

Status and Trends of Research on China's Machine Translation— CiteSpace-Based Visual Bibliometric Analysis (2020–2025)

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Article Detail:	Abstract
Received: 19 June 2026; Received in revised form: 21 July 2026; Accepted: 25 July 2026; Available online: 29 July 2026 Keywords— CiteSpace, Machine Translation, Knowledge Mapping ©2026 The Author(s). Published by International Journal of English Language, Education and Literature Studies (IJEEL). This is an open access article under the CC BY license (https://creativecommons.org/licenses/by/4.0/).	Machine translation is a language processing technology and cross-lingual intelligent task, which adopts computer algorithms and artificial intelligence to automatically transform text between different natural languages without manual sentence-by-sentence participation. In recent years, machine translation has been increasingly widely applied in translation practice, and relevant research has gradually become a popular academic hotspot. As a typical representative intelligent technological application in the fields of artificial intelligence and language services in China, machine translation is of vital importance to grasping the developmental context and evolutionary pattern of China's artificial intelligence industry and language service sector. From the perspective of development trends, machine translation research is expected to remain a cutting-edge topic in translation studies. Based on 497 research papers published in CNKI during the research period, this paper adopts the CiteSpace information visualization software. From five dimensions including authors, research institutions, burst keywords, keyword relevance and timeline, it focuses on research hotspots and development trends, conducts a systematic analysis of domestic literature in the field of machine translation in China, and summarizes the research focuses and frontier trends in this domain. Using CiteSpace as the visualization analysis tool, this study finds that domestic machine translation research from 2020 to 2025 presents the following characteristics: it is led by core authors yet lacks adequate team collaboration; foreign language universities and top research institutions occupy a dominant position, and regional features have formed distinctive research clusters. The main research line remains stable, the research on human-machine relationship keeps advancing, and interdisciplinary features are becoming increasingly

prominent. Research hotspots have been upgraded in technology, application scenarios and translation quality, forming a research pattern featuring the linkage of technology, process and data as well as the in-depth integration of industry, academia and research. Meanwhile, this study also predicts the potential development trends of machine translation in such directions as intelligent human-machine collaborative translation, multimodal translation, and the application of large language model-based translation.

I. INTRODUCTION

With the deepening of global exchanges and the explosive growth of cross-lingual information, traditional human translation is constrained by low efficiency and high cost, making it difficult to meet the demand for large-scale data processing. Meanwhile, the rapid advancement of computer technology, artificial intelligence and deep learning, together with the continuous accumulation of big data corpus resources, has provided solid technical support and data foundation for machine translation (Xiao, 2018). Against this backdrop, machine translation has emerged and maintained rapid development. Machine translation is an important product of the integration of artificial intelligence and language services. It can break down language barriers and facilitate international exchanges and cross-cultural communication, while greatly improving translation efficiency, reducing costs, and meeting the demand for real-time processing of massive texts (Wang, Chen, 2021). Furthermore, it promotes the interdisciplinary development of linguistics and computer science. Widely applied in foreign trade, cultural tourism, education and scientific research, government affairs and foreign affairs, it plays a vital supporting role in the digitalization and intelligent development of language services (Cui, 2021). However, there is still a lack of systematic and comprehensive bibliometric analysis on the academic literature of machine translation in current academic circles.

This paper aims to address two research questions: (1) What is the research status of machine translation in CNKI literature? (2) What are the emerging trends and potential future research

directions of machine translation research in China? Adopting bibliometric methods such as high-frequency authors, high-frequency institutions and burst keywords, this study explores research hotspots and development trends, and systematically presents the knowledge mapping of machine translation research from 2020 to 2025, hoping to provide valuable references for domestic research on machine translation.

II. DATA SOURCES AND ANALYTICAL TOOLS

Data Sources

Since this study aims to examine the recent status of domestic machine translation research, the time frame is set from January 1, 2020, to October 12, 2025, and the data retrieval was conducted on October 12, 2025. Papers with co-occurring keywords of "machine translation" were retrieved from the SSCI and CSSCI databases. The rationale for selecting "machine translation" as the search keyword is that it is a standard and universally accepted term in this field. It fully covers the research scope of this paper, including professional text translation, cognitive translation mechanisms and translation error analysis, and accurately matches relevant research findings. Meanwhile, it facilitates subsequent bibliometric analyses such as author collaboration and research trends, ensuring complete search samples and valid analytical results. Taking machine translation as the search word, this paper conducts an advanced search on CNKI, with the literature type limited to journal papers and the time span ranging from 2020 to October 12, 2025. After literature export, low-relevance papers such as conference articles

were eliminated, and only highly relevant literature was retained. Finally, a total of 497 valid papers were screened out for analysis. Founded in June 1999 and initiated by Tsinghua University and Tsinghua Tongfang, CNKI is a national knowledge information infrastructure. As China's largest integrated academic literature database platform with the most complete resource types, it serves as a comprehensive knowledge service system covering the whole life cycle of academic research. It contains more than 90% of domestic knowledge and information resources and has formed a massive literature resource pool of over 100 million articles.

Analytical Tools

The main statistical and analytical tool adopted in this study is CiteSpace 6.3.1. Developed by the research team led by Professor Chaomei Chen at Drexel University in the United States, CiteSpace 6.3.1 is a Java-based software for bibliometric analysis and literature visualization. It helps identify research hotspots and academic frontiers in a given discipline by analyzing high-frequency keywords and burst terms. As a core tool in the field of scientific knowledge mapping, it enables in-depth

mining and visual presentation of massive academic literature.

Knowledge Mapping Analysis of Machine Translation Based on CiteSpace High-Influence Authors

Authors with certain academic influence epitomize the scientific research activities in a specific disciplinary field (Li, 2014). Analyzing high-influence authors can not only accurately identify the core research forces and talent echelons within the field, but also explore the current status and existing deficiencies of cross-team and cross-institutional academic collaboration by examining the collaboration network of influential scholars. It provides a reliable reference for disciplinary development and resource allocation (Lu, Li, Zhou, 2025) . Meanwhile, it complements other analytical dimensions, enabling a more systematic interpretation and more objective conclusions regarding the research status of the field.

Figure 1 presents the collaborative network of active authors who published journal articles on machine translation from 2020 to October 12, 2025, comprising 157 author nodes and 30 collaborative links.

