A Preliminary Discussion on Artificial Intelligence Empowering Traditional Chinese Medicine Publishing (Postprint)

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Abstract

Traditional Chinese Medicine (TCM) is an invaluable treasure of ancient Chinese science, and TCM publishing serves as a crucial vehicle for preserving and disseminating TCM knowledge. In recent years, artificial intelligence technology has gradually precipitated disruptive transformations within the publishing industry, presenting tremendous opportunities for the development of TCM publishing by empowering knowledge dissemination, ancient text preservation, book content, creative processes, and topic selection and editing, while simultaneously introducing a series of challenges distinctive to TCM. [Objective] To discuss the impact of artificial intelligence on TCM publishing, with the aim of contributing to AI-enabled TCM publishing. [Methods] Starting from AI' s role in assisting TCM publishing, this paper discusses the challenges AI brings to TCM publishing, the opportunities it presents, and strategies for addressing these challenges. [Results] AI can empower TCM publishing across multiple dimensions including knowledge dissemination, ancient text preservation, publishing content, book creation, and topic selection and editing, while also introducing challenges related to copyright and ethics. [Conclusion] Under the new circumstances, AI can empower TCM publishing, playing a role in enhancing quality and efficiency for TCM inheritance, and contributing to the promotion of China' s excellent traditional culture and the realization of Healthy China.

Full Text

A Preliminary Discussion on Artificial Intelligence Empowering Traditional Chinese Medicine Publishing

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Abstract

Traditional Chinese Medicine (TCM) represents a treasure of ancient Chinese science, and TCM publishing serves as a crucial vehicle for carrying and disseminating TCM knowledge. In recent years, artificial intelligence technology has gradually triggered disruptive transformations in the publishing industry, bringing tremendous opportunities for the development of TCM publishing. AI can empower knowledge dissemination, ancient text preservation, book content creation, and the editorial process in TCM publishing, while simultaneously presenting a series of challenges unique to TCM. [**Purpose**] This paper discusses the impact of AI on TCM publishing, aiming to contribute to the empowerment of TCM publishing through artificial intelligence. [**Methods**] Beginning with AI' s role in assisting TCM publishing, this paper examines the challenges AI poses to TCM publishing, as well as the opportunities it brings and strategies for addressing these challenges. [**Results**] AI can empower TCM publishing across multiple dimensions including knowledge dissemination, ancient text preservation, publishing content, book creation, and topic selection/editing, while also introducing challenges related to copyright and ethics. [**Conclusion**] Under the new circumstances, AI can empower TCM publishing, playing a quality-enhancing and efficiency-improving role in TCM inheritance, and contributing to the promotion of China' s excellent traditional culture and the realization of Healthy China.

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Traditional Chinese Medicine represents a treasure of ancient Chinese science that has safeguarded the health of the Chinese nation for thousands of years. Since the 18th National Congress of the Communist Party of China, TCM has encountered unprecedented opportunities for revitalization and development. In his congratulatory letter to the China Academy of Chinese Medical Sciences on its 60th anniversary, General Secretary Xi Jinping pointed out: "We must thoroughly excavate the essence of the TCM treasure trove, give full play to the unique advantages of TCM, promote the modernization of TCM, and propel TCM onto the world stage, so as to effectively inherit, develop, and utilize this precious legacy left to us by our ancestors" [1]. TCM publishing serves as a vital means of carrying and disseminating TCM knowledge. In recent years, guided by Xi Jinping Thought on Culture, TCM publishing professionals have actively explored cultural origins, fully excavating outstanding traditional TCM culture. They have profoundly summarized research experiences and guided

the modernization of TCM, playing an irreplaceable role in disseminating TCM knowledge, cultivating TCM talent, promoting TCM culture, and telling TCM stories from both "inheritance" and "innovation" perspectives.

Artificial Intelligence (AI) is a crucial technology that has recently triggered disruptive transformations in the publishing industry. Its concept can be traced back to the 1950s, representing the technology and science of using computer systems to simulate human intelligent behavior. Particularly in recent years, Generative Artificial Intelligence developed on the basis of Generative Adversarial Networks (GAN) has brought enormous opportunities to the scientific publishing industry. As a key element of new quality productive forces, AI simulates human learning and thinking through optimized algorithms and big data learning, demonstrating remarkable capabilities across various fields. In TCM publishing, AI can significantly enhance work efficiency, depth, and breadth, serving as an important measure to implement the spirit of the 20th Party Congress and the Third Plenary Session of the 20th Central Committee. It also provides crucial support for implementing the "TCM Development Strategic Planning Outline (2016-2030)" [2], optimizing industrial structure, improving publishing quality, enhancing publishing and dissemination effectiveness, cultivating high-quality talent teams, and promoting high-quality TCM publishing development. This paper discusses the opportunities AI brings to TCM publishing, the challenges it faces, and strategies for breakthroughs, with the hope that AI technology can play a greater role in TCM publishing, promote TCM development, and contribute to Healthy China.

