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Challenges and Solutions for Large Language Models in Metaphor Translation of Political Texts

Shubin Chen, Zhen Wang

School of Foreign Languages, Gannan Normal University, Ganzhou, China
Email: chenshubin1979@163.com, 18073789133@163.com

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Abstract

This paper aims to analyze the dilemmas faced by large language models (LLMs) in the metaphor translation of current political texts and explore strategies to enhance the accuracy of such translations. Through the literature research method, it sorts out the working principles of LLMs, the characteristics and translation requirements of current political texts, and theories related to metaphors. The study finds that when LLMs translate metaphors in current political texts, they struggle to accurately capture the political connotations and semantic evolution behind metaphors at the semantic comprehension level; due to cultural differences, it is difficult to convey the cultural connotations when translating metaphors with local cultural colors; in complex contexts, their understanding of metaphors in long texts and those with implicit political intentions is insufficient; problems such as insufficient data quality and diversity, poor interpretability, and lack of robustness of the models themselves also restrict translation effectiveness. To break through these dilemmas, strategies are proposed, including adding high-quality current political text data with precise metaphor annotations, constructing a political and cultural knowledge graph, strengthening the model's ability to analyze the context of long texts, improving the model architecture to enhance interpretability and robustness, developing metaphor translation auxiliary tools, and introducing human intervention. These strategies are expected to provide directions for the development of artificial intelligence translation.

Keywords

Large Language Models (LLMs), Translation of Political Texts, Metaphor Comprehension

1. Introduction

Large language models (LLMs) refer to deep learning models trained on massive text corpora, designed to process natural language for understanding and generating human language. Representing a major achievement in artificial intelligence and computational linguistics, LLMs stand as a paradigm of linguistic research in the AI era. The advent of LLMs research was marked by Ashish Vaswani *et al.*'s introduction of the Transformer architecture in 2017. An explosion in LLMs development occurred in 2019. The launch of OpenAI's ChatGPT (Chat Generative Pre-trained Transformer) in November 2022 garnered global attention, with some scholars heralding it as an opportunity for the "Fourth Industrial Revolution." This spurred rapid development of domestic Chinese LLMs. In 2023, Baidu's ERNIE Bot (Wenxin Yiyan), Alibaba's Tongyi Qianwen, among others, were released, with companies like ByteDance and iFlyTek also actively developing in the LLMs field.

In the translation domain, machine translation has evolved since the 1950s through rule-based, example-based, and statistical machine translation phases, with neural machine translation (NMT) becoming dominant in recent years. The advantages of LLMs in machine translation primarily manifest in translation quality. Leveraging transfer learning, LLMs can apply acquired knowledge to new tasks. Their powerful language comprehension and generation capabilities enable them to grasp the deeper meaning of source texts more accurately, effectively resolving issues like lexical ambiguity and long-distance dependencies by drawing on extensive knowledge bases, thereby enhancing both translation quality and efficiency.

The translation of current political texts serves as a vital channel for understanding China's social development and a crucial window for national external communication. It bears the mission of showcasing the national image, disseminating governance philosophies, and establishing discursive confidence [1], while also undertaking the critical task of breaking down language barriers and promoting international exchange. For the purpose of this study, "current political texts" are defined as official, authoritative documents issued by state institutions, government departments, or ruling parties within a specific contemporary context (typically the past decade), which directly reflect national political orientations, policy guidelines, and governance philosophies [1]. The metaphors pervasive in such documents, deeply rooted in Chinese history, culture, and political processes, carry unique cultural connotations and political ideologies. However, when processing current political texts rich in such metaphors, AI LLMs reveal shortcomings, including inadequate comprehension of cultural backgrounds, deviations in semantic grasp, and insufficient contextual analysis. Therefore, a thorough analysis of the dilemmas LLMs face in translating metaphors within current political texts and the exploration of strategies to enhance translation accuracy have become crucial research topics for improving the precision of China's external communication and strengthening its international discourse power.

To achieve the research goals, this paper is structured as follows: Section 2 elaborates on the working principles of LLMs, the characteristics and translation requirements of current political texts, and the application of LLMs in political text translation. Section 3 analyzes the presentation and functions of metaphors in political texts based on Conceptual Metaphor Theory, with specific examples from the 2024 Government Work Report. Section 4 explores the dilemmas faced by LLMs in translating metaphors in current political texts from dimensions such as semantic comprehension, cultural differences, context dependence, data quality, and model defects. Section 5 proposes solutions to enhance LLMs' metaphor translation capabilities in current political texts. Section 6 summarizes the study, highlighting key findings and future research directions.

