Knowledge Graph Construction for Ancient Disaster and Famine Literature: A Digital Humanities Perspective (Postprint)

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Abstract

[Purpose/Significance] The problem of diverse types and difficult retrieval of ancient disaster and famine documents has profoundly constrained research on ancient disaster and famine history. Employing digital humanities techniques to organize, analyze, and utilize these documents facilitates their creative transformation and innovative development in the new era.

[Methods/Process] This paper takes ancient disaster and famine documents as its research object. On one hand, from the ontological level, it constructs a domain knowledge model oriented toward ancient disaster and famine documents based on their conceptual knowledge system and combined with the perspective of traditional bibliography, completing semantic description of these documents. On the other hand, based on ontology construction, it builds a domain knowledge graph for ancient disaster and famine documents from the empirical level, and from the scenario application level, completes the associative display and knowledge discovery research of multi-dimensional knowledge including documents, figures, spatiotemporal information, and events within the domain.

[Results/Conclusion] Through case-based empirical research, the feasibility of constructing a knowledge graph for ancient disaster and famine documents based on ontology technology is verified, providing new reference for the knowledge organization and development/utilization of ancient disaster and famine documents in the digital intelligence era.

Full Text

Construction of Knowledge Graph for Ancient Disaster Famine Literature from the Perspective of Digital Humanities

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Abstract:
[Purpose/Significance] The complexity and difficulty in retrieving ancient disaster famine literature significantly constrains the study of ancient disaster history. Utilizing digital humanities techniques for the organization, analysis, and research of these documents can promote their creative transformation and innovative development in the new era. [Method/Process] This study focuses on ancient disaster famine literature. On the one hand, based on the ontological framework derived from the conceptual knowledge system of ancient disaster famine literature and incorporating perspectives from traditional bibliography, a domain knowledge model is constructed to semantically describe the literature. On the other hand, building on this ontology, knowledge graphs for ancient disaster famine literature are developed from an empirical standpoint. From the perspective of practical application, the study showcases the multi-dimensional knowledge association and discovery research of documents, persons, spatiotemporal data, and events within the domain. [Result/Conclusion] The empirical case studies validate the feasibility of constructing knowledge graphs for ancient disaster famine literature using ontology technology, providing new insights into the knowledge organization and utilization of such literature in the digital and intelligent era.

Keywords: Disaster famine literature; Ontology; Knowledge graph; Knowledge organization; Digital humanities

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Human history can also be understood as a chronicle of humanity's persistent struggle against disasters. China, with its vast territory and diverse geographical environment, has experienced frequent disasters since ancient times. According to statistics from *A History of Famine Relief in China*, from the 1st century to the 1940s, China witnessed a total of 5,258 natural disasters, including floods, droughts, locust plagues, hailstorms, storms, epidemics, earthquakes, frost, and famine [2]. Against this historical backdrop, China has produced a wealth of disaster famine literature, containing massive amounts of disaster-related knowledge with invaluable historical significance. The precious experiences and lessons from ancient disaster prevention, mitigation, and relief efforts

remain highly beneficial for contemporary society, which continues to face disaster threats.

As primary source materials for ancient disaster history research, existing ancient disaster famine documents, though rich in type, are widely scattered and fragmented. Research methods remain largely confined to traditional bibliography and philology. Moreover, the independence of individual humanities scholars has created numerous "academic islands," making research findings difficult to reuse. The rich historical knowledge embedded in these materials has yet to be adequately developed and utilized. Under the wave of digital humanities, technology-enabled traditional humanities research has gradually gained widespread attention and recognition, offering new methods and tools for conventional bibliographic and philological studies. From ontology's standardized representation and comprehensive interpretation of domain knowledge concepts at the semantic level to knowledge graphs' associative display and intelligent querying of domain knowledge concepts, the "ontology + knowledge graph" knowledge organization model has quietly taken root in digital humanities, yielding numerous theoretical and applied achievements. This provides methodological guidance for the mining, organization, and utilization of disaster knowledge within famine literature.