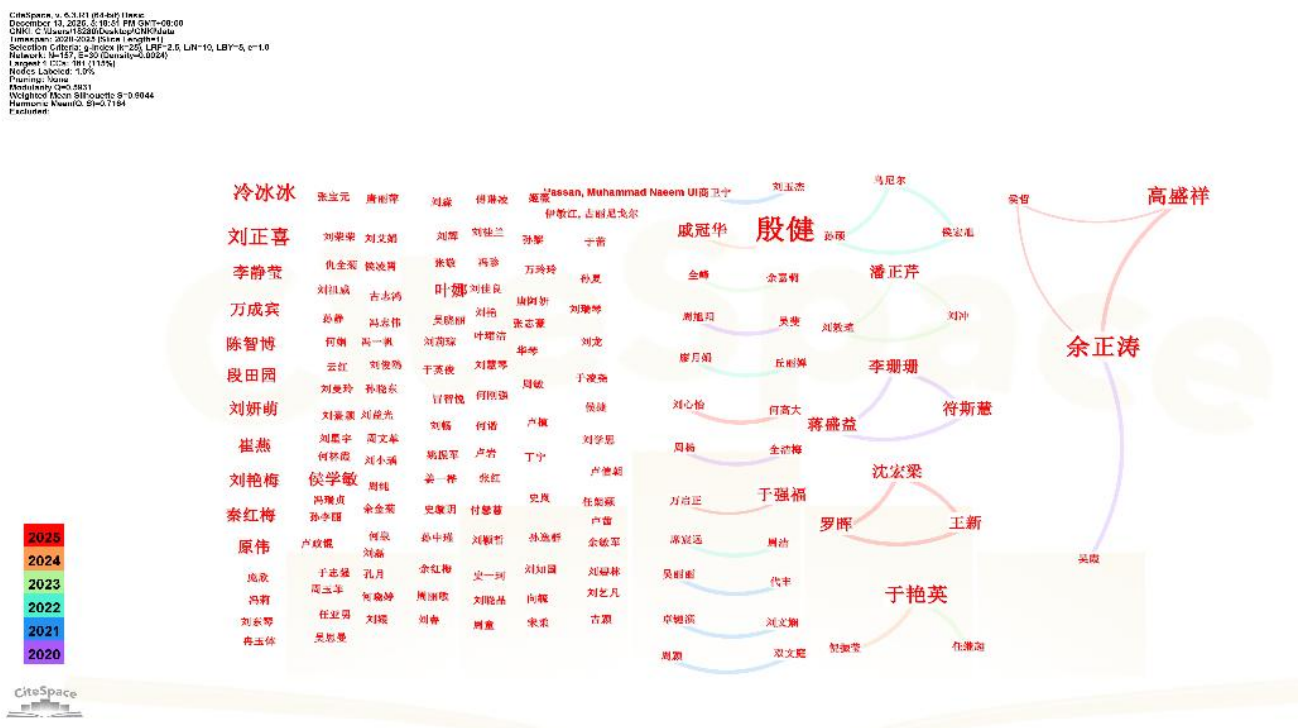


Fig.1. High-influence Author

Highly influential literature on domestic machine translation research is concentrated in 2025. In terms of network structure, several stable collaborative subgroups centered on scholars such as Yin Jian, Yu Zhengtao, Yu Yanying, and Ye Na have been formed, who constitute the core academic force driving the development of machine translation research. Nevertheless, cross-team and cross-institutional cooperation among these subgroups remains sparse. The research community is still dominated by small-scale independent research groups, with evident deficiencies in the depth and breadth of inter-institutional collaboration, indicating persistent barriers to academic cooperation. As Li and Chen (2017) pointed out in *CiteSpace: Text Mining and Visualization in Scientific Research*, small-group clustering is a common feature of academic collaborative networks, especially prevalent in technology-oriented disciplines, which is highly consistent with the emerging technical attributes of machine translation research.

From the perspective of temporal evolution, early core scholars, such as Leng Bingbing and Liu Zhengxi, laid a solid foundation for research in this field. They took the lead in introducing machine translation into college translation teaching scenarios and established a basic research framework for the integration of machine translation and translation education, providing theoretical support for the subsequent reform of translation technology teaching. Meanwhile, they pioneered the adoption of corpus-based and empirical textual research methods to explore machine translation quality assessment and practical applications, thereby establishing the mainstream research ideas and analytical paradigms in this field. Furthermore, their studies have refined core research topics including translation teaching, corpus application, and translation quality evaluation, improved the academic discourse system of domestic machine translation research, and laid a solid academic foundation for subsequent scholars to conduct in-depth and expanded research. However, obvious limitations remain: research perspectives tend to focus on macroscopic description, the

theoretical framework lacks localization adaptation, empirical methods are simplistic with small sample sizes, cross-institutional and cross-team collaboration is inadequate, research outcomes are poorly integrated with practical application, and forward-looking exploration into interdisciplinary integration and new technologies is insufficient. These issues undermine the reproducibility and universality of research findings, making it hard to fully address practical demands in complex scenarios (Jiang, 2022). In the middle research stage, the emergence of emerging scholars represented by Yu Yanying and Shen Hongliang has further diversified the research directions of machine translation. Yu Yanying has focused on machine translation research on specialized texts such as petrochemical and scientific English, systematically analyzing error types and redundancy problems in the translation of professional texts, and promoting the in-depth development of machine translation from general scenarios to vertical industries including energy and science and technology (Yu & Tong, 2021). Nevertheless, its research still has notable shortcomings. It mostly conducts case analysis relying on conventional translation software such as Youdao and Google, with limited research samples and simplistic comparison dimensions. Few studies incorporate cutting-edge large language model translation technologies like GPT, and no practical improvement strategies for translation optimization have been formulated. Accordingly, the research lacks practical application value and popularization potential (Deng & Zhang, 2026). From philosophical and cognitive perspectives, Shen Hongliang explored the essence of “comprehension” in machine translation and proposed that machines possess a unique language comprehension mechanism independent of human beings, which provides novel theoretical deliberations and cognitive perspectives for technological development (Shen, Wang, Luo, 2025). But Shen Hongliang's research lays excessive emphasis on philosophical speculation and conceptual deduction, lacking experimental verification based on large-scale empirical corpora

and mainstream translation models. The definition of "independent machine comprehension" remains overly macroscopic and abstract. It fails to conduct detailed analysis combining the actual operational mechanisms and limitations of large language models, nor establish a verifiable analytical framework for differences between human and machine comprehension. The theoretical construction is poorly connected with engineering practice and empirical data, offering limited guiding value for practical technological implementation (Dai & Huang, 2025). In recent years, core research teams led by Yin Jian and Yu Zhengtao have remained continuously active, demonstrating the strong sustainability and vigorous development momentum of machine translation research in China. Nevertheless, such sustainability is mainly reflected in in-depth explorations within individual core teams, while

collaborative innovation across different teams still has considerable room for improvement. This phenomenon is consistent with the general characteristic of domestic academic collaboration networks, where research cooperation is largely confined to fixed research groups (Guo, Li, Liu, 2025).

Publishing Institutions

The analysis of publishing institutions takes academic literature-producing institutions as the research object. Through quantitative and visual analysis from the dimensions of institutional cooperation network, geographical distribution and temporal evolution, it aims to reveal the pattern of research forces, cooperation modes and development context in a certain field. Figure 2 shows the knowledge mapping analysis of publishing institutions within the time span of this study.

