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The World Humanities Report

Digital Humanities in China, 1980–2020

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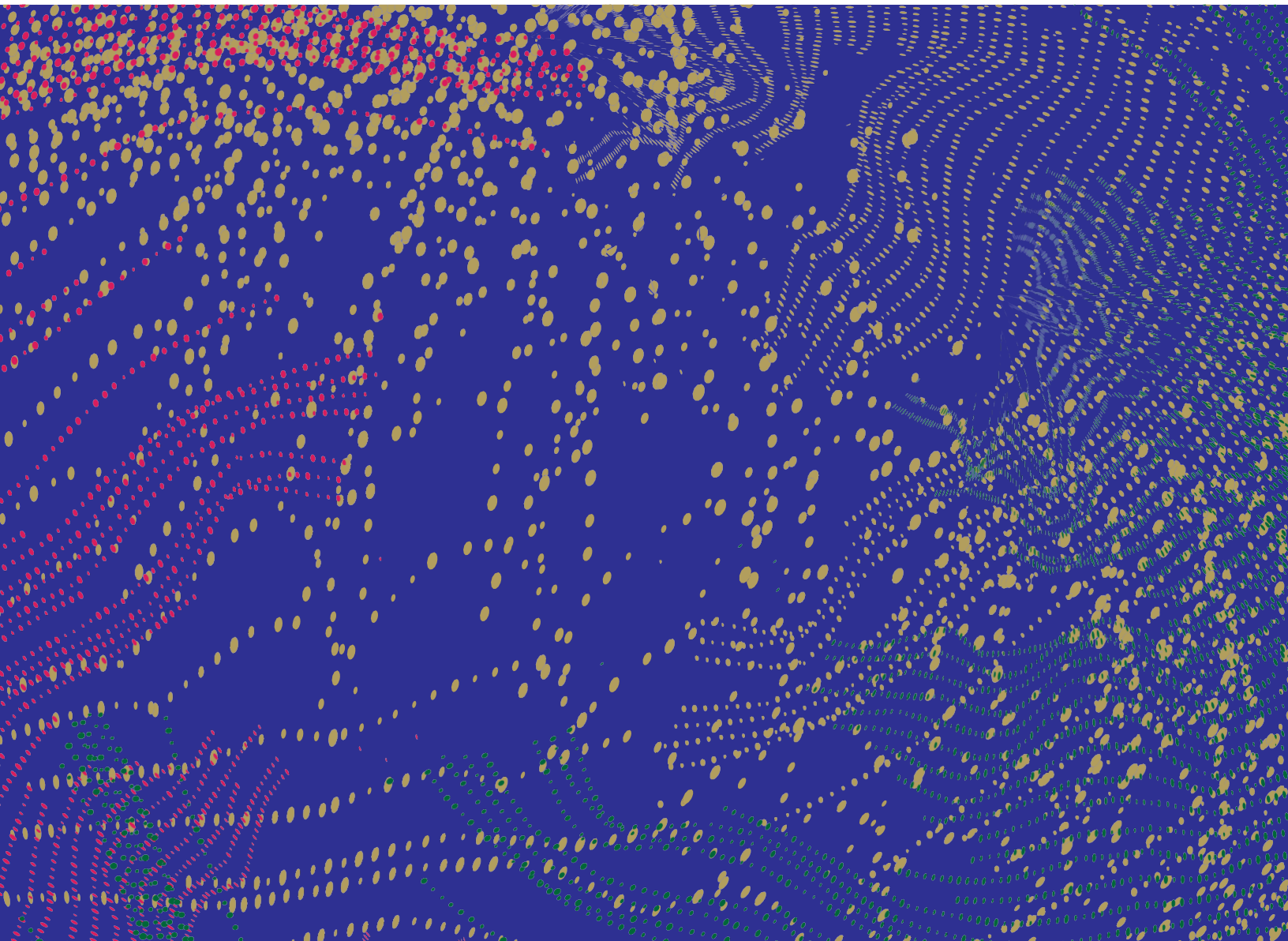

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Digital Humanities in China, 1980–2020

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Since the end of the twentieth century, data science and information network technology have exerted an increasingly widespread influence on fundamental aspects of humanistic knowledge. They have profoundly reshaped the methodological foundations and forms of research in the humanities and social sciences. Digital humanities, which grew out of computational humanities, have become a paradigm of knowledge production emerging on a global scale. It has attracted mainland Chinese, Taiwanese, and Hong Kong scholars from a variety disciplines, who have formed a cooperative, symbiotic research community that is interdisciplinary, transregional, intercultural, and translingual.

Course of Development

The rise of digital humanities presupposes the digitization of humanities materials and document archives. The history of digitization and bibliometrics in the People's Republic of China (PRC) can be traced back to the pioneering work of digitizing ancient books in the 1980s and 1990s.[1] Starting in 1984, Qian Zhongshu proposed introducing computer technology to the retrieval and application of classical Chinese documents at the Chinese Academy of

[1] As early as 1975, Wu Yongtong of the University of Hamburg, Germany, used a computer to complete the indexing of an English translation of the *Book of Songs*. The same year, scholars at Sichuan University used computers to piece together oracle bone fragments. These should be similar to the digitization practices of ancient books that appeared earlier. See Mao Jianjun, "Guji suoyin de dianzihua" [Electronization of ancient book indices], *Zhongguo suoyin*, no. 4 (2006); Geng Yuanli, "Sanshi nian lai Zhongguo guji shuzihua yanjiu zongshu 1979–2009" [An overview of research on the digitization of Chinese ancient books over the past thirty years, 1979–2009], in *Di er jie Zhongguo guji shuzihua guoji xueshu yantaohui lunwen ji* [Proceedings of the second international symposium on the digitization of ancient Chinese books] (2009), 12–28.

Social Sciences. A team led by his assistant, Luan Guiming, successively created collections of digitized ancient texts, such as the Complete System of Chinese Characters, the Database of the *Complete Tang Poetry*, and the Philosophers Compendium, among others. In 1994 his team proposed that microcomputers from around the globe should be used to form a shared database.[2] Around the same time, some institutions of higher learning created a retrieval system for the *Complete Tang Poetry*, *Records of the Historian*, and local gazetteers. After the expansion of the GBK encoding set to more than 20,000 Chinese characters, the improvement of OCR technology, and the rise of the internet, a universal electronic document retrieval platform emerged. In 1996 the Shanghai Library took the lead in constructing a search system for ancient Chinese rare books, and shortly afterward the Chinese National Library officially launched its Chinese digital library project. Two retrieval databases, Siku Quanshu and the Gujin Tushu Jicheng, as well as another two databases—the database of premodern Chinese texts Guoxue.com GXT and Database of Chinese Classic Ancient Books—became tools commonly used by researchers.

