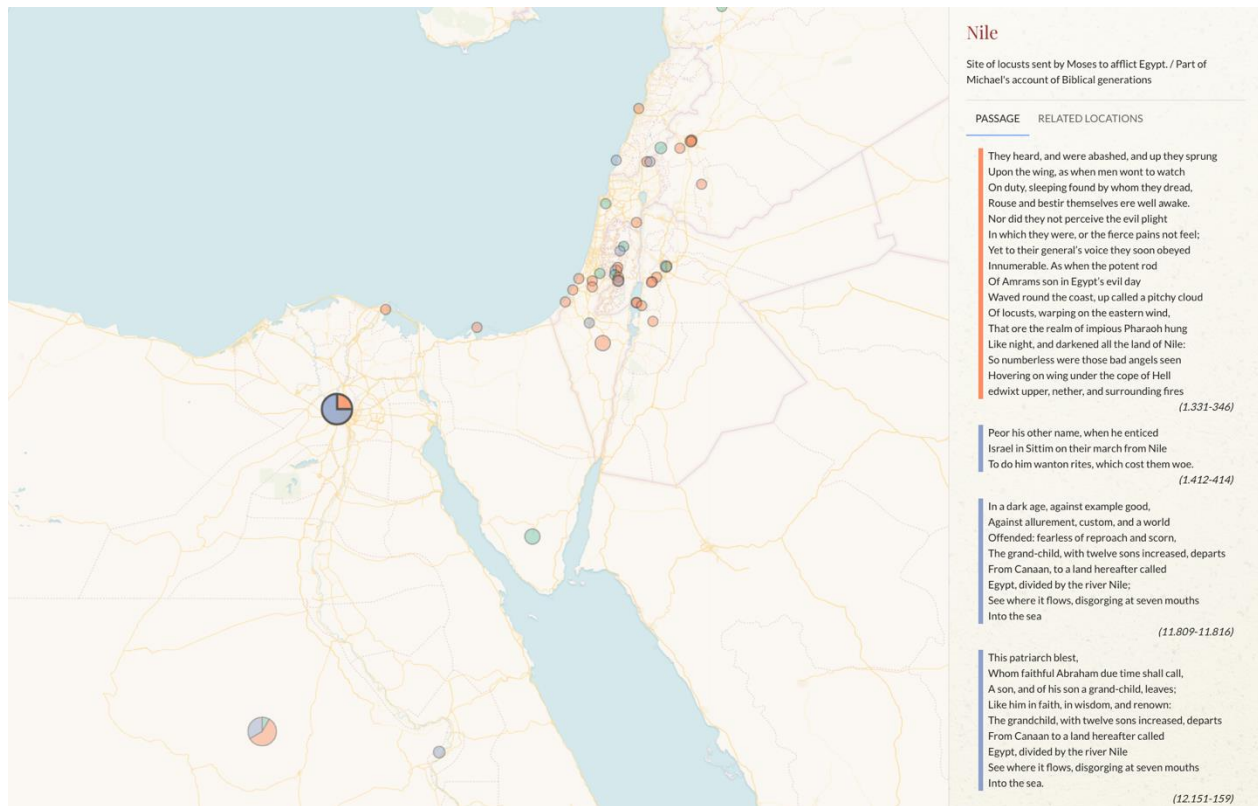


Figure 3

Pie charts show the context and passage for every separate place name reference if a place is mentioned more than once.

This prototyping moment is not meant to present a novel argument about *Paradise Lost*; as demonstrated through scholarly examples, snippets of the connection between platial references and moral valence exists in Milton studies, dispersed across many works. What we have done is approach each place in *Paradise Lost* through this close reading and research framework and visualize it on a map. In turn, this grants readers easier access to the spatiality of *Paradise Lost* and encourages them to seek patterns and make connections. Moral valence animates the places on the map in a dynamic interface, like Milton does through various critiques in the text, making it a useful resource for exploring and generating research questions. One can imagine visualizing other literary frameworks or arguments arrived at through close reading, for example, or including more georeferenced maps to study them against.