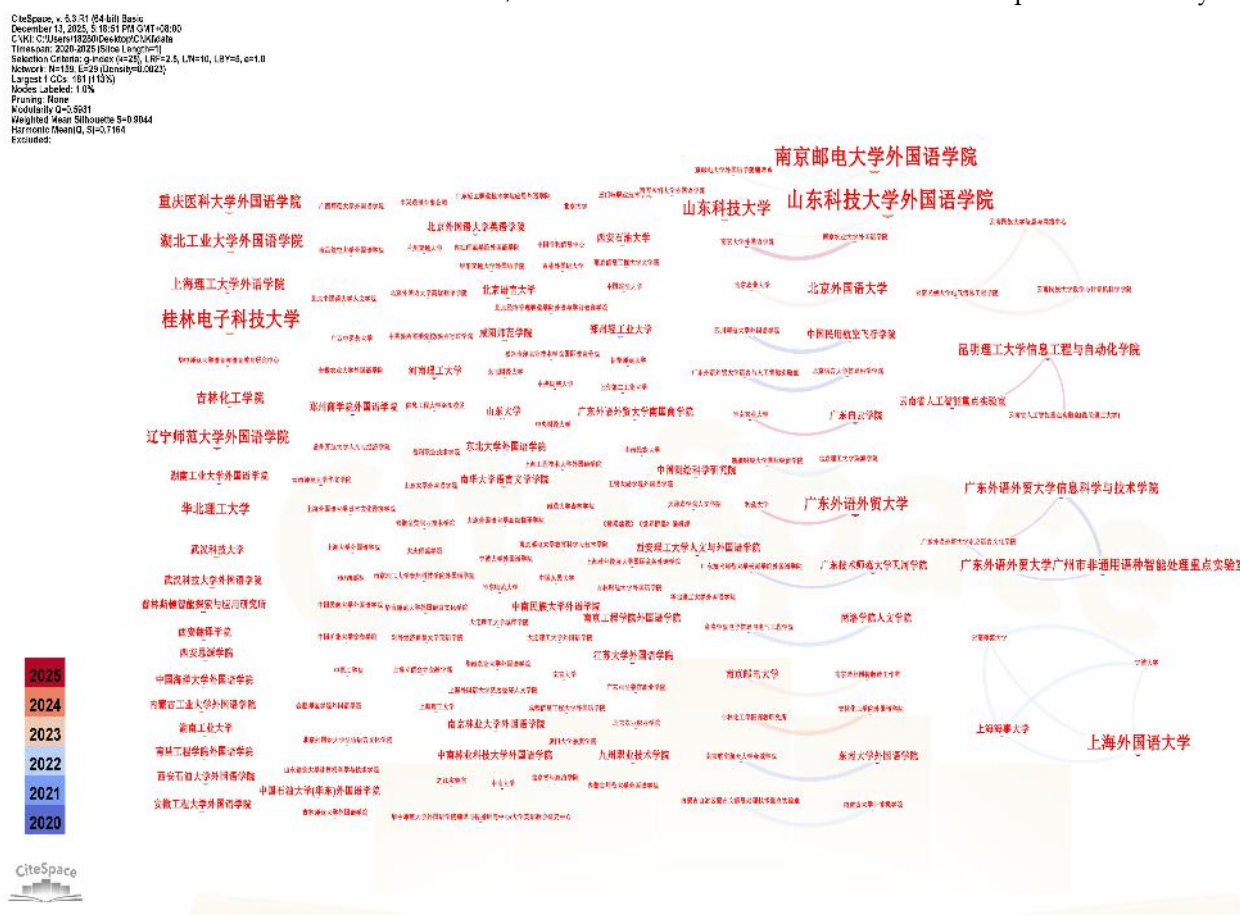


Fig.2. Publishing Institutions

Based on the visual analysis of the institutional cooperation network in the field of domestic machine

translation from 2020 to 2025 using CiteSpace, the network consists of 159 institutional nodes and 29

cooperation links. In terms of the spatial distribution of publishing institutions, research forces are mainly concentrated in foreign language universities, foreign language schools of comprehensive universities, and some science and engineering universities with technological advantages. Several cooperative subgroups have formed with the School of Foreign Languages of Nanjing University of Posts and Telecommunications, the School of Foreign Languages of Shandong University of Science and Technology, Guangdong University of Foreign Studies, and other institutions as the core. Among them, institutions such as the School of Foreign Languages of Nanjing University of Posts and Telecommunications and the School of Foreign Languages of Shandong University of Science and Technology occupy pivotal positions and serve as the core forces advancing research in this field. Renowned foreign language universities including Guangdong University of Foreign Studies and Shanghai International Studies University lead the theoretical and applied research directions by virtue of their profound disciplinary accumulation. In addition, technology-oriented institutions represented by the Faculty of Information Engineering and Automation of Kunming University of Science and Technology and the Yunnan Key Laboratory of Artificial Intelligence play a vital role in the technological research, development and industrial application of machine translation. The cooperation between prestigious foreign language universities, high-level science and engineering institutions, and key laboratories has further promoted the integrated development of linguistics and intelligent technology.

Although translation technology research has become a vital interdisciplinary domain integrating translation studies and artificial intelligence, prominent disciplinary barriers still exist in domestic relevant research (Wang & Liu, 2022). Despite certain inter-institutional cooperation and relatively close collaboration within individual institutional subgroups, cross-institutional and cross-regional partnerships remain insufficient. Accordingly, the

overall research layout presents characteristics of local agglomeration and scattered distribution nationwide. This phenomenon reflects that disciplinary and geographical barriers still prevail in domestic machine translation research. Academic cooperation is largely confined to institutions within the same university or adjacent regions, leaving considerable room for improvement in interdisciplinary and cross-regional collaborative research (Diao, 2017).

The number of enterprises mainly engaged in machine translation and artificial intelligence translation has risen to 1,545. With translation technology deeply intertwined with industrial demands, the industry is evolving into a collaborative ecosystem integrating language, technology and industry (Translators Association of China, 2025). As can be seen from Table 2, research clusters have gradually taken shape in regions such as Yunnan and Guangdong. A growing number of science and engineering universities, research laboratories and even translation enterprises have joined relevant research undertakings. It is indicated that domestic machine translation research is shifting from a single linguistic perspective toward the diversified integration of technology and industry. However, cross-institutional and cross-regional cooperation remains insufficient and requires further enhancement, so as to boost the overall development of research in this field

Keywords

Word frequency analysis is a classic bibliometric approach that identifies research hotspots and frontier trends in a specific discipline by counting the occurrence frequency of keywords in academic literature (Li, 2014). As highly condensed representations of the core content of academic papers, keywords can be analyzed to effectively capture the mainstream research themes and hot topics in a given research field. CiteSpace can automatically extract keyword fields from literature data, unify synonymous terms and filter stop words. On this basis, the software conducts frequency statistics on standardized keywords to screen out

high-frequency terms. Taking high-frequency keywords as network nodes and the co-occurrence of keywords in the same literature as connecting edges, it constructs a keyword co-occurrence network and intuitively visualizes the distribution and internal correlation of core research keywords through scientific mapping. Meanwhile, the embedded clustering algorithm classifies closely associated keywords into distinct thematic clusters and presents the evolutionary trajectories of research topics via

timeline visualization. In addition, CiteSpace is capable of detecting burst keywords with a sharp surge in occurrence frequency within a specific time period, which generally indicate emerging research frontiers and developmental trends in the disciplinary domain (Li & Chen, 2017).

Figure 3 illustrates the high-frequency keyword co-occurrence network of machine translation research within the research period, generated via CiteSpace.