Addressing the problems of unclear concepts, ambiguous systems, and difficult utilization in ancient disaster famine literature, this study explores knowledge organization models from a digital humanities perspective. On one hand, ontology technology clarifies conceptual connotations within ancient disaster famine literature, accurately establishing the knowledge system by integrating traditional bibliographic perspectives. The ontology construction incorporates "event" elements alongside "objects," "people," and "spatiotemporal" dimensions. On the other hand, a domain knowledge graph for ancient disaster famine literature is constructed based on graph databases. Through graph pattern structures, the knowledge is precisely presented, and graph reasoning enables further associative display of hidden knowledge and multi-dimensional knowledge discovery research, thereby facilitating scenario-based applications of the ancient disaster famine literature knowledge graph.

1 Research Status

The rise of digital humanities provides new opportunities for the entire lifecycle of ancient books, from collation to development [3]. Currently, under the influence of digital humanities, intelligent protection and development of ancient books driven by digital intelligence technologies represent a new research trend. From a knowledge organization perspective, semantic web technologies such as ontology, linked data, knowledge graphs, and nanopublications have been gradually applied to ancient book knowledge organization. Some studies focus on specific domains, such as Cheng Xiufeng et al. [4], who constructed an ontology for "Song Dynasty Large Timber Construction Techniques" using traditional architectural ancient books and demonstrated its application value

through knowledge graphs. Zhang Weidong et al. [5] took *Jin Gui Yao Lue* as an example, structuring unstructured knowledge in traditional Chinese medicine ancient books through domain ontology and knowledge graph construction to achieve visual presentation. Gao Jinsong et al. [6] used *Sha Hu Zhi* as a case study, constructing a semantic knowledge association framework and knowledge graph to enable semantic organization and multi-dimensional knowledge discovery of historical materials in local gazetteers. Xie Wei et al. [7] took version images of *Tian Gong Kai Wu* as objects, achieving digital conversion and knowledge graph application of multi-version materials through ontology architecture and linked data construction. Other studies adopt a macro perspective on the ancient books domain, such as Ouyang Jian et al. [8], who achieved large-scale knowledge graph construction for Chinese dynastic extant classics through knowledge graph technology and human-machine collaboration. Chen Tao et al. [9] designed an interconnection framework for ancient book resources driven by semantic technology, verifying its rationality and feasibility in tablet inscription resources. Wang Xiaoguang et al. [10] utilized semantic technologies like ontology and nanopublications for knowledge representation and semantic modeling of ancient book annotation texts, revealing semantic relationships and enabling semantic publication and reconstruction of annotated literature.

As an important component of Chinese classical literature, disaster famine literature is widely distributed across various document types but lacks systematic and holistic characteristics, presenting a discrete distribution pattern. Research in this field traditionally belongs to the intersection of historical philology and disaster history. In this regard, Mr. Deng Yunte's *A History of Famine Relief in China* stands as an early representative monograph, systematically reviewing the development of famine relief and disaster governance in China over thousands of years from a general history perspective, revealing the complete picture of Chinese famine relief thought [2]. Since the 1980s, numerous excellent monographs on disaster historical materials have emerged, including *Historical Data on Catastrophic Tides in China*, *Tables of Natural and Man-made Disasters in Chinese Dynasties*, *Chronological Tables of Major Natural Disasters and Anomalies in Ancient China*, *Historical Materials on Agricultural Natural Disasters in China*, *Compendium of Meteorological Disasters in China*, *Preliminary Compilation of Republican Era Famine Relief Materials*, and *Integration of Chinese Famine Governance Books*. Despite scholars' extensive work in collating and researching disaster historical materials, these efforts remain insufficient compared to the rich historical materials accumulated in Chinese civilization. Research papers on disaster literature approach the topic from different perspectives: some focus on specific texts or ideas, such as Ma Mengxue's [11] study on famine relief texts in *Integration of Chinese Famine Governance Books* and Li Zhenzhen's [12] examination of famine governance thought in the mid-to-late Ming Dynasty. Others adopt a macro perspective using bibliographic approaches, such as Li Qin's [13] investigation of classical literature and catalogs, and Ji Xu's [14] discussion of systematic classification and evolutionary changes in historical disaster literature.