Before these developments, in 1979, China had initiated the creation of machine-readable corpora. The General Office of National Language Commission launched a national corpus program to promote research on modern Chinese grammar, syntax, semantics, and pragmalinguistics. In 2003 the Chinese Language Resources Alliance became the first allied academic organization to promote the sharing of Chinese-language materials in China. Chinese natural language processing used corpora data to set up algorithmic models to complete many unit tasks involving word frequency, annotation, organizing, mining, and analysis. Many research teams from throughout China, including Sun Maosong's team from Tsinghua University, have achieved important breakthroughs in typical tasks, such as automated Chinese word segmentation, semantic computing, textual classification, affective classification, opinion mining, entity recognition, and entity relation extraction. In doing so, crucial experience for research on Chinese text mining was gained.

In terms of research, Chinese scholars in China and abroad, such as Chen Bingzao, Li Xianping, Shi Jianjun, and Chen Dakang, adopted generic

[2] Tian Yi, "Guji zhengli yu yanjiu de dianzihua" [The electronization of ancient book collation and research], *Zhongguo wenhua*, no. 1 (1994): 85–89; Zheng Yongxiao, "Qian Zhongshu yu Zhongguo Shekeyuan gudai dianji shuzihua gongzuo" [Qian Zhongshu and the Chinese Academy of Social Sciences work on the digitization of ancient classics], *Shandong shehui kexue*, no. 6 (2019): 30–39.

stylometric methods and used statistics or computer-assisted methods to make a determination about the uniformity of the first eighty and last forty chapters of the *Dream of the Red Chamber*, one of the most famous Chinese classical novel from the eighteenth century.[3] Li Duo of Peking University oversaw the development of the Complete Tang Poetry electronic retrieval system, which through textual comparison algorithms flagged nearly five thousand reappearing poems.[4] Some of the first instances of quantitative research in literature include Shang Yongliang's analysis of the geographic regions of Tang poets and their intergenerational interactions, as well as Wang Zhaopeng and Liu Zunming's quantitative study of Song *ci* poetry and authorship.[5] The creation of common databases begat a new round of research results, and quantitative historiography quietly got a boost. The creation of the China Multigenerational Panel Data Series (CMGPD), by a team led by Li Zhongqing and Kang Wenlin, made it possible to trace long-term individual records and changes in family histories across generations. Compared to long-term studies of demographic and social changes in the West, this has garnered quite favorable results.[6] From the early 1990s, Peking University, Academia Sinica in Taiwan, and Harvard University, which led the project, jointly created the China Biographical Database of Past Dynasties. The joint creation of digital humanities infrastructure, such as the Chinese Historical Geographic Information System (CHGIS) by Fudan University and Harvard in 2001, has allowed historians to

[3] Chen Dakang, "Cong shuli yuyanxue kan hou sishi hui de zuozhe" [Authorship of the final forty chapters from the perspective of mathematical linguistics], *Honglou meng xuekan*, no. 1 (1987): 293–318.

[4] Li Duo, "Cong jiansuo dao fenxi: Jisuanji zhishi fuwu de shidai" [From retrieval to analysis: The era of computer knowledge service], *Wenxue yichan*, no. 1 (2009): 135–37.

[5] Shang Yongliang, "Tang zhiming shiren zhi cengji fenbu yu daiqun fazhan de dingliang fenxi" [A quantitative analysis of the hierarchical distribution of famous Tang dynasty poets and the development of intergenerational poetry societies], *Wenxue yichan*, no. 6 (2003): 50–59, 143; Wang Zhaopeng, "Lishi de xuanze: Songdai ciren lishi diwei de dingliang fenxi" [Historical choices: A quantitative analysis of the historical position of *ci* poets of the Song dynasty], *Wenxue yichan*, no. 4 (1995): 47–54; Liu Zunming, "Ben shiji Dongpo *ci* yanjiu de dingliang fenxi: Cixue yanjiu dingliang fenxi zhi yi" [A quantitative analysis of research on Dongpo's *ci* poetry this century: One in a series of quantitative analyses of *ci* poetry], *Wenxue yichan*, no. 6 (1999): 59–65.

[6] The CMGPD includes three sub-databases of Liaoning, Shuangcheng, and Royal families. The first two sub-databases have been released to the global academic community for free on the ICPSR (Inter-university Consortium for Political and Social Research) website. One hundred and twenty-three papers and works have used or cited the CMGPD's data from Liaoning and Shuangcheng sub-databases, eight of which have won nine academic awards or recognition.

become pioneers in the digital humanities. Successful projects using quantitative analysis in the humanities came out in succession. Digital methodologies broke through some stereotypes that had not been questioned in the predigital age.

Stipulations for standards of metadata were jointly launched in 2002 by the National Library of China, the Institute of Scientific and Technical Information of China, and the National Science Library of the Chinese Academy of Science. Together, they initiated the National Digital Library Standard Specification Project. This system, which references standards from the Ministry of Science and Technology and the China Academic Library and Information System (CALIS), was later implemented and popularized. It remains the standard followed by the national library system in China for document carrier metadata.[7] The creation of later digital infrastructure in the digital humanities can all be traced back to these systems.

In 2009 the term "digital humanities," as understood today, appeared in academic circles in the PRC.[8] And in 2011 the first Digital Humanities Research Center was set up at Wuhan University. At this time, digital humanities started to transition toward the deep processing of knowledge and knowledge discovery. Relevant specialized tools and technological paradigms emerged one after another. Remarkable progress was made in the next few years: empirical research on semantic description framework on Dunhuang fresco digital images by Wang Xiaoguang and his team;[9] research on and the construction of a local name recognition system for agricultural products in ancient local chronicles by Bao Ping and his team;[10] preliminary explorations of text mining by Guo

[7] This is according to an explanation by Zhu Benjun, an associate research librarian at Peking University Library.

[8] In 2009 Wang Xiaoguang of the School of Information Management at Wuhan University gave a talk titled "The Emergence, Development, and Frontiers of 'Digital Humanities'" at the Ministry of Education's Forum on Innovation in Humanities and Social Science Research Methods. In the talk, he called for digital humanities as an innovative necessity to serve China by ushering in revolutionary changes and improvements to humanities and social science research paradigms.

[9] Wang Xiaoguang, Xu Lei, and Li Gang, "Dunhuang bihua shuzi tuxiang yuyi miaoshu fangfa yanjiu" [Semantic description framework research on Dunhuang fresco digital images], *Zhong guo tu shu guan xue bao*, no. 1 (2014): 50–59.

[10] Zhu Suoling and Bao Ping, "Fangzhi lei guji diming shibie ji xitong goujian" [System design for location name recognition in ancient local chronicles], *Zhongguo tushuguan xuebao*, no. 3 (2011): 118–24.

Jinlong and others;[11] word segmentation and named entity recognition in fore-Qin literature by Huang Shuiqing, Wang Dongbo, and Chen Xiaohe; and clustering methods to research questions of authorship attribution by several scholars.[12] Since then, several scholars have been able to integrate digital humanities with traditional studies of culture and history in their published works.[13] Applied to literary research, technological methodologies, such as GIS (geographic information system), text mining, affective computing, stylometry, named entity recognition, and network analysis, produced some highly original application cases.[14]

[11] Guo Jinlong, Xu Xin, and Lu Yujie, "Renwen shehui kexue yanjiuzhong wenben wajue jishu yingyong jinzhan" [Progress in text mining applications in humanities and social science], *Tushu qingbao gongzuo*, no. 8 (2012): 10–17.