#### Prototyping moment 2: Parallel map visualizations

Navigating multiple works at once has never been easier—a stark comparison is the labour of using a bookwheel, once a groundbreaking sixteenth century-invention by Agostino Ramelli in the form of a rotating bookcase to facilitate an easier way of reading more than one large book at once, to tools like *Juxta* (McGann 2012), a collation tool used for comparing multiple editions on a single screen. The message across these technologies, however, is clear: there is scholarly value in comparative work. *A Map of Paradise Lost* has multiple layers; for example, we have manually geoparsed (identified all locatable place name references and matched them with their corresponding coordinates) the references to places in Genesis as a separate layer (purple), and included a layer of all places mentioned in the bible from *OpenBible* as an additional layer (white),



in an attempt to study the extent to which biblical naming was reproduced in *Paradise Lost* (Crossway 2011). However, maps have to be readable in order to make sense of them. Crowding all of these layers onto a single interface may be confusing, and overlaying historical maps simply counterproductive. In the case of *Paradise Lost*, more traditional methods of visualizing temporal change such as through timelines or annotations is not applicable—content that deals with biblical accounts, classical antiquity, mythology, and Milton’s contemporary world, that oscillates between old geographical naming and new—does not lend itself to such defined temporal categories. Georectifying historical maps that, although imperfectly, but more closely capture these broad spatial categories is a more productive solution for this type of project. In an attempt to learn more about the geography that Milton references and the surrounding areas in these different contexts, and to more legibly navigate the multiple layers, we have built a functionality that allows to split the screen into up to four parts, where each part can be customized separately (Figure 4).

