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Intelligent Heritage: Mapping the Rise of Computational and AI Approaches in Digital Humanities

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Abstract

The digital humanities (DH) have rapidly matured into a transformative domain where computational innovation intersects with humanistic scholarship. Over the past two decades, this interdisciplinary field has redefined how researchers interpret, preserve, and disseminate cultural knowledge. The present study conducts a thorough bibliometric examination of publications indexed in the Scopus database to map the intellectual structure, leading contributors, and evolving thematic directions of DH scholarship. Based on an analysis of 544 peer-reviewed journal articles published from 2001 to 2024, the study integrates citation performance, productivity indicators, and network visualization techniques. The results indicate a steady expansion of DH research, with substantial scholarly activity concentrated in United Kingdom, United States, and China. Prominent thematic areas include digital heritage conservation, artificial intelligence applications in cultural inquiry, and data-intensive frameworks such as big data analytics. Co-occurrence network analysis further reveals interlinked clusters centered on digital curation, cultural informatics, and computational methodologies. Collectively, the findings demonstrate how DH contributes to advancing cultural sustainability, enhancing knowledge ecosystems, and reinforcing interdisciplinary collaboration. These findings provide a valuable reference for scholars, policy makers, and institutions aiming to cultivate innovation and strengthen global research partnerships within this dynamic and continually evolving discipline.

Keywords: Bibliometric, Computational Approaches, Digital Heritage, Digital Humanities, Intelligent Heritage.

Introduction

The rapid expansion of digital infrastructures over the past three decades has fundamentally reshaped the modes through which humanities scholarship is produced, disseminated, and applied to the interpretation of cultural knowledge. Within this broader transformation, digital humanities (DH) have emerged as a dynamic and increasingly influential interdisciplinary domain, integrating computational methodologies with humanistic inquiry to generate new forms of cultural understanding and knowledge production (1, 2). Rather than functioning as a mere extension of traditional digitization practices, contemporary DH research employs a progressively sophisticated range of analytical tools, spanning data mining, natural language processing, and artificial intelligence (AI), to interrogate complex cultural datasets at scale (3). This methodological intensification represents a decisive shift from descriptive archival work toward what scholars have begun to characterize as intelligent heritage analytics, wherein computational systems actively participate in the interpretation and recontextualization of cultural memory (4).

Over the past two decades, DH has experienced substantial and sustained growth, driven by the proliferation of open-access digital archives, the maturation of computational linguistics and machine learning frameworks, and the rising availability of large-scale cultural datasets amenable to algorithmic analysis (5). Scholars across multiple disciplines have applied digital methods to a broad spectrum of inquiry, including textual analysis, cultural heritage preservation, social media studies, and computational historiography (6, 7). More recently, the emergence of generative AI technologies, including large language models

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and multimodal generation systems, has introduced transformative possibilities for automated content analysis, metadata enrichment, and synthetic reconstruction of historical artefacts within DH contexts (1). These developments have accelerated the field's evolution while simultaneously raising important questions about epistemological integrity, authorship, and the ethical governance of AI in humanistic research (2, 7–11). Despite this expansion, the intellectual architecture and evolving research frontiers of DH remain unevenly mapped. Previous bibliometric investigations have tended to concentrate on selective thematic domains or disciplinary subsets, leaving a substantive gap in integrative, data-driven analyses of the field's global development (1, 2, 7–11). Critically, the growing influence of AI-enabled methodologies within DH has not yet been systematically examined through the lens of large-scale bibliometric evidence. Furthermore, the existing literature has largely overlooked the structural asymmetries between Global North and Global South research ecosystems within DH. The disproportionate concentration of institutional capacity, computational infrastructure, and archival digitization resources in North America, Western Europe, and select East Asian nations has created persistent inequalities in knowledge production and scholarly participation. Researchers and institutions in Southeast Asia, Africa, and Latin America continue to face significant barriers to engagement, including limited access to proprietary AI platforms, restricted connectivity to globally indexed digital archives, and the marginalization of non-English scholarly contributions within dominant citation databases. These disparities constitute not merely a logistical challenge but an epistemic concern, insofar as they risk entrenching existing patterns of cultural hegemony within a field ostensibly committed to inclusive knowledge democratization.

In response to these identified gaps, the present study undertakes a comprehensive bibliometric investigation of DH scholarship indexed in the Scopus database, spanning the period 2001 to 2024. By systematically analyzing publication outputs, citation dynamics, authorship patterns, and keyword co-occurrence networks, this research seeks to uncover the underlying knowledge architecture shaping the contemporary DH landscape and to trace its evolution across temporal, geographical, and thematic dimensions. Analytical attention is directed toward the emergence of computational and AI-related research clusters, which increasingly signal a methodological reorientation within the broader humanities scholarship community. The present study addresses the following research questions:

(a) How is the current knowledge structure of DH research configured at the global level?
(b) What temporal and thematic patterns are discernible within the DH literature across the study period?
(c) Which authors, institutions, and countries have assumed the most influential roles in advancing the field?
(d) Which highly cited works have most significantly shaped the intellectual trajectory of the field?
(e) What thematic clusters define the evolving research frontiers and prospective directions of DH inquiry?

By systematically addressing these questions, the present study contributes to ongoing scholarly conversations in three substantive ways. First, it provides an updated and empirically grounded global mapping of DH research trajectories, employing robust bibliometric indicators to move beyond descriptive narrative reviews. Second, it foregrounds the growing role of computational and AI-driven approaches in reshaping humanistic inquiry, situating these developments within the broader paradigm shift toward intelligent heritage scholarship. Third, it offers critical insights into the geographical and institutional asymmetries that currently characterize the field, providing an evidential basis for policymakers, research funders, and cultural institutions seeking to strengthen equitable interdisciplinary innovation in the digital age. Collectively, the study positions DH not merely as a technical support apparatus for the humanities, but as an evolving epistemic framework that is actively redefining the generation, interpretation, and long-term stewardship of cultural knowledge in an increasingly computational world.

Methodology

Database Selection and Search Strategy

This study employed a quantitative bibliometric approach to systematically examine the

development of DH research. The Scopus database was selected as the primary bibliographic repository, with records retrieved on 8 October 2025. Scopus was purposefully chosen on account of its extensive multidisciplinary coverage, rigorous peer-review indexing standards, and comprehensive metadata infrastructure, which collectively enable reliable and reproducible scient metric analysis across the natural sciences, social sciences, engineering, and the humanities (12, 13). These attributes render it particularly well-suited for mapping a cross-disciplinary field such as DH, where scholarly contributions traverse multiple subject classifications.

The temporal scope of the study was delimited to the period 2001-2024. This boundary was determined to capture the full arc of DH's emergence and consolidation as a formally recognized research domain, coinciding with the establishment of dedicated institutional programs, specialist journals, and indexed publication venues. To ensure broad conceptual coverage, the search strategy incorporated a range of synonymous and related terms commonly employed in DH scholarship. The selected keywords encompassed both established and emerging nomenclature within the field, including: "digital humanities," "computational human," "digital culture," "digital scholarship," "technological humanities," and "digital heritage." The search was applied to the TITLE-ABS-KEY field encompassing article titles, abstracts, and author keywords to maximize retrieval sensitivity while preserving thematic relevance. The Boolean search expression applied was as follows:

TITLE-ABS-KEY ("digital humanities" OR "computational human" OR "digital culture" OR "digital scholarship" OR "technological humanities" OR "digital heritage")

This query produced an initial corpus of 1,455 documents spanning the specified period, collectively representing the broad intellectual scope and methodological diversity of DH scholarship.

