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Analysis of ChatGPT's Place Name Translation Errors: A Case Study of Thai Translations of Place Names in Nanjing

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Abstract: This study investigates the accuracy of ChatGPT in translating Nanjing's place names from Chinese into Thai, identifying key challenges that impact translation quality. The most frequent error type is phonetic transcription errors, which account for 33.80% of all errors. This highlights the significant difficulty in accurately converting Chinese phonetics into Thai. Translation deviations follow at 14.08%, representing cases where the translation partially captures the intended meaning but fails to fully convey it. Cultural background omissions, at 8.45%, reveal the system's struggle to incorporate cultural and historical context into translations. Additionally, grammatical structure errors (4.23%) and lack of referential function (2.82%) indicate limitations in handling syntactic differences and spatial references between the two languages. Despite 28.17% of translations being correct, the high prevalence of phonetic and contextual errors underscores the need for improvements in phonetic accuracy, cultural awareness, and syntactic precision in ChatGPT's translation capabilities. To address these shortcomings, this study proposes a collaborative human-machine model that integrates cultural knowledge databases, phonetic optimization techniques, grammar enhancement tools, specialized translation modules, and post-editing mechanisms. This approach ensures historical and contextual accuracy, refines phonetic transcription through pinyin-to-phoneme mapping, and strengthens syntactic alignment. Furthermore, the incorporation of Named Entity Recognition (NER) and Translation Memory (TM) technologies enhances consistency and linguistic precision, significantly improving the system's ability to handle complex place name translations.

Keywords: ChatGPT; Place Names; Thai Translation; Human-AI Collaboration.

1 Introduction

As a vital branch of translation studies and cross-cultural research, place name translation serves multiple functions, encompassing linguistic conversion, cultural transmission, historical evolution, and regional representation. In cross-cultural communication, place names are more than mere geographical identifiers; they are profound reflections of a

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region's cultural heritage, historical context, and distinctive geographical features. Consequently, the translation of place names plays a pivotal role in fostering cultural exchange, boosting tourism, and enhancing international understanding. Accurate and culturally sensitive translation of place names improves their acceptability and effectiveness in the target language, whereas inappropriate translations can lead to misunderstandings, cultural misrepresentations, or even the erosion of the original culture's significance.

One of the most significant challenges in place name translation lies in striking a balance between cultural transmission and linguistic conventions. Translation is not merely a process of literal conversion but also a recreation of cultural meanings. Li (2020) examined the adaptation of place name translation to the target language, emphasizing that translation strategies are often shaped by the cultural norms, reader expectations, and political considerations of the target language. For instance, certain place names may be intentionally modified due to political sensitivities or may face challenges related to cultural adaptation. Place name translation cannot rely solely on phonetic transcription or semantic translation; instead, it requires a careful balance between the two approaches. Moreover, errors in translation can result in cultural dislocation and information loss, which are recurring issues in this field. Liu & Qian (2015), using the translation of attractions in Yangzhou's Slender West Lake as a case study, highlighted the strengths of semantic translation in conveying cultural connotations, while phonetic transcription helps preserve the historical origins of place names. However, overreliance on phonetic transcription risks stripping place names of their cultural context, leading to a loss of their original significance. If place names are translated too rigidly or mechanically, readers in the target language may misinterpret them or even be misled. Feng (2019), in her research on the translation of campus place names at Southwest University of Science and Technology, proposed a variety of translation methods, including phonetic transcription, semantic translation, and a hybrid approach. She stressed that translation choices should be guided by the functional role of place names and their specific usage contexts. Similarly, Zeren (2019) noted that when translating place names in ethnic minority regions, it is essential to account for linguistic differences between ethnic languages and Mandarin Chinese to prevent misunderstandings arising from inappropriate translation methods.