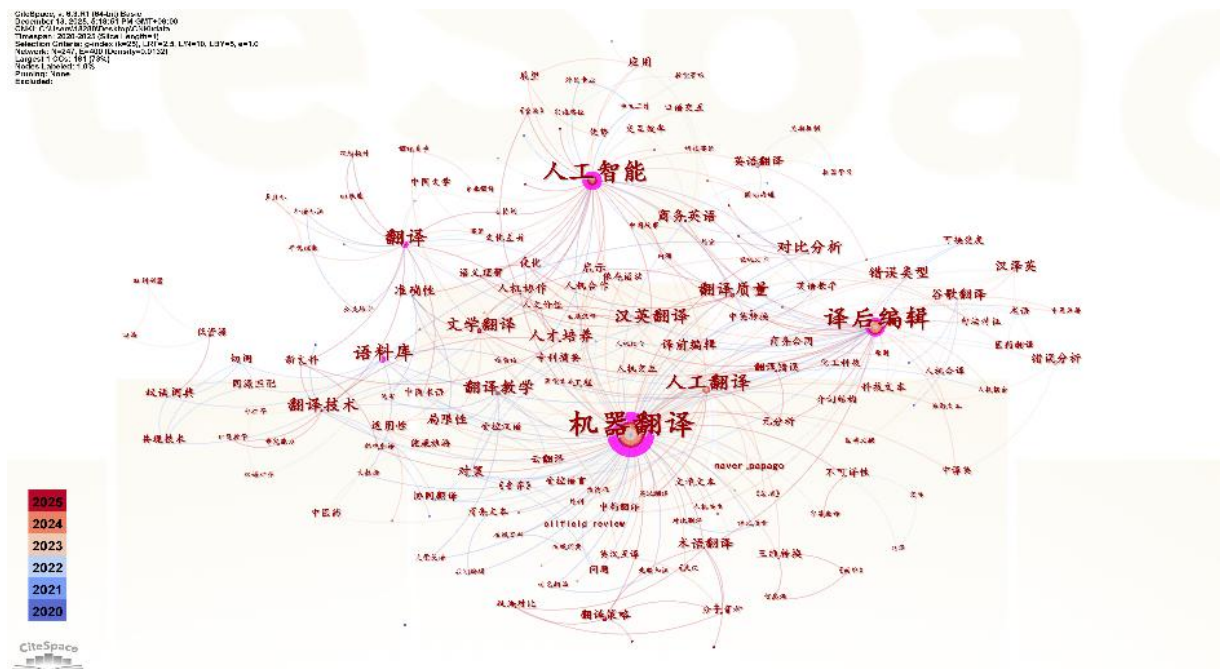


Fig.3. Keyword Co-occurrence Network

The network comprises 247 nodes and 400 co-occurrence links. In terms of core nodal distribution, keywords including machine translation, artificial intelligence, post-editing, Chinese-English translation, and translation technology occupy the dominant positions in the mapping with the largest node sizes, representing the predominant research hotspots in this field (Hu & Wang, 2024). Among these terms, machine translation constitutes the largest node and serves as the central hub of the entire network, maintaining close co-occurrence associations with artificial intelligence, translation technology, post-editing and other core keywords.

This demonstrates that contemporary domestic machine translation research is deeply integrated with artificial intelligence technologies, focuses on the translation practice of the core Chinese-English language pair, and attaches great importance to the essential role of post-editing in optimizing translation quality (Wang, 2022).

Based on the keyword clustering map of machine translation research generated by CiteSpace, this study compiles Table 1 to systematically sort out the research hotspots and thematic focuses within each cluster.

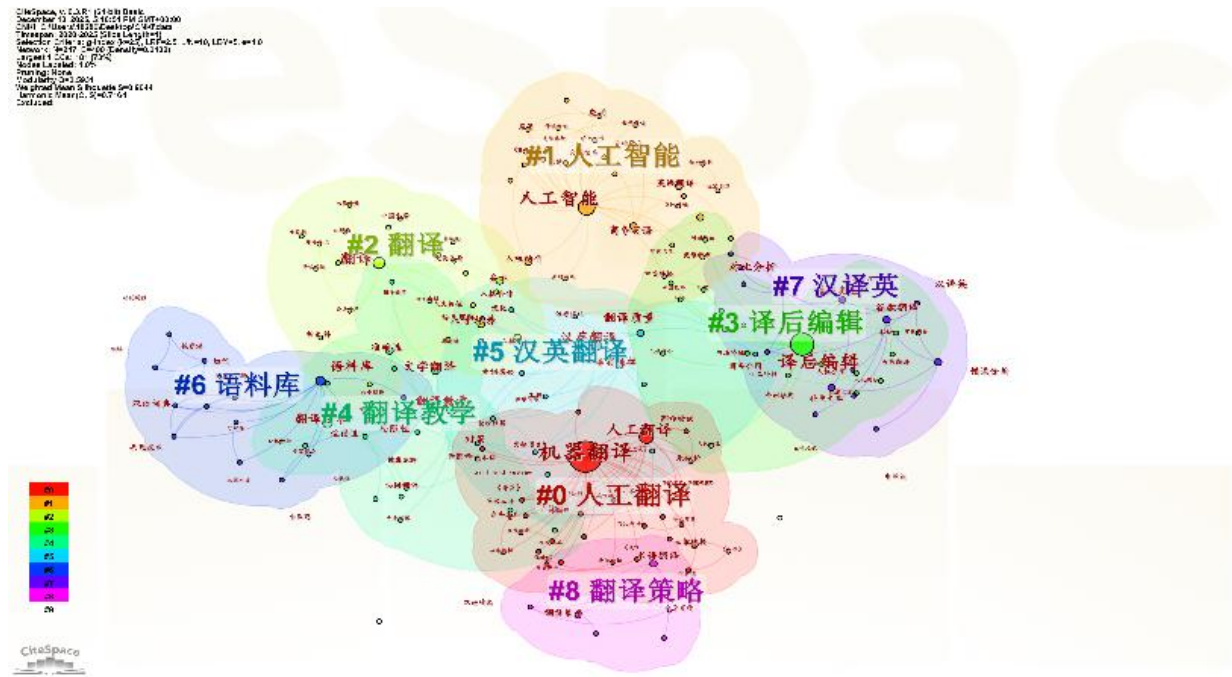


Fig.4. Keyword Cluster

Table 1. Keywords cluster

序号	Cluster Term	Related Cluster Term
# 0	Human Translation	Machine Translation, Human Translation, Medical Literature, Terminology Translation
# 1	Artificial Intelligence	Artificial Intelligence, Business English, English Translation, Machine Learning, Interaction Efficiency
# 2	Translation	Translation, Literary Translation, Semantic Comprehension, Talent Cultivation, Accuracy
# 3	Post-editing	Post-editing, Error Type, Comparative Analysis, Medical Translation, Scientific and Technical Texts
# 4	Translation Teaching	Translation Teaching, Limitations, Applicability, College English, Online Dictionaries
# 5	Chinese-English Translation	Chinese-English Translation, Translation Quality, Human-Machine Collaboration, Pre-editing, Chinese-English Conversion
# 6	Corpus	Corpus, Low-resource, Bilingual Dictionary, Homology Matching
# 7	Chinese-English Translation	Chinese-English Translation, Error Analysis, Traditional Chinese Medical Classics, Terminology, Syntactic Features
# 8	Translation Strategy	Translation Strategy, Bilingual Contrast, Molecular Breeding, Place Name Translation

As shown in Table 1, machine translation research generates eight distinct clusters with different thematic terms, which can be broadly categorized into three types: technology-driven research, applied practice research, and educational

integration research. The technology-driven category centers on artificial intelligence, machine translation, and machine learning, focusing on the integration of translation research and intelligent technologies. The applied practice category takes Chinese-English

translation, post-editing, and translation quality as core themes and explores the extension of theoretical findings to practical application scenarios. The educational integration category revolves around college English, translation teaching, and talent cultivation, concentrating on the in-depth integration of machine translation technology and foreign language education.

