



HAL
open science

Beyond Digital Humanities Thinking Computationally: Position Paper

Christian Henriot, Cécile Armand

► **To cite this version:**

Christian Henriot, Cécile Armand. Beyond Digital Humanities Thinking Computationally: Position Paper. Beyond Digital Humanities: How computational methods are reshaping scholarly research, Cécile Armand, Sep 2023, Aix en Provence, France. halshs-04194570v1

HAL Id: halshs-04194570

<https://shs.hal.science/halshs-04194570v1>

Submitted on 3 Sep 2023 (v1), last revised 19 Sep 2023 (v3)

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Beyond Digital Humanities Thinking Computationally: Position Paper

Cécile Armand (Aix-Marseille University)
Christian Henriot (Aix-Marseille University)

« L'historien de demain sera programmeur ou il ne sera pas »
Emmanuel Leroy-Ladurie, *Nouvel Observateur*, 8 May 1968

Introduction

The humanities form a vast and intricate mix of disciplines. They have historically been anchored in textual analysis, interpretive methodologies, and a profound commitment to understanding the human experience. Over the past few decades, this landscape has been shaken by the advent of the Digital Humanities (DH)—a domain that promises to marry the traditions of humanistic research with the dynamism of digital technologies. On the surface, DH emerged as a beacon of innovation, offering tools and techniques that promised to revolutionize research. It speaks the language of interactivity, big data, and digitization, capturing the imagination of scholars and institutions alike.

However, as is often the case with new paradigms, the initial euphoria brings with it a set of challenges. One of the primary challenges is definitional. What, precisely, is meant by "Digital Humanities"? The term, in its broadness, has become an umbrella so expansive that it loses specificity. Does the digitization of a medieval manuscript qualify as DH in the same way as a complex algorithm analyzing patterns across thousands of literary texts? While extensive literature already exists defining the DH, we do not aim to provide a new definition in this paper (see References). Instead, we suggest shifting from definitional perspectives to a more heuristic framing of the debate. The very versatility of DH, which is its strength, can also be its ambiguity. A significant caveat is that the rise of DH inadvertently cast humanities research in a restrictive binary light. Instead of moving beyond dichotomies like old/new, traditional/digital, and close/distant, the emerging paradigm shifts often reinforced these boundaries.

This essay, therefore, seeks to navigate this terrain with a critical lens from the perspective of two historians rooted in empirical research. While recognizing the invaluable contributions of DH, it aims to challenge the overarching and sometimes nebulous concept of "digital" in the humanities. Instead, it advocates for a shift away from overarching concepts to focus on the transformative potential of **computational methods within individual disciplines**. The objective is not to dismiss DH and associated notions but to refine our understanding, ensuring that the "digital" turn is anchored in methodological rigor, discipline-specific needs, and the core values of the humanities.



In the sections that follow, we will dissect the limitations of the DH label, dig deep into the nuances of **computational methodologies**, and argue for a future where these methods are not mere appendages but **integrated cores** of humanities research.

The Limitations of the "Digital Humanities" Label

The Digital Humanities (DH) has been heralded as the new frontier of scholarship, a transformative force reshaping the contours of academic inquiry. However, with its rise to prominence, the term has become increasingly elusive in its definition. This ambiguity, while reflecting the diversity of the field, poses significant challenges that merit closer scrutiny. It is even more an issue when, instead of the progressive process of development as happened in the United States, the DH label has been adopted wholesale, without much critical distance, by scholars and above all decision-makers (ministries, funding agencies, etc.) as happened in France.

First, the term "digital" is broad and multifaceted. In today's world, where the digital permeates nearly every aspect of our lives, what does it mean for the humanities to be "digital"? Is it about the use of digital archives, the application of computational algorithms, or perhaps the online dissemination of research? The term DH, in its endeavor to encompass various facets, has become somewhat of a catch-all phrase, obscuring the nuances and specificities of the practices it represents. It is often used as a buzzword, sprinkled in grant and job applications, university degree programs, and naturally, in résumés. This widespread usage makes it challenging to differentiate genuine practitioners from those merely employing the term to align with contemporary expectations.

This leads to the second challenge: the risk of oversimplification. By grouping a diverse array of practices under a single umbrella, we dilute the unique contributions and challenges of each. For instance, the digitization of ancient texts, while invaluable, is a vastly different endeavor from using machine learning to analyze literary motifs across centuries. By placing both aspects under the DH banner, we conflate methodological, epistemological, and practical considerations that are in fact worlds apart. This subjects DH to valid criticism for its absence of a robust epistemological foundation.