With the rapid advancement of AI technology, machine translation (MT) has become an increasingly important tool in the field of place name translation. Deep learning-based natural language processing models, such as ChatGPT, utilize extensive datasets to achieve fast and efficient translations of place names. This technological progress offers significant advantages in terms of improved translation efficiency and reduced costs. However, when translating place names that carry deep cultural connotations and complex historical backgrounds, AI systems still face notable challenges. As a natural language generation model, ChatGPT relies on the input data it receives to perform translations. However, due to limitations in its training data, AI translation often struggles with accuracy and cultural adaptability. Machine learning models may lack the ability to fully grasp the cultural and historical contexts embedded in place names, which can result in translations that either omit or misinterpret cultural significance in the target language. This issue is particularly evident when translating place names with multiple layers of meaning or cultural implications, often leading to mistranslations or insufficient contextual processing. For example, place names with historical, religious, or regional significance may not be accurately captured or represented by AI systems, resulting in translations that fail to convey the expected cultural depth and historical value. While AI translation can serve as a valuable tool to support place name translation, it cannot fully replace human translators in terms of accuracy, cultural sensitivity, and the ability to interpret complex contexts. Human translators, with their deep cultural understanding and contextual awareness, consistently demonstrate higher levels of accuracy and cultural fidelity in place name translation. Therefore, this

study will conduct an empirical analysis of ChatGPT's performance in translating Nanjing place names, examining its potential shortcomings in areas such as phonetic transcription, cultural background processing, grammatical structure, and referential function. Additionally, the study will propose improvement strategies and explore the development of a human-machine collaborative translation model. The aim is to enhance translation accuracy and cultural adaptability, thereby advancing the scientific application and practical value of AI technology in the field of place name translation.

2 Research Questions

Based on the preceding discussion, this study aims to analyze the translation errors generated by ChatGPT in rendering place names in Nanjing, evaluate the strengths and limitations of AI in place name translation, and propose targeted strategies for improvement. The specific research questions guiding this study are as follows:

(1)What types of common translation errors occur when ChatGPT translates major place names in Nanjing?

(2)What are the categories and distribution patterns of these translation errors?

(3)What are the underlying causes of these translation errors?

(4)How can ChatGPT's accuracy in place name translation be enhanced, particularly in terms of cultural adaptation and contextual processing?

By addressing these questions, this study seeks to provide both theoretical insights and practical recommendations for the application of artificial intelligence in place name translation, ultimately contributing to the improvement of AI translation accuracy and acceptability in cross-cultural communication.

3 Research Methods

First, this study selects place names in Nanjing as the research objects, compiling a total of 71 place names across diverse categories. These categories include historical sites and cultural attractions, natural landscapes and parks, universities and research institutions, commercial and shopping centers, transportation hubs, streets and districts, tourist areas, mountainous scenic spots, modern facilities, and business districts. These selections reflect Nanjing's rich cultural heritage, natural beauty, and modern urban development. Next, the chosen place names are input into the ChatGPT interface with the instruction: *Please translate the following place names into Thai.* The translation results are systematically recorded to ensure consistency and accuracy. To maintain the comprehensiveness and reliability of the data, all translations are conducted under uniform conditions, with timestamps recorded to minimize external influences and ensure the integrity of the study.

Place name translation errors are categorized into the following types: *Phonetic transcription errors:* Occur when the translated name fails to accurately reflect the original pronunciation. *Cultural background omission*: Occurs when the translation neglects the historical and cultural significance of the place name, resulting in a loss of meaning. *Grammatical structure errors*: Occur when differences in grammar between Chinese and Thai are not properly addressed. *Translation deviations*: Occur when the translation leads to cultural misunderstandings or misinterpretations of regional meanings. *Lack of referential function*: Occurs when the translated name fails to provide clear geographical or directional meaning in the target language. For each type of translation error, frequency statistics are conducted to

identify the most common error patterns in ChatGPT's translations. By calculating the accuracy rate of ChatGPT's translations of Nanjing place names, the study evaluates its overall translation performance. The distribution of different error types is analyzed to determine which errors are most prevalent. A case-by-case analysis is conducted to examine specific instances of translation errors, identifying their underlying causes. Additionally, the study evaluates whether ChatGPT exhibits biases or deficiencies in understanding cultural backgrounds and geographical features, or if technical limitations contribute to translation errors.

During the data processing phase, this study carries out the following tasks:

(1)Detailed Analysis of Specific Examples: Conducts an in-depth analysis of specific translation error instances to thoroughly examine the nature and potential causes of translation errors.

(2)Cause Analysis: Investigates the nature and root causes of translation errors to identify the specific manifestations and underlying reasons for issues in ChatGPT's place name translations.

Based on the analysis results, this study proposes targeted strategies to improve the accuracy of ChatGPT's place name translation and provides practical guidance for future research on AI-assisted place name translation. These strategies not only aim to enhance ChatGPT's translation performance but also contribute to advancing the overall quality of machine translation in cross-cultural communication contexts.