1. Opportunities Brought by AI to TCM Publishing

1.1 Empowering TCM Knowledge Dissemination

The development of the publishing industry has evolved with changing knowledge transmission methods, progressing from oracle bones and bamboo slips to paper and now to digital publishing, with authors, editors, and readers all benefiting from successive technological innovations. In November 2022, the National Administration of Traditional Chinese Medicine issued the "14th Five-Year Plan for TCM Informatization Development" [3], which identified the primary tasks as promoting innovative applications of TCM data resources and accelerating breakthroughs in key TCM digital technologies. The plan advocates using big data, AI, and other new-generation information technologies to strengthen the living inheritance of renowned TCM practitioners' academic experience and traditional pharmaceutical craftsmanship, and to support the development of TCM academic schools. It also calls for building a national digital library of ancient TCM texts based on existing digital platforms, establishing a protection database for TCM traditional knowledge, constructing AI technology application platforms and TCM knowledge service systems for ancient TCM texts, and supporting the construction of a digital museum for the National TCM Museum. A series of digital libraries dedicated to the TCM field have been established, with collections including knowledge articles, textbooks,

academic works, ancient texts, and journals. For instance, projects such as the 2023 Provincial TCM Ancient Texts Digital Library Construction Project by the National Administration of TCM, the TCM Digital Library of China TCM Publishing House (National TCM Culture Education Base Online Exhibition Hall), the National Physician' s Collection Database of the China Academy of Chinese Medical Sciences Information Institute, the Ethnic Medicine Digital Dissemination Platform of TCM Ancient Texts Publishing House, the Chinese Ancient Books Resource Database of the National Library of China, and the Shidian Ancient Texts Database developed by ByteDance in collaboration with Peking University. These digital libraries help readers quickly obtain relevant information from vast collections and provide digital reading and knowledge services. Additionally, functions based on AI image recognition and document question-answering technologies enable readers to immerse themselves in online exhibitions and even receive preliminary answers by inputting questions through information retrieval. Building these platforms not only supports the integration of digital publishing resources and constructs knowledge service frameworks but also promotes the development of large-scale data platforms in the TCM field. From another perspective, they expand and emphasize the influence of high-quality TCM digital content to promote China' s outstanding traditional medical technology and culture, while providing creators with opportunities to access more information to generate new knowledge and concepts.

1.2 Empowering Ancient TCM Text Preservation

General Secretary Xi Jinping attaches great importance to TCM development and the collection, organization, and protection of ancient texts. He has pointed out that we must "collect and protect all ancient classics and materials that can be gathered since ancient times, and continue to pass on the world' s only uninterrupted civilization." This important instruction provides direction for advancing TCM development and the preservation of historical ancient texts. Among the numerous TCM books, many contain obscure and difficult content that cannot be comprehensively and efficiently mastered through individual effort alone. Moreover, various schools of thought have created certain barriers, hindering academic communication and making it difficult to effectively disseminate many research achievements and practical experiences. These outstanding contents urgently require integration. In the 1970s, professionals first attempted to apply AI technology to the TCM field. In 2017, the State Council' s "New Generation Artificial Intelligence Development Plan" [4] proposed accelerating AI innovation applications with healthcare as a key focus. Leveraging AI' s exceptional capabilities in data collection and mining, data processing and analysis, and deep learning can assist in the structured and scientific expression of vast ancient literature and clinical experience. Based on this, AI applications in generative adversarial networks forming generative AI will help improve the capacity and efficiency of ancient text collation and compensate for the shortage of high-quality talent and resource imbalances in TCM ancient text research. For example, the South China University of Technology

research team has released multiple achievements including the "Ancient Text Document Analysis and Recognition System," "Tonggu Large Model," and "Yi Script Document Analysis and Recognition System," which use AI technology to make ancient texts more comprehensible and provide technical support for data mining, knowledge discovery, and intelligent development and utilization of Chinese ancient texts and cultural relics. Among these, the "Ancient Text Document Analysis and Recognition System" can realize ancient text punctuation and classical-vernacular translation; the "Tonggu Large Model" can intelligently perform classical-vernacular translation, sentence punctuation, and ancient text retrieval; and the "Yi Script Document Analysis and Recognition System" can automatically and accurately locate and identify Yi script characters in images. These AI technologies may bring new hope for the protection and utilization of ancient TCM texts.