2. LLMs and Translation of Current Political Texts

LLMs are based on deep learning architectures. The process begins with collecting vast amounts of textual data. Words are then mapped to specific vector spaces via word embeddings, enabling computers to process language numerically. Subsequently, extensive computational resources are used to train neural network models with enormous numbers of parameters. Through continuous parameter adjustment during training, the model learns linguistic patterns and semantic information within the data, enabling optimal performance across various natural language processing (NLP) tasks. The "large" in LLMs primarily refers to three aspects: the vast number of parameters, the massive scale of training data, and the high demand for computational resources. These "large" characteristics contribute to the increasing parameters of advanced models, leading to superior generalization capabilities and increasingly accurate outputs in specialized domains.

The most significant milestone in LLMs development was the Transformer model introduced by Google. In 2017, Google published the paper "Attention is All You Need," proposing the Attention mechanism and the Transformer architecture based on it [2]. The value of this architecture lies in being a sequence-to-sequence model entirely based on the attention mechanism, eliminating reliance on Recurrent Neural Networks (RNNs), Convolutional Neural Networks (CNNs), or Long Short-Term Memory (LSTM) networks. The Transformer architecture is a neural network-based structure whose key components include an encoder and a decoder. The encoder, comprising input embedding, multi-head attention mechanisms, feed-forward neural networks, and layer normalization, is responsible for converting input text into a fixed-length vector representation. The decoder includes components similar to the encoder (input embedding, multi-head attention, feed-forward networks, layer normalization) but also incorporates masked multi-head attention and encoder-decoder attention mechanisms to generate the next output token. These key components work synergistically, enabling the Transformer to efficiently handle NLP tasks. The application of the Transformer architecture not only enhanced the accuracy and efficiency of machine translation but also propelled the comprehensive advancement of NLP technology.

Current political texts possess distinct characteristics. They are essential textual carriers that record and reflect significant events, policy guidelines, and development strategies in the political, economic, social, and diplomatic spheres of a nation [3]. As expressions of national will, they play an irreplaceable role in national governance, policy dissemination, and public opinion guidance. By definition, current political texts are characterized by pronounced authority and seriousness. Their content is formulated and released by official bodies or government departments, representing the positions and viewpoints of the state and government, thus commanding high credibility. Take government work reports, for instance; although delivered orally by leaders, they represent the stance of a national government and serve as the official articulation of national will and policy. The language employed is rigorous and standardized, striving for precision to ensure accurate and consistent information transmission and avoid ambiguity. When elaborating on policies and plans, accurate and standardized professional terminology is typically used, with strict definitions of relevant concepts and expressions, enabling readers to clearly and unambiguously understand policy intentions and their essence.

The core function of current political texts determines their strong political orientation and guiding nature. These documents are closely centered on the nation's political direction, development strategies, and policy priorities, aiming to propagate the theories, lines, principles, and policies of the governing party, guide public opinion, and shape public thinking. The content typically focuses on major national strategic deployments, solutions to social hot-spot issues, and stances in international relations. By elaborating on these aspects, they convey correct values and political orientations to the public, foster social consensus, and advance the nation's development endeavors. For example, in documents concerning the Rural Revitalization Strategy, the goals, tasks, and measures are detailed, guiding various sectors of society to focus on and participate in rural development, thereby fostering a favorable atmosphere for collective advancement.

Current political texts also exhibit distinct contemporaneity and practicality. They are closely intertwined with the current era and societal development needs, promptly reflecting the situations and tasks faced by the nation at different times, and proposing corresponding policy measures and solutions, thus possessing strong relevance and operability. As times evolve and society progresses, the content of current political texts is continuously updated and enriched to adapt to new developmental contexts and requirements. For instance, in the current digital era, documents concerning the digital economy, cybersecurity, etc., constantly emerge. These documents, closely attuned to the pulse of the times, plan and guide development in relevant fields, propelling construction and progress in emerging areas. Simultaneously, current political texts emphasize the integration of theory and practice; the proposed policies and guidelines are derived from practical experience summaries and are intended for practical application, thereby possessing significant practical value.