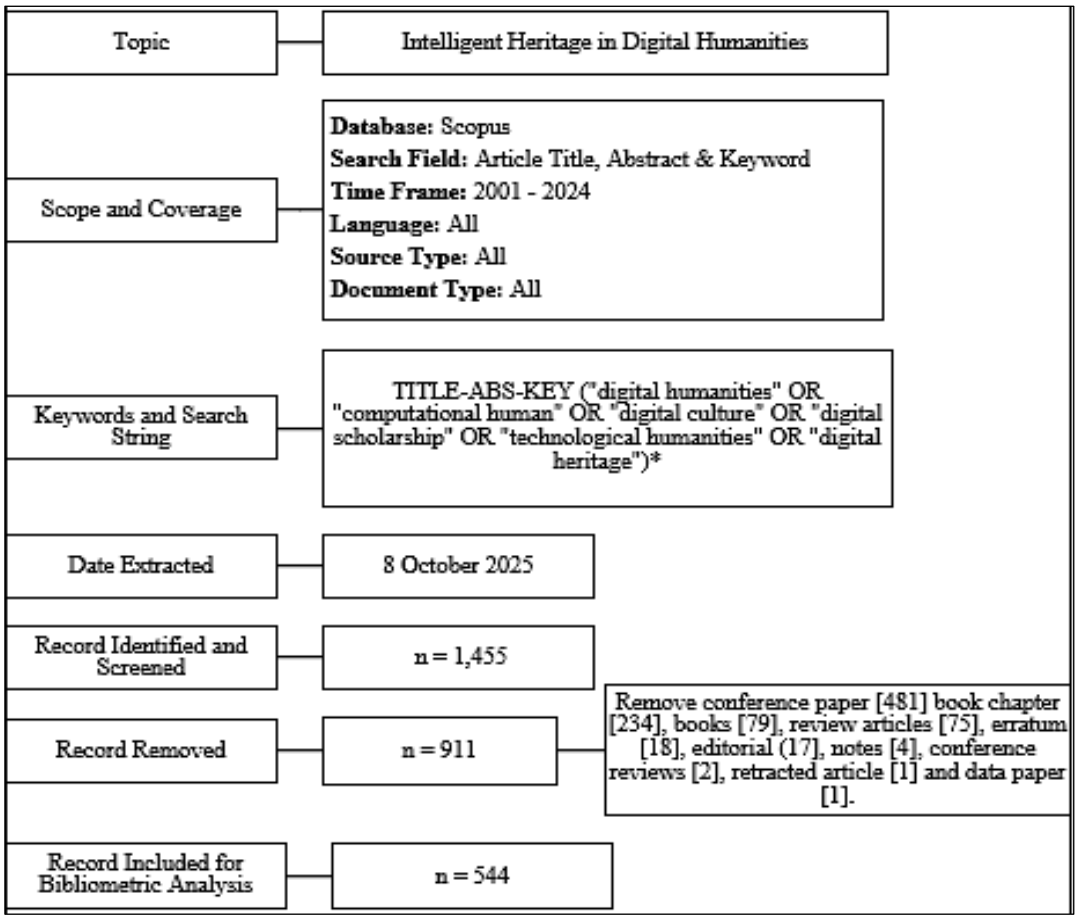

Figure 1: Flow Diagram of the Search Strategy and Systematic Screening Process for the Digital Humanities Bibliometric Dataset

Inclusion and Exclusion Criteria

To enhance analytical precision and thematic coherence, a systematic multi-stage screening process was applied to the retrieved corpus. Only primary research outputs that represent direct scholarly contributions were retained for analysis. Document types that do not fulfil this criterion were excluded from the dataset, specifically: conference proceedings (n = 481), book chapters (n = 234), monographs (n = 79), review articles (n = 75), errata (n = 18), editorial pieces (n = 17), notes (n = 4), conference reviews (n = 2), retracted articles (n = 1), and data papers (n = 1). The disciplinary scope of inclusion was unrestricted, encompassing all subject areas indexed within the retrieved DH keyword cluster, thereby reflecting the field's inherently cross-disciplinary character.

Following this systematic refinement, the final analytical corpus comprised 544 peer-reviewed journal articles published between 2001 and 2024. Restricting the dataset to original research articles improves record comparability and strengthens the validity of the bibliometric indicators subsequently reported. The complete data identification, screening, and selection workflow is presented in Figure 1.

Data Cleaning and Harmonization

Prior to bibliometric analysis, a structured data preparation phase was undertaken to ensure the robustness, internal consistency, and analytical reliability of the dataset. Inconsistencies in bibliographic metadata if left unaddressed may distort network structures, inflate or suppress performance indicators, and introduce systematic error into co-occurrence analyses (12). To mitigate these risks, two dedicated tools were employed, Open Refine and biblioMagika (14).

The dataset was first exported from Scopus in CSV format. Using OpenRefine, the retrieved records were subjected to systematic inspection and normalization. Attention was directed toward variability in author name representations, institutional affiliation designations, and keyword expressions dimensions known to exhibit high heterogeneity in cross-disciplinary and internationally distributed corpora such as DH. Variant spellings, institutional abbreviations, and duplicate entries were identified through clustering algorithms and manually reconciled to ensure uniform representation across records. This harmonization step substantially reduced noise in the dataset and enhanced the reliability of subsequent authorship and network analyses.

Concurrently, biblioMagika was utilized to compute a comprehensive suite of bibliometric performance indicators. Records flagged for missing or inconsistent metadata were manually verified against the original Scopus entries. Multi-valued fields were standardized, and fragmented records were consolidated to preserve dataset coherence. The cleaned and harmonized dataset was subsequently exported for the main analytical phase. This preprocessing stage collectively enhanced data comparability and strengthened the overall analytical validity of the investigation.

Analytical Framework and Bibliometric Indicators

The analytical framework was designed to address the five research questions formulated in the introduction and to provide a multidimensional characterization of DH scholarship. The study integrated descriptive bibliometric measurement with network-based visualization to enable both quantitative assessment and thematic interpretation. Descriptive bibliometric indicators were computed using biblioMagika across five analytical units: publication year, source title, author, institution, and country. The indicators generated included Total Publications (TP), Number of Contributing Authors (NCA), Number of Cited Publications (NCP), Total Citations (TC), Citations per Paper (C/P), Citations per Cited Paper (C/CP), Citations per Author (C/A), Authors per Paper (A/P), and Citations per Year (C/Y). Additionally, three core impact indices were calculated to evaluate scholarly influence and knowledge diffusion. The h-index was defined as the largest value of h such that h publications within the corpus each received a minimum of h citations. The g-index extends this measure by accounting for the cumulative citation distribution of the highest-ranked publications, identifying the largest value g such that the top g papers collectively received at least g^2 citations. The m-index, derived by dividing the h-index by the number of years since the author's first publication, was applied to evaluate citation accrual rate relative to research career duration. These indicators were analyzed across annual, authorial, institutional, and national dimensions to construct a comprehensive representation of

research productivity and scholarly impact within the field.

Network Visualization and Thematic Mapping

To uncover the conceptual architecture of DH research, keyword co-occurrence analysis was conducted using VOSviewer (version 1.6.20) (15–18). From the full corpus, 3,273 unique author keywords were initially identified. A minimum co-occurrence threshold of 20 was applied to retain only high-frequency terms with sufficient relational density for network construction. This filtering procedure yielded 90 terms that were subsequently retained for mapping. Prior to network construction, a systematic thesaurus-based standardization procedure was conducted to merge spelling variants and semantically equivalent expressions while preserving conceptually distinct terminology. Association strength was employed as the normalization metric to account for differences in absolute keyword frequency, thereby enabling more accurate identification of genuine conceptual proximity between terms. The resulting network was partitioned into thematic clusters using modularity-based community detection, with each cluster representing a distinct intellectual domain within the broader DH landscape.