Moreover, the broad characterization of DH can inadvertently nourish a form of techno-utopianism. The allure of the "digital" might lead to an uncritical embrace of technology, overshadowing questions about its appropriateness, limitations, and potential biases. Not every digital tool is suited to every humanities question, and the indiscriminate application of such tools can lead to superficial or misguided analyses. Conversely, such techno-utopianism often sparks skepticism and even resistance among many in the scholarly community. Those who step into this territory are sometimes viewed as "geeks" or people who have lost their scholarly compass. In truth, the primary obstacle for humanities researchers is not technical or technological but deeply hermeneutic. The core questions are: How can we adapt tools and techniques not explicitly designed for, or even less by, humanities scholars? And how can we interpret computational outputs to create insightful, human-centric narratives?

Lastly, the broad DH label can have serious institutional implications. As universities, ministries, and funding agencies rally behind the DH banner, there is also a risk that resources might be channeled predominantly towards projects that are "digital" in appearance rather than

those that offer genuine methodological innovation. This could inadvertently sideline projects that employ digital tools in more subtle, yet profoundly transformative, ways. This is not true everywhere. European institutions have been slow in responding to the DH trend compared to US, and now Chinese institutions. Yet, the movement is unmistakable.

The rise of digital humanities has fostered numerous assumptions, epitomizing the ambivalent relationship humanities scholars have with digital tools. These preconceived notions have substantially relegated digital humanities to the academic periphery. The most prevalent assumptions about DH encompass:

1. **The Ancients vs. the Moderns:** There is a belief that some scholars unwaveringly depend on traditional methods, whereas others are more inclined to adopt digital techniques.
2. **The Generational Bias:** Digital tools are often seen as the domain of younger scholars. An extension of this notion suggests that certain scholars are innately adept with digital tools, while others are inherently challenged by them.
3. **The Revolutionary Paradigm:** Outsiders often harbor lofty expectations, presuming that digital methods will instantly yield groundbreaking results, revolutionizing current scholarship.
4. **Nothing New Under the Sun:** These high expectations frequently lead to disappointment. Scholars advocating for digital methods often face the dismissive query: "What insights have you provided that were not already evident? Was the effort justified?"
5. **Good vs. Bad Criticism:** While not entirely dismissive, some scholars, with a rudimentary grasp of digital capabilities, invest significant effort in dissecting its biases and challenges. Some critiques highlight ethical concerns, like unequal access to digital platforms globally. Others warn that historians and anthropologists might abandon physical archives or fieldwork, choosing instead to mine databases and online social media from their desks. A few underscore the limitations of technologies like optical character recognition (OCR) and the potential distortion of sources during digitization.

While a discerning approach to the digital realm is vital, such overblown or misinformed critiques hinder a comprehensive appreciation of the potential that digital methodologies offer to humanities research.

The term "Digital Humanities" has some virtues: it captures the dynamism of humanistic research and points to a **gradual shift towards an interdisciplinary mindset**. However, as we tread this path, it is crucial to approach the domain discerningly. We must prioritize precision and clarity, especially given the potential complexities introduced by advanced technological innovations, such as the latest ChatGPT-like generative models. While Digital Humanities (DH) was preceded by Humanities Computing, it has continuously evolved, giving rise to various "digital" sub-domains. Notable examples include *digital history*, coined in 1993 as one of the initial digital labels specific to a discipline, and the more recent (2010s) *digital sociology* and *digital anthropology*. In some instances, specific methodologies, such as GIS, have even catalyzed the formation of a new field, like the *spatial humanities*.

More recently, the term "computational" has begun to be used in certain domains. For example, although no "digital political science" or "digital economics" has emerged, since the 2000s Computational Social Science has offered a counterpart to DH in major social science disciplines like sociology, political science, and economics. These disciplines have cultivated distinct communities, conferences, and journals. As this trend has spread, the term *computational* has also been paired with the humanities, resulting in *Computational humanities*.

This signals a shift towards a more profound engagement with advanced computational methods, such as machine learning and simulations, and a broader immersion in the realm of algorithms (see Table 1). Yet, operating under a new overarching concept may prove as elusive as before.

Table 1. Digital-related concepts in perspective

Feature	Digital Humanities (DH)	Computational Social Science (CSS)	Computational Humanities (CH)
Scope	Encompasses digitization, visualization, basic computational analysis, and more.	Utilizes computational techniques to analyze and model social phenomena.	Focuses on using advanced computational techniques to tackle humanities problems.
Interdisciplinary focus	Primarily humanities disciplines collaborating with digital technologies.	Collaboration between social sciences and computational or statistical methodologies.	Deep integration between humanities and advanced computational methodologies.
Relationship to humanities disciplines	Augments traditional humanities with digital tools; often retains core humanistic questions.	Primarily rooted in traditional social sciences but reshaped by computational methodologies.	A deeper merger, often reshaping traditional humanistic questions with computational thinking.
Aims	To digitize, analyze, and visualize humanistic data; enhance traditional research with digital tools.	To understand, predict, or model social phenomena using computational methods; often empirical in focus.	To deeply engage with and sometimes transform humanistic questions using advanced computational techniques.