The distinctiveness of current political texts dictates their specific translation requirements. Huang Youyi's "Three Closenesses" principle for external communication offers valuable insights for translating Chinese current political texts [4]. This principle advocates: closeness to China's actual development, closeness to foreign audiences' demand for information about China, and closeness to foreign audiences' thinking habits. In terms of translation strategy, flexibility based on specific text features, communication objectives, and target audience characteristics is essential, adhering to the fundamental principle of "maintaining Chinese characteristics while facilitating mutual understanding between China and the world" ("以我为主、融通中外") [5]. "Maintaining Chinese characteristics" means fidelity is paramount, encompassing fidelity to China's political and cultural stance and fidelity to the original text's connotation and essence. This is crucial because Chinese current political texts involve the Party and state's domestic and foreign affairs, embodying government policies and governance philosophies, leaving no room for misinterpretation. Furthermore, these texts are rich in new concepts, categories, and expressions, often lacking exact equivalents in foreign languages, necessitating faithful conveyance of their meaning based on accurate comprehension. "Facilitating mutual understanding" means that while faithfully preserving the original text's meaning and spirit, the translation should also accommodate the target language readers' thinking patterns, cultural customs, reading psychology, and expressive habits, striving for equivalent effect. For example, Chinese often use repetition for logical cohesion, semantic emphasis, and rhythmic effect. English, valuing conciseness, may find excessive lexical or semantic repetition counterproductive. Similarly, Chinese, as a paratactic language, frequently employs subjectless sentences, run-on sentences, and long sentences in political texts. English, being a hypotactic language, generally requires subjects, emphasizes logical relationships, uses connectives frequently, and rarely employs long, subjectless run-on sentences.

In the field of political texts translation, the application of LLMs has demonstrated significant advantages. Compared to human translation, LLMs exhibit clear strengths in processing conventional texts. Trained on massive datasets, they demonstrate precise semantic understanding of the source language, can flexibly parse complex sentence structures, and produce natural and fluent translations, while also adapting to different language styles to ensure high-quality output. Leveraging formidable computational power, LLMs enable efficient parallel processing, responding rapidly to translation requests, whether for lengthy content or real-time communication scenarios. Models also possess adaptability, continuously learning to keep pace with language evolution, and can be fine-tuned for specific domains to meet diverse needs. Furthermore, they support numerous language pairs, and adding new languages is relatively straightforward, ensuring broad coverage. In terms of cost, LLMs reduce labor and time expenses, offering users high-value translation services.

Currently, there are no publicly reported large-scale projects specifically apply-

ing mainstream LLMs like DeepSeek, ChatGPT, or ERNIE Bot to political translation tasks. While ChatGPT lacks publicized major project collaborations in this specific area, as a leading LLM, it is used or studied in related translation work. For instance, Wen Xu and Tian Yaling used the report of the 20th CPC National Congress as corpus, focusing on ChatGPT-generated translations and comparing them with outputs from Google Translate, Youdao Translate, and DeepL [6]. Their analysis revealed that ChatGPT exhibited certain advantages over the other three tools. However, its limitations remained evident in handling content involving ideology, complex structures, culturally loaded terms, metaphors and metonymies, and in ensuring translation accuracy. The iFlyTek dual-screen translator, powered by the iFlyTek Spark LLMs, assisted the Third Forum on International Communication of the Asian Elephant, providing high-quality translation services for keynote speeches and salon discussions, ensuring seamless communication between Chinese and foreign guests.

3. Presentation and Function of Metaphors in Political Texts

The Western tradition of metaphor study began with Aristotle, who assigned metaphor a dual identity in rhetoric and poetics. It was not until George Lakoff and Mark Johnson defined metaphor as "a cross-domain mapping from a source domain to a target domain" [7] that a new chapter in metaphor research from a cognitive science perspective was opened. Metaphor systematically maps one conceptual domain onto another through human cognition and reasoning. In their 1980 collaborative work Metaphors We Live By, Lakoff and Johnson argued that metaphor is not merely a linguistic device but a fundamental mode of thinking [7]. This underscores that metaphor is not just a linguistic phenomenon but a cognitive process intrinsic to humans.