Burst keywords refer to terms whose usage frequency suddenly increases or newly emerges within a short period (Li, 2014). They serve as a powerful tool for analyzing cutting-edge areas and

developmental trends in a given discipline. Unlike conventional high-frequency keywords, burst keywords, by virtue of their dynamic characteristics, can more accurately reflect the research frontiers of a field. Based on the 497 valid articles selected for this study, keyword burst detection was conducted using CiteSpace.

As shown in Figure 5, there are 14 burst keywords in machine translation research, which allow us to clearly trace the research frontiers and development trajectory of the field during this period.

Top 14 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2020 - 2025
翻译教学	2020	2.01	2020	2021	
翻译技术	2020	2.01	2020	2021	
语料库	2020	1.35	2020	2021	
准确性	2020	1.21	2020	2021	
局限性	2020	0.73	2020	2021	
人机交互	2020	0.52	2020	2021	
人机翻译	2021	1.16	2021	2022	
专利摘要	2021	0.92	2021	2022	
启示	2021	0.22	2021	2022	
译前编辑	2023	1.24	2023	2025	
科技文本	2023	1.24	2023	2025	
错误类型	2023	1.24	2023	2025	
专业翻译	2023	0.49	2023	2025	
中译英	2023	0.49	2023	2025	

Fig.5. Burst Keywords

According to the burst keyword mapping generated by CiteSpace, *translation teaching* and *translation technology* show the highest burst strength of 2.01, starting as early as 2020. This phenomenon may result from the combined effects of the field's development stage, disciplinary transformation, and social demands. At that time, machine translation technology entered a period of widespread application with significantly reduced technical barriers. Coupled with the large-scale promotion of online teaching amid the COVID-19 pandemic, both *translation technology* and *translation teaching* quickly became focal points in academic circles (Xun, Xiang,

2020). Meanwhile, translation studies was accelerating its paradigm shift from traditional linguistic research to an interdisciplinary model of "language + technology". The education sector had an urgent demand for technology-enabled talent cultivation, creating a high degree of resonance between supply and demand for these two themes. This phased transformation and pressing social demand directly triggered an outburst of relevant research, leading to broad academic consensus and high research engagement. As a result, these themes emerged as the most strongly detected research frontiers in the burst analysis, marking the

official entry of domestic machine translation research into the stage of exploring technology-enabled teaching applications (Wang, 2022).

In addition, other keywords with strong burst strength include corpus, accuracy, pre-editing, scientific and technical texts, error types, and human-machine translation. Both *corpus* and *accuracy* showed research burst starting in 2020 at the initial development stage of the field. Machine translation evolved from a laboratory concept into a practical digital tool widely applied in translation education, establishing a fundamental research framework grounded in corpus resources and centered on translation accuracy (Li, Peng, Jin, 2024). In 2021, *human-machine translation* became the core burst keyword. Research broke away from the conventional perception of opposition between human and machine translation and shifted toward the practical paradigm of human-machine

collaboration (Zhang, 2021). Keywords such as *pre-editing*, *scientific and technical texts*, and *error types* registered strong bursts in 2023. The research focus gradually shifted from the feasibility of machine translation to the pursuit of accurate and high-quality translation. Research scope expanded beyond general language texts to specialized domains such as science, technology and medicine (Ana Muñoz-Miquel, 2025). By adopting pre-editing and post-editing strategies to systematically address various error types, machine translation research achieved a qualitative leap toward refinement, specialization and scenario-based application(Wang, 2022).

Timeline

From Figure 6, the keyword time-zone map generated by CiteSpace 6.3.1, the complete research context and evolutionary logic of machine translation research over the past five years can be systematically identified.

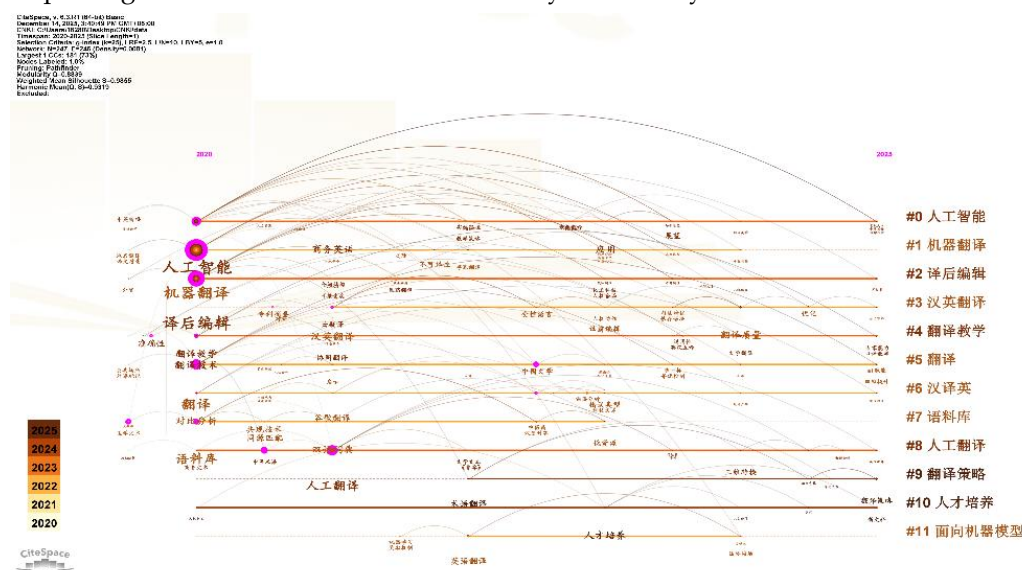


Fig.6. Keyword Timeline

Taking time as the evolutionary axis, the map intuitively reveals the research hotspots, thematic shifts and trend changes in different research stages:

Around 2020, the research focus of machine translation centered on artificial intelligence, machine translation per se, as well as fundamental application directions including post-editing, translation teaching, corpus linguistics, and Chinese-English

translation. Serving as the starting point of research at that stage, these themes mostly revolved around the basic application scenarios of machine translation and the integration of traditional translation studies with emerging technologies, reflecting the characteristics of early-stage research oriented toward technology introduction and scenario adaptation (Feng & Shao,2020). Over time, research

themes have shown an obvious trend of differentiation and in-depth development. On the one hand, at the general technical level, research has extended to such topics as translation quality optimization, human-machine collaboration, pre-editing, low-resource translation, and controlled language, focusing on improving the performance of machine translation and expanding its application boundaries (Wang H F, Wu H, He Z J, et al, 2021). On the other hand, application scenarios have continuously penetrated into vertical fields, with emerging segmented research directions including business English, medical translation, subtitle translation, the external communication of Chinese literature, and bilingual alignment of traditional Chinese medicine, reflecting the in-depth integration of technology and industrial demands (Lv, Li, Tao, et al, 2025). In the later stage shown in the map, the systematicness and forward-looking nature of relevant research have become more prominent. Research topics such as translation strategies for machine models, talent training, translation development against the background of the New Liberal Arts, and cross-cultural communication have become new research priorities. This indicates that research has shifted from simple technical application to holistic reflections on the industrial ecosystem, talent training system and future development of the discipline (Lyu C, et al, 2024). Meanwhile, the linkage distribution of keywords in the time-zone map also reveals the inherent inheritance among research themes. The fundamental research in the early stage has laid a solid foundation for subsequent exploration in specialized fields and academic frontiers. As the core driving force throughout the whole period, artificial intelligence has continuously advanced the evolutionary process of machine translation research: from basic adaptive application to in-depth performance optimization, from single technology application to cross-disciplinary integration, and from practical application to systematic disciplinary development. It also reflects the transformation trajectory and the shift of academic hotspots in

domestic translation research amid the technological wave (Wang & Liu, 2022).