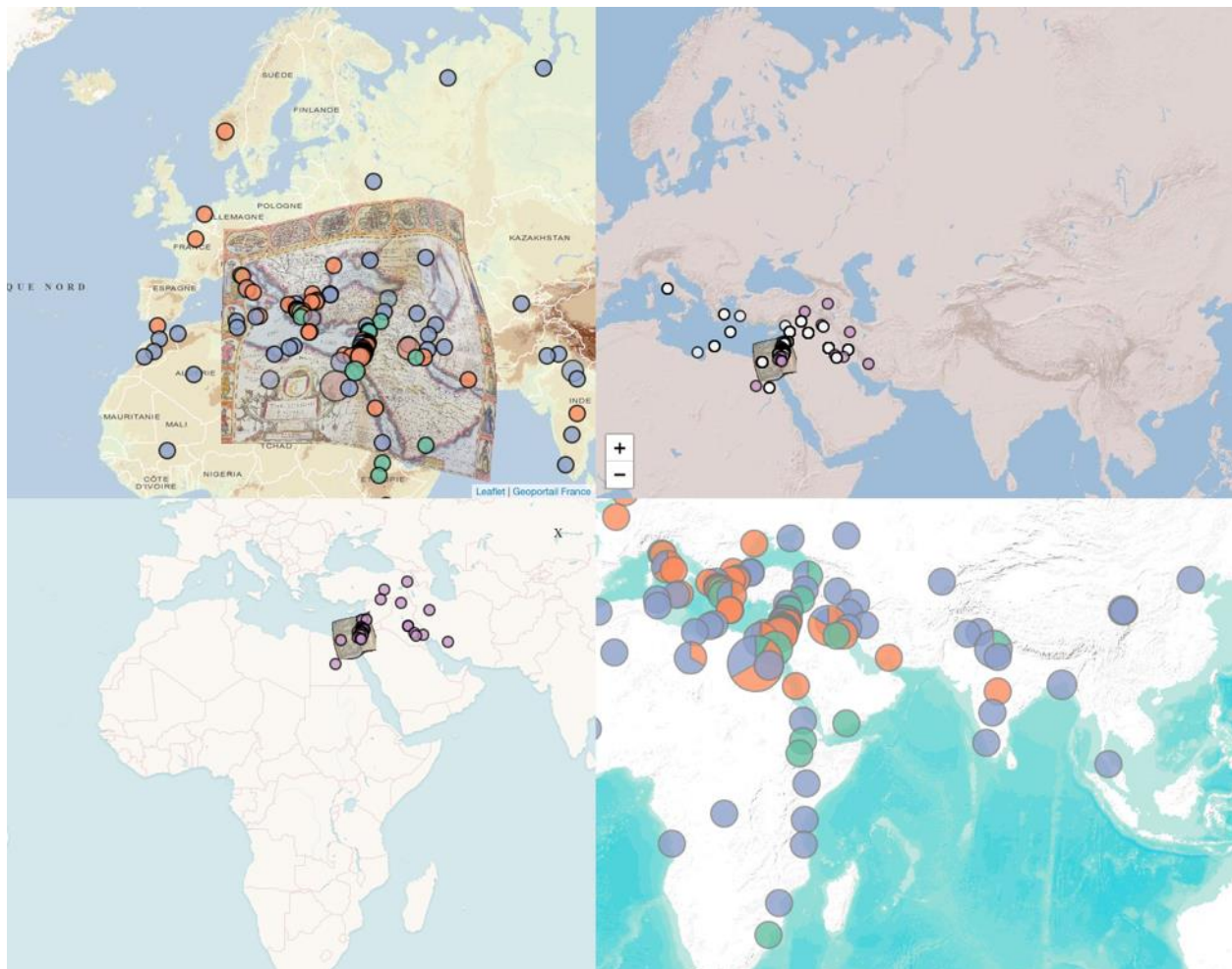


Figure 4

*A Map of Paradise Lost* parallel map visualizations.

Different basemaps, historical maps, layers, and marker types can be visualized and compared simultaneously, since the maps are synchronized. Some questions this feature can generate are: What are the same place names mentioned across different works? How globally encompassing are they, and where do they focus on most? How did place names and boundaries change over time? One can imagine that with additional

georectified layers, more historical comparison can be carried out. Even outside of the context of the epic poem, users can inquire how, for example, places were renamed after the Turkish conquest in comparison to earlier or current naming. By visualizing these maps side-to-side, parts of biblical and historical geography of the Levant, and place name referencing across the entirety of *Paradise Lost*, Genesis, and the Bible can be situated and understood by a broader audience.

### Prototyping moment 3: Building capacity for interdisciplinary collaboration in mapping projects

The process of creating the data for geospatial humanities projects, including defining the categories and variables, extracting and cleaning data, standardizing it across, and reshuffling categories for generating the most readable and useful geovisualizations, is a meticulous process that requires revisiting the data many times, especially since we are carrying out all these steps manually for the sake of accuracy, since the content of *Paradise Lost* does not easily lend itself to automatic methodologies. In interdisciplinary collaborations, all parties bring their skillsets and the division of labour happens with respect to individual expertise. This means that updating, revising, and moving the data to fuel the map in a project like *A Map of Paradise Lost*, would necessarily require the humanist and developer to both be actively engaged in a stepwise process that may not always be a productive division of labour, and can actually impede the project from expanding in the future without the continuous active involvement of a developer in part of the process. Our final prototyping moment grants non-developers more autonomy in contributing to the project, while also planning for longer-term sustainability without having to rely on too many outside variables that increase the need for updates and iterative control. The solution to both aforementioned considerations is the data pipeline (see Figure 5).