1.3 Empowering TCM Publishing Content

Currently, generative AI large models can be classified according to interaction object types to create personalized content such as realistic images, music, and text. For example, ChatGPT based on large models can generate images, music, animations, and other content. This capability may empower TCM publishing content, enabling TCM publishing to present information in ways more acceptable to readers. For instance, the "Mawangdui Han Tomb Medical Texts: Sixteen Types and Digital Publications" project, which received key funding from the 2024 National Publication Fund, includes animated presentations of Daoyin diagrams from the Mawangdui Han tomb medical texts. Numerous animation generation models can now complete the task from text description to animation output. The Foreign Language Teaching and Research Press built an AI-generated content platform using Amazon Web Services in 2023, which flexibly constructs and deploys AI models to automatically generate text, images, and voice, providing support for publishing and educational services. This example offers valuable insights for empowering TCM publishing content. Furthermore, generative AI large-scale visual-language model technology may rejuvenate publishing industry products and reshape models. Generative AI can capture and analyze reader attention hotspots through big data, recommend corresponding themes and topics based on editorial intent and target audiences, and provide appropriate suggestions for text content structure, writing style, and language to further enhance work quality and readability. For example, Alibaba Cloud' s Qwen-VI can conduct market research and analyze reader interests by deeply understanding and analyzing social media content, helping publishers capture emerging popular themes and changes in reader preferences. For TCM book bibliographic databases, large models can also precisely customize content that readers wish to learn and read, meeting individualized "thousand people, thousand faces" reading needs.

1.4 Empowering TCM Book Creation

Like creators of other types of books, TCM publishing creators can also benefit from AI technology development, mainly in three aspects: more convenient information acquisition, AI-assisted document and image generation, and improved office efficiency. Certain AI models can assist book creators in general information retrieval, paper reading, and academic writing, ensuring depth and breadth in literature processing and improving knowledge acquisition efficiency. For example, the "Technology Literature Large Model" jointly developed by the Documentation and Information Center of the Chinese Academy of Sciences and iFLYTEK Co., Ltd. can efficiently extract information and intelligently process scientific literature. The "Volcano Engine" large model service platform and pre-trained large models can complete scientific knowledge retrieval, paper intensive reading, data analysis, and paper writing assistance through AI-assisted methods. The "pubscholar Public Welfare Academic Platform"built by the Documentation and Information Center, Computer Network Information Center, and Science Press of the Chinese Academy of Sciences adopts a new method of academic resource co-construction and sharing, integrating domestic high-quality public welfare academic resources to enable readers to obtain academic information more quickly and conveniently. The "Shuzhi Bencao" TCM language model based on Huawei' s Pangu large model can assist researchers in mining and summarizing TCM theoretical evidence based on massive TCM text data pre-training. The "Tianhe Ling Shu" large model has conducted professional 3D modeling of all human acupuncture points, constructing vivid 3D digital humans that facilitate the mining and application of TCM evidence-based evidence, providing new impetus for TCM academic innovation and industrial development. AI models that improve work efficiency are also widely used in book creation, such as iFLYTEK' s "Xinghuo Cognitive Large Model," which features real-time voice recording-to-text and full-text summarization functions that can efficiently meet the needs of oral inheritance during TCM' s unique follow-along consultation process, playing a significant role in the textualization and documentation of TCM characteristic scenarios.

1.5 Empowering TCM Topic Selection and Editing

AI empowers TCM topic selection and editing mainly in the following aspects: assisting and optimizing topic selection, improving TCM editor work efficiency, and enhancing editing quality. Through market analysis, generative AI can help editors find relevant materials, analyze data, and assist in completing topic planning according to editorial expectations. The "Generative AI Digital Intelligence Publishing Project" led by CITIC Publishing Group aims to promote deep integration of AI technology in the publishing process to enhance publishing benefits and reduce costs. Simultaneously, generative AI accumulates large amounts of data for publishers to use in various stages such as topic evaluation, translation, preliminary review, cover design, matching hot market topics, and document writing, significantly improving editorial work capacity. In terms of assisting

editorial work, AI may facilitate the online integrated transformation of editorial workflows, achieving intelligent manuscript organization, field management, and review processes to improve editorial efficiency. Regarding editing quality improvement, "Mido Wenxiu," the first large language model specifically designed for the intelligent proofreading vertical field, can assist professional users in improving proofreading quality, increasing proofreading speed, and reducing error rates, empowering high-quality development of language and text work in the new era. It is believed that AI models with added TCM-specific content will soon emerge, capable of strictly guarding ideological boundaries, identifying feudal superstitions and rumors, and recognizing prohibited TCM substances and Qigong content.

2. Challenges and Strategies for AI in TCM Publishing

While AI brings opportunities to TCM publishing, it also presents a series of challenges, including both common issues faced by the entire publishing industry and challenges unique to TCM. Beyond computer technology-level risks (such as data quality, data security, and algorithm-level risks), generative AI in the publishing field may pose other serious risks, among which copyright disputes and technical ethics issues are particularly prominent, requiring publishers to consider challenges and strategies from an application perspective.