Computational Methods: An Uncharted Frontier in Humanities

The “Digital” captivates the imagination with its broad strokes of innovation. Yet, if we venture beneath the surface, it becomes evident that the true transformative power lies not merely in the digital realm but in the intricate world of **computational methodologies**. These methods, characterized by their depth and specificity, offer unparalleled opportunities to redefine the boundaries of humanities research. At its core, "computational" transcends mere digitization or the use of digital tools. It represents an analytical, **algorithmic approach to data**, providing structured and often quantitative avenues to explore humanities questions. Whereas *digital* might signify a medium or format, *computational* signifies a method—a rigorous, systematic, and replicable way of interrogating data using computer-driven concepts or approaches.

For instance, consider the realm of literature. While digital tools might allow us to access vast online libraries or view intricate visualizations, computational methods enable *distant reading*—a way to analyze vast corpora of text, identifying patterns, trends, and anomalies that would be impossible to discern through traditional close reading. Such methods do not just add

to our existing toolbox; they fundamentally reshape the questions we can ask and the insights we can glean. Similarly, in history, while digital archives offer enhanced accessibility, computational methodologies like Geographic Information Systems (GIS) allow scholars to engage in spatial history, mapping and analyzing the geographies of historical events, migrations, and social changes. Yet GIS can also be used to venture into literary texts or literary production. In other words, most methodologies can apply to all sorts of sources.

Text remains central to humanistic research. When documents were only represented as scanned images of their originals, scholars were shielded from the challenges of massive corpora but also missed the opportunities presented by computational methodologies. Literary scholars were among the first to grapple with the "big data" dilemma, largely because literary works published before the 20th century were already in the public domain. As libraries began systematically digitizing these works, the entire literary output of the 18th and 19th centuries became available in full-text format. From that point on, as periodicals, newspapers, archives, and academic literature were added to the mix, scholars found themselves navigating an expansive sea of texts that surpassed the processing capacity of the human mind.

Scholars had little choice but to adopt methodologies that had been evolving over decades, even if they had previously made limited impact due to their niche specialization, such as *humanities computing* (from the 1960s to the 2000s). The combined influence of the internet's rise, enhanced computing power, and the proliferation of machine learning has profoundly changed research methods and significantly broadened the scope of algorithm-based methodologies. The integration of machine learning and artificial intelligence into the humanities has progressed rapidly, paving the way for numerous new research avenues.

Yet, the embrace of computational methods is not without its challenges. These methods necessitate **a new kind of literacy**—a fluency in algorithmic thinking, a grasp of data structures, and an understanding of statistical analyses. Humanities scholars, traditionally trained in qualitative methodologies, must explore this new landscape, discerning which tools align with their research objectives and ensuring their appropriate and ethical application. They also need to overcome their reluctance to move out of their comfort zone, to accept to make the time to read outside of their familiar fields, and finally to admit that there will be a learning curve to become proficient in computational methodologies.

Adopting **computational methods** is not straightforward, particularly given the need to adapt them to the distinct nuances of each discipline. A one-size-fits-all approach risks superficiality. Scholars should therefore immerse themselves in these varied methods, choosing and customizing them to align with their research agenda and questions. We argue that while the digital turn in the humanities has been groundbreaking, it is the depth and specificity of computational methods that hold the key to the future. They offer not just new tools but new paradigms, challenging us to rethink the very essence of humanities research in the 21st century.

The evolution of computational methodologies in the humanities underscores a crucial need for **strong interdisciplinary collaboration and training**. The intricacies of algorithms, machine learning, and artificial intelligence are realms that most humanities scholars will mostly never fully master. Conversely, while computer scientists can craft sophisticated algorithms, they do not possess the interpretive skills required to analyze and understand the cultural, historical, or literary significance of the data these algorithms process.



This presents **an imperative for genuine intellectual engagement across disciplines**. A synergy between computer science and the humanities can lead to the co-creation of tools and methods that are both technologically advanced and grounded in humanistic inquiry. A recent example of such collaboration is HistText, an application for leveraging large-scale historical corpora developed by a team of historians, computer and data scientists who have worked closely together for more than five years (Blouin et al., 2023).¹ Such interdisciplinary collaboration ensures that the algorithms are tailored to address specific research questions in the humanities, while the data they produce is interpreted with the depth and nuance that only humanistic scholarship can provide.

The future of computational humanities lies in this collaborative spirit. As we march deeper into the age of data, **the silos between disciplines must dissolve**. The key is creating environments where computer scientists and humanists can engage in sustained dialogue, learning from one another, challenging each other, and together advancing a richer, more holistic understanding of the world. This is where the potential for groundbreaking discoveries lies.

The Critical Turn: From Tool Use to Tool Understanding

The attraction of technology often lies in its promise of efficiency, its ability to automate tasks, and its capacity to unveil patterns beyond human discernment. In the landscape of Digital (DH) or Computational Humanities (CH), this attraction is palpable. Digital tools and platforms offer enticing possibilities for analysis, visualization, and dissemination. This is how most commercial platforms advertise their products, with self-aggrandizing claims and powerful visualizations. The humanities need to embark on this digital voyage and for this reason they are now at a critical juncture: the **need to move beyond mere tool use to a profound understanding** of these tools.