4 Research Results

Based on the data, the main types of errors and their distribution in ChatGPT's translation of Nanjing place names are summarized as follows:

Table 1 Types of Errors and Their Distribution in ChatGPT's Translation of Nanjing Place Names

Error Type	Count	Percentage
Correct Translation	20	28.17%
Phonetic Transcription Errors	24	33.80%
Translation Deviations	10	14.08%
Cultural Background Omission	6	8.45%
Grammatical Structure Errors	3	4.23%
Lack of Referential Function	2	2.82%
Total	71	100%

The distribution of errors in ChatGPT's translation of Nanjing place names reveals several key patterns: *Phonetic Transcription Errors* are the most prevalent, accounting for 33.80% of all errors, indicating significant challenges in accurately converting Chinese phonetics into Thai. *Translation Deviations* follow at 14.08%, reflecting instances where the translation partially captures the meaning but fails to fully convey the intended message. *Cultural Background Omission*, at 8.45%, highlights the system's difficulty in incorporating cultural and historical context into translations. *Grammatical Structure Errors* (4.23%) and *Lack of Referential Function* (2.82%) suggest limitations in handling syntactic differences and spatial references between languages. Overall, while 28.17% of translations were correct, the high frequency of phonetic and contextual errors underscores the need for improved phonetic accuracy, cultural awareness, and syntactic precision in ChatGPT's translation capabilities.

4.1 Phonetic transcription errors 33.80%

Phonetic transcription errors are the most common type of error in ChatGPT's place name translations, accounting for 33.80% of all errors. This result indicates that phonetic transcription is the most challenging aspect when converting Chinese place names into Thai. ChatGPT may struggle to accurately apply phonetic transcription rules, particularly when handling polyphonic characters, special pronunciations, and tonal shifts in Chinese place names. For example:

> *Zǐjīnshān Zijin Mountain incorrectly translated as* ***pʰuːkʰǎwsɯ̂ːtɕin****, whereas the correct phonetic transcription should be* ***pʰuːkʰǎwtɕɯːtɕin****. From a phonological perspective, ChatGPT exhibits significant shortcomings in syllable construction and consonant-vowel matching, particularly in the conversion between the phonetic features of Chinese Pinyin and the phonological rules of Thai. Firstly, the phonetic transcription is inaccurate, as ChatGPT fails to correctly handle the initial consonant [z] in the word Zǐ. In contrast, the manual correction appropriately uses [tɕ], which aligns with the fricative characteristics of the Thai phonological system. Additionally, tone marking is another prominent issue. ChatGPT incorrectly uses the stress symbol [ˆ], whereas the first tone in Mandarin Chinese does not exhibit such a feature, indicating a deficiency in tone conversion. These issues reflect ChatGPT's lack of accurate mastery of phonetic rules and pronunciation characteristics when converting between Chinese and Thai phonological systems. This highlights the urgent need for optimization of its phonetic transcription algorithm to improve accuracy and consistency in cross-linguistic phonetic conversion. Jīmíngsì Jiming Temple was mistranslated as wáttɕîːmǐŋ, while the correct transcription is wáttɕiːmǐŋ. From a phonological perspective, ChatGPT demonstrates significant deficiencies in handling Mandarin tones. In the transliteration of the place name Jīmíngsì, ChatGPT incorrectly rendered Jīmíng as wáttɕîːmǐŋ, where [tɕîː] is marked with a third tone (falling-rising tone). However, the tone of Jī in Mandarin is actually the first tone (high-level tone). The correct transcription should be wát tɕiːmǐŋ, where [tɕiː] accurately reflects the high-level tone characteristic of Mandarin's first tone. The first tone (high-level tone) in Mandarin is characterized by a high, flat pitch contour with a consistently high pitch, while the third tone (falling-rising tone) exhibits a descending and then rising pitch contour, which is markedly different. As a result, ChatGPT's tone recognition and conversion failed to correctly distinguish between the high-level tone and the falling-rising tone, leading to an error in phonetic transcription. This issue highlights ChatGPT's lack of an accurate grasp of Mandarin tone characteristics when converting from Chinese to Thai phonological systems, particularly in terms of tone matching and conversion rules. It underscores the need for ChatGPT's transliteration algorithm to strengthen tone feature recognition and optimize conversion rules to ensure that phonetic transcription accurately reflects the tonal characteristics of Mandarin.*