Thematic evolution and factorial mapping techniques were additionally applied to trace the developmental trajectories of major research themes across time and to reveal their interconnections at different stages of the field's maturation. The overall analytical workflow integrated four complementary platforms: Microsoft Excel was used for preliminary data organization and tabular presentation; OpenRefine supported metadata harmonization and deduplication; biblioMagika generated core bibliometric performance indicators; and VOSviewer was employed for advanced visualization and thematic interpretive mapping (14). The combined deployment of these tools ensured methodological rigor while enabling a holistic interpretation of publication dynamics, collaboration structures, and thematic diversification within DH scholarship.

Results and Discussion

The bibliometric examination of DH scholarship reveals a field that has undergone steady consolidation and accelerated expansion over the past two decades. Within the DH corpus examined, artificial intelligence manifests across three principal dimensions: (a) computational text and image analysis, encompassing natural language processing and computer vision; (b) predictive modelling and pattern recognition applied to cultural datasets; and (c) intelligent heritage systems integrating augmented and virtual reality (VR) platforms. These dimensions are operationalized through the keyword co-occurrence analysis and thematic clustering presented in subsequent sections. Based on Table 1, the dataset comprises 544 research articles published between 2001 and 2024. The dataset captures 25 citable years and records a total of 7,095 citations, with an average of 12.90 citations per paper and 15.19 citations per cited paper. The field's cumulative h-index of 40 indicates a moderate but increasingly influential knowledge base. The annual citation rate of 308.48 further demonstrates sustained scholarly attention toward DH research. Interestingly, the authors-per-paper ratio of 1.00 suggests that single-author contributions still play a prominent role, reflecting the intellectual traditions of the humanities, although signs of collaborative expansion are gradually emerging.

Table 1: Summary Bibliometric Profile of the Digital Humanities Publication Corpus (14)

Overview	Dataset
Publication Period	2001 - 2024
Total Documents	544
Citation Window	25
Total Authors	544
Cited Documents	467
Total Citations	7,095
Citation per Documents	12.90
Citation per Cited Documents	15.19
Annual Citation Rate	308.48

Citation per Author	12.90
Author per Document	1.00
Citation in h-core	5,797
h-index	40

The temporal distribution of publications demonstrates a clear developmental trajectory. During the early phase (2001-2010), output remained relatively modest, indicating that DH was still in its formative stage. However, from the mid-2010s onward, publication growth became markedly more pronounced. This inflection point coincides with the rapid diffusion of artificial intelligence, machine learning, large-scale digitization initiatives, and computational text analysis tools across the humanities. The upward trend toward 2024 suggests that DH has transitioned from a niche methodological movement into a recognized interdisciplinary research domain. Importantly, the absence of a plateau in recent years indicates that the field remains in an expansionary phase rather than approaching maturity as shown in Figure 2.

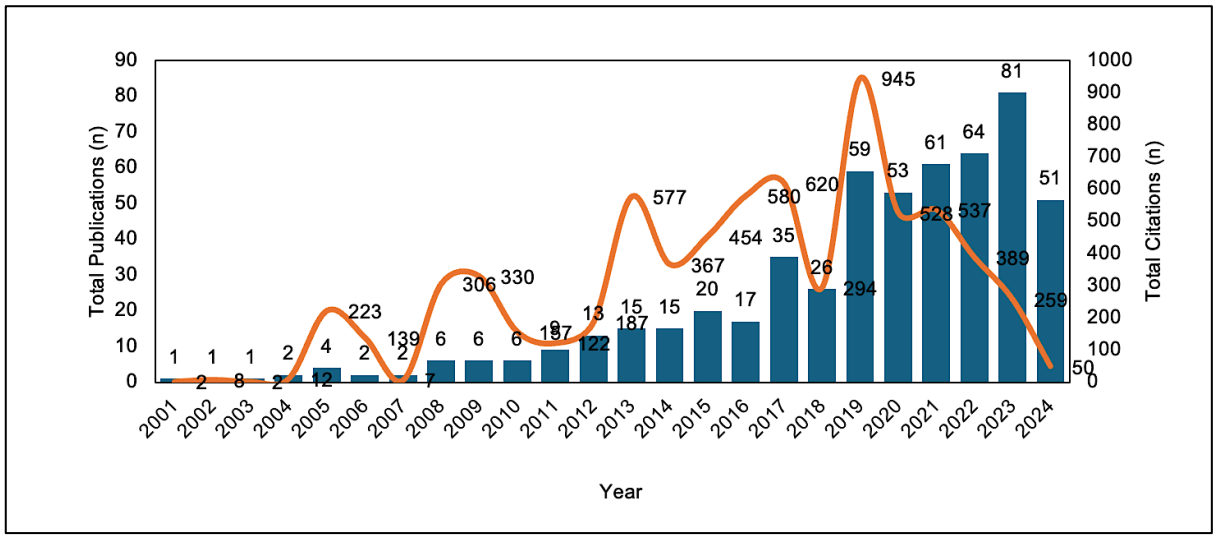

Figure 2: Annual Total Publications (Bar Chart) and Cumulative Citations (Orange Line) for DH Research, 2001-2024

At the author level, the productivity landscape is characterized by a relatively concentrated but internationally distributed group of scholars as shown in Table 2. Julianne Nyhan of University College London emerges as the most productive contributor with five publications and 47 citations. She is closely followed by several prominent UK-based scholars, including Claire Warwick, Oliver Duke-Williams, Simon Mahony, and Melissa Terras. This clustering around major UK institutions reflects the historical institutionalization of DH in British research environments. However, citation impact tells a more nuanced story. Okan Arikan of the University of Texas demonstrates the highest citation efficiency (C/P = 72.50), illustrating that scholarly influence in DH is not solely determined by publication volume. This divergence between productivity and impact suggests a field in which methodological innovation and cross-disciplinary relevance can generate disproportionate scholarly visibility.

Table 2: Most Productive Authors (14)

Full Name	Current Affiliation	Country	TP	TC	*h*	*g*	*m*
Arikan, Okan	University of Texas	United States	2	145	2	2	0.095
Warwick, Claire	Durham University	United Kingdom	4	107	4	4	0.222
Terras, Melissa	University College London	United Kingdom	4	79	4	4	0.222
Rimmer, Jon	University College London	United Kingdom	2	65	2	2	0.111
Blandford, Ann	University College London	United Kingdom	2	65	2	2	0.111
Mahony, Simon	University College London	United Kingdom	4	62	3	4	0.375
Sula, Chris Alen	Pratt Institute	United States	3	49	3	3	0.429
Duke-Williams, Oliver	University College London	United Kingdom	4	48	3	4	0.250

Nyhan, Julianne	University College London	United Kingdom	5	47	4	5	0.333
Burghardt, Manuel	University of Leipzig	Germany	3	35	2	3	0.500
Edmond, Jennifer	Trinity College Dublin	Ireland	3	28	3	3	0.500
Gonzalez-Perez, Cesar	Institute of Heritage Sciences	Spain	2	26	2	2	0.286
Golub, Koraljka	Linnaeus University	Sweden	3	24	2	3	0.333
De Luca, Livio	Campus CNRS Joseph-Aiguier	France	2	18	2	2	0.667
Blanke, Tobias	University of Amsterdam	Netherlands	3	17	1	3	0.056
Estill, Laura	St Francis Xavier University	Canada	3	15	1	3	0.143
Capurro, Carlotta	Utrecht University	Netherlands	2	9	2	2	0.667
Marcondes, Carlos H.	Minas Gerais Federal University	Brazil	2	7	1	2	0.167
Gooch, Megan	Centre for Digital Scholarship	United Kingdom	2	4	1	2	0.333
Strange, Damon	University of Oxford	United Kingdom	2	4	1	2	0.333

Note: TP: Total publications, TC: Total citation, *h*: h-index, *g*: g-index, *m*: m-index.