III. RESEARCH FINDINGS

Distribution of Publications by Publication Year

From 2020 to 2021, research in the field of machine translation still focused on the integration of basic technological applications and traditional translation scenarios. Artificial intelligence and machine translation served as the core themes throughout this period. Keywords such as post-editing, translation teaching, corpus construction, and Chinese-English translation emerged intensively, indicating that scholarly attention at that time was largely directed toward the basic adaptability of machine translation. Researchers mainly explored how relevant technologies could be implemented in traditional areas such as translation teaching and corpus support. Meanwhile, discussions on early commercial translation tools including cloud translation and Google Translation gradually emerged. On the whole, research remained at the stage of technology introduction and preliminary application (Tao, 2023).

During 2022–2023, the research focus gradually shifted toward scenario-specific applications and technical optimization, with a substantial increase in explorations of machine translation in vertical domains. Research hotspots successively emerged in multiple segmented directions, including business English translation, medical translation, subtitle translation, the overseas translation of Chinese literary works, and bilingual alignment of traditional Chinese medicine. Meanwhile, emerging research topics such as human-machine collaboration, pre-editing, low-resource translation, and controlled language came into academic sight. This shift indicates that research in this phase broke through the limitations of basic application practices. Instead, it focused on the adaptive optimization of machine translation for diverse industrial scenarios and addressed practical translation challenges such as untranslatability and insufficient corpus resources,

demonstrating a refined and scenario-oriented trend of technological application (Wang & Liu, 2022).

From 2024 to 2025, relevant research further developed toward systematization and forward-looking exploration. Emerging research priorities included translation quality optimization, machine model-oriented translation strategies, talent cultivation, and translation development under the background of the New Liberal Arts. This transformation is primarily driven by the rapid iteration of artificial intelligence technologies, which has substantially advanced the capability of machine translation and prompted academic attention to the industrial ecological changes brought about by technological progress. Scholars have not only conducted in-depth investigations into model adaptation strategies and translation quality evaluation systems but also reconsidered talent training modes and cross-cultural communication demands in the translation field. This research shift indicates that academic focus has evolved from isolated technological applications toward systematic exploration of the coordinated development of technology, industry and professional talents (Ataman D, 2024).

Influence of Core Authors

In the field of machine translation research, multiple collaborative sub-networks centered on core scholars have taken shape. Some teams maintain close internal connections and stable collaboration, yet a large-scale cross-team collaborative network has not been fully established overall, presenting a pattern of local concentration and overall dispersion. Scholars represented by Yin Jian, Yu Zhengtao and Pan Zhengqin occupy pivotal nodes in the network with dense collaborative ties, ranking as the most influential core authors in this field. In addition, scholars including Jiang Shengyi, Shen Hongliang and Yu Yanying have each formed stable research groups, playing a vital bridging role within their respective sub-networks.

The research conducted by these core author teams primarily focuses on the practical application of machine translation, translation teaching

optimization, post-editing, and the adaptation of language processing technologies. Through long-term and continuous collaborative outputs, these efforts have advanced domestic machine translation research from pure technical application toward scenario-oriented, teaching-oriented, and systematic development, thereby laying a solid academic foundation for the progress of this research field. In contrast, most other research groups in this domain predominantly adopt independent research modes or small-scale collaboration. A widespread cross-institutional collaborative network has not yet been established, resulting in relatively fragmented research forces and a lack of integrated academic synergy across different teams.

Overall, the current collaboration pattern in machine translation research is characterized by domination by core teams and supplementation by scattered independent studies. Core authors including Yin Jian, Yu Zhengtao, and Pan Zhengqin, along with their research teams, serve as the backbone of advancing domestic machine translation research. Their studies not only focus on technical applications but also extend to multiple dimensions such as teaching practice and translation quality improvement, providing crucial support for the sustainable development of this research field.

Institutional Publication Influence

Research institutions in the field of machine translation are widely distributed, forming a pattern dominated by foreign language schools with the collaborative participation of multidisciplinary universities. Among them, institutions with large-scale network nodes, including the School of Foreign Languages of Nanjing University of Posts and Telecommunications, the School of Foreign Languages of Shandong University of Science and Technology, Guangdong University of Foreign Studies, and Shanghai International Studies University, stand out as core institutions with prominent publication output and academic influence, representing the major research forces in this domain.

In terms of collaborative relationships, several

small-scale research clusters have emerged in machine translation research. Typical examples include the local collaborative networks centered on the School of Foreign Languages of Shandong University of Science and Technology and the School of Foreign Languages of Nanjing University of Posts and Telecommunications, as well as the cross-departmental collaborations of Guangdong University of Foreign Studies with its School of Information Science and Technology and the Guangzhou Key Laboratory of Intelligent Processing for Non-Universal Languages. This indicates that certain institutions have established stable internal or inter-university cooperation. Nevertheless, cross-regional and inter-institutional collaboration remains loose at the overall level. Most institutional nodes prioritize independent research, and no large-scale nationwide collaborative network has been formed, resulting in an overall low collaboration density in this field.

Such distribution and collaborative characteristics reflect that domestic machine translation research is currently mainly undertaken by foreign language schools in universities. Although research forces are widely dispersed, cross-institutional academic collaboration remains to be strengthened. Core institutions exert a prominent leading role in this field, while most local universities mostly conduct independent explorations and fail to form extensive academic synergy.

Research Hotspots

Burst terms during 2020–2021, such as “translation teaching”, “corpus”, and “accuracy”, indicate that early-stage research primarily focused on the basic application, teaching practice, and corpus support of machine translation, representing an exploratory phase for technological implementation. Keywords emerging from 2021 to 2022, including “human-machine translation” and “patent abstract”, reflect that research began to concentrate on the application of machine translation in specific text types and human-machine collaborative modes. From 2023 to the present, the continuous surge of burst terms such as

“pre-editing”, “scientific and technological texts”, “error types”, and “professional translation” demonstrates that the research focus has shifted toward refined technological optimization and vertical scenario adaptation. Current studies mainly explore approaches to improving translation quality through pre-editing, optimizing models by analyzing error patterns, and expanding the application of machine translation to scientific, technological and professional domains. These findings are highly consistent with the core clusters in the clustering map, including “post-editing”, “Chinese-English translation”, and “translation teaching”. Overall, three pillar directions have been formed in current machine translation research: technical quality optimization, teaching application, and scenario-specific translation (Wang & Liu, 2022).

“Machine translation” and “artificial intelligence” serve as the core nodes running through the research field, radiating high-frequency related topics such as “post-editing”, “translation quality”, “human-machine collaboration”, and “low-resource languages”. These elements clearly outline the current landscape of research hotspots in this domain. On the one hand, “human-machine collaboration” and “pre-editing/post-editing” constitute the core of technical optimization, with academic research predominantly focusing on improving translation efficiency and quality through human-machine synergy. On the other hand, the high-frequency occurrence of vertical research fields including “scientific and technological texts”, “medical translation”, and “Chinese literature translation” reflects the in-depth expansion of application scenarios. Relevant research is no longer limited to general texts but extends to professional domains and cultural outbound translation. Meanwhile, the emerging relevance of themes such as “translation teaching”, “talent cultivation”, and “new liberal arts” indicates that research perspectives have shifted from pure technical exploration to a comprehensive dimension integrating education and talent training.