When examining metaphors in current political texts, George Lakoff and Mark Johnson's Conceptual Metaphor Theory (CMT), introduced in their seminal work Metaphors We Live By (1980), provides a crucial analytical framework. Based on the nature of the source domain, CMT categorizes conceptual metaphors primarily into three types: structural metaphors, ontological metaphors, and orientational metaphors. Among these, structural metaphors are particularly prominent in current political texts. Their essence lies in using a well-structured, easily comprehensible concept (source domain) to systematically construct another, more abstract concept (target domain). Although the cognitive domains differ, their structures correspond, with elements mapping regularly. This metaphorical approach effectively transforms abstract political concepts, policies, or national strategies into systematic cognitive frameworks more readily understood by the public. For example, conceptualizing poverty alleviation as a "battle against poverty" (e.g., the 2015 Decision on Winning the Battle Against Poverty) utilizes the structure of war (goal setting, strategic deployment, overcoming difficulties, achieving victory) to systematically build and understand the target domain of poverty alleviation. Structural metaphors manifest diversely and can be further

subdivided into ten subcategories: opera, journey, illness, machine, building, war, weather, sports, and music metaphors.

Ontological metaphors form the foundation of the human conceptual system. They involve conceptualizing abstract, complex ideas, emotions, states, and mental activities as concrete, tangible entities that can be reasoned about, quantified, and categorized—a cognitive process of projecting one concept onto another domain [7]. For instance, "locking power in the cage of the system" conceptualizes "power" as a restrainable animal and "system" as a "cage" with physical boundaries. Ontological metaphors reify abstract political concepts, systems, or governance goals, rendering them operable and visualizable, thereby strengthening the public's concrete perception of policies. This category includes ten subcategories: animal, metal, container, body, water, picture, circle, text, plant, and other ontological metaphors.

Orientational metaphors stem from direct bodily experiences. They involve organizing elements within a single conceptual system based on spatial orientations such as up/down, in/out, front/back, deep/shallow, and center/periphery [7]. Lakoff points out that the spatial structure of the source domain (the spatial mapping) is projected onto the target domain, endowing the abstract target domain with the basic logic of an image schema [8], e.g., "more is up, less is down," "good is up, bad is down." For example, "never allow turning back the wheels of history" binds policy adjustment to the spatial reversal of a vehicle "reversing," simplifying complex political disputes through oppositional orientation to consolidate the mainstream narrative. Orientational metaphors assign value attributes to political concepts through spatial orientation, reinforcing the intuitiveness and acceptance of ideology. They can be summarized into six subcategories: UP/DOWN metaphors, FRONT/BACK metaphors, and CENTER/PERIPHERY metaphors.

To concretely examine the application of conceptual metaphors in current political texts, this study selected the 2024 Government Work Report and its official English translation as representative texts for in-depth analysis. This bilingual report totals 30,722 Chinese characters. Through systematic close reading and manual annotation of the full report, involving item-by-item searching, identification, and verification, 93 expressions containing conceptual metaphors were effectively identified. These identified instances constitute the core corpus for the subsequent detailed examination of their type distribution, mapping mechanisms, and cross-linguistic conversion strategies.

As **Table 1** shows, the distribution of metaphor types in the Report exhibits significant structural characteristics. Ontological metaphors are the most prevalent, followed by structural metaphors, with orientational metaphors being the least frequent. These three types of metaphors utilize source domains drawn from the everyday experiences of the Chinese people (e.g., construction, journey planning) to transform abstract political concepts into perceptible imagery, possessing distinct Chinese characteristics. For instance, in the phrase "...comprehensively advancing the building of a modern socialist country has taken solid steps," the

Table 1. Primary metaphor types and distribution in the 2024 government work report.

Metaphor Type	Number	Metaphor Keywords/Examples	Percentage
Structural Metaphor	25	new journey, process, taking solid steps, battle against poverty...	26.88%
Ontological Metaphor	63	advance/push forward reform, propel high-quality development, new pattern...	67.74%
Orientational Metaphor	5	withstand external pressure, overcome internal difficulties, joint efforts from all across the nation...	5.37%

source domain is WALKING, and the target domain is NATIONAL CONSTRUCTION. The structural metaphor "NATION BUILDING IS A JOURNEY/WALK" facilitates the transfer of meaning from bodily experience to political concept. Similarly, in "reform and opening up were advanced further in depth," the source domain is "AN OBJECT THAT CAN BE PUSHED," and the target domain is REFORM AND OPENING UP. Through the verb "advance/push forward," reform is endowed with the ontological features of "having mass, being displaceable, requiring external force," constituting an ontological metaphor ("REFORM IS AN OBJECT/ENTITY"). Furthermore, in "joint efforts from all across the nation," the term "across" (上下, literally up/down) does not merely denote geographical space. Instead, through orientational metaphor, "social hierarchical relationships nationwide" are transformed into "spatial vertical relationships," using concrete spatial concepts to aid the comprehension of abstract social collaboration structures.