In summary, existing research on ancient book knowledge organization has deconstructed, reorganized, and associated intrinsic historical and cultural knowledge from various perspectives. However, most studies focus primarily on "objects," "people," or "spatiotemporal" dimensions, with less attention paid to "event" elements within ancient books. This study takes ancient disaster famine literature as its research object. Its structural characteristics determine that it contains rich disaster "event" elements, while the field has yet to see significant digital humanities intervention. Conducting knowledge organization research to promote the development and utilization of its historical knowledge in the new era can advance ancient disaster history research, and the convenience of knowledge graphs can lower utilization barriers, facilitating transformation from specialized research to public education.

2 Design and Construction of Ancient Disaster Famine Literature Knowledge Ontology Model

Ontology, as an "explicit specification of conceptualization" [15], represents one of the most widely applied forms of semantic knowledge organization and serves as an efficient semantic knowledge modeling tool [16]. Based on the "Six Arts Method" [17], this study designs and constructs the ancient disaster famine literature knowledge ontology model across six dimensions.

2.1 Scenario—Conceptual Analysis and Category Definition of Ancient Disaster Famine Literature

Scenario analysis forms the foundation of ontology model construction, and clarifying the scenario is the prerequisite for domain ontology model development. This study accomplishes scenario clarification primarily through the analysis and definition of core concepts related to ancient disaster famine literature. In traditional research, only classical philology and disaster history fields typically address ancient disaster famine literature, resulting in relatively complex conceptual definitions without unified consensus. Broadly speaking, any ancient document recording disaster-related information qualifies as ancient disaster famine literature, measured at the character/sentence level. Narrowly defined, ancient disaster famine literature uses individual pieces/sections as the basic unit. Considering China's vast number of ancient books, collating literature at the broad definition level is practically impossible. Therefore, this study adopts a narrow perspective, defining the minimum granularity of ancient disaster famine literature at the piece/section level. After defining the extension of the global concept, further classification of its intensional categories is necessary based on different literature structural characteristics. This study primarily references Ji Xu's "Four Systems Theory," dividing ancient disaster famine literature into four types: disaster chronicles, famine relief books, disaster mitigation books, and disaster literature in collected works [14]. The specific category structure is shown in [Figure 1: see original paper].

2.2 Reuse—Existing Ontology Reuse

In the dimension of ontology reuse, the focus involves systematically reviewing properties of existing conceptual frameworks to identify and adopt elements that align with classes and their attributes defined within specific domains. Ontology reuse helps reduce overall construction costs and minimize repetitive tasks. Furthermore, when researchers define common entities according to unified standards and specifications, it significantly enhances ontology reliability and cross-system portability. Specifically, at the operational level of reuse, this study primarily reuses general ontologies including DC, FOAF, Time, Geo, and the Shanghai Library Ontology Model (SHL). To meet the special needs of the disaster famine literature domain, a proprietary Disaster Famine Literature vocabulary (abbreviated as DFL) was created as a supplement.

2.3 Things—Class and Hierarchy Structure Definition

Things manifest as concrete conceptual elements of entities in ontology, referred to as classes. Classes and their hierarchical structures constitute the basic conceptual framework of the ontology model. Based on a clarified scenario, classes are defined considering not only basic concepts but also social subjects, spatiotemporal dimensions, historical sources, events, and other elements. Seven first-level entity classes are established: DisasterLiterature (DFL: DisasterLiterature), DisasterType (DFL: DisasterType), DisasterEvent (DFL: DisasterEvent), Person (FOAF: Person), Space (GEO: SpatialThing), Time (TIME: TemporalEntity), and Sources (DFL: Sources). Further subdivision through subclasses is implemented for each entity type. For example, DisasterLiterature contains four subclasses: DisasterMitigationBook (DFL: DisasterMitigationBook), RescueBook (DFL: RescueBook), DisasterChronicle (DFL: DisasterChronicle), and CollectionDisasterLiterature (DFL: CollectionDisasterLiterature). The specific disaster literature ontology classes and their hierarchical relationships are shown in [Figure 2: see original paper].