Institutional analysis further reinforces the centrality of a small number of globally influential research hubs as shown in Table 3. University College London dominates the landscape with 59 publications and 1,114 citations, supported by a strong h-index of 20. The University of California follows with 43 publications and 944 citations, while Shanghai Jiao Tong University, King's College London, and Jilin University represent important additional nodes in the global DH network. Notably, KU Leuven exhibits exceptionally high citation efficiency, indicating strong research quality relative to output size. The institutional pattern reveals a three-tier structure: established Anglo-American leaders, rapidly advancing Chinese universities, and a wider periphery of emerging contributors. The presence of Universiti Sultan Zainal Abidin within the dataset, albeit with modest citation impact, signals the early but still limited penetration of DH scholarship into Southeast Asian contexts.

Table 3: Most Productive Institutions (14)

Institution Name	**Country**	**TP**	**NCA**	**TC**	***h***
Duke University	United States	15	15	2668	13
University College London	United Kingdom	59	59	1114	20
University of California	United States	43	43	944	13
KU Leuven	Belgium	21	21	784	9
University of Basel	Switzerland	18	18	329	14
University of Illinois	United States	16	16	290	8
Weizmann Institute of Science	Israel	24	24	264	11
Shanghai Jiao Tong University	China	29	29	263	11
Jilin University	China	24	24	246	6
University of Leipzig	Germany	16	16	234	10
National University of Singapore	Singapore	21	21	222	9
University of Texas	United States	15	15	201	5
Johns Hopkins University	United States	15	15	189	11
Philip Morris Products S.A.	Switzerland	16	16	176	11
Utrecht University	Netherlands	16	16	110	7
King's College London	United Kingdom	25	25	105	7
University of Oxford	United Kingdom	16	16	100	4
University Complutense of Madrid	Spain	14	14	88	8
Affiliation NA	Country NA	20	20	82	6
NOVA University Lisbon	Portugal	14	14	56	4
Helmholtz Center Munich	Germany	14	14	56	4
University of Bologna	Italy	18	18	40	4
University of Latvia	Latvia	18	18	26	3
Universidade Federal de Santa Catarina	Brazil	16	16	12	2
Universiti Sultan Zainal Abidin	Malaysia	14	14	8	2

Note: TP: Total publications, NCA: Number of Contributing Authors, TC: Total citation, *h*: h-index.

In Table 4, country-level analysis confirms the geographical concentration of DH research. The United States leads decisively with 140 publications and 2,349 citations, followed by the

United Kingdom with 88 publications and Germany and China with 41 publications each. Italy, Spain, Australia, and the Netherlands also contribute meaningfully to the field. However, when citation efficiency is considered, several smaller contributors such as Greece, Japan, and Switzerland demonstrate disproportionately high impact relative to output volume. This pattern indicates that while Anglo-American systems dominate in scale, high-quality DH scholarship is more geographically dispersed. Nevertheless, participation from Southeast Asia remains comparatively modest. Countries such as Indonesia, Singapore, and Malaysia appear in the dataset but with limited output, highlighting a significant opportunity for regional research expansion, an issue of relevance for future DH development in the Global South.

Table 4: Productive Countries (14)

Country	TP	NCA	TC	*h*
United States	140	500	2349	27
United Kingdom	88	324	1237	20
Germany	41	152	780	13
China	41	236	453	10
Netherlands	29	78	304	10
Spain	30	111	276	9
Australia	29	96	257	8
Canada	21	68	255	8
Belgium	8	30	252	5
Greece	7	39	249	7
Italy	31	141	242	10
Japan	7	19	203	4
Switzerland	12	58	200	5
South Korea	7	23	176	4
Finland	9	31	138	7
Sweden	14	30	109	5
France	19	80	108	7
Ireland	8	15	108	6
Israel	6	39	95	4
Indonesia	6	35	51	4
Singapore	6	39	47	3
Not Available	9	18	39	3
Hong Kong	6	21	36	4
India	12	64	30	3
Brazil	7	30	15	2

Note: TP: Total publications, NCA: Number of Contributing Authors, TC: Total citation, *h*: h-index.

The examination of the most highly cited publications offers important insight into the intellectual composition and knowledge flows shaping DH research. As shown in Table 5, the most influential article has 281 citations (19), followed by several other highly cited works originating predominantly from computational science, engineering, and data-intensive research domains. This distribution is analytically significant because it demonstrates that the citation gravity of DH is not confined within traditional humanities scholarship. Instead, the field continues to draw heavily on methodological advances from computational modelling, signal processing, and machine learning research communities. At the same time, the presence of culturally and theoretically oriented contributions (20-22) indicates that DH has progressively developed its own intellectual core rather than functioning merely as a technical application layer. These humanities-centered works focus on conceptual clarification, scholarly communication, and community mapping within DH, thereby signaling the maturation of the field's internal discourse. Their continued visibility among highly cited works suggests that interpretive and critical scholarship remains an essential counterbalance to the growing computational orientation.

Notably, the citation profile reveals a dual knowledge stream operating within DH. On one side, highly cited computational and modelling studies reflect the field's increasing reliance on

data-driven and algorithmic approaches. On the other, heritage-focused and library-oriented works (23-25) highlight the enduring importance of cultural engagement, digital preservation, and public-facing scholarship. This coexistence confirms that DH is evolving as a structurally hybrid domain rather than converging toward a purely technical paradigm. From a developmental perspective, the citation landscape suggests that DH remains in a phase of methodological consolidation. The strong influence of computationally oriented publications indicates ongoing knowledge importation from adjacent scientific fields, while the steady presence of humanities-grounded works reflects internal disciplinary stabilization. Taken together, the evidence points to an emergent but increasingly coherent research ecosystem in which computational innovation and humanistic interpretation are mutually constitutive. This hybrid epistemology may ultimately represent the defining strength of DH as it continues to expand across disciplinary and institutional boundaries.

Table 5: 20 Most Highly Cited Articles

Title	Cites	Cites Per Year	Reference
Large metasurface aperture for millimeter wave computational imaging at the human-scale	221	24.56	(26)
Three-dimensional digital documentation of cultural heritage site based on the convergence of terrestrial laser scanning and unmanned aerial vehicle photogrammetry	137	19.57	(27)
Deep neural networks as a computational model for human shape sensitivity	194	19.40	(28)
Segregating the core computational faculty of human language from working memory	281	16.53	(19)
Epoxy pre-polymers as new and effective materials for corrosion inhibition of carbon steel in acidic medium: Computational and experimental studies	101	14.43	(29)
A social network analysis of Twitter: Mapping the digital humanities community	126	12.60	(20)
A gamified augmented reality application for digital heritage and tourism	68	11.33	(25)
Experiencing the digital world: The cultural value of digital engagement with heritage	102	10.20	(23)
A computational framework to infer human disease-associated long noncoding RNAs	121	10.08	(30)
Social media and internet driven study recruitment: Evaluating a new model for promoting collaborator engagement and participation	110	10.00	(31)
A computational model of human auditory signal processing and perception	154	8.56	(32)
Computational redesign of human butyrylcholinesterase for anticocaine medication	168	8.00	(33)
The meaning of the digital humanities	99	7.62	(21)
No half measures: Overcoming common challenges to doing digital humanities in the library	93	7.15	(22)
Endocrine disruption: Computational perspectives on human sex hormone-binding globulin and phthalate plasticizers	68	6.80	(34)
Supporting digital scholarship in research libraries: Scalability and sustainability	78	6.00	(24)
On the meanings of self-regulation: Digital humanities in service of conceptual clarity	66	6.00	(2)
Evolving in common: Creating mutually supportive relationships between libraries and the digital humanities	73	5.62	(35)
Development of a three-dimensional multiscale computational model of the human epidermis	88	5.50	(36)

Computational studies of human motion: Part 1, tracking and motion synthesis	104	5.20	(37)

Note: Data extracted from Scopus database (accessed 8 October 2025), processed using biblioMagika (14)

Mapping of thematic structures reveals that the current DH landscape is dominated by interconnected clusters centered on digital heritage preservation, AI-enabled humanities research, digital archival ecosystems, and social media-driven cultural analytics. The prominence of AI-related terminology signals a clear methodological transition within the field from early digitization-focused work toward more advanced computational interpretation and predictive analytics. This shift supports the argument that DH is evolving from a primarily digitization-driven enterprise into an intelligence-enhanced research ecosystem. Such a transition carries important implications not only for research practice but also for questions of epistemology, data ethics, and technological dependency within the humanities.