[12] Huang Shuiqing, Wang Dongbo, and He Lin, "Yi *Hanxue yinde congkan* wei lingyu cibiao de xian Qin dianji zidong fenci shentao" [Exploring of word segmentation of fore-Qin literature based on the Domain Glossary of Sinological Index Series], *Tushu qingbao gongzuo*, no. 11 (2015): 27–133; Huang Shuiqing, Wang Dongbo, and He Lin, "Ji yu xian Qin yuliaoku de gu Hanyu diming zidong shibie moxing goujian yanjiu" [Research on constructing automatic recognition model of ancient Chinese place names based on pre-Qin corpus], *Tushu qingbao gongzuo*, no. 12 (2015): 135–40; Nian Hongdong, Chen Xiaohe, and Wang Dongbo, "Xian dangdai wenxue zuopin de zuozhe fenshen shibie yanjiu" [Research on authorship attribution of contemporary literature], *Jisuanji gongcheng yu yingyong*, no. 4 (2010): 226–29.

[13] Chen Gang, "Shuzi renwenxue yu lishi dili xinxihua yanjiu" [Digital humanities and the informationization studies for historical geography], *Nanjing shehui kexue*, no. 3 (2014): 136–42; Wang Tao, "Tiaozhan yu jiyu: 'Shuzi shixue' yu lishi yanjiu" [Challenges and opportunities: "Digital history " and historical research], *Quanqiushi pinglun*, no. 8 (2015): 184–201, 360; Wang Zhaopeng, "Jianshe Zhongguo wenxue shuzihua ditu pingtai de gouxiang" [Ideas on constructing a digitized map platform for Chinese literature], *Wenxue yichan*, no. 2 (2012): 131–33; Zheng Yongxiao, "Qinggan jisuan yingyong yu gudian shici yanjiu chuyi" [Affective computing applied in Chinese classical poetry studies], *Keyan xinxihua jishu yu yingyong*, no. 4 (2012): 59–66; Liu Jingchen, "Dashuju shidai de gudian wenxue yanjiu: Yi shuju fenxi shuju wajue yu tuxiang jiansuo wei zhongxin" [Research on classical literature in the era of big data: A focus on data analysis, data mining, and image retrieval], *Wenxue yichan*, no. 3 (2015): 182–90.

[14] Nian Hongdong, Chen Xiaohe, and Wang Dongbo, "Xian dangdai wenxue zuopin de zuozhe fenshen shibie yanjiu"; Xu Chao, "*Zuozhuan* de yuyan wangluo he shehui wangluo yanjiu" [Research into the language network and social network of *Zuozhuan*] (PhD diss., Nanjing Normal University, 2014); Zhao Siyuan, "Shijiu shiji Huizhou xiangcun de tudi shichang xinyong jizhi yu guanxi wangluo" [Land markets, credit mechanisms, and social-relation networks in nineteenth-century Huizhou villages], *Jindaishi yanjiu*, no. 4 (2015): 82–97; Zhao Wei, "'Shehui wangluo fenxi' zai xiandai Hanyu lishi xiaoshuo yanjiu zhong de yingyong chutan: Yi Li Jieren de *Dabo* wei li" [The application of social network analysis in modern Chinese historical novel: Li Jieren's trilogy *Great Wave*], in *Shuwei renwen: Zai xianzai guoqu he weilai zhijian* [Digital humanities: Between past, present, and future], ed. Xiang Jie (Taipei: Taiwan daxue chuban zhongxin, 2016), 387–426.

Chinese digitization projects in Hong Kong, Taiwan, and overseas started earlier. In 1984 Academia Sinica in Taiwan launched its automation project of historical records, which digitized successively such classical collections as the *Thirteen Classics*, *Twenty-Five Dynastic Histories*, and the *Siku quanshu*. Databases that can be used for word and phrase retrieval, such as the Rare Book Impact Database and the Twenty-Five Dynastic Histories Database, have been launched one after another. In 1995 Luo Fengzhu of Yuan Ze University in Taiwan developed the Tang Poetry Multimedia Network System, which includes search functions for author, keyword, poem title, and verse. The Digital Archives and e-Learning Technologies Program launched by the Science and Technology Management Department of Taiwan offers an effective guarantee mechanism for the digitization of documents. Academia Sinica also launched its Chinese Civilization in Time and Space (CCTS) project. Based on data retrieval, "e-textual criticism," method of textual research and criticism that leverages electronic resources, proposed by Huang Yinong has garnered widespread attention on both sides of the Taiwan Strait. Since 2009, National Taiwan University has hosted, with assistance from various other universities and research institutions in Taiwan, an annual Digital Archives and Digital Humanities International Conference. The proceedings were compiled for the Series on Digital Humanities published by National Taiwan University. Two scholars, Jin Guantao and Liu Qingfeng, designed and promoted the creation of the Database on History of Modern Chinese Thought (1830–1930), which includes periodicals from the late-Qing and the early Republican eras, archives from the late Qing dynasty, documents from the Qing dynasty, writings by scholars, translations by foreigners in China, Western textbooks, and other materials totaling more than 100 million characters. Its built-in semantic retrieval function is often used by researchers in the fields of literature and history. Research findings have been collected in *Studies in the History of Ideas: The Formation of Important Modern Chinese Political Terms*,[15] published in 2008 in Hong Kong. The establishment of the Research Center for Digital Humanities of National Taiwan University in 2012 marked the transition in Taiwan from "digital archives" to "digital humanities."[16] The China Biographical Database (CBDB), led by Peter Bol of Harvard University, by February 2024 had collected

[15] Jin Guantao and Liu Qingfeng, Guan nian shi yan jiu—zhong guo xian dai zhong yao zheng zhi shu yu de xing cheng (Hong Kong: Chinese University of Hong Kong, 2008).

[16] Qiu Weiyun, "Woguo Taiwan shuzi renwen yanjiu jincheng, 2009–2017" [The course of research in digital humanities in Taiwan, 2009–2017], *Tushuguan luntan*, no. 4 (2020): 9–19.

biographical information of more than 535,000 historical individuals. In addition, humanists in the PRC use MARKUS, a semiautomated text annotation platform created by Hilde De *Weerdt* and Taiwanese scholar He Haoyang, and the Database of Ming Qing Women's Writings, managed by McGill University's Fang Xiujie.

Starting in 2016, digital humanities in the PRC entered an institutionalized stage of accelerated development. With scholarly output increasing progressively year after year, digital humanities scholarship displayed its own systematic characteristics. In 2020, 425 articles in digital humanities were published, eight times more than in 2016. Most were about libraries, archives, and museums or information science, and 20 percent of them were supported by the National Social Science Fund. Digital humanities research teams have emerged one after another, and academic exchanges and publications have flourished.