Current machine translation research is evolving along three distinct directions. First, at the technical

level, research has shifted from basic technical application to refined optimization involving human-machine collaboration, pre-editing and post-editing, and error analysis, with a core focus on improving translation quality and scenario adaptability. Second, at the application level, research scope has expanded from general texts to vertical domains such as science and technology, medicine, and literature, with particular attention to the practical demands of professional translation and the external dissemination of Chinese culture. Third, at the educational and talent training level, the integration of machine translation and translation teaching has been continuously deepened. Scholars have begun to explore innovative training modes for translation talents under the framework of the new liberal arts to adapt to the industrial transformation driven by technological changes. Overall, machine translation research has departed from the early stage of technological introduction and entered a diversified development phase featuring technical optimization, in-depth scenario exploration, and ecological reconstruction. The continuous iteration of artificial intelligence technology will further promote the development of machine translation research toward greater intelligence, accuracy, and industrial practicality.

IV. DISCUSSION

Causes of Literature Distribution

Around 2020, relevant research was still in the early exploratory stage with limited publication output. Research themes were mainly confined to fundamental concepts such as “machine translation”, “artificial intelligence”, and “corpus”. This phenomenon is primarily attributed to the immaturity of artificial intelligence and machine translation technologies at that time. Academic research mainly focused on the discussion of basic theories and technical adaptability, and a large-scale research upsurge had not yet emerged in this field.

After 2012, especially during 2020–2022, the number of published papers increased significantly, and research themes expanded from singular

fundamental concepts to diverse application scenarios, including “translation teaching”, “post-editing”, and “Chinese-English translation”. Such changes can be attributed to the breakthroughs in deep learning technologies, which have substantially improved the performance of machine translation systems. The widespread adoption of commercial translation tools has also prompted academic attention to the practical value of machine translation technologies in teaching, text processing, and other fields. Meanwhile, the increasing acceptance of emerging technologies within domestic translation disciplines has further contributed to the growing number of relevant research outcomes (TAC, 2023).

From 2023 to the present, the volume of publications has remained at a consistently high level, and research topics have further developed toward refined research directions, including “pre-editing”, “scientific and technological texts”, “professional translation”, and “talent cultivation”. This shift is primarily driven by the rapid iteration of large language models and generative artificial intelligence, which has continuously expanded the functional boundaries of machine translation. Academic research is no longer limited to general text translation but has turned to the adaptive optimization of machine translation for specialized fields such as science, technology, and medicine. Additionally, increasing attention has been paid to the impacts of technological transformation on the translation industry and talent training paradigms. Furthermore, the disciplinary transformation of translation studies under the framework of the new liberal arts has facilitated the rise of research on “talent cultivation” and “translation strategies”, ultimately forming the current literature distribution pattern characterized by stable publication output and diversified research themes (TAC, 2025).

Overall, the temporal distribution of publications in machine translation research is jointly driven by technological iteration, policy guidance, and practical application demands.

Influence of Core Authors

Multiple research clusters centered on prominent scholars have been formed in the field of machine translation research. With stable publication output, high collaboration intensity, and sustained research achievements, these core authors have exerted a significant influence on the development of this research domain. Scholars including Yin Jian, Yu Zhengtao, and Pan Zhengqin occupy pivotal positions in the collaborative network and represent the most influential core authors in the field. The research team led by Yin Jian features close internal cooperation and forms a stable research cluster centered on the scholar. Its research outcomes demonstrate obvious continuity in the knowledge mapping. Focusing on the optimization paths of machine translation in teaching and practical application over a long period, the team has advanced the integrated development of machine translation and translation teaching in China. The team led by Yu Zhengtao and Gao Shengxiang constitutes another crucial independent research branch with a well-structured collaborative network. Its research primarily focuses on technical explorations such as machine model-oriented translation strategies and cross-lingual processing, providing substantial support for the technical adaptation and optimization of machine translation systems. Pan Zhengqin and her team have conducted in-depth and continuous research on post-editing and translation quality assessment, forming distinctive research characteristics. Their findings offer valuable references for the refined development of practical machine translation application scenarios.

In addition, scholars including Jiang Shengyi, Shen Hongliang, and Yu Yanying have each established stable research groups, playing a vital bridging role within their respective sub-networks and promoting the development of machine translation in niche directions such as specific text types and teaching scenarios. In contrast, a large number of scholars still prioritize independent research or small-scale collaborative projects. A widespread cross-institutional collaboration network

has yet to be established, resulting in relatively fragmented research forces in this field.

Overall, these core authors and their research teams serve as the backbone of the development of domestic machine translation research. Their studies cover multiple crucial dimensions, including technical optimization, scenario-based application, and educational integration. Through sustained collaboration and academic output, they have constructed a key academic context for this field and provided solid support for the refined and systematic development of machine translation research from preliminary basic applications to advanced and well-established practices.

Regional Development of Institutions and Its Impacts on Machine Translation

The core publishing institutions engaged in machine translation research are mainly foreign language schools of domestic universities and several science and engineering colleges. Their distribution is closely associated with the characteristics of local disciplinary development and the allocation of scientific research resources, which profoundly shapes the overall development trend of machine translation research.

Foreign language universities represented by Guangdong University of Foreign Studies leverage their traditional strengths in foreign language education and translation research to conduct in-depth long-term studies on the practical application of machine translation, the optimization of translation teaching, and language service technologies. Relying on research platforms such as the Guangzhou Key Laboratory of Intelligent Processing for Non-Universal Languages, these institutions have advanced research on the adaptation of machine translation to multilingual and professional scenarios, serving as a vital base for exploring practical application scenarios of machine translation in China. Established foreign language institutions including Shanghai International Studies University and Beijing Foreign Studies University boast solid linguistic disciplinary foundations and have sustained productive research in translation

quality assessment, corpus construction, and Chinese-foreign translation comparison. Their continuous academic output provides robust theoretical support for the linguistic adaptation and optimization of machine translation systems.

The foreign language schools of science and engineering universities, including Nanjing University of Posts and Telecommunications, Shandong University of Science and Technology, and Kunming University of Science and Technology, have formed distinctive interdisciplinary research features by drawing on their institutions' interdisciplinary resources in information technology and artificial intelligence. For instance, the School of Foreign Languages of Nanjing University of Posts and Telecommunications focuses on interdisciplinary research integrating machine translation and natural language processing, while the Faculty of Information Engineering and Automation of Kunming University of Science and Technology explores machine translation model optimization. Such research efforts have driven the transformation of machine translation research from pure linguistic-oriented studies to technology-enabled innovation and model optimization, and set a valuable benchmark for interdisciplinary translation research conducted by local universities.

Overall, the distribution and development of these core institutions reflect a research pattern dominated by foreign language universities and empowered by science and engineering universities, which further promotes the diversification of machine translation research. Foreign language universities prioritize practical application scenarios and teaching practice, while science and engineering universities focus on technical optimization and model adaptation. The collaborative complementarity between the two types of institutions jointly facilitates the evolution of domestic machine translation research from basic application to refined, interdisciplinary and scenario-oriented development, and provides solid support for the disciplinary transformation and talent cultivation of translation studies in various

regions.