Taken together, the findings indicate that DH has entered a phase of methodological maturation accompanied by expanding global visibility. Nevertheless, the field remains unevenly distributed across regions and institutions. While leading Western and Chinese universities continue to shape the research frontier, substantial opportunities exist for broader geographical diversification and for deeper integration of emerging technologies within humanities scholarship. The continued convergence between computational innovation and humanistic inquiry suggests that DH will remain a strategically important domain in the evolving landscape of interdisciplinary research.

The author-keyword co-occurrence analysis as shown in Figure 3 provides a granular view of the conceptual architecture underpinning contemporary DH scholarship. From the full corpus, 3,273 unique keywords were initially identified. After applying a minimum occurrence threshold of 20, a refined set of 90 high-frequency terms was retained for network construction using the association strength normalization in VOSviewer. Prior to mapping, a systematic thesaurus-based standardization procedure was conducted to merge spelling variants and synonymous expressions while preserving conceptually distinct terminology. This harmonization step was critical to ensure semantic coherence and to prevent artificial fragmentation of thematic clusters.

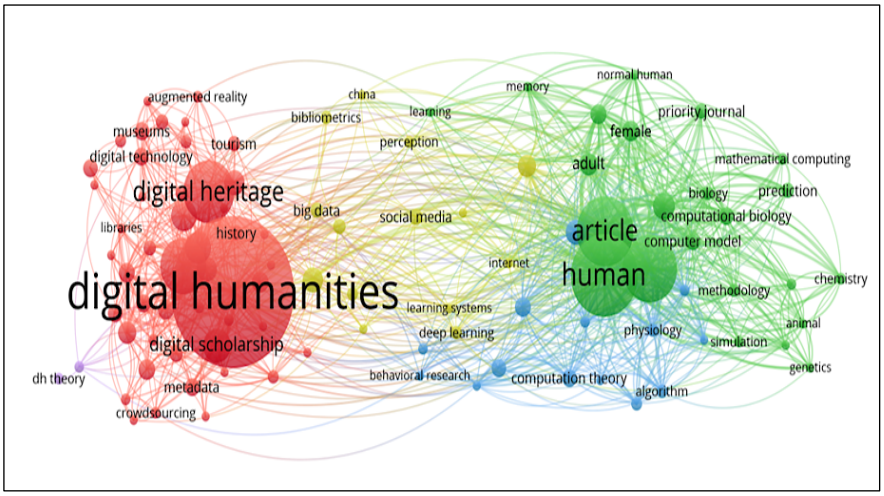

Figure 3: Author-keyword co-occurrence Network (Threshold ≥20; 90 Terms), with Three Clusters Identified by Association Strength

The resulting network reveals a tripartite intellectual structure that reflects the evolving priorities of DH research. Cluster A (red) is centered on digital heritage and preservation and is dominated by terms such as cultural heritage, digital archives, digitization, museums, and digital preservation. The prominence of this cluster indicates that the foundational mission of DH remains strongly tied to memory institutions and long-term cultural stewardship. The persistence of these themes suggests that, despite rapid technological advances, the field continues to

prioritize the conservation, accessibility, and sustainability of cultural assets. This cluster also reflects the institutional leadership of libraries, archives, and museums in driving early DH adoption.

Cluster B (green) represents the computational and artificial intelligence frontier of DH. Anchored by high-salience terms such as computer simulation, deep learning, digital cultural heritages, and human, this cluster captures the methodological intensification currently reshaping the field. The strong presence of machine learning, computer vision, and photogrammetry-related terminology indicates a decisive shift from descriptive digitization toward advanced analytical modelling of cultural data. Importantly, the centrality of the term "human" within this cluster highlights the continuing epistemic tension in DH between computational scalability and humanistic interpretation. This pattern confirms that DH is increasingly positioned at the intersection of data science and humanities inquiry rather than remaining a purely digitization-focused enterprise. Cluster C (blue) reflects the growing emphasis on platforms, user engagement, and immersive technologies. Key terms such as big data, virtual reality, social media, and new media signal the field's movement toward experiential, participatory, and public-facing digital scholarship. The emergence of extended reality (XR)/virtual reality (VR)-related vocabulary suggests that DH is progressively expanding beyond archival work into interactive knowledge environments and audience-centric dissemination models. This transition aligns with broader shifts in digital culture, where the boundaries between research production, public humanities, and digital experience design are becoming increasingly blurred.

Frequency analysis of author-supplied keywords further reinforces these structural patterns as shown in Figure 4 and Table 6. The term digital humanities appear most frequently (122 occurrences; 5.84%), confirming its role as the field's primary identity marker. It is followed by digital heritage (40; 1.91%) and cultural heritage (36; 1.72%), which together underscore the enduring centrality of heritage-oriented scholarship. Secondary terms such as digital scholarship and digital culture indicate the field's conceptual diversification but at comparatively lower intensity. The presence of technically oriented keywords including photogrammetry, big data, and digital technology provides additional evidence of methodological convergence between humanities research and computational innovation.

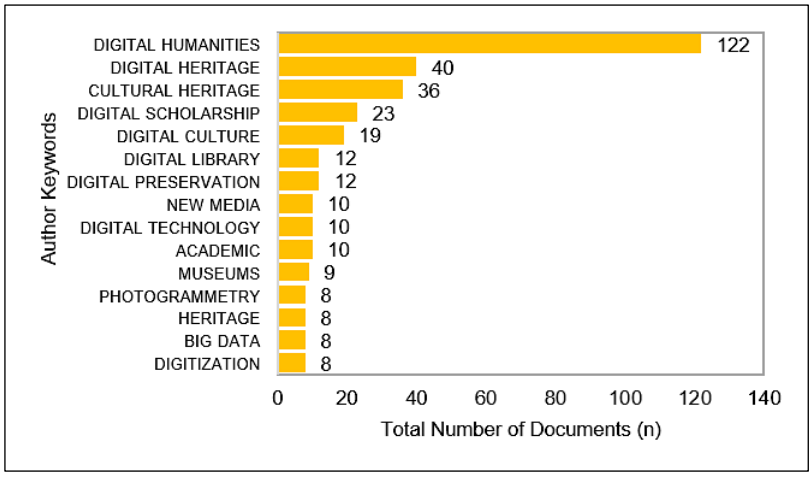

Figure 4: Density/Overlay Visualization of Author-keyword Salience Across Clusters (14)

Table 6: Author Keywords (14)

Author Keywords	Count	Percentage
Digital Humanities	122	5.84
Digital Heritage	40	1.91
Cultural Heritage	36	1.72
Digital Scholarship	23	1.10
Digital Culture	19	0.91
Digital Library	12	0.57

Digital Preservation	12	0.57
New Media	10	0.48
Digital Technology	10	0.48
Academic	10	0.48

Figure 5 and Table 7 present an index keyword analysis presents a complementary perspective that is more strongly shaped by database classification practices. High-frequency terms such as "human" [61], "humans" [48], and "computer simulation" [28], confirm the computational orientation observed in Cluster B. Meanwhile, the appearance of "virtual reality" [12] and "social media" [11] supports the interpretation that immersive and platform-based research trajectories are gaining momentum. However, the dominance of generic indexing labels (e.g., article, adult, male, female) also reflects the limitations of automated indexing in fully capturing the conceptual richness of DH scholarship.