At the heart of the humanities lies a tradition of critical inquiry—a deep-seated commitment to questioning, interpreting, and understanding. As digital and computational methodologies become integral to this intellectual tradition, it is imperative that they are not just passively adopted but critically engaged with. This means not just asking what these tools can do, but also probing deeper questions: How do they work? What assumptions underlie their algorithms? What biases might they introduce? What are the epistemological implications of their use? What is in fact a digital “source”, especially for digital-made resources? To properly answer these questions requires both **hermeneutics skills rooted in the humanistic tradition** and a deep understanding of computational reasoning.

Consider, for instance, a text analysis tool that employs machine learning to categorize literary themes. While the tool might efficiently classify texts, a critical humanist would question the criteria for categorization, the potential biases in the training data, and the broader implications of algorithmic topic determination. A historian would question what the classification of texts may reveal on the conditions of production of the source and how various kinds of social actors appeared therein. Such critical engagement ensures that computational methods enhance, rather than dilute, the analytical depth of humanities research. In sum, it is never about using tools; it

¹ <https://shs.hal.science/halshs-04178820v1> [Accessed 21 August 2023]



is about understanding and shaping these tools in tandem to ensure they align with the epistemological needs of the humanities.

This critical turn is essential not just for epistemological reasons, but a condition for **ethical scholarship**. In an era where algorithms have been shown to perpetuate biases, from racial to gendered, humanities scholars have a responsibility to ensure their methods uphold the values of equity, inclusivity, and academic rigor. This demands not just a superficial use of tools but a deep dive into their mechanics, their data sources, and their potential pitfalls. Such a critical understanding of tools requires —we are tempted to write “demand”— **interdisciplinary dialogue**, which in turn, requires some minimum training in the alter disciplines or at least a basic understanding of their fundamental concepts and approaches. By understanding the foundations of computational methods, humanities scholars can engage more effectively with fields like computer science and data analytics, to establish collaborations that are rooted in mutual understanding.

In other words, the compass guiding this digital journey must be critical inquiry. It is not enough to wield digital tools; scholars must dissect them, understand them, and critically situate them within the broader range of humanities research. In doing so, they ensure that the digital turn in the humanities is not just technologically advanced, but also intellectually robust and ethically grounded.

Discipline-Specific Transformations

The Digital Humanities (DH) label, while encompassing a vast array of tools and techniques, finds its most profound impact in the discipline-specific transformations it instigates. By briefly examining the case of individual disciplines, we can discern better the nuanced ways in which computational methodologies reshape research in the humanities. Below we briefly discuss three illustrative case studies:

Literature: From Close Reading to Distant Reading:

Traditionally, literary studies have been rooted in close reading—a meticulous, line-by-line analysis of texts, dissecting nuances, motifs, and stylistic choices. However, the digital age presents a deluge of textual data, from vast digital libraries to online repositories. In this discipline, computational methods have introduced the concept of "distant reading." Scholars like Franco Moretti or Matthew Jockers have pioneered this approach, using algorithms to analyze vast corpora of text, identifying patterns and trends across large literary datasets. This macroscopic lens allows researchers to discern stylistic evolutions, thematic shifts, and literary influences at a scale previously unimaginable. Yet, this not the end of it. This is a path that more advanced methodologies (sentiment analysis, literary genetics, text reuse, etc.) have been continuously enriching. These approaches complement close reading offering both a panoramic view and deep dives into literary texts at all scales.

History: From Digital Archives to Computational methods:

Historical research, once bound to the tactile pages of archives and manuscripts, has witnessed a digital revolution. Digital archives have democratized access, but it is computational methods that have truly transformed historiographical practices. Techniques like Geographic Information Systems (GIS) allow historians to engage in spatial history, mapping the

geographies of historical events and migrations. Textual analysis of historical corpora allows historians to extract and gather a wealth of targeted data from a wide range of sources, which actually meets one of the basic tenets of historical research. Network analysis tools shed light on complex webs of historical relationships, from diplomatic ties to trade networks. Computational methods, therefore, offer multi-dimensional routes into the past, weaving together spatial, temporal, and relational narratives.

Sociology: From Field Surveys to Digital Ethnography

Sociology, with its pulse on societal structures and dynamics, finds in computational methods a powerful ally. Traditional survey methodologies, while invaluable and certainly irreplaceable, face challenges of scale and scope as people all over the planet have been depositing an unimaginable number of digital traces on all sorts of platforms (Skyblog, Facebook, TikTok, etc.). Digital tools offer solutions to tackle this challenge. Network analysis, for instance, provides insights into societal structures, power dynamics, opinion trends, and community formations. Meanwhile, digital ethnography harnesses online multimedia platforms, from social media to forums, as rich terrains for sociological inquiry. These digital spaces, teeming with interactions, debates, and cultural exchanges, become sites for nuanced sociological analyses, offering real-time insights into societal shifts, cultural trends, and emergent social phenomena.