Peking University has held a digital humanities forum for three consecutive years since 2016. Tsinghua University held the inaugural "International Workshop on Digital Humanities and Literary Research" in 2017. Nanjing University convened a seminar "Digital Humanities: Academic Frontiers and Exploration in the Age of Big Data," and in 2018 it established a Digital Humanities Initiative research center. In 2019 Renmin University set up a digital humanities research center and established the first master's program in digital humanities in China under its School of Information Resource Management. In January 2021 Peking University officially announced the establishment of its Digital Humanities Research Center. Currently, China has two special committees on digital humanities, the Digital Humanities Committee of the Chinese Information Society of Social Sciences and the Digital Humanities Committee of the China Society of Indexers (namely, the Chinese Alliance of Digital Humanities Organizations, CADHO). Since 2020 the latter has been responsible for soliciting papers and putting on the national digital humanities annual conference as well as selecting outstanding projects and papers for the year.[17]

Periodicals, columns, translated works, and research papers in the field of digital humanities have also sprung up. Since 2016, Jiang Wentao and Anatoly

[17] The Digital Humanities Committee of the Chinese Society of Social Sciences Information and the Dunhuang Academy co-organized the International Symposium on the Digitization of Cultural Heritage and the Academic Annual Meeting of the Digital Humanities Committee of the Chinese Society of Social Sciences Information in July 2019. The Digital Humanities Committee of the Chinese Index Society and Shanghai Library hosted the Second National Digital Humanities Annual Conference (DH2020) in October 2020.

Detwyler have been responsible for the Digital Humanities column in the journal *Shandong shehui kexue* [Shandong social sciences]. They have also translated and introduced a series of foreign digital humanities theories and applications from abroad, relevant debates, and interviews, as well as published results of several local quantitative studies. In December 2019 Tsinghua University and Zhonghua Book Company cofounded the first digital humanities academic journal in the PRC, the *Journal of Digital Humanities*. Its founding lead editors are Tsinghua University's Liu Shi (Department of Chinese) and Sun Maosong (Department of Computer Science) and the editor in chief of Zhonghua Book Company Gu Qing. This journal upholds a spirit of openness, integration, innovation, and sharing. In the academic community, it actively advocates for and upholds a certain standard, and it has become an essential space for incubating high-quality results in digital humanities and for forming a healthy critical discourse. In addition, in 2020 Renmin University set up another academic journal, *Digital Humanities Research*.

Methodological Communities and the Construction of Infrastructure

New methodologies are fundamental to the digital humanities. As the foreword to the inaugural issue of the *Journal of Digital Humanities* points out, "digital humanities, which emerged in timely fashion as a response to the digital age, is a humanistic area of study aided by methods and tools of computer and data science. Its very nature is interdisciplinary; it is also a methodology. It applies digital technologies to humanistic hermeneutics and is a transformation of the knowledge production paradigm set off by changes in media."[18] In the past decade, digital humanities studies have formed some technical subfields with relatively clear features, such as text mining, network analysis, visualization, and geographic information systems, which could be called "interdisciplinary methodological communities." In recent years great progress in machine learning has been made. Paradigms driven by big data represented by deep machine learning are maturing. Humanities scholars have started to hope for "computational intelligence" based on big data in the humanities, which will bring about dramatic changes in traditional humanities research. In actual research, humanities scholars primarily advocate being "issue-oriented." That is, with a strong

[18] Liu Shi, Sun Maosong, and Gu Qing, "*Shuzi renwen* fakan ci" [Foreword to Digital humanities], *Shuzi renwen*, no. 1 (2020): 1.

awareness of problems, they construct datasets, searching for one or two main technical methods that suit the problem. In this way, they deal simultaneously with traditional humanities concerns and digital technologies, making research contributions to both.

Text mining is a general term for a series of technology "collections" used in what Franco Moretti has called the "distant reading" of massive amounts of texts.[19] It has facilitated innovations in information acquisition methods: from the most basic semantic retrieval and text preprocessing steps—such as standardization, word segmentation, and text labeling/annotation—to subsequent dataset modeling, various text automatic clustering and text classification, topic models, opinion extraction, pattern recognition, affective analysis, stylistic measurement, and author attribution determinations. A combination of deep learning and large-scale corpora, especially the proposal and release of pre-training models, provides numerous application scenarios for the practice of big data pretraining model plus small data fine-tuning in artificial intelligence writing and ancient Chinese texts organization. The Jiu Ge artificial intelligence poetry writing system, developed by the Sun Maosong team of Tsinghua University, trains specialized vocabulary and syntax models on more than 800,000 lines of a classical Chinese poems corpus and annotated knowledge base. Not only can this system compose poems that are coherent in meaning and conform to meter, but it can also evaluate the poems that it has created. The pre-training model called BERT-CCPoem of Chinese classical poems can provide vector representations of any line from any classical Chinese poem. It can also be widely used in the intelligent retrieval and recommendation of classical poems as well as for stylistic analysis and affective computing. Beijing Normal University's Natural Language Processing Laboratory used BERT to successfully improve the accuracy of named entities. A system of ancient verse breaks and multifaceted ancient book annotating system they developed can automatically mark punctuation, book titles, and proper names with an accuracy of rate over 90 percent. Deng Ke's team at Tsinghua University used the unsupervised Chinese text analysis TopWORDS system to identify proper names from classical documents. Through repetitive computational learning to detect words and phrases from ancient texts, this system can quickly create a proper name index from a massive collection of classical documents with minimal human effort. In addition, Zhonghua Book Company and Dragon Springs Temple (Longquan

[19] Franco Moretti, *Distant Reading* (London: Verso, 2013).

Si) have developed a automatic sentence break punctuation system. In terms of text marking and statistical analysis, a team led by Xiang Jie of National Taiwan University has focused on using feature-based algorithms to explore the classification structure, proportion, and entries provided by historical documents in *leishu* (a unique genre of reference books in ancient China) and the Danxin archives, which contain administrative and judicial records from the Qing dynasty. Such analysis would be impossible to do manually.[20] As for the application of automatic text classification and clustering, a classification algorithm based on supervised learning and an unsupervised clustering algorithm can be used in the study of classical genres and *leishu*; it can even be used in the study of modern genres, where it can dialogue with some propositions in literary history. As for ancient texts, Hu Renfen, Zhu Yuchen, and Li Shen of Beijing Normal University used a neural word vector-based K-menas algorithm to conduct automatic clustering experiments on extant documents in the *Hanshu Yiwenzhi*. It offers far more possibilities to transcend the "Hanzhi" doctrine in philology.[21] As for modern texts, such as collected in the Republic of China Periodical Corpus (1918–1949), which is a collaboration between the University of Chicago Textual Optics Lab and the Shanghai Library, feature modeling, topic models, neural networks, naive Bayes classifiers, hierarchical clustering, network analysis, and other methods are used to try to conduct multilevel research on the configurational factors of "new genres" in modern journals.[22]