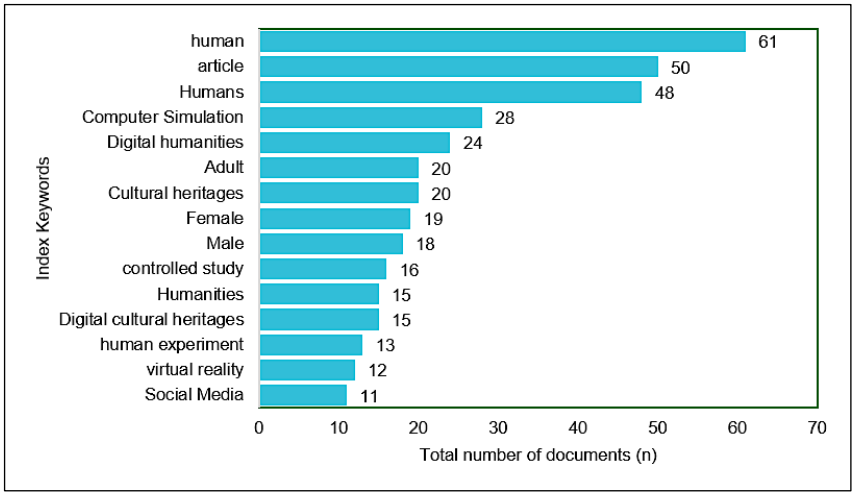

Figure 5: Highest-frequency Index Keywords (14)

Table 7: Index Keywords (14)

Index Keywords	Count	Percentage
human	61	2.14
article	50	1.75
humans	48	1.68
computer simulation	28	0.98
digital humanities	24	0.84
adult	20	0.70
cultural heritages	20	0.70
female	19	0.67
male	18	0.63
controlled study	16	0.56

Overall, the co-occurrence structure indicates that DH is currently undergoing a methodological rebalancing. While heritage preservation remains the field's historical core, computational intelligence and immersive engagement technologies are rapidly expanding its research frontier. The coexistence of these three clusters suggests that DH is not converging toward a single dominant paradigm but is instead evolving as a layered and hybrid knowledge ecosystem. This structural pluralism may ultimately constitute one of the field's greatest strengths, enabling DH to remain adaptable amid fast-moving technological change.

This bibliometric investigation delineates the structural expansion and thematic diversification of DH, yet it simultaneously exposes several critical gaps that warrant systematic scholarly attention. Although the field has demonstrated robust growth, its geographical distribution remains uneven. The overwhelming concentration of output and citation impact in the United States, the

United Kingdom, and China reflects strong technological capacity and institutional investment in these countries, but it also signals an imbalance in global knowledge production. To cultivate a more representative and pluralistic DH ecosystem, future research should prioritise underexplored regions, particularly Southeast Asia, Africa, and Latin America. Empirical studies examining local research infrastructures, policy environments, and digitization practices in these contexts would significantly enrich the global DH narrative. Cross-national comparative work is especially needed to reveal how different socio-cultural settings shape the adoption, adaptation, and sustainability of DH initiatives.

Another strategic direction concerns the deepening integration of advanced computational technologies into humanities research. While artificial intelligence and machine learning are already visible within the current knowledge structure, their transformative potential remains only partially realised. Future investigations should move beyond proof-of-concept applications toward evaluating how AI-driven systems can meaningfully enhance interpretive depth, metadata enrichment, and large-scale cultural analytics. Emerging technologies such as the Internet of Things (IoT) and blockchain also deserve closer examination, particularly regarding their capacity to support provenance tracking, secure cultural data management, and smart heritage environments. However, technological expansion must be accompanied by rigorous ethical scrutiny. Issues surrounding algorithmic bias, cultural sensitivity, data sovereignty, and digital colonialism require sustained critical inquiry to ensure that technological acceleration does not undermine humanistic values.

Sustainability represents another underdeveloped yet increasingly urgent research frontier. Although life cycle assessment (LCA) has been adopted in some digital heritage contexts, the dominant environmental focus of LCA frameworks does not fully capture the socio-cultural longevity of DH infrastructures. Future research should therefore work toward multidimensional sustainability models that integrate environmental efficiency, cultural resilience, economic viability, and community accessibility. Attention should be given to the environmental footprint of large-scale digital storage, high-performance computing, and immersive media production. Integrating green computing principles and responsible data stewardship into DH workflows would align the field more closely with global sustainability agendas.

The structural asymmetry between Global North and Global South DH infrastructures represents a critical analytical dimension that transcends mere publication statistics. Disparities in access to high-performance computing, proprietary AI tools, and digitized archival collections systematically disadvantage researchers in lower-income countries. Furthermore, the predominance of English-language platforms and citation databases introduces multilingual and multicultural blind spots that remain inadequately addressed in the existing literature. These conditions not only limit participation in the global DH community but also risk reproducing colonial patterns of knowledge extraction, whereby cultural materials from the Global South are digitized and analyzed primarily within Western institutional frameworks.

Closely related is the need to conceptualize digital supply chains within DH ecosystems. As heritage institutions increasingly rely on distributed data infrastructures, cloud services, and open-access platforms, questions of data governance, intellectual property, and infrastructural dependency become more pressing. Future studies should investigate how sustainable digital supply chains can be designed to balance openness with security and efficiency with ethical responsibility. Research into decentralized architectures, energy-efficient storage systems, and transparent data provenance mechanisms would be particularly valuable for strengthening institutional trust and long-term preservation capacity.

Methodologically, the dominance of quantitative bibliometric approaches while valuable for macro-level mapping should be complemented by richer qualitative inquiry. In-depth case studies, institutional ethnographies, and expert interviews can illuminate the socio-technical realities that large-scale metrics often obscure. Longitudinal research tracking the evolution of DH curricula, funding ecosystems, and collaborative networks would also provide important insight into the field's maturation process. Such mixed-method designs would enable future scholarship to capture both structural patterns and lived practices within DH communities.

These findings carry important theoretical implications for the conceptualization of DH as an epistemic project. As illustrated in Figure 6**,** the tripartite cluster structure identified in this study aligns with, y*et al.,*so extends, the framework regarding DH as a critical practice (3), which emphasized reflexivity and interdisciplinary openness. Whereas Berry's model focused primarily on text-based computational analysis, the present findings indicate that the field has substantially expanded to encompass heritage informatics, computational vision, and immersive media, dimensions not fully captured in earlier theoretical accounts. This expansion suggests that DH requires an updated theoretical framework, one that explicitly integrates the concept of intelligent heritage as a distinct epistemic category.

Finally, this study highlights several methodological constraints that future work should address. Reliance on a single database, even one as comprehensive as Scopus, inevitably limits coverage, particularly for regionally published or non-English scholarship. Subsequent bibliometric studies should adopt multi-database strategies incorporating Web of Science, Dimensions, and other indexing platforms to enhance representativeness. Likewise, keyword-based retrieval although systematic remains sensitive to terminological variation. Expanding controlled vocabularies, incorporating multilingual search strings, and applying iterative query validation would improve retrieval precision. Greater triangulation between quantitative mapping and qualitative validation will ultimately produce a more nuanced and globally grounded understanding of DH scholarship.