The use of metaphors in current political texts extends far beyond simple rhetorical devices. Their core value lies in fulfilling multiple critical functions that serve specific political communication and cognitive construction objectives. Scholars have explored this deeply: Suhela Adilieti [9] points out that metaphors play a significant persuasive and advisory role in current political texts, serving as powerful tools for politicians to effectively express political intentions, strive for political goals, and win public understanding and support. Chen Wenge further emphasizes that the fundamental purpose of the extensive use of metaphors in political discourse is to conceptualize and convey abstract political realities, creating a public opinion foundation for implementing specific policies or actions [10]. He argues that metaphors profoundly permeate ideology and social cognition during this process, specifically functioning in framing, information filtering, effective persuasion, analogical reasoning, and value assessment. Hao Yuehong's research complements the functions of metaphors in information transmission and image shaping, noting that current political texts use metaphors to transform abstract and complex political concepts into concise and vivid everyday language, significantly enhancing information comprehensibility and public acceptance, while also actively shaping a positive government image and strengthening the

persuasiveness and impact of political discourse [11]. In summary, metaphors are indispensable cognitive and discursive strategies for current political texts to achieve political intention communication, social consensus building, and government image construction.

4. Dilemmas of LLMs in Translating Metaphors in Current Political Texts

Focusing on LLMs themselves, Che Wanxiang *et al.* identified inherent shortcomings, including poor interpretability, susceptibility to bias, security risks, difficulty in guaranteeing information accuracy, high computational cost and energy consumption, dependence on vast amounts of high-quality data coupled with sensitivity to data flaws, and imperfect evaluation systems. These models also face challenges in handling complex semantics and domain-specific tasks [12]. These endogenous problems are amplified when LLMs process metaphorical expressions in current political texts, leading to multi-dimensional dilemmas in semantic understanding, cultural conversion, and contextual analysis, severely constraining translation accuracy and effectiveness. Specifically, the distinct characteristics of ontological, structural, and orientational metaphors identified in Section 3 (see **Table 1**) pose unique challenges that exacerbate these inherent limitations.

LLMs encounter multiple systemic challenges when translating metaphors in current political texts, primarily manifested in the following interrelated dimensions:

First, significant limitations exist at the semantic comprehension level. The rich implied meanings embedded in metaphors often exceed the current models' parsing capabilities. Although LLMs can process surface linguistic information, their capacity to excavate deep semantics is limited, particularly weak when dealing with complex semantic relationships. Political metaphors typically carry specific political connotations and symbolic meanings. For instance, the metaphor "crossing the river by feeling the stones" (摸着石头过河) vividly conveys the core spirit of "exploring while practicing" in China's reform process. An LLM might only produce a literal translation (e.g., "crossing the river by feeling the stones"), failing to accurately transmit its underlying policy orientation and practical philosophy. Furthermore, the semantics of metaphors evolve dynamically with changing times and political contexts. Due to a lack of real-time understanding of political dynamics and insufficient grasp of how specific policy metaphors are understood differently across development periods (e.g., the deepening connotation of "Xiaokang Society" - moderately prosperous society), models are prone to producing distorted or inaccurate translations. This challenge is particularly acute for Ontological Metaphor. As the most prevalent type (67.74% in the 2024 Report), their core function is to reify abstract concepts (e.g., "power", "reform") into concrete entities (e.g., "locking power in the cage of the system"). LLMs struggle to accurately map the specific ontological properties assigned (e.g., what kind of "object" is reform? Mass? Shape? Movability?) and understand the implications of the

chosen source domain (e.g., why a "cage"? What does that imply about controllability?).