Jin Guantao, Liu Qingfeng, Zheng Wenhui, Liu Zhaolin, Qiu Weiyun, Liang Yingyi, and others have taken the Database on History of Modern Chinese Thought (1830–1930) as their subject. They employ methods such as word frequency statistics, natural language distribution laws, word vectors, and co-

[20] See Xiang Jie, Chen Lihua, Du Xiechang, and Zhong Jiaxuan, "Shuwei renwen shiye xia de zhishi fenlei guancha: liangbu guanxiu leishu de bijao fenxi" [Observing the evolution of worldview through digital humanities: A comparative study of two *leishu*], *Dong Ya guannianshi jikan*, no. 9 (2011): 229–86; Xiang Jie and Hong Yimei, "Shuzi renwen qujing xia de Danxin dang'an chongzheng yu fenxi" [Re-collation and analysis of the Danxin archives using a digital humanities approach], *Dang'anxue tongxun*, 1 no. 6 (2020): 4–13. The Dan-Xin archives were originally called the Taiwan Secretariat and refer to the toponyms Danshui and Xinzhu in northern Taiwan.

[21] Zhu Yuchen and Li Shen, "*Hanshu* 'YiWenZhi' mulu fenlei zai shenshi" [Reexamination of the Catalogue Classification of Hanshu Yiwenzhi], *Shuzi renwen*, no. 3 (2021): 37–52.

[22] Spencer Stewart and Zhao Wei, "'Xin wenlei bijiao wenxue yu shuzi jichu sheshi jianshe: Yi Minguo shiqi qikan yuliaoku (1918–1949) jiyu PhiloLogic 4 wei li de tansuo" [New literary styles, comparative literature and the "Republican China Periodicals Corpus (1918–1949), based on PhiloLogic4"], paper presented at the Second Annual National Digital Humanities Conference (CDH2020), Shanghai, China, October 19–21, 2020.

occurrence network analysis. Starting from Raymond Williams's "keywords," R. G. Collingwood's history of concepts, and Reinhart Koselleck's conceptual history theory, they utilize standard algorithms to automatically generate keyword clusters from a vast corpus through a series of core categories. A historical-semantic description of the axiological system represented by these word groups and networks was used to sketch out and discuss the structural transformation and evolutionary trends of modern ideas and concepts in an effort to facilitate research on the "digital transformation" in the history of ideas, the history of concepts, and intellectual history.[23] In addition, Bao Ping's team at Nanjing Agricultural University, Zhao Siyuan of Shanghai Jiaotong University, Hu Heng of Renmin University of China, and Shen Bin of the Guangdong Academy of Social Sciences have all achieved significant results in the excavation of local historical records and documents. In recent years, the Gao Jianbo team has also made frequent breakthroughs in the field of affective computing, with most of their collaborative achievements being published overseas.[24]

Social network analysis shifts the focus from the study of individuals and their social classes or groups to social structures created through the connection of various individuals and social "nodes." In this area digital humanities have made the most substantial progress. Social network analysis is also the methodological basis of many relational databases in the humanities. For example, CBDB (China Biographical Database) can help users retrieve biographical information about people from the ancient past almost immediately. Their network of social relations, including relatives, teachers, friendships, writings, and correspondence, can also be had at a glance. With data extracted from CBDB, Yan Chengxi and Wang Jun designed algorithms to construct political networks in the Song dynasty.[25] Xu Yongming has also utilized CBDB data to create a network of Tang Xianzu's social relationships using *The Chronicle of*

[23] Jin Guantao, Qiu Weiyun, Liang Yingyi, Chen Baiyu, Shen Mankun, and Liu Qingfeng, "Guannian qun bianhua de shuwei renwen yanjiu: Yi *Xin qingnian* wei li [A digital humanities study of the change of conceptual groups using the journal *New Youth*], in *Shuweirenwen: Zai guoqu, xianzai he weilai zhijian* [Digital humanities: past, present and future] (Taipei: Taiwan daxue chuban zhongxin, 2016), 427–63.

[24] E.g., Qiyue Hu et al., "Fractal Scaling Laws for the Dynamic Evolution of Sentiments in *Never Let Me Go* and Their Implications for Writing, Adaptation and Reading of Novels," *World Wide Web* 24, no. 4 (2021): 1147–64.

[25] Yan Chengxi and Wang Jun, "Shuzi renwen shijiao: Ji yu fuhao fenxifa de Song dai zhengzhi wangluo keshihua yanjiu" [Digital humanities perspectives: Research on the visualization of Song dynasty renovation networks based on symbol analysis], *Zhongguo tushuguan xuebao*, no. 5 (2018): 87–103.

Tang Xianzu's Life (Tang Xianzu nianbiao) and Gephi, a network analysis and visualization software.[26] Most humanities scholars still build their own datasets for use in such projects. Wang Tao used information on the place and time of birth and death of people in *Allgemeine Deutsche Biographie (ADB)* to draw "birth and death maps" of Germans in the fifteenth and eighteenth centuries. He found that the migration patterns of these Germans corroborate the rise and fall of core cities during the rise of Prussia.[27]

Chen Song carried out a network analysis of extant Song dynasty local official schools inscriptions, which revealed a structural chasm in the exchange of ideas between Sichuan and other regions during the Song dynasty as well as the increasing influence of Neo-Confucianism ideologues in commemorative inscriptions dedicated to local government schools.[28] Yan Cheng established a social network of boudoir poets centered around Gu Taiqing, explaining the "interruption mystery" of the Autumn Red Poetry Society (Qiuhong Shishe).[29] Textual networks are another type of network that has attracted more attention in humanities research. In the annotated corpus of the *Zuozhuan* (one of the earliest and most important historical works in ancient China), Xu Chao and others have identified "personal" entities and "event" entities through a co-occurrence network. In doing so, they discovered the closeness of the network and the special significance of Confucius as the lowest aggregation-degree correlation node.[30] Other scholars, who do not subscribe to word co-occurrence and data-driven approaches, tend to use a rule-based approach to extract interpretable relationships from successive generations of texts, to build relational

[26] Xu Yongming, "Zhongguo gudian wenxue yanjiu de ji zhong keshihua tujing: Yi Tang Xianzu yanjiu wei li" [Some visualization approaches to the study of classical Chinese literature: A case study on Tang Xianzu], *Zhejiang daxue xuebao*, no. 2 (2018): 164–74.

[27] Wang Tao, "Shuzi renwen kuangjia xia 'Deyizhi renwuzhi' de qunxiang miaohui yu leixing fenxi" [The group portraits and typological analysis of German prosopography within a digital humanities framework], *Lishi yanjiu*, no. 5 (2018): 148–92.