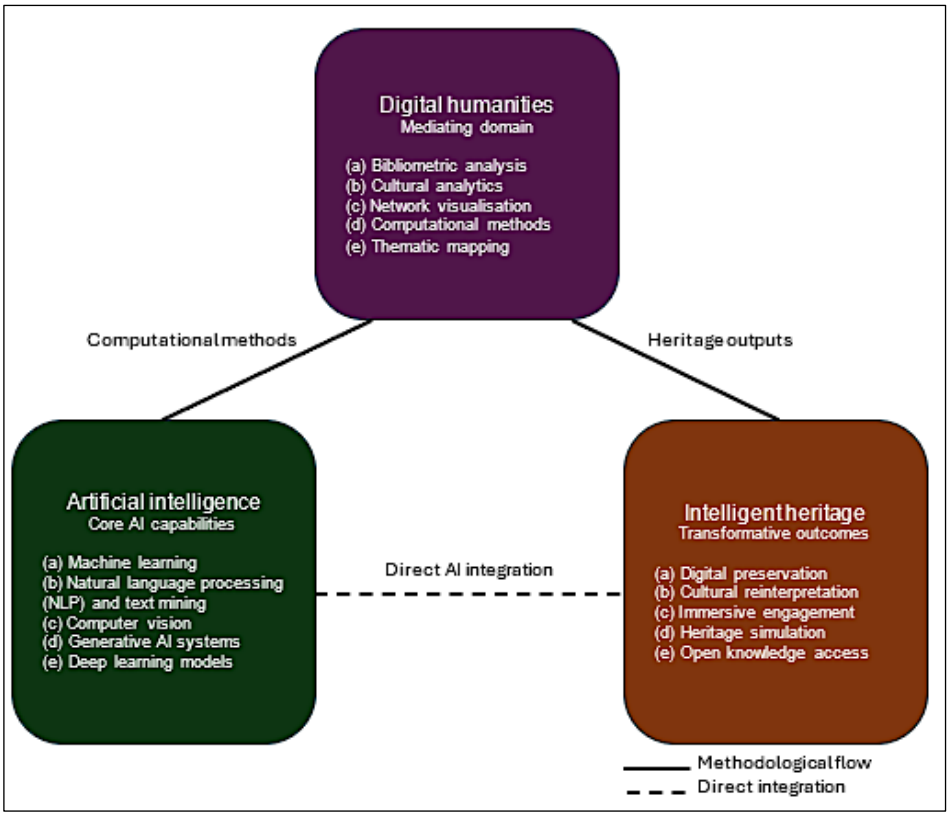

Figure 6: Conceptual Framework of the Tripartite Relationship Between Artificial Intelligence, Digital Humanities, and Intelligent Heritage

Conclusion

This study provides a systematic, evidence-based synthesis of the DH research landscape, revealing the field's transformation from a niche digitization movement into a mature interdisciplinary domain. Based on 544 publications indexed between 2001 and 2024, the findings demonstrate sustained growth in both scholarly output and citation influence, indicating that DH has achieved significant academic consolidation. The predominance of journal-based dissemination and English-language publication further reflects the field's increasing institutional legitimacy within the

global research ecosystem. Citation indicators including an h-index of 40 confirm the expanding intellectual visibility of DH scholarship. Geographically, research production remains concentrated in the United States, the United Kingdom, and China, highlighting the continuing importance of technological infrastructure, research funding, and institutional capacity in shaping the field's development. Nevertheless, the gradual emergence of contributions from Europe, Asia, and selected Global South contexts suggests the early stages of broader international diffusion. This evolving pattern indicates that DH is transitioning toward a more networked and collaborative global knowledge domain, although significant asymmetries persist.

Thematic mapping identifies three tightly interconnected knowledge domains that currently structure DH research: (a) digital heritage and preservation, (b) computational and artificial intelligence applications, and (c) immersive and participatory technologies. Together, these domains signal a paradigmatic shift toward what may be conceptualized as intelligent heritage, whereby digital infrastructures do not merely store cultural materials but actively enable reinterpretation, simulation, and experiential engagement. The growing incorporation of virtual reality, machine learning, big data analytics, and augmented reality demonstrates that DH has moved well beyond basic digitization into advanced computational humanities practice. Several methodological limitations warrant acknowledgement. First, the reliance on Scopus as the sole database may have excluded relevant scholarship indexed only in Web of Science, Dimensions, or Google Scholar. Second, keyword-based retrieval is sensitive to terminological variation, potentially omitting studies employing alternative nomenclature. Third, the analysis is restricted to English-language publications for the most part, which may underrepresent DH scholarship produced in non-Anglophone academic traditions. Fourth, thematic clustering via VOSviewer involves interpretive judgment; triangulation with expert consensus or qualitative methods would strengthen cluster validity. Future research would benefit from multi-database integration and mixed-method triangulation to capture both macro-level patterns and contextual depth. Greater attention to multilingual scholarship and regionally grounded DH practices is also necessary to avoid reinforcing existing epistemic imbalances.

Looking ahead, the trajectory of DH scholarship is likely to be shaped by three emerging forces: the democratization of large language models and generative AI tools, the expansion of decentralized heritage platforms enabled by blockchain and distributed ledger technologies, and the growing urgency of ethical governance frameworks for AI-mediated cultural analysis. These forces will demand new forms of institutional collaboration, revised data stewardship protocols, and a fundamentally expanded conception of what it means to preserve and interpret cultural heritage in an artificially intelligent world. DH now occupies a strategic position at the intersection of technology, culture, and knowledge production. Its future trajectory will depend on the field's capacity to remain methodologically innovative, geographically inclusive, and ethically attentive. By strengthening international collaboration, investing in sustainable digital infrastructures, and critically engaging emerging technologies such as the Internet of Things (IoT) and artificial intelligence (AI), the DH community can continue advancing the vision of intelligent heritage that preserves cultural memory while enabling new forms of interpretation and public engagement in an increasingly digital world.

Abbreviations

None.

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Author Contributions

Abang Mohd Razif Abang Muis: Conceptualization, Methodology, Supervision, Writing-Original Draft, Mohd Sohaimi Esa: Data Curation, Investigation, Musmuliadi Kamaruding: Formal Analysis, Visualization, Abg Mohd Shukri Abg Muis: Methodology, Validation, Chaiwat Meesanthan: Investigation, Writing-Review, Editing. All authors have read and agreed to the published version of the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest.

Data Availability

The data supporting the findings of this study were derived from the Scopus database. The processed data are available from the corresponding author upon reasonable request.

Declaration of Artificial Intelligence (AI) Assistance

During the preparation of this manuscript, the authors used AI-assisted language tools to improve readability and language quality. The authors reviewed and edited the content as necessary and take full responsibility for the content of the publication.

Ethics Approval

Not Applicable.