Secondly, cultural differences constitute a deep barrier to conversion. Metaphors are deeply culturally rooted, and political-cultural contexts vary significantly across countries and regions. Metaphors in current political texts are often deeply embedded in local cultural soil. LLMs processing them can easily lead to the loss or misinterpretation of cultural information. For example, the Chinese concept "Chinese Dream" (中国梦) embodies profound historical traditions and national value aspirations. Its translation (e.g., "Chinese Dream") may fail to convey its essence to foreign audiences without necessary cultural elaboration. Differences in cultural backgrounds also result in divergent metaphorical expressions and audience comprehension patterns between source and target languages. Models struggle to adapt to this fundamental difference, often producing inappropriate or even erroneous translations. This limitation is particularly exposed when handling culturally specific Western political metaphors lacking direct equivalents in the target language (e.g., some metaphors based on specific religious or historical events). The cultural barrier manifests distinctly in Orientational Metaphor. These rely heavily on spatial concepts derived from bodily experience, which can have culturally divergent value associations (e.g., "UP = GOOD/DOWN = BAD" is common but not universal). Metaphors like "joint efforts from all across (上下) the nation" depend on understanding the specific cultural schema linking social hierarchy ("up/down") with spatial orientation. LLMs may translate the spatial term literally but miss its crucial socio-political connotation.

Thirdly, the high dependency on context presents a significant translation challenge. The precise meaning of a metaphor is highly contingent on its specific textual and political context. Contextual understanding is a critical aspect of NLP [12], and the context of current political texts is especially complex and multifaceted. Accurately translating metaphors requires models to deeply understand and integrate extensive contextual information. However, when processing lengthy documents or interwoven complex contexts (e.g., passages involving subtle nuances in international relations), models often struggle to fully grasp relevant background information, preceding textual cues, and political situations, thereby failing to anchor the metaphor's precise meaning. This deficiency in the depth and breadth of contextual understanding directly hinders the model's ability to grasp the specific connotations of metaphors within particular political scenarios, especially those carrying implicit political intentions and stance information, where the risk of misinterpretation and translation deviation is greater. This challenge is amplified for metaphors with implicit intent. Both Ontological and Structural Metaphors often carry subtle political messages (e.g., the "cage" metaphor implies the need for strong institutional constraints on power). Discerning this implicit layer requires integrating the metaphor with the broader political discourse and historical context, a task current LLMs find difficult.

Fourthly, issues related to training data quality and update timeliness constrain model performance. The performance of LLMs is highly dependent on the scale, quality, and diversity of their training data. In the domain of metaphor translation, data-level defects are particularly acute: flaws within training data have been proven to impact model performance [12]. Specifically, if training corpora lack sufficient representation of current political texts, or if the annotation and parsing of metaphors within them are biased or erroneous, models cannot learn reliable translation patterns. Moreover, insufficient data coverage (e.g., lacking instances from specific policy domains or emerging political metaphors) results in models being unable to handle or making mistakes when encountering related expressions. Crucially, model data updates lag behind the evolution of real-world political discourse, preventing the timely recognition and translation of newly emerging political metaphors, impacting the timeliness and accuracy of translations. This data dependency affects all metaphor types but is critical for contextual usage patterns. Data needs to illustrate how different metaphor types function within complex political discourse contexts.

Finally, the inherent structural deficiencies of the models are significantly amplified in complex metaphor translation scenarios. LLMs suffer from intrinsic issues such as poor interpretability and insufficient robustness [12], which become particularly salient when processing political texts rich in metaphors. The "black box" nature of model decision-making makes it difficult to trace the specific rationale behind metaphor translations, complicating root cause analysis when errors occur. Simultaneously, the lack of model robustness (*i.e.*, resistance to interference and stability) means that when faced with complex metaphorical expressions or noisy political texts (e.g., containing ambiguity or polysemy), the stability and accuracy of translation outputs are easily compromised, making consistent translation quality difficult to guarantee. A concrete example of such translational inadequacies can be observed in the handling of the structural metaphor "我国经济波浪式发展、曲折式前进" (China's economy grew in a wave-like fashion amid twists and turns). Doubao's translation, "China's economy has developed in a wave-like manner and advanced in a tortuous way," separates the two metaphorical components ("wave-like" and "tortuous") into parallel phrases, disrupting the structural coherence of the original that links "wave-like" (cyclical fluctuations) and "tortuous" (challenges) as interconnected aspects of economic progress. DeepSeek's version, "China's economy has advanced in a wavy development and tortuous progress," further distorts the metaphor by nominalizing "development" and "progress," weakening the dynamic sense of movement inherent in the source text. In contrast, the official translation maintains the structural unity by embedding both metaphors within the verb phrase "grew in a wave-like fashion amid twists and turns," preserving the intended meaning that economic growth inherently involves both cyclical patterns and overcoming obstacles—a nuance lost in the LLMs' translations due to their inability to grasp the systemic relationship between the two metaphors.