From the perspective of proprietary classes in the disaster literature ontology, DisasterLiterature serves as the core object element, with all other entity elements being related to it. DisasterType primarily characterizes disaster types recorded in specific disaster literature, associating mainly with DisasterLiterature and DisasterEvent. Considering the graph structure characteristics of knowledge graphs, it is defined as a class entity rather than an attribute to facilitate visual presentation. DisasterEvent represents specific disaster events recorded in disaster literature, typically involving where, when, what type, and what location, thus associating with DisasterLiterature, Time, Location, and DisasterType. The specific definition and description of DisasterEvent constitute an important distinguishing feature of this study from other classical literature knowledge organization research. Since the minimum granularity of disaster literature is at the piece/section level, many disaster literature pieces originate from larger literature categories. The higher-level extension of disaster literature does not belong to disaster literature itself; therefore, Sources is used

to represent the parent literature of disaster literature to ensure the integrity and compliance of historical material resources.

From the perspective of general classes, Person is the subject in disaster literature. On one hand, as authors, they influence and constrain the formation of disaster literature through their social identities. On the other hand, as participants, they constitute content components of disaster literature. Considering that persons, as social activity subjects, are inevitably constrained by spatiotemporal dimensions, they associate with DisasterLiterature, Space, Time, and Sources. Space and Time entity instances are generated dependently based on entities such as DisasterLiterature, DisasterEvent, Person, and Sources, forming spatiotemporal elements of these entities. Space includes two subclasses: Region (SHL: Region) and Place (SHL: Place), describing "area" and "point" characteristics of physical space. Time includes two subclasses: Instant (TIME: Instant) and Interval (TIME: Interval), describing "point" and "line" characteristics of temporal existence. Considering the cultural characteristics of ancient Chinese temporal descriptions, Interval is further subdivided into Reign (SHL: Reign), Dynasty (SHL: Dynasty), and ProperInterval (TIME: ProperInterval).

2.4 Relations and Constraints—Attribute Vocabulary Definition

Relations in ontology manifest as object properties and data properties. The concept of constraints is concretized through property domains and ranges to 刻画 (portray) the intension and extension of relations. Regarding object properties, both their domains and ranges are classes. Data properties have classes as domains and specific data types as ranges. This study focuses on associations between entity classes in disaster literature ontology construction. Object properties play a key role, possessing vector characteristics capable of expressing one-to-many or many-to-one relationships between objects. For example, in the disaster literature ontology, the recordDisasterEvent (DFL: recordDisasterEvent) relationship between DisasterLiterature and DisasterEvent, the subordinate (DFL: subordinate) relationship between DisasterLiterature and Sources, and the creatorOf (SHL: creatorOf), creator (DC: creator), and releventPerson (DFL: releventPerson) relationships between DisasterLiterature and Person all represent concrete manifestations of object properties. The study establishes 21 object properties, as shown in . Inherent characteristics of entities constitute data properties. By defining data properties, this study comprehensively describes intrinsic attributes of ancient disaster literature concepts. Specifically, 21 data properties are designed, as shown in , including general properties such as title (DC: title) and description (DC: description). To facilitate subsequent knowledge graph construction in graph databases and entity retrieval, the domains of these data properties are set as the top-level entity (OWL: Thing), representing attributes shared by all classes within the ontology.

2.5 Evaluation—Model Assessment and Presentation

Evaluation is primarily achieved through ontology model assessment and concrete construction demonstration. This study uses the Protégé tool for concrete engineering modeling of the ontology. The built-in reasoner in Protégé is employed to evaluate and verify the ancient disaster famine literature knowledge ontology model [18]. Verification results show no mutually exclusive relationships among elements within the ontology, complying with ontology construction standards. The final ancient disaster famine literature knowledge ontology model is shown in [Figure 3: see original paper], which completes knowledge description of ancient disaster famine literature at the schema level, clarifies the conceptual system, and provides reliable knowledge representation specifications for knowledge graph construction.