[28] Chen Song, "Wei xue zuo ji: Cong wangluo fenxi he wenben fenxi shijao kan Song dai difang guanbeiji de zuozhe he zhuti" [Writing for local government schools: Authors and themes in Song dynasty school inscriptions], *Shuzi renwen*, no. 4 (2020): 24–72.

[29] Yan Cheng, "Gu Taiqing jiaoyou wangluo fenxi shiye xia 'Qiu hong yin she' bianqian kao" [Research on changes in the "Autumn Red Poetry Society" from the perspective of an analysis of Gu Taiqing's social network], *Shandong shehui kexue*, no. 7 (2018): 64–69.

[30] Xu Chao, "*Zuozhuan* de yuyan wangluo he shehui wangluo yanjiu."

networks of fictional figures, to uncover underlying narrative intentions, and to touch on the evolution of character views.[31]

Image and visualization are indispensable and important methods for digital humanities research. Xiang Fan and Zhu Shunshan of Tsinghua University used family relationship data in the CBDB along with genealogical data and visualizations from the Shanghai Library, 3D technology, and interactivity to construct a huge three-dimensional tree-like network of the ancient Chinese royal genealogy. This reconstructed genealogy can be used to discover and interpret dubious family records. Wang Jun and Li Xiaoyu of Peking University have carried out text processing and analysis on the *Song Yuan Xuean* (a historical work compiled during the Ming and Qing dynasties) using their Song-Yuan Xuean Knowledge Atlas System, which extracts persons, times, places, and written works and the complex semantic relations among them. This knowledge atlas vividly shows the influence of historical events on the development of Neo-Confucianism at the time. Another visualization project is the Chinese Commercial Advertisement Archive (CCAA), a collaboration between Tani Barlow of Rice University in the US and Chen Jing of Nanjing University. It is a visual media data construction project in which advertising texts and images are analyzed quantitatively. It involves the digitization and metadata labeling of a massive amount of commercial advertisements in combination with text mining and automatic image clustering tools. Text and image are then placed on other information-related nodes to trace the relationship evident between the development of advertising and modern Chinese social thought. Since 2019, Chen Jing's team (which includes Nanjing Yunjin Color Digital Protection and Utilization and a Virtual Exhibition of Nanjing Traditional Crafts Nonmaterial Cultural Heritage) has been working on a project that focuses on the digital preservation and utilization of the rich colors found in Nanjing Yunjin, a traditional Chinese silk fabric. The results are much anticipated in the field.

In the past two decades, historical geographic information and spatial humanities research have benefited from remarkable achievements in geographic information technology. After 2014, Chen Gang, Pan Wei, and others proposed the establishment of informationization for historical geography that

[31] Zhao Wei, "Shehui wangluo fenxi yu *Dabo* sanbuqu de renwu gongneng" [Social network analysis and character functions in *Big Wave* trilogy], *Shandong shehui kexue*, no. 9 (2018): 50–64.

combines digital humanities and GIS.[32] The community generally believes that digital humanities, which is superior to GIS in its information mining of historical texts, should be widely adopted. The Chinese Historical Geographic Information System (CHGIS) uses typical vectorized data to describe actual geographic information about the world in a point-line-surface combination, which has had a profound influence on subsequent historical geographic informationization. Information platforms have been launched in succession: the Silk Road Historical Geographic Information Open Platform jointly set up by Capital Normal University and Shanxi Normal University; the Six Dynasties Jiankang Historical Geographic Information System developed by Chen Gang's team at Nanjing University; the Information Integration Database of Qing Dynasty Famine Chronicles hosted by Renmin University of China's Xia Mingfang, and the Chinese Historical Map Geographic Information Platform hosted by Cao Shuji of Shanghai Jiaotong University. Other representative projects include the Huaxia Genealogy GIS Platform created by the Lü Guonian, Jiang Nan, and Hu Di team at Nanjing Normal University; and the historical geography team of Renmin University with the help of the Jinshen lu Database, which made use of functions of GIS in Qing history research and the study of political history to bring about a new understanding of the issue of Qing political districts from a geographical perspective.[33] In addition, Wang zhaopeng's Chronological Map of Tang and Song Dynasty Literature integrates GIS, electronic maps, and chronological information about the work of Tang and Song writers and proposes the concept of geo-referencing [*xi di*] to describe the digital integration of documents with the visual presentation of literary space. The Academic Map Publishing Platform, created by Xu Yongming of Zhejiang University in collaboration with Harvard University, supports users who personally upload data, and it can generate academic maps, including tracking maps of historical figures and various entity location query maps, thus providing an amiable and professional information-sharing environment. Jian Jinsong of Sun Yat-sen University in Taiwan has for some years advocated on-site research [*xiandi yanjiu*]—primarily field investigations—supplemented by GPS

[32] Chen Gang, "Shuzi renwenxue yu lishi dili xinxihua yanjiu"; Pan Wei, "Shuzi renwen beijing xia lishi dili xinxihua de yingdui: Zoujin lishi dili xinxihua 2.0 shidai" [Response of historical geographic information against the background of digital humanities: Entering the era of historical geographic informatization 2.0], *Yunnan Daxue xuebao*, no. 6 (2018): 80–87.

[33] Pan Wei, Wang Zhe, and Man Zhimin, "Jin ershi nian lai lishi dili xinxihua de fanzhang chengjiu [Achievements in the development of historical geographic informationization in the past 20 years], *Zhongguo lishi dili luncong*, no. 1 (2020): 25–35.

and astronomical calendar tools to restore and reproduce the scenes of events and literary behaviors found in classical literature. The SHAPC Lab planned and built by He Jie of Tianjin University's School of Architecture combines GIS, remote sensing, spatial computing, and other information technology with text mining to carry out research on spatial humanities and scene computing related to cultural heritage, landscape, and urban history.

In the field of humanities, the demands of large-scale macro perspectives, large-scale computing and mining, temporal and spatial visualization, and epistemological reconfiguration have introduced new challenges to resource management and the creation of data infrastructure. In light of the lack of in-depth descriptions and interpretations of the semantic characteristics of resources in a large number of existing subject databases, the granularity of epistemological units is not fine enough, the semantic association between resources is insufficient, the phenomenon of isolated islands of information is obvious, the service model is singular, and there are few semantic retrieval and data mining functions. Unable to bring about automatic knowledge discovery or overcome other deficiencies, the library-archives-museum (LAM) and information management field has proposed a set of "smart data" solutions.[34]

The Wang Xiaoguang team of the Digital Humanities Center of Wuhan University collaborated with the Dunhuang Academy to focus on the construction of Dunhuang Smart Data project and to work on the protection, research, and dissemination of the cultural heritage of Dunhuang. With the help of metadata, subject headings, semantic enhancement, knowledge maps, the international image interoperability framework (IIIF), and other technologies and standards, an image-enhanced display and narrative system for Dunhuang fresco were created. The crux of the work of Feng Huiling's team from Renmin University in China is on protecting and researching historical and cultural villages and towns, represented by the Gaoqian Digital Memory Website project, which consists mainly of total factor digitization plus holographic presentations. This provides users with an immersive knowledge base on Gaoqian that is searchable, presentable, and rich in semantic associations, and which completes the remediation and interactive interpretation of a variety of texts.