These examples underscore a pivotal observation: the transformation ushered in by computational methods is not about a mere addition of tools but a **fundamental reimagining of disciplinary practices**. In each discipline, a computational approach effectively neutralizes dichotomies such as between quantitative/qualitative or between close and distant reading. For instance, topic modeling (a statistical method that helps to identify themes in vast collections of texts based on the most frequent word co-occurrences) allows navigating between various scales on a continuum ranging from individual words, to documents, cross-document topics, and entire corpora (Armand 2023, Henriot 2023). Similarly, scholars who embrace network analysis can move swiftly from individual nodes, dyads, and sub communities to the global network structure. They can complement graph visualization with a careful examination of statistical metrics and utilize their knowledge of the context to interpret the position of specific nodes within the whole structure (Armand, 2024). This nuanced perspective aligns more closely with the concept of 'multiscalar' reading, enabling scholars to explore vast datasets while also zooming in on intricate patterns. It is these discipline-specific transformations, grounded in the unique questions and traditions of each disciplinary field, that will chart the course forward of humanistic research.

The Future: Integration Rather than Replacement

The rapid ascent of **computational methodologies** raises a fundamental debate about its implications for the future of humanities scholarship. Will computational methods supersede “traditional” methodologies? Or will they merely exist as supplementary tools in the scholarly arsenal? The reality, as often is the case, lies precisely in the continuum from well-established methodologies to the critical adoption of the most advanced technologies. The future does not call for a replacement, but a **necessary integration of these methodologies into the toolbox of humanists**.



At the heart of the humanities lies the quest for understanding—to unravel the complexities of human experience, culture, and history. This core remains unaltered, irrespective of the tools employed. Humanistic methodologies offer depth, nuance, and a rich interpretive framework. They form the bedrock upon which new methods must be built, not the foundations to be uprooted.

Computational methodologies, while transformative, are not panaceas. They offer specific strengths—scale, pattern recognition, and data-driven insights. Yet, they also come with limitations, including potential biases and an emphasis on quantifiability. They also encounter the inherent limitations of digital sources stemming from the digitization of printed works, accompanied by an array of OCR and segmentation issues. Herein lies the potential for integration. Computational methods can address some of the limitations of conventional methodologies, offering broader scopes or novel perspectives. Notably, quantification also has its virtues. It can be a powerful corrective against the methodological flaws of mainstream cultural studies. Conversely, traditional hermeneutics is necessary to ground computational analyses, providing interpretive depth and qualitative richness.

Let us consider literature again. While computational tools can analyze vast literary datasets, identifying macroscopic trends or stylistic evolutions, they cannot delve into the intricate symbolism of a poem or the nuanced character development in a novel. The distant reading offered by computational tools and the close reading of traditional literary analysis are not adversaries but allies. Together, they provide a holistic understanding, from overarching trends to intricate nuances.

In the historical field, social historians who are interested in particular groups of people can harness natural language processing (NLP) techniques to turn biographical sources into prosopographical databases. With linked data, it becomes possible to draw connections within and among individual data points. Historians can then conduct multidimensional analyses to reconstruct individual trajectories and networks, identify trends and regularities as well as disrupting events and atypical cases among the population under study. In this data-driven framework, knowledge of the historical context and close reading of archival materials remain a prerequisite for interpreting patterns and turning data points into meaningful narratives.

In the field of anthropology, finally, researchers can utilize computational methods to map the spread of emotions on social media. Yet to effectively assess their actual influence on social and political movements, digital anthropologists need to gather empirical information on contemporary events happening in the “real” world. They would also gain in cross-analyzing their findings with those drawn from other, more conventional media such as newspapers and television.

The future of the humanities in the digital age is not about replacement but about symbiosis. It is about recognizing the strengths and limitations of both humanistic and computational methods and integrating them into a cohesive body of scholarship that is rigorous, diverse, and reflective of the multifaceted human experience. The path forward is clear—it is one of interdisciplinary collaboration and a continued commitment to the core values of the humanities.

Conclusion: Embracing the Computational Future

The Digital/Computational Humanities, with their promise of innovation and interdisciplinary dynamism, have left an indelible mark on the scholarly landscape. Yet, as we argued, broad labels capture but a fraction of the profound transformations underway. The true essence of this shift lies not in the mere adoption of digital tools, but in the deep, discipline-specific **integration of computational methodologies**.

Each discipline within the humanities has its own framework of rich intellectual traditions, questions, and methods. Computational tools, in their vast array, offer unique opportunities to augment these traditions. From the distant reading of vast literary corpora to the intricate network analyses of historical relationships, computational methods are unlocking new horizons of inquiry. Yet, their true potential is realized not when they stand alone, but when they intertwine with the established methodologies of each discipline, creating a symbiotic relationship that amplifies the strengths of both.