3 Case Study: Construction of Ancient Disaster Famine Literature Knowledge Graph

3.1 Case Selection and Data Collection

This study's case selection references the cataloging data from Ji Xu's *Research on Ancient Chinese Disaster Famine Literature* [14], extending its data scope to compile authoritative historical materials including official histories, comprehensive treatises, institutional histories, local gazetteers, agricultural books, and collected works literature, ensuring accuracy and completeness. A total of 582 disaster literature entries from the Han to Qing dynasties were collected. Detailed person data primarily originates from the National Library's historical figure database and Shanghai Library's name authority files, verified against *Chronological Tables of Birth and Death of Chinese Historical Figures* and other sources, yielding 589 person entries. Spatial data was verified against *Historical Atlas of China* based on spatial information in the literature. Temporal data primarily references the Chinese historical chronology compiled by Shanghai Library. Through manual data collection and verification, the final dataset was saved in structured CSV format files, providing a reliable data foundation for this case study.

3.2 Knowledge Annotation and Fusion

After in-depth collection and analysis of ancient disaster famine literature, disaster events, disaster types, and related spatiotemporal information remain in unstructured text form. To semantically annotate this unstructured text, an ontology model-based approach was adopted to construct semantic tags and build abstract concepts and instances according to ontology classes and property relationships. This study primarily uses the MARKUS [19] ancient text annotation platform for knowledge annotation work. After annotation, entity annotation data was exported as structured CSV data. Notably, due to different contexts and expression methods, entity and relation ambiguities may occur during annotation. To handle these ambiguities, synonym dictionaries were constructed

to align various entities, preserving primary appellations for ambiguous entities. Additionally, unique ID identifiers were assigned to each entity to resolve issues of entities with identical names.

3.3 Knowledge Mapping and Storage

After knowledge fusion, structured data was imported into the ontology by establishing rules in Protégé, completing knowledge mapping from CSV format to RDF format data. For knowledge storage, Neo4j graph database serves as the storage medium, featuring graph-pattern knowledge storage that forms graph-based knowledge structures through node and edge associations [20]. This study primarily uses the Neosemantics (n10s) plugin to import RDF data into Neo4j, ensuring complete migration of ontology models and instance data into Neo4j. This process not only provides a new method for disaster literature knowledge storage but also further promotes ontology application in the disaster literature domain.

3.4 Knowledge Graph Visualization

In knowledge graphs, the "node-edge-node" triple constitutes the core of knowledge structure, providing a comprehensive method to grasp knowledge contexts within the ancient disaster famine literature domain. Through visualization of the ancient disaster famine literature knowledge graph, entity data related to disaster literature, disaster events, disaster types, persons, spatiotemporal dimensions, and source literature form knowledge networks, enabling mining and extraction of implicit knowledge embedded in disaster literature and empowering knowledge discovery. This transforms static, flat knowledge into three-dimensional, dynamic knowledge association networks, ultimately promoting efficient utilization of ancient disaster famine literature from the supply side. For example, the visualization centered on the collected disaster literature piece "Wu Yue Da Han" (Great Drought in Wu and Yue) from *Su Xueshi Ji*, Volume 2, as shown in [Figure 4: see original paper], clearly displays its associated disaster event "Kangding Yuan Nian Wu Yue Da Han" (Great Drought in Wu and Yue in the First Year of Kangding), records the disaster type as "drought," and identifies the author as Su Shunqin from the Northern Song Dynasty. This intuitive knowledge graph presentation effectively demonstrates the richness and depth of related knowledge.