These errors indicate that ChatGPT fails to fully adhere to the phonetic correspondence rules between Chinese Pinyin and Thai pronunciation, particularly in handling polyphonic characters, tonal shifts, and special phonetic variations. Therefore, the system urgently needs to optimize its phonetic transcription algorithm, enhance the accuracy of Chinese Pinyin recognition, and incorporate Thai phonetic transcription rules to achieve more precise conversions; thereby improving translation quality. The high frequency of phonetic transcription errors highlights ChatGPT's significant shortcomings in learning and applying phonetic rules. This issue is particularly evident when dealing with complex syllables, unique phonetic patterns, and regional dialects in Chinese place names, where its phonetic transcription capability appears notably weak. These findings suggest that the system requires further optimization in terms of the accuracy of phonetic rules and the breadth of their application across different linguistic contexts.

4.2 Translation Deviations 12.08%

Translation deviations account for 14.08% of errors in ChatGPT's Thai translations of place names. The core issue primarily stems from insufficient understanding of specific Chinese terminology, administrative division concepts, and cultural backgrounds, leading to deviations in functional meaning, context, and referential accuracy. For example, ChatGPT translated *Nánjīng Dàtúshā Jìniànguǎn* Nanjing Massacre Memorial Hall as *pʰí.pʰít.tʰá.pʰăn kaːn kʰâː láːŋ pʰàw pʰan nân tɕīŋ*, using the term *kʰâː.láːŋ.pʰàw.pʰan* genocide. However, this Thai term specifically refers to systematic, premeditated actions aimed at exterminating an entire or substantial portion of a group, race, religion, or nationality. In contrast, the term *Dàtúshā* massacre in the Chinese context generally denotes the deliberate killing of large numbers of people, often associated with atrocities or war crimes, but not necessarily involving the systematic planning typical of genocide. Therefore, using *kaːnsăŋ.hăːn mùː* mass killing would better convey the historical facts of the Nanjing Massacre, enabling Thai readers to understand the nature of the event correctly. Another example is *XióngzhōuJiēdào* Xiongzhou Street, which ChatGPT mistakenly translated as *muāŋsôŋtɕūː (muāŋ = city)*. This reflects a fundamental misunderstanding of the administrative division concept in China. In the Chinese administrative system, *Jiēdào* 街道 street is an administrative unit under a county-level city or district, on par with *zhèn* 镇 town, rather than an independent city. The misuse of the term *muāŋ* city fails to capture the correct administrative function. Instead, the more appropriate Thai term would be *ʔam.pʰɤ̄ː* (district or county-level unit) to align with the Thai administrative structure. This choice preserves the referential function while retaining the phonetic transcription, allowing Thai readers to grasp both the administrative level and geographical identity. Therefore, the correct translation should be *ʔam.pʰɤ̄ː sŏŋ tɕ͡ow tɕ͡iaː tâw*. The relatively high frequency of such errors indicates that ChatGPT may have limitations in comprehending the cultural, historical, or regional characteristics of place names. This issue is particularly pronounced when translating place names with distinct cultural significance or historical context, as ChatGPT may fail to account for the relevant background information, resulting in inaccurate translations. These findings highlight the system's insufficient capability in processing the cultural dimensions of place names, underscoring the need for enhanced cultural learning and contextual understanding in AI-driven translation models.

4.3 Cultural Background Omission 8.45%

Errors related to cultural background omission account for 8.45% of the total, primarily manifesting in the translation of place names with profound historical and cultural significance. In such cases, ChatGPT predominantly adopts phonetic transcription, which, although retaining the referential function of the place name to some extent and allowing Thai users to recognize its designation, fails to accurately convey the cultural connotations embedded within the name. For instance, *Zhōngshān Líng* Zhongshan Mausoleum was translated as *sùʔsăːntɕ͡oŋsaːn*, which merely transcribes the term *Zhōngshān* without reflecting its role as the mausoleum of Dr. Sun Yat-sen and its political symbolism. The correct translation should adopt a full phonetic transcription combined with an explanatory note, such as *tɕ͡oŋsaːnlǐŋ ʔà.núʔ.sɔ̌ːn.sà.tʰăːnkʰɔ̌