Humanities scholars cannot escape embracing the computational turn, not as a radical departure, but as **a critical extension of the humanities' core values**. Humanities have always championed depth, nuance, and critical inquiry. *Computational methods, when approached with discernment and criticality, can enhance these values, offering scale, precision, and novel perspectives*. Scholars must venture beyond surface-level tool adoption, striving for a profound understanding of the computational landscape. This means critically engaging with algorithms, understanding their biases, and ensuring that their application aligns with the ethical and epistemological foundations of the humanities. To do this, they will have to work closely with specialists in computing, not on a daily basis, but at various points in the course of their research, which will include self-training and training.

We argue that the key element to facilitate this transition is to move away from the dominant overarching concepts (DH, CH, CSS, etc.) and **to place the emphasis on computational methodologies**. Humanities scholars have a wide array of such methodologies at their disposal. They do not need them all at the same time. They may not even need them at the same level of depth, depending on their questions, approach or the nature of their sources. They need to start from their needs and explore which methods are more likely to match their intellectual inquiry. A historian or a sociologist does not care about what “digital humanities” can do. But they need to become aware of what specific computational methods can do in their research.

The first challenge to unlock the barriers toward computational methodologies, however, is the **absolute dearth of training in computational sciences and programming for humanities scholars** in most universities. It should be the role of academic institutions to encourage and facilitate this transition. A second, related challenge is the **lack of recognition** that computational skills usually receive in evaluation procedures for academic recruitment or promotion. By the same token, computational methods are rarely considered during peer review process in conventional journals. In this respect, the *Journal of Digital History* is a notable exception in the field of historical research.

To conclude this paper, we call for a new kind of computational thinking in the humanities, which encompasses **three key dimensions**: the capacity to translate humanities questions into machine-actionable tasks; the aptitude to interpret computational outputs from a humanistic and critical perspective; and the ability to weave their discoveries with previous findings into

a consistent, compelling narrative that speaks to a wide community of readers beyond their specific field of expertise. These are the three vital skills that humanities scholars will have to acquire soon if they want to maintain their relevance in the age of algorithms and artificial intelligence.

The journey beyond Digital Humanities is not a journey away from the core of the humanities, but rather a deepening of its essence. It is about harnessing the power of computation to enrich and expand our understanding of the intricate mosaic of human experience.

References

- A Companion to Digital Humanities*. Blackwell Reference Online. Oxford: Blackwell, 2004.
- Abanoz, Enes, ed. *Opportunities and Challenges for Computational Social Science Methods*. Advances in Human and Social Aspects of Technology Book Series. Hershey, PA: Information Science Reference, 2022.
- Alvarez, R. Michael, and Seo-young Silvia Kim. *Computational Social Science*. Oxford Bibliographies. New York: Oxford University Press, 2019.
- Alvarez, R. Michael, ed. *Computational Social Science: Discovery and Prediction*. Analytical Methods for Social Research. New York: Cambridge University Press, 2018.
- Armand, Cécile. “Bonding minds, bridging nations: Sino-American alumni networks in the Era of Exclusion (1882-1936)”, in Henriot (Ed.), *Modern China in Flux: Networks, Mobility, and Transformation*, Berlin, De Gruyter (scheduled for publication in 2024).
- Armand, Cécile. “Mapping the Transnational Public Sphere in Modern China: A Bilingual Topic Modeling of the Republican Press (1919-1949).” *Journal of Digital History*, Fall 2023.
- Bay, Jessica. *Matthew K. Gold, Editor. Debates in the Digital Humanities*, University of Minnesota Press, 2012, Vol. 4, 2014.
- Bertoni, Eleonora, Matteo Fontana, Lorenzo Gabrielli, Serena Signorelli, and Michele Vespe, eds. *Handbook of Computational Social Science for Policy*. Cham: Springer International Publishing, 2023.
- Blouin Baptiste, Cécile Armand, Christian Henriot. HistText: An Application for leveraging large-scale historical textbases. 2023. halshs-04178820
- Bod, Rens, Jaap Maat, and Thijs Weststeijn, eds. *The Making of the Humanities. Volume III, The Modern Humanities*. Amsterdam: Amsterdam University Press, 2014.
- Bodenhamer, David J., John Corrigan, and Trevor M. Harris, eds. *The Spatial Humanities: GIS and the Future of Humanities Scholarship*. Spatial Humanities (Indiana University Press). Bloomington: Indiana University Press, 2010.
- Burdick, Anne, Johanna Drucker, Peter Lunenfeld, Todd Samuel Presner, and Jeffrey T. Schnapp. *Digital-Humanities*. Cambridge, Mass.: The MIT Press, 2016.
- Chambliss, Julian C., and Ellen Moll. *Making Sense of Digital Humanities: Transformations and Interventions in Technocultures*. East Lansing: MSU Libraries, 2022.
- Chen, Shu-Heng, ed. *Big Data in Computational Social Science and Humanities*. Computational Social Sciences. Cham: Springer International Publishing, 2018.
- Cohen, Daniel J, and Roy Rosenzweig. *Digital History: A Guide to Gathering, Preserving, and Presenting the Past on the Web*. Philadelphia: University of Pennsylvania Press, 2006.
- Engel, Uwe, Anabel Quan-Haase, Sunny Xun Liu, and Lars Lyberg, eds. *Handbook of Computational Social Science. Volume 1, Theory, Case Studies and Ethics*. European Association of Methodology Series. London: Routledge, 2022.