4 Application Scenarios of Ancient Disaster Famine Literature Knowledge Graph

4.1 Scenario 1: Explicit Knowledge Query in Ancient Disaster Famine Literature

Explicit knowledge query is an explicit information retrieval method based on existing knowledge. Through clearly specified query conditions and parameters,

information matching the query conditions can be obtained from existing knowledge bases. In ancient disaster famine literature research, explicit knowledge query enables rapid and accurate acquisition of required explicit information. Compared to implicit knowledge discovery, explicit knowledge query is easier to conduct and understand, suitable for scenarios requiring explicit query conditions and specific knowledge acquisition. In this study, explicit knowledge query relies on the pre-constructed knowledge graph structure and relationships. Using Cypher language to query nodes and relationships in the knowledge graph enables accurate retrieval of ancient disaster famine literature knowledge. Compared to traditional structured query languages, Cypher language is more user-friendly and easier to understand, employing natural language-like syntax that allows researchers to conduct knowledge retrieval without familiarity with complex query statements.

In ancient disaster famine literature research, explicit knowledge query can retrieve literature related to specific disaster events, disaster types, regions, and time periods. By specifying relevant query conditions, matching literature information can be obtained from the database for further in-depth research on disaster causes, response measures, impacts, and other aspects. For example, using the retrieval of Qing Dynasty pest control mitigation books as a case, this study directly presents relevant information through Cypher language, as shown in [Figure 5: see original paper]. The findings reveal that such books primarily focus on locust control, with authors mostly being local officials or those with local administrative experience. This phenomenon closely relates to the characteristics of locust plagues, which are sudden, highly destructive, and rapidly spreading, causing extensive damage that can result in "all vegetation, or even cattle hair and banners, being consumed within thousands of miles" [21].

4.2 Scenario 2: Implicit Knowledge Discovery in Ancient Disaster Famine Literature

Implicit knowledge discovery analyzes and mines potential patterns, regularities, and associations hidden in data to reveal previously undetected knowledge and information. Unlike explicit knowledge query, implicit knowledge discovery does not require explicitly specified query conditions and parameters but instead discovers hidden knowledge through comprehensive data analysis and mining. In ancient disaster famine literature research, implicit knowledge discovery can help reveal hidden knowledge in ancient society's disaster response and relief measures.

4.2.1 Macro-level External Knowledge Association Analysis In implicit knowledge discovery for ancient disaster famine literature, macro-level external knowledge association analysis reveals the overall background and correlations of ancient disaster relief through statistical analysis of knowledge in the literature. Taking famine relief books as an example, macro-level external

knowledge association analysis can discover different regions' contributions and importance in relief work by analyzing geographical information in ancient disaster literature, further exploring how regional factors influenced ancient disaster relief. By analyzing authors' identity backgrounds and official experiences, the role and influence of local officials in ancient disaster relief and their association with famine relief books can be revealed. Since most famine relief book authors lived during the Ming and Qing dynasties, knowledge expansion based on Ming-Qing famine relief books forms a "dynasty-famine relief book-person-location" knowledge discovery chain, as shown in [Figure 6: see original paper]. Based on statistical analysis of birthplace data attributes of author entities, among 40 famine relief book authors with clear birthplace records from the Ming and Qing periods, 31 authors came from East China regions including Zhejiang, Jiangsu, Shanghai, Jiangxi, Shandong, and Fujian. During the Ming and Qing dynasties, as the core region of national economic development, East China bore substantial national fiscal revenue. Meanwhile, economically developed areas often suffered more severe losses during disasters, making disaster prevention and relief particularly important in East China. Additionally, through analysis of authors' personal experience data attributes, most famine relief book authors had official experience, with some having served as local officials or possessing local administrative backgrounds. Local officials typically stood at the frontline of disaster response. For instance, Liu Shijiao recorded a relief operation in the 37th year of the Wanli reign in *Huang Zhu Lue*, involving joint efforts of local officials and scholar-officials, demonstrating the important role of officials in disaster relief work.