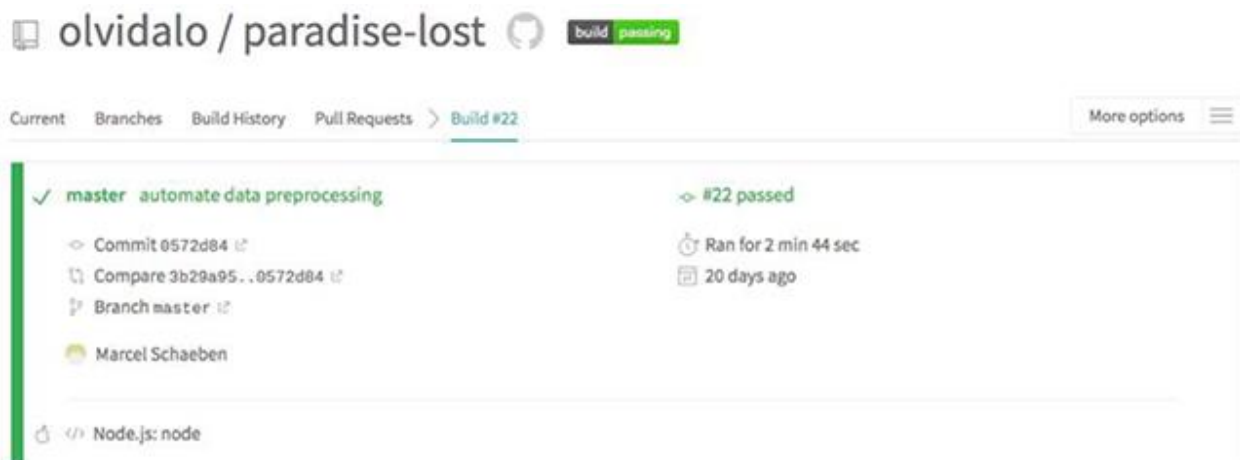


Figure 5

Travis CI running automated tasks on a remote server and pushing all the changes from the GitHub code and data repository to the GitHub Pages web hosting service for immediate online publication to *A Map of Paradise Lost*.

Organized in a single spreadsheet, the data platform is a building block of the application. All required processing of the data is carried out using the standard build tools that are used in the development of the app; we do not use an extra database, an extra server where the database lives, or entry forms. The idea of the pipeline is that any collaborator can edit the content with a knowledge of how to use spreadsheets and the very basics of the git-based collaborative platform GitHub. If a team member makes a change to a spreadsheet

and makes a commit to push the changes to GitHub, this sets off the pipeline which builds the app, validates if the data is complete and in the right format, and then publishes it to the web server. Through validation, ideally, nothing can be broken in the process. Humanists do not need to engage with the building process, pipelines, and other technical details that have already been developed, and can focus on the content. This division of labour raises the questions brought up by scholars such as Stephen Ramsay (2016) about whether a digital humanist has to be a coder or not; for this paper and project, this inquiry is rather narrow since the iterative nature of the project invites digital humanists, but also early modern scholars, to share their expertise on Milton by suggesting other potential close readings and literary frameworks for interpreting the spatiality of *Paradise Lost*. By making it a more straightforward task to contribute to the project, we are working towards a less labour-intensive, steep-learning-curve model that is more productive and accessible. Rather than insist that all contributors must have advanced coding skills and a background in early modern literature in order to equally contribute to all aspects of the project, we build on one of digital humanities' strongest suits: that through interdisciplinary collaboration, contributors from different fields can, together, build something neither could have done separately. The collaborative feature presented in this paper can open the project to a larger group of Milton scholars who can expand existing readings by adding new interpretive layers or editorial analyses from other scholarly editions.

## Conclusion

By addressing the prototyping process of *A Map of Paradise Lost*, we sought to offer an explanation of select prototyping moments in order to address the question "why map literature?"—essentially pointing to how the process of mapping is not unlike that of close reading, and that through data gathering and visualization, existing and novel interpretations of literature can be validated, expanded, and contested. The digital medium also encourages a space for creativity and for experimentation with scholarly communication and methodologies; for example, the project introduces a novel approach for cartographic comparison where maps and data layers can be visualized side-by-side for more intuitive explorations. The data pipeline provides a model for collaboration in which contributors with different technical skills can more readily contribute to a project, in an attempt to encourage a community of practice among literary experts that can essentially be adapted to other projects and their respective content. In doing so, we are also conscious of the iterative nature of digital projects and their ephemerality in terms of maintenance, thus thinking and prototyping towards sustainability.

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