V. FUTURE RESEARCH DIRECTIONS

From a technical perspective, future research will further advance toward human-machine collaboration and refined optimization. Burst keywords in the knowledge mapping, such as "pre-editing", "error types", and "translation quality", have maintained a sustained surge since 2023. Combined with high-frequency associated themes in the co-occurrence network, including "human-machine collaboration", "post-editing", and "optimization", it is evident that academic research is no longer confined to the basic application of machine translation. Instead, scholars have shifted focus to constructing a more sophisticated human-machine collaborative workflow. Through pre-translation text processing, post-translation quality evaluation and error correction, a closed-loop optimization system can be established to address the issues of accuracy and acceptability of machine translation outputs in complex contexts and low-resource languages. This represents a core approach to enhancing the practicality and adaptability of translation models amid the continuous iteration of artificial intelligence technologies.

In terms of application scenarios, machine translation will continue to expand toward vertical professional fields and cultural outbound translation scenarios. The concentrated emergence of research themes such as "scientific and technological texts", "professional translation", "medical translation", and "Chinese literature" in the clustering mapping, as well as the evolutionary trends of nodes related to "Chinese-English translation" and "cultural outbound translation" in the time-zone mapping, indicate that future research will pay greater attention to the adaptation of machine translation in professional domains. This includes terminology alignment and syntactic optimization for specialized texts in science and technology, business, medicine, and other industries. Meanwhile, increasing focus will be placed on the application of machine

translation in the external dissemination of Chinese culture. Scholars will explore how emerging technologies can facilitate the international communication of cultural content such as Chinese literature and traditional Chinese medicine, and address translation challenges posed by culture-loaded words and literary expressions. Overall, machine translation research will continue to shift from general scenarios toward industrialized, professional, and culture-oriented applications (Wang & Liu, 2025; Hu, 2025).

Furthermore, with the advancement of new liberal arts construction and the transformation of the translation industry, machine translation research will achieve in-depth integration with talent cultivation and industrial ecology. The emergence of thematic nodes including “talent cultivation”, “new liberal arts”, and “machine model orientation” in the time-zone mapping demonstrates that future research will no longer be limited to a pure technical perspective. Instead, it will integrate the development of machine translation with translation education and industrial demands, exploring innovative training modes for translation professionals under the background of new liberal arts to cultivate interdisciplinary talents equipped with both solid linguistic competence and proficient technical literacy. In addition, greater attention will be paid to the impacts of machine translation on the ecological transformation of the translation industry, including the reconstruction of translation workflows, the formulation of industrial standards, and the establishment of human-machine collaborative working modes. Such research will promote the transformation of machine translation from a technical tool to fundamental infrastructure for the translation industry, thereby realizing the coordinated development of technology, education and the translation industry (Mu, 2024; Wang et al., 2025).

Overall, the future development of machine translation will be fundamentally driven by artificial intelligence technology, take human-machine collaborative optimization as the main technical

thread, prioritize vertical domain applications and cultural outbound translation as key application focuses, and rely on talent cultivation and industrial ecological restructuring as critical support. This trend will foster a new development pattern featuring the coordinated evolution of technology, application, education, and industry, and continuously advance machine translation research toward greater intelligence, higher accuracy, and better adaptation to practical demands (Wang & Liu, 2025; Hu, 2025).

VI. MAJOR FINDINGS

Overall, domestic machine translation research has undergone a complete evolutionary process from basic application to in-depth diversified exploration over the past five years, presenting distinct phased characteristics and predictable future trends. Early research primarily focused on the technological introduction and teaching adaptation of machine translation. The keyword burst mapping indicates that the burst terms from 2020 to 2021 were concentrated on “translation teaching”, “corpus”, and “accuracy”, demonstrating that academic attention at that time was largely placed on the practical implementation of emerging technologies in traditional translation scenarios. With the continuous iteration of artificial intelligence technologies, the research focus has gradually shifted to technical optimization, giving rise to emerging themes such as “human-machine translation” and “pre-editing”. This shift reflects the academic community’s sustained exploration of improving machine translation quality and expanding its application boundaries.

In terms of current research hotspots, machine translation is evolving toward scenario-based, refined, and interdisciplinary development. The keyword co-occurrence network and clustering mapping demonstrate that core research hotspots have centered on “post-editing”, “scientific and technological texts”, and “professional translation”. This indicates that academic research is no longer limited to general text translation but has extended to vertical fields such as science and technology,

medicine, and cultural outbound translation, focusing on practical issues including professional terminology alignment and complex context adaptation. Meanwhile, the prevalence of highly correlated themes such as “translation quality”, “error types”, and “optimization” reveals that research priorities are shifting from simple technical application to the construction of closed-loop optimization systems, promoting the development of machine translation from functional availability to practical usability.

Looking ahead, machine translation research will continue to deepen across three dimensions: technology, application, and research ecology. In terms of technology, research priorities will focus on human-machine collaboration, pre-editing and post-editing, and low-resource translation. Scholars will further explore the in-depth integration of artificial intelligence technologies and diverse translation scenarios to improve the adaptability and accuracy of translation models. In terms of application, translation demands in professional fields such as science and technology, culture, and medicine will drive the industrialization of relevant research, facilitating the external dissemination of Chinese culture and international academic and industrial exchanges in specialized disciplines. In terms of education and industrial development, the integration of machine translation and translation teaching, as well as the exploration of interdisciplinary talent training models, will emerge as a vital research direction. Such progress will promote the restructuring of the translation industry ecosystem and advance the disciplinary transformation of translation studies under the framework of the new liberal arts initiative.

VII. RESEARCH LIMITATIONS AND FUTURE RESEARCH SUGGESTIONS

This study conducts a bibliometric analysis of domestic research on machine translation based on literature retrieved from the CNKI database, and there are still certain limitations. First, the data source is limited solely to the CNKI database,

excluding relevant publications from foreign databases such as WOS and Scopus, which fails to fully cover the research progress of the international academic community. Second, the analysis mainly focuses on domestic literature published from 2020 to 2025, with an insufficient review of the research context in earlier stages, making it difficult to fully present the long-term evolutionary trajectory of machine translation research. Furthermore, this study only carries out a macroscopic analysis based on bibliometric mapping, without an in-depth content analysis of the core viewpoints and theoretical frameworks of highly cited literature, which limits the interpretation of specific research findings.

In view of the deficiencies of the current study and the development trends of this field, future research can be further expanded from three aspects. First, in terms of data dimension, the scope of databases should be extended to integrate multilingual literature at home and abroad, so as to construct a more comprehensive literature repository for machine translation research. Meanwhile, incorporating literature with a longer time span can help systematically sort out the historical development context of the field. Second, in terms of research methods, on the basis of bibliometric analysis, qualitative methods such as content analysis and case studies can be adopted to deeply interpret the theoretical contributions and practical value of core literature, thereby compensating for the deficiencies of purely quantitative analysis. Third, in terms of research directions, greater emphasis should be placed on emerging application scenarios of machine translation driven by generative AI and large language models, especially the adaptive research for vertical fields such as scientific and technological texts and cultural external translation. In addition, cross-institutional and interdisciplinary cooperation should be strengthened to promote the in-depth integration of machine translation technology with linguistics, computer science, and translation teaching, and facilitate the coordinated development of the industrial ecology and

disciplinary system of translation studies.

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