- Engel, Uwe, Anabel Quan-Haase, Sunny Xun Liu, and Lars Lyberg, eds. *Handbook of Computational Social Science. Volume 2, Data Science, Statistical Modelling, and Machine Learning Methods*. European Association of Methodology Series. London: Routledge, 2022.
- Engel, Uwe, ed. *Handbook of Computational Social Science*. London: Routledge, 2022.
- Fickers, Andreas, and Juliane Tatarinov, eds. *Digital History and Hermeneutics: Between Theory and Practice*. De Gruyter, 2022.
- Fiormonte, Domenico, Francesca Tomasi, and Teresa Numerico. *The Digital Humanist: A Critical Inquiry*. Translated by Christopher Ferguson and Desmond Schmidt. Baltimore, Maryland: Project Muse, 2020.
- Fitzpatrick, Kathleen. *Planned Obsolescence Publishing, Technology, and the Future of the Academy*. New York: New York University Press, 2012.
- Foster, Ian, Rayid Ghani, Ron S. Jarmin, Frauke Kreuter, and Julia Lane. *Big Data and Social Science: Data Science Methods and Tools for Research and Practice*. Edited by Ian Foster, Rayid Ghani, Ron S. Jarmin, Frauke Kreuter, and Julia Lane. 2nd ed. Chapman and Hall/CRC, 2020.
- Fu Haiyan, Xu Jian, eds. *Dashuju yu zhongguo lishi yanjiu*. Beijing: Shehui kexue wenxian chubanshe, vol.1, 2017, vol. 2, 2020, Vol. 3, 2021, Vol. 4, 2023
- Gilbert, G. Nigel. *Computational Social Science*. Sage Benchmarks in Social Research Methods. London: SAGE, 2010.
- Gillet, Seth, Florence Hengchen, and Simon Max deWilde van Hooland. *Introduction Aux Humanités Numériques Méthodes et Pratiques*. Louvain-la-Neuve: De Boeck Supérieur, 2016.
- Gregory, Ian N., and A. Geddes, eds. *Toward Spatial Humanities: Historical GIS and Spatial History*. Spatial Humanities (Indiana University Press). Bloomington: Indiana University Press, 2014.
- Gregory, Ian, Donald A. DeBats, and Donald Lafreniere, eds. *The Routledge Companion to Spatial History*. Milton Park, London: Routledge, 2018.
- Grimmer, Justin, Margaret E. Roberts, and Brandon M. Stewart. *Text as Data: A New Framework for Machine Learning and the Social Sciences*. Princeton: Princeton University Press, 2022.
- Henriot, Christian. "Eminent Chinese of the Shenbao (1872-1891). A digital investigation of news reporting and newspaper-making in late imperial China." *Journal of Digital History*, Fall 2023.
- Humanités numériques: de nouveaux récits en histoire de l'art?* Histoire de l'art. Paris: Association des professeurs d'archéologie et d'histoire de l'art des universités (APAHU), 2021.
- Jockers, Matthew Lee. *Macroanalysis: Digital Methods and Literary History*. Topics in the Digital Humanities. Urbana: University of Illinois Press, 2017.
- Jones, Steven E., *The Emergence of the Digital Humanities*. London: Taylor and Francis, 2020.
- Kee, Kevin, ed. *Pastplay: Teaching and Learning History with Technology*. Ann Arbor: University of Michigan Press, 2014.
- Kertész, János, Rosario N. Mantegna, and Salvo Micciché, eds. *Computational Social Science and Complex Systems*. Proceedings of the International School of Physics "Enrico Fermi." Amsterdam: IOS Press, 2019.
- Kim, Dorothy, and Jesse Stommel, eds. *Disrupting the Digital Humanities*. Goleta, CA: Punctum Books, 2018.