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References

1. Fenlon K, Frazier E, Muñoz T. Digital humanities. In: Encyclopedia of Libraries, Librarianship, and Information Science. 2025:501-10. https://doi.org/10.1016/B978-0-323-95689-5.00140-1
2. Burman JT, Green CD, Shanker S. On the meanings of self-regulation: Digital humanities in service of conceptual clarity. Child Dev. 2015; 86(5):1507-21. https://doi.org/10.1111/cdev.12395
3. Berry D. What are the digital humanities? Br Acad. 2019. https://www.thebritishacademy.ac.uk/blog/what-are-digital-humanities
4. Asundi AY, Revanasiddappa BS, Krishnamurthy M. Digital humanities. Desidoc J Libr Inf Technol. 2023; 43(4):276-81. https://doi.org/10.14429/djlit.43.04.19207
5. Meneses L, Furuta R. An introduction to digital humanities. In: Proceedings of the 18th ACM/IEEE Joint Conference on Digital Libraries. ACM; 2018: 417-8. https://doi.org/10.1145/3197026.3201781
6. Roy D, Deshbandhu A. Digital humanities. Year's Work Crit Cult Theory. 2024; 32(1):37-53. https://doi.org/10.1093/ywcct/mbae019
7. Wahid SH. Exploring the intersection of Islam and digital technology: A bibliometric analysis. Soc Sci Humanit Open. 2024; 10:101085. https://doi.org/10.1016/j.ssaho.2024.101085
8. Muis AMRA, Alias MS, Kamaruding M, Mokthar MZ. Islamic perspective on human development management: A philosophical approach. Int J Acad Res Bus Soc Sci. 2018; 8(4):543-52. https://doi.org/10.6007/ijarbss/v8-i4/4031
9. Sintang S, Hamid FAA, Samsul SS, Prasojo ZH, Muis AMRA, Ramlie HA. Manifestasi ta'awun NGO Islam dalam menyantuni golongan B40 di Sabah semasa pandemik Covid-19. Glob J Al-Thaqafah. 2024;172-91. https://doi.org/10.7187/GJATSI072024-12
10. Ismail NN, Kamaruding M, Ali NHN, Khairuddin D, Muis AMRA, Ali MZM. Islamic principles in engineering education: Significance, challenges, and strategies. In: Business Sustainability with Artificial Intelligence (AI): Challenges and Opportunities. 2025;555-65. https://doi.org/10.1007/978-3-031-71526-6_48
11. Vishalinromiya J. Digital humanities as a treasure trove for the developing countries: An exploration. Shanlax Int J Engl. 2023; 12(S1):501-6. https://doi.org/10.34293/rtdh.v12iS1-Dec.80
12. Burnham JF. Scopus database: A review. Biomed Digit Libr. 2006; 3(1):1. https://doi.org/10.1186/1742-5581-3-1
13. Aghaei Chadegani A, Salehi H, Yunus MM, Farhadi H, Fooladi M, Farhadi M, Ale Ebrahim N. A comparison between two main academic literature collections: Web of Science and Scopus databases. Asian Soc Sci. 2013; 9(5):18-26. https://doi.org/10.5539/ass.v9n5p18
14. Ahmi A. biblioMagika. 2024. https://bibliomagika.com
15. Van Eck NJ, Waltman L. Software survey: VOSviewer, a computer program for bibliometric mapping. Scientometrics. 2010; 84(2):523-38. https://doi.org/10.1007/s11192-009-0146-3
16. Aria M, Cuccurullo C. Bibliometrix: An R-tool for comprehensive science mapping analysis. J Informetr. 2017; 11(4):959-75. https://doi.org/10.1016/j.joi.2017.08.007
17. Arruda H, Silva ER, Lessa M, Proenca D Jr, Bartholo R. VOSviewer and Bibliometrix. J Med Libr Assoc. 2022; 110(3):392-5. https://doi.org/10.5195/jmla.2022.1434
18. van Eck NJ, Waltman L. Visualizing bibliometric networks. In: Measuring Scholarly Impact. Springer International Publishing; 2014:285-320. https://doi.org/10.1007/978-3-319-10377-8_13
19. Makuuchi M, Bahlmann J, Anwander A, Friederici AD. Segregating the core computational faculty of human language from working memory. Proc Natl Acad Sci USA. 2009; 106(20):8362-7. https://doi.org/10.1073/pnas.0810928106
20. Grandjean M. A social network analysis of Twitter: Mapping the digital humanities community. Cogent Arts Humanit. 2016; 3(1):1171458. https://doi.org/10.1080/23311983.2016.1171458
21. Liu A. The meaning of the digital humanities. PMLA. 2013; 128(2):409-23. https://doi.org/10.1632/pmla.2013.128.2.409
22. Posner M. No half measures: Overcoming common challenges to doing digital humanities in the library. J Libr Adm. 2013; 53(1):43-52. https://doi.org/10.1080/01930826.2013.756694
23. King L, Stark JF, Cooke P. Experiencing the digital world: The cultural value of digital engagement with heritage. Heritage Soc. 2016; 9(1):76-101. https://doi.org/10.1080/2159032X.2016.1246156

24. Vinopal J, McCormick M. Supporting digital scholarship in research libraries: Scalability and sustainability. J Libr Adm. 2013; 53(1):27-42. https://doi.org/10.1080/01930826.2013.756689
25. Paliokas I, Patenidis AT, Mitsopoulou EE, Tsita C, Pehlivanides G, Karyati E, Tsafaras S, Stathopoulos EA, Kokkalas A, Diplaris S, Meditskos G, Vrochidis S, Tasiopoulou E, Riggas C, Votis K, Kompatsiaris I, Tzovaras D. A gamified augmented reality application for digital heritage and tourism. Appl Sci. 2020; 10(21):7868. https://doi.org/10.3390/app10217868
26. Gollub JN, Yurduseven O, Trofatter KP, Arnitz D, Imani MF, Sleasman T, Boyarsky M, Rose A, Pedross-Engel A, Odabasi H, Zvolensky T, Lipworth G, Brady D, Marks DL, Reynolds MS, Smith DR. Large metasurface aperture for millimeter wave computational imaging at the human-scale. Sci Rep. 2017; 7(1):42650. https://doi.org/10.1038/srep42650
27. Jo YH, Hong S. Three-dimensional digital documentation of cultural heritage site based on the convergence of terrestrial laser scanning and unmanned aerial vehicle photogrammetry. ISPRS Int J Geo-Inf. 2019; 8(2):53. https://doi.org/10.3390/ijgi8020053
28. Kubilius J, Bracci S, Op de Beeck HP. Deep neural networks as a computational model for human shape sensitivity. PLoS Comput Biol. 2016;12(4): e1004896. https://doi.org/10.1371/journal.pcbi.1004896
29. Dagdag O, Safi Z, Hsissou R, *et al.* Epoxy pre-polymers as new and effective materials for corrosion inhibition of carbon steel in acidic medium: Computational and experimental studies. Sci Rep. 2019; 9(1):11715. https://doi.org/10.1038/s41598-019-48284-0
30. Liu MX, Chen X, Chen G, Cui QH, Yan GY. A computational framework to infer human disease-associated long noncoding RNAs. PLoS One. 2014; 9(1):e84408. https://doi.org/10.1371/journal.pone.0084408
31. Khatri C, Chapman SJ, Glasbey J, Kelly M, Nepogodiev D, Bhangu A, Fitzgerald JE.Social media and internet driven study recruitment: Evaluating a new model for promoting collaborator engagement and participation. PLoS One. 2015; 10(3):e0118899. https://doi.org/10.1371/journal.pone.0118899
32. Jepsen ML, Ewert SD, Dau T. A computational model of human auditory signal processing and perception. J Acoust Soc Am. 2008; 124(1):422-38. https://doi.org/10.1121/1.2924135
33. Pan Y, Gao D, Yang W, Cho H, Yang G, Tai HH, Zhan CG.Computational redesign of human butyrylcholinesterase for anticocaine medication. Proc Natl Acad Sci USA. 2005; 102(46):16656-61. https://doi.org/10.1073/pnas.0507332102
34. Sheikh IA, Turki RF, Abuzenadah AM, Damanhouri GA, Beg MA. Endocrine disruption: Computational perspectives on human sex hormone-binding globulin and phthalate plasticizers. PLoS One. 2016; 11(3):e0151444. https://doi.org/10.1371/journal.pone.0151444
35. Vandegrift M, Varner S. Evolving in common: Creating mutually supportive relationships between libraries and the digital humanities. J Libr Adm. 2013; 53(1):67-78. https://doi.org/10.1080/01930826.2013.756699
36. Adra S, Sun T, MacNeil S, Holcombe M, Smallwood R. Development of a three-dimensional multiscale computational model of the human epidermis. PLoS One. 2010; 5(1):e8511. https://doi.org/10.1371/journal.pone.0008511
37. Forsyth DA, Arikan O, Ikemoto L, O'Brien J, Ramanan D. Computational studies of human motion: Part 1, tracking and motion synthesis. Found Trends Comput Graph Vis. 2005; 1(2-3):77-254. https://doi.org/10.1561/0600000005

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