2.1 Copyright Challenges and Strategies from AI

Currently, an increasing number of authors are using AI to assist in writing. Generative AI can mimic original creators' styles and apply data and viewpoints through big data learning. If authors excessively rely on AI for writing, it may cause academic plagiarism, reduce publishing value, and infringe upon original creators' intellectual property rights. To attempt to regulate the copyright issues involved, the European Commission passed the draft "AI Act" in 2021, requiring disclosure of all works used to train AI, while the Act also proposed transparency requirements for generative AI. The "AI Act" passed in 2024 [5] demands strict regulation of AI use. In response to this issue, the publishing industry has also formulated corresponding strategies. For example, People' s Daily' s "Tianmu" intelligent identification system can identify AI-generated content and deepfake content, and trace synthetic methods to their source. Pearson Publishing Group uses technical means to prohibit external AI from training on its content. Stanford University' s DetectGPT tool possesses detection capabilities specifically for AI-generated text, providing important technical support for editorial work. It can effectively distinguish between human-written and machine-generated content, ensuring content originality and publication quality.

2.2 Ethical Challenges and Strategies from AI

The ethical challenges brought by AI are particularly prominent in the publishing industry. Generative AI already possesses the capability to "write" articles

[6], which may make it difficult for the public to distinguish information authenticity, interfering with social trust. Synthetic images or videos using AI may be used in books and audio-visual products to spread false information, damaging personal reputations and privacy while also interfering with readers' judgment of truth. In response to this issue, governance principles and ethical norms are gradually taking shape, with a series of policies being released successively. In 2019, China released the "New Generation AI Governance Principles—Developing Responsible AI" [7], clarifying the governance framework for AI development to ensure safe, reliable, and controllable AI technology development. In 2021, the "New Generation AI Ethics Norms" [8] were released, integrating ethics and morality into the entire AI lifecycle and proposing basic ethical requirements including privacy and security protection. In 2023, the "Interim Measures for Generative AI Services Management" [9] were promulgated, perfecting China's regulatory framework for generative AI services to ensure effective risk prevention while promoting technological development. Currently, large models from eight enterprises/institutions have passed the review according to the "Interim Measures for Generative AI Services Management" requirements and are open to public registration and service provision.

2.3 Challenges and Strategies for AI in TCM Publishing

The inheritance and innovation of TCM cannot be separated from AI technology empowerment. Current TCM publishing aligns with new development concepts and serves as an important boost for TCM to become new quality productive forces. However, AI empowering TCM publishing still faces some problems and challenges: First, TCM-related AI technology itself started relatively late, resulting in relatively weak TCM AI research, talent shortages, and relatively insufficient creative resources. Second, TCM possesses the unique attribute of "bianzheng lunzhi"(pattern differentiation and treatment), making it challenging to extract personalized diagnosis and treatment knowledge for intelligent review using AI large model technology during TCM knowledge compilation. Based on these two points, while there are many AI models with review functions, mature products specifically trained on TCM big data for TCM manuscript review have not yet emerged. The key to addressing this issue lies in cultivating interdisciplinary TCM and AI talent and popularizing knowledge. Currently, some TCM universities have established interdisciplinary programs related to new engineering and new medical sciences, such as the Intelligent Medical Engineering major at Shanghai University of Traditional Chinese Medicine. These programs aim to meet the development needs of China's new generation AI strategy by cultivating medical-engineering compound leading talents and medical innovation talents with solid foundations in TCM and engineering, as well as mastery of data science and AI theories, methods, and skills, and medical-theoretical-engineering thinking. People's Medical Publishing House and China TCM Publishing House also have AI and TCM information technology-related products.

The "14th Five-Year Plan for Publishing Industry Development"issued by the National Press and Publication Administration [10] requires that high-quality publishing industry development strengthen the leading role of new-generation information technology support, innovate publishing formats, dissemination methods, and operation models, advance digitalization and digital industrialization of the publishing industry, and greatly enhance industry digitalization, datafication, and intelligence levels, pointing the direction for the publishing industry. In July 2024, the Third Plenary Session of the 20th Central Committee of the Communist Party of China proposed that "high-quality development is the primary task of building a modern socialist country in all respects. We must lead reform with new development concepts" and "must enhance cultural confidence, develop advanced socialist culture, promote revolutionary culture, inherit excellent traditional Chinese culture, accelerate adaptation to the new situation of rapid information technology development, cultivate a large contingent of outstanding cultural talents, and stimulate the cultural innovation and creativity of the entire nation" [11]. Under the new circumstances, AI can empower TCM publishing, playing a quality-enhancing and efficiency-improving role in TCM inheritance, and contributing to the promotion of China' s excellent traditional culture and the realization of Healthy China.

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