5. Solutions: Strategies to Enhance LLMs' Metaphor Translation Capability in Current Political Texts

Given the numerous challenges faced by LLMs in translating metaphors, particularly within current political texts, a multi-pronged approach focusing on improving model training, enhancing cultural understanding, optimizing contextual processing, boosting model performance, and leveraging external resources is essential for enhancing translation quality.

Optimize Model Training Data: Increase high-quality and diverse political text data, specifically enriched with metaphorical expressions. Collect extensive political materials from various countries, periods, and domains (e.g., government reports, political commentary articles) to expose the model to various metaphor types and their translation patterns. Precisely annotate metaphors within the data, not just their literal meaning, but also detailing cultural background, political connotations, and contextual references. For example, when annotating "Belt and Road Initiative" (一带一路), elaborate on its role as an initiative promoting international cooperation and shared development, encompassing infrastructure, trade, cultural exchange, etc., aiding the model in more accurate comprehension and translation. Wu Mengcheng *et al.*, focusing on pre-trained language models for Classical-to-Modern Chinese machine translation, successfully built the Siku-Trans translation model based on an encoder-decoder architecture. Achieving a BLEU score of 37.41 and a CHRF score of 33.03, it demonstrated Siku-Trans's accuracy significantly surpassed models like SikuGPT, SikuBERT-UNILM, and OpenNMT [13].

Incorporate Cultural Knowledge: LLMs training data often exhibits bias, with most popular models currently grounded in Western cultural contexts [14]. Duan Yucong *et al.* found leading models like Claude, Hunyuan, and Gemini exhibited relatively low bias, while models like ERNIE Bot (Wenxin Yiyan), PaLM2, and Baichuan still require strengthening in linguistic diversity and inclusivity [15]. Construct knowledge graphs incorporating information on various countries' political cultures, historical backgrounds, and value systems, and integrate these into the model. The practical implementation of such a knowledge graph involves several critical steps. It necessitates the systematic collection and structuring of core political entities (e.g., policies, institutions, events), cultural concepts (e.g., "Chinese Dream," "American Dream"), historical backgrounds, and metaphorical expressions prevalent in political discourse across different nations. This information is organized and interconnected using semantic relationships, such as triples denoting that "Chinese Dream" IS_A "National Aspiration," "Chinese Dream" EMBODIES "Historical Tradition," or "Chinese Dream" RELATED_TO "Great Rejuvenation." Establishing explicit cross-cultural links is paramount, connecting culture-specific concepts with their potential equivalents or explanatory contrasts in other cultural contexts (e.g., juxtaposing "Whole-Process People's Democracy" with Western electoral democracy models). Crucially, metaphorical expressions require detailed annotation specifying their source domain,

target domain, cultural grounding, and established translation precedents. Integrating this knowledge graph into the LLM workflow, potentially through techniques like Retrieval-Augmented Generation (RAG), enhances translation capability. When the model encounters a metaphor rich in political or cultural connotations during translation (e.g., "Community with a Shared Future for Mankind" 人类命运共同体), the system first queries the knowledge graph. This retrieval process fetches pertinent contextual information, cultural background, established translation equivalents, and cross-cultural explanations associated with the metaphor. The retrieved knowledge is then supplied as supplementary context to the LLM alongside the source text. This enriched input guides the model to generate a translation that demonstrates greater cultural sensitivity and semantic accuracy. For instance, regarding the concept of "democracy," different nations have varying understandings and practices. A knowledge graph can inform the model about the differences between China's whole-process people's democracy and Western electoral democracy, enabling more accurate conveyance of connotation when translating related metaphors. Conduct specialized training on culturally specific metaphors, e.g., focusing on common cultural metaphors in Chinese current political texts like "sitting for the imperial examination" (赶考), enabling the model to deeply learn their historical allusions and meanings within contemporary political contexts, thereby improving its handling of such metaphors.