4.2.2 Micro-level Internal Knowledge Evidence-based Analysis Micro-level internal knowledge evidence-based analysis examines specific events, details, and associations within ancient disaster famine literature through fine-grained internal knowledge, forming knowledge support and arguments for problems or contexts through analysis and reasoning. As the concretization of internal knowledge in ancient disaster famine literature, evidence-based analysis of disaster events enables finer-grained hidden knowledge discovery. As shown in [Figure 7: see original paper], the knowledge association display for Sui Dynasty Henan disaster events is presented. The 11 disaster events in Sui Dynasty Henan were distributed across 10 years under 3 reign periods of Emperor Wen and Emperor Yang, primarily involving four natural disaster types: flood, drought, earthquake, and epidemic, with floods occurring most frequently (8 times). Historical sources mainly consist of two types of orthodox historical literature: *Zizhi Tongjian* and *Book of Sui*. Taking Tang Dynasty Henan epidemic events as the core for knowledge discovery analysis, as shown in [Figure 8: see original paper], Henan experienced 9 epidemic events during the Tang Dynasty. Temporally, epidemics occurred slightly more frequently in the late Tang period than in the early period, with summer seeing more occurrences than other seasons. The knowledge graph further reveals a significant correlation between epidemics and flood/drought disasters, corroborating experts' assertions about

the correlation between Tang Dynasty epidemics and natural disasters [22]. The reason flood and drought disasters triggered epidemics relates to post-disaster famine weakening people's physical condition, making them more vulnerable to viral invasion. Through micro-level internal knowledge evidence-based analysis, detailed information in ancient disaster famine literature can be deeply mined to reveal associations and patterns between events. In this application scenario, users can gain more comprehensive understanding of ancient disaster occurrence mechanisms, influencing factors, and interactions with other factors. Simultaneously, through reasoning and association of details, academic support for ancient disaster famine literature research can be formed, providing a solid foundation for related research and decision-making.

5 Conclusion

This study takes ancient disaster famine literature as its research object, 立足于 (grounded in) the digital humanities context, combining bibliographic perspectives to standardize domain knowledge modeling based on ontology technology. Building on this foundation, knowledge graph construction was implemented at the empirical level, and scenario-based applications completed explicit knowledge query and implicit knowledge discovery research within the ancient disaster famine literature domain. The injection of digital humanities methods provides, to a certain extent, knowledge organization approaches for traditional ancient disaster famine literature research in the digital intelligence era.

From the perspective of ancient disaster famine literature, this study serves two purposes. First, it clarifies and establishes the conceptual system of ancient disaster famine literature knowledge. Ancient disaster famine literature has always been characterized by diverse types and inconsistent structures, with various conceptual systems that defy unified consensus. Ontology, through establishing domain knowledge rules and systems, helps promote standardized development of its conceptual system. Second, it promotes the utilization of ancient disaster famine literature. This research provides more convenient application products for scholars and enthusiasts of ancient disaster history research. The efficiency of knowledge graph queries helps disaster history researchers obtain required knowledge faster, more comprehensively, and more accurately without repeatedly consulting massive amounts of ancient books. From the digital humanities perspective, this study breaks through the limitations of existing ancient book knowledge organization research that primarily focuses on "objects," "people," and "spatiotemporal" dimensions while paying less attention to "event" elements. It fully considers the "event" elements contained in ancient disaster famine literature and the causal relationships between multiple types of knowledge elements. Simultaneously, expanding research domains necessarily requires strengthening both the depth of digital technology and humanities method integration and the breadth of research objects. This study's focus on ancient disaster famine literature also provides case-based references for "breaking barriers" in communication between classical philology, bibliography, and digital

humanities.

The limitations of this study lie in its case-based approach to data collection and knowledge graph construction for ancient disaster famine literature, enabling only localized "small but refined" knowledge organization and discovery research. Future work will consider introducing automated knowledge extraction methods to achieve "large but comprehensive" macro-level knowledge organization and application research. Additionally, setting the minimum granularity of ancient disaster famine literature at the piece/section level makes it difficult to include historical materials from remote periods like the pre-Qin era. Considering their relatively small number, future work may adopt character/sentence-level granularity for separate ontology category definition and data collection for classical corpus materials.

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Note: Figure translations are in progress. See original paper for figures.