- Lazer, David, and Stefan Wojcik. *Political Networks and Computational Social Science*. Edited by Jennifer Nicoll Victor, Alexander H. Montgomery, and Mark Lubell. Vol. 1. Oxford: Oxford University Press, 2017.
- Liu Zhiwei, Wang Lei, eds. *Shuzi renwen yu xin wenke fazhan*. Beijing: Shehui kexue wenxian chubanshe, 2023
- Manifesto of Computational Social Science*. EDP Sciences, 2012.
- McLevey, John. *Doing Computational Social Science: A Practical Introduction*. Los Angeles: SAGE, 2022.
- Moretti, Franco. *Graphs, Maps, Trees: Abstract Models for a Literary History*. ACLS Humanities E-Book. London: Verso, 2007.
- Muhanna, Elias, ed. *The Digital Humanities and Islamic & Middle East Studies*. Berlin: De Gruyter, 2016.
- Nelimarkka, Matti. *Computational Thinking and Social Science: Combining Programming, Methodologies and Fundamental Concepts*. Los Angeles: SAGE, 2023.
- Payne, Diane, Johan A. Elkink, Nial Friel, Thomas U. Grund, Tamara Hochstrasser, Pablo Lucas, and Adrian Ottewill. *Social Simulation for a Digital Society: Applications and Innovations in Computational Social Science*. Springer Proceedings in Complexity. Cham: Springer, 2020.
- Ramsay, Stephen. *Reading Machines: Toward an Algorithmic Criticism*. Topics in the Digital Humanities. Urbana: University of Illinois Press, 2017.
- Ridolfo, Jim. *Digital Samaritans: Rhetorical Delivery and Engagement in the Digital Humanities*. Digital Rhetoric Collaborative (Ann Arbor, Mich.). Ann Arbor: University of Michigan Press, 2015.
- Rudas, Tamás, and Gábor Péli, eds. *Pathways Between Social Science and Computational Social Science: Theories, Methods, and Interpretations*. Computational Social Sciences. Cham: Springer International Publishing, 2021.
- Salganik, Matthew J. *Bit by Bit: Social Research in the Digital Age*. First paperback edition. Princeton: Princeton University Press, 2019.
- Schiuma, Giovanni, and Daniela Carlucci, eds. *Big Data in the Arts and Humanities: Theory and Practice*. Data Analytics Applications. Boca Raton, FL: CRC Press, Taylor & Francis Group, 2018.
- Schreibman, Susan, Raymond George Siemens, and John Unsworth. *A New Companion to Digital Humanities*. Blackwell Companions to Literature and Culture. Malden, MA: Chichester: Wiley/Blackwell, 2016.
- Shah, Dhavan V., Joseph N. Cappella, and W. Russell Neuman, eds. *Toward Computational Social Science: Big Data in Digital Environments*. Annals of the American Academy of Political and Social Science. Los Angeles: SAGE, 2015.
- Shixue yuekan, *Dashuju shidai de shiliao yu shixue*. Beijing: Renmin chubanshe, 2017.
- Shu Jian, ed. *Dashuju shidai de lishi yanjiu*. Shanghai: Shanghai yuwen chubanshe, 2017
- Shuwei renwen yu jindai zhongguo zhishifenzi*, Zhengzhi daxue shuwei shiliao yanjiu congkan. Taipei: Guoli zhengzhi daxue tushuguan, 2020.
- Siemens, Raymond George, and Susan Schreibman. *A Companion to Digital Literary Studies*. Blackwell Companions to Literature and Culture. Chichester: Wiley-Blackwell, 2013.
- Sophie Anquetil, Carine Duteil-Mougel, Vivien Lloveria. *Le Sens des données. Le Statut du corpus et herméneutique à l'aune des Humanités Numériques*. Paris: Editions L'Harmattan, 2019.
- Svensson, Patrik, and David Theo Goldberg, eds. *Between Humanities and the Digital*. Cambridge, Mass.: MIT Press, 2015.



- The Shape of Data in the Digital Humanities Modeling Texts and Text-Based Resources.* Digital Research in the Arts and Humanities. London: Routledge, 2020.
- Travis, Jennifer, and Jessica DeSpain, eds. *Teaching with Digital Humanities: Tools and Methods for Nineteenth-Century American Literature.* Topics in the Digital Humanities. Urbana: University of Illinois Press, 2018.
- Vinck, Dominique. *Humanités Numériques : La culture face aux nouvelles technologies.* Paris: Le cavalier bleu, 2016.
- Whalen, Ryan, ed. *Computational Legal Studies: The Promise and Challenge of Data-Driven Research.* Elgar Studies in Legal Research Methods. Cheltenham: Edward Elgar Publishing Limited, 2020.
- Xiang Jie, ed. *Cong baocun dao chuangzao: kaiqi shuwei renwen yanjiu* (From preservation to knowledge creation: the way to digital humanities). Shuwei renwen yanjiu congshu (Taipei: Guoli taiwan daxue chuban zhongxin, 2011 (reed. 2016).
- Xiang Jie. *Shuwei renwen yanjiu yu jiyi* (Digital humanities and craft: technological change). Series on digital humanities. Taipei: Guoli taiwan daxue chuban zhongxin, 2014.
- Yaovi Akakpo. *Humanités Numériques et Éducation en Afrique. Innovations sociales en Afrique.* Paris: Editions L'Harmattan, 2021.
- Ye, Xinyue, and Hui Lin, eds. *Spatial Synthesis: Computational Social Science and Humanities.* Human Dynamics in Smart Cities. Cham: Springer International Publishing, 2020.