The digital humanities field has generally recognized that, on the one hand, it is necessary to create a large-scale general-purpose platform and knowledge base for academic humanities and to establish a unified standard for technology

[34] Wang Xiaoguang, Tan Xu, and Xia Shengping, "Dunhuang zhihui shuju yanjiu yu shijian" [Dunhuang smart data research and practice], *Shuzi renwen*, no. 4 (2020): 11–23.

and metadata as soon as possible so that the sharing of data, technology agreements, and resources across the country and even the world can be realized.[35] On the other hand, it is necessary to empower humanities scholars and strengthen their capacity to create research platforms for various disciplines. General-purpose platforms, such as Digital Humanities Platform of Shanghai Library, consolidated the Chinese Genealogical Knowledge Service Platform, the Chinese Ancient Books Union Catalogue and Evidence-Based Platform, the Personal Name Standard Database, the Chinese Modern Newspaper and Periodical Database, and the Shanghai Historical and Cultural Events Knowledge Database among other existing resources. Such general-purpose platforms have established a vocabulary system and a massive knowledge map of standard descriptions of people, institutions, events, objects, time and space, and domain concepts. This can provide one-stop resource discovery and also help humanities scholars control local or platform data and conduct real-time data experiments to carry out parameter debugging and model optimization in the process of distant reading, close reading, and shared reading. The Docusky Collaboration Platform, managed by Xiang Jie of National Taiwan University, consolidates personal text format conversion, labeling and database construction, exploration and analysis, visual observations, GIS integration, and other digital humanities tool modules, and is dedicated to providing personalized data storage and analysis platforms for scholars in the humanities. Such platforms also provide application programming interfaces (APIs), which can retrieve information from external sources such as CBDB, MARKUS, CText (Chinese Text Project), and CBETA (Chinese Buddhist Electronic Text Association) so that humanities researchers no longer need to rely on information technology experts each step of the way. Scholars can thus independently and freely integrate digital methods to conduct research in the humanities.

At the same time, scholars such as Liu Wei, Xia Cuijuan, Wang Hongsu, Chen Tao, Zhang Lei, Zhu Qinghua, Zhao Yuxiang, Zhao Shenghui, Xu Xin, Wang Lihua, Zhang Yongjuan, and Shan Rongrong have all made outstanding contributions to the technical design and theoretical construction of humanities

[35] Bao Bide, Xia Cuijuan, and Wang Hongsu, "Shuzi renwen yu Zhongguo yanjiu de wangluo jichu sheshi jianshe" [Digital humanities and the construction of network infrastructure for Chinese studies], *Tushuguan zazhi*, no. 11 (2018): 18–25; Zhu Benjun and Nie Hua, "Shuzi renwen: Tushuguan shijian de xin fangxiang" [Digital humanities: New directions in library practice], *Daxue tushuguan xuebao*, no. 4 (2017): 23–29; Zhu Benjun and Zhang Jiuzhen, "Digital Humanities Cyberinfrastructure for Studies of Ancient China: Past, Present, and Future," *Library Trends* 69, no. 1 (2020): 319–33.

infrastructure. Zhu Benjun, Zhang Jiuzhen, and others are fully aware of the cultural and strategic significance of national infrastructure construction. Chinese scholars must firmly seize the initiative of constructing digital infrastructure. Relevant organizations should speed up top-level designs to "make sure domestic and overseas discussions related to Chinese issues are carried out under the same digital basic framework" and at the same time to attract overseas scholars to participate and establish a presence therein."[36] Experienced scholars of Chinese classical philology have made proposals about how to move from the digitization of ancient books to datamation and knowledge transformation, which have generated much enthusiasm. Liu Shi and Sun Maosong of Tsinghua University have proposed a plan for creating a Chinese Classics Knowledge Base (CCKB) based on more than 200,000 ancient books and supplemented by appropriate tools, which aims to transcend the original physical and logical structures of ancient Chinese texts through digitization and reorganization of information, enabling users to access and understand these documents in new ways. The in-depth organization and knowledge management of documents are carried out through entities and interrelationships,[37] and the digital humanities are propelling forward an upsurge in knowledge engineering infrastructure in China.

Prospects and Challenges

Since 2019, when the Chinese Ministry of Education was pushing hard for the creation of a "new liberal arts," great expectations have been placed on the digital humanities in China. Digital humanities have brought about the expansion of both data and topics of discussion. Some phenomena that could not previously be observed have been revealed, and some topics of discussion that were difficult to imagine or to deal with have emerged. These days, when disciplines become more and more specialized, digital humanities reawaken the great ambition of humanists to reflect on and solve major issues and comprehensive problems. In the context of digital humanities, the barriers and taboos between social sciences and humanities scholarship will be further eliminated,

[36] Zhu Benjun, "Zhongshi xin wenke de shuzi jichu sheshi jianshe" [Paying attention to the construction of digital infrastructure for new liberal arts], *Zhongguo shehui kexue bao*, August 2020.

[37] Liu Shi and Sun Maosong, "Guanyu jianshe 'Zhongguo gudian zhishiku' de sikao" [Thoughts on the construction of a classical Chinese knowledge base], *Renmin zhengxie bao*, August 24, 2020.

quantitative empirical methods will be further standardized in use, and an interdisciplinary and multidisciplinary collaborative knowledge production method will reshape the fields of humanities and social sciences. The advancement of Chinese digital humanities is expected to spark reflections on the knowledge base, epistemology, methodology, and assessment system of Chinese humanities. An age of integration and a confrontation with disciplines is upon us. Changes in media have ushered the entire academic community into a postdigital society, and open-access academic publications and publishing methods will gradually affect academic production. Document infrastructure has penetrated every branch of the humanities, and scholars in this new era must understand data. In big data infrastructure, self-constructed thematic datasets that are meaningful for a single proposition will be connected with big data, which can meet diversified research needs and can open up problem-focused research. At the same time, small data will also be made public by users and will continue to flow into a sea of global data in an open and shared digital setting; there it will assume the role of a bridge connecting a wider range of public cultures.

In the future, more and more document databases will finish being upgraded to relational and structured knowledge bases, which organize information according to semantic units and can simulate the knowledge environment of domain applications. This will allow researchers to free themselves from storing paper documents, to realize the datamation of truly efficient and shared resources, and to promote the modern transformation of philology and the diversification of research questions in the humanities. In their article "Big Data Technologies and the Modern Transformation of Traditional Philology," Liu Shi and Li Feiyue propose that traditional philology is big data technology of the paper age. Contemporary big data technology has changed our way of understanding and apprehending the scale of traditional philology. They all reflect people's endless pursuit of knowledge mining, organization, management, and reengineering capabilities.[38] Some mainstream natural language processing technologies and general algorithms are constantly improving, and the accuracy and recall rates of tasks such as automatic version comparison, automatic punctuation and sentence segmentation, automatic proofreading, and text collation are always nearing ideal standards. Large-scale ancient book processing

[38] Liu Shi and Li Feiyue, "Dashuju jishu yu chuantong wenxianxue de xiandai zhuanxing" [Big data technologies and the modern transformation of traditional philology], *Zhongguo shehui kexue*, no. 2 (2020): 63.

and analysis platforms for users of various teaching and research organizations, such as Tsinghua University's Xuancong Digital Humanities Intelligence Platform and Shanghai International Studies University's Chinese Ancient Books Basic Data Analysis Platform, are already under construction. These platforms are expected to incorporate more specialized tools, methods, and data into one system, laying the foundation for the Chinese Classics Knowledge Base.

The aim of digital humanities is to establish a corresponding mapping and simulation system in the virtual world after objects and historical materials have been completely digitized. It is hoped that digital humanities can attain a logical framework that is consistent with the actual world and that it can be regarded as a typical "representative practice."[39] Computing perforce has a "compression effect," transforming rich and vivid humanistic experience into geometric figures and abstract symbols, which can be disseminated on the screen or through the internet. Distant reading of big data comes, after all, at the expense of losing detail. This process of "dimensionality reduction and preservation" is inevitable for passing down human knowledge brought about by changes in media. Moreover, like the idea in economics that "all models are wrong," no universally correct cultural model exists. The findings of individual cases in the digital humanities are highly relevant, and it is difficult to generalize universal truths. For most issues, distant reading can only be a supplement to close reading, and humanities scholars are really most concerned about the particularity created by endless details. Digital humanities cannot automatically acquire a critical dimension. Much research in digital humanities is guided by "algorithm optimization," which will distance it further from specific social, cultural, and even technical contexts. Hence, between data-driven, knowledge-driven, and problem-driven approaches, humanities scholars also need to find equilibrium and develop digital humanities as a method of interpretation and criticism; that is, give it a reflective dimension.

Some humanities scholars believe that digital humanities must go beyond an "instrumental role." They oppose both the disciplinarization of digital humanities and giving dominance to subjects that have only technological superiority.[40] They also advocate for a "plural digital humanities." In the future,

[39] Liu Wei and Ye Ying, "Shuzi renwen de jishu tixi yu lilun jiegou tantao" [Exploring technical system and theoretical structure of digital humanities], *Zhongguo tushuguan xuebao*, no. 5 (2017): 32–41.

[40] Chen Jing, "Shuzi renwen zhishi shengchan zhuanxing guocheng zhong de kunjing yue tuwei" [The crisis and solution of digital humanities in the transformation of knowledge production], *Wenhua yanjiu*, no. 2 (2018): 171–85; Chen Jing, "Fushu de shuzi renwen: Bijiao

more quantitative results should appear in the form of "computational criticism." In order to break the algorithmic black box and reveal the cultural logic behind a phenomenon, humanities scholars should do three things: start out from their own domain knowledge and close reading experience, adroitly use digital tools to design experiments, and communicate with data-driven results.[41] More importantly, a dedication to practicing what one preaches remains a prerequisite for disenchanting technology. Humanities scholars can effectively participate in the construction, deployment, operation, and evaluation of complex computing and experimental systems rather than outsourcing them to IT. By taking these precautions, the various components of scholarly practice will not be severed, and we will avert the disciplines in the humanities reaching an impasse in the pursuit of extreme autonomy. At this stage, improving information literacy and cultivating computational thinking and operational skills are still required skills for Chinese humanities scholars in digital humanities that have originated from practice. Realistically, steadfast commitment to practice is also the only effective way to avoid a bubble and an overheating of the digital humanities.

Moreover, there is still a long way to go in the creation of an assessment system. Are assembling databases, creating platforms, and developing algorithms considered achievements? How do we integrate the pathbreaking contributions of pioneering innovations into the current assessment system of humanities and social sciences? Who is qualified to assess such achievements in digital humanities? Who in the end can be considered a digital humanist? While emphasizing standards, are we not establishing new barriers to entry ? These

shiye xia de Zhong Xi shuzi renwen" [Plural digital humanities: Chinese and Western digital humanities from a comparative perspective], *Zhongguo bijiao wenxue*, no. 4 (2019): 14–28; Anatoly Detylwer and Jiang Wentao, "Shuzi renwen zuowei yi zhong fangfa: Xifang yanjiu xianzhuang ji zhanwang" [Digital humanities as a method: Current state and prospects of research in the West], *Shandong shehui kexue*, no. 11 (2016): 26–33; Jiang Wentao, "Zuowei yi zhong wenxue yanjiu fangfa de shuzi renwen: Yinshua wenhua jichu sheshi, ershi shiji wenxue pipingshi, yiji wenxue shehui xue" [Digital humanities as literary research method: Print culture infrastructure, literary criticism in the twentieth century, and the sociology of literature], *Zhongguo bijiao wenxue*, no. 4 (2019): 29–47; Dan Hansong, "Chaoxiang 'shuzi renwen' de wenxue piping shijian: Jinlu yu fansi" [Digital humanities-oriented literary criticism: Past, present, and future], *Wenhua yanjiu*, no. 2 (2018): 204–19; Zhao Wei, "Cong gainian moxing dao jisuan ping: Franco Moretti zhihou de shijie wenxue yanjiu" [From conceptual model to computational criticism: Research on world literature after Franco Moretti], *Xi'nan Minzu Daxue xuebao*, no. 8 (2020): 181–89.

[41] Zhao Wei, "Zuo wei jisuan piping de shuzirenwen" [Digital humanities as computational criticism], *Zhong guo Wenxue Piping*, no. 2 (2022): 157–66, 192.

questions and concerns concern, which accompanied the development of digital humanities in Europe and the United States, are now spreading to the Chinese scholarly community, triggering discussions about what is and is not digital humanities and what the nature of a digital humanities assessment system might be.[42] In contrast to conventional forms, such as traditional publications, essays, and journals, how do we develop an assessment system that can accommodate more diverse digital output and findings? How we achieve resource-oriented and nonutilitarian academic goals between quantitative evaluation and peer review, as well as strike a balance between the "standard" production model (large teams and large projects) and the development of "micro-digital humanities," will depend on further shifts in societal perspectives and innovations in the mechanisms of academic production.

Translated from the Chinese by Steven Day

[42] In the fourth issue of the *Journal of Macau Polytechnic University* (2019), Sang Hai organized debate on "What Isn't Digital Humanities?" In September 2020, Nanjing University also organized a seminar "An Academic Assessment System for Digital Humanities: Definitions and Setting Norms," which created a great stir socially. See "'Shu zi ren wen de xue shu ping jia ti xi: Ding yi yu gui fan jian gou' yan tao hui fa yan hui bian" [Compilation of speeches on "Evaluating of digital humanities scholarship: Definition and standards" conference], *Shuzi renwen*, no. 1 (2021): 1–57.

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