Strengthen Contextual Processing Capabilities: Design more advanced context comprehension mechanisms, utilizing deep learning techniques to enhance the model's ability to analyze long texts and complex contexts. For example, when processing a passage about international political situations, the model should be able to comprehensively consider previously mentioned international relations and political events to accurately interpret metaphors. Introduce pragmatics knowledge to help the model understand the use and meaning of metaphors within specific communicative situations. For instance, in diplomatic settings, some metaphorical expressions might be euphemistic; the model needs pragmatics knowledge to accurately grasp the true intent for appropriate translation.

Enhance Model Performance: Improve model architecture to increase interpretability and robustness. Develop visualization tools to display the model's decision-making process and rationale during metaphor translation, facilitating analysis and improvement. Optimize model training algorithms to enhance noise resistance, ensuring stable and accurate translations even with complex or noisy text. Employ methods like adversarial training to boost model robustness. Zhang Rui *et al.* proposed an end-to-end multi-task learning framework, ASMI, to enhance the robustness of Machine Reading Comprehension (MRC) models. They designed a contextual attention mechanism to predict answer context soft labels, thereby strengthening the context's guiding role for the question-answering task and reducing the impact of distracting sentences on the model.

Leverage External Resources for Assisted Translation: Develop specialized metaphor translation assistance tools integrating various knowledge resources. For

instance, create a tool incorporating a rich metaphor knowledge base and cultural background query system. When the model translates "Community with a Shared Future for Mankind" (人类命运共同体), it can retrieve detailed information about its concept, background, and development from the knowledge base for more accurate translation. Introduce human intervention mechanisms for reviewing and refining model outputs. Professional human translators, drawing on expertise and experience, can meticulously adjust the model's metaphor translations. For metaphors with high cultural specificity and political sensitivity, human translators are essential to ensure accurate conveyance of the original meaning and avoid misinterpretation.

6. Conclusions

This study focused on evaluating the application performance and challenges of Artificial Intelligence Large Language Models (LLMs) in the critical task of translating metaphors within current political texts. The research found that mainstream LLMs encounter a series of systemic difficulties when translating metaphors rich in cultural connotations and political intentions found in such documents. At the semantic comprehension level, models struggle to accurately identify the deep political connotations behind metaphors and their dynamic semantic features evolving with policy developments. Cultural differences impede the effective conveyance of specific cultural nuances inherent in locally rooted metaphors (e.g., "Chinese Dream"). When confronted with complex contexts, models exhibit poor performance in analyzing long texts and identifying metaphors carrying implicit political intentions, directly impacting translation accuracy. Furthermore, limitations in the quality and diversity of available data, coupled with the models' inherent deficiencies in interpretability and robustness, significantly constrain the effectiveness of translation.

To address these dilemmas, this study proposed a comprehensive strategy based on multi-dimensional collaborative optimization. The core approach involves: solidifying the data and knowledge foundation (expanding high-quality political corpora with deep metaphor annotation, constructing knowledge graphs integrating political-cultural backgrounds); strengthening the model's core capabilities (enhancing complex context comprehension and analysis, improving architecture and training methods to boost interpretability and robustness); and establishing human-AI collaboration mechanisms (developing specialized assistance tools and introducing human review at critical junctures). These strategies are mutually reinforcing, aiming to systematically enhance LLMs' ability for precise comprehension and conversion of political metaphors. The core contribution of this study lies in systematically revealing the bottleneck problems when applying LLMs to political metaphor translation and innovatively proposing an integrated optimization solution combining data, knowledge, model architecture, and human-AI collaboration. These strategies not only provide viable technical pathways for improving the accuracy of political text translation and reducing cross-cultural mis-

understandings but also point the way for advancing the deep application of AI translation technology in key areas such as national external communication and the construction of international discourse power.

Looking ahead, the continuous development of LLMs technology, such as improvements in computational efficiency and algorithmic innovation, holds promise for progressively enhancing their ability to handle complex semantic tasks. Building upon the strategic directions proposed in this study, future research could focus on exploring areas such as enhancing models' adaptive learning capabilities for dynamic political semantics, more effectively integrating multimodal information to deepen cultural understanding, and establishing more robust human-AI collaborative translation mechanisms. These efforts will ultimately drive the achievement of comprehensive precision in both the comprehension and output of metaphors in current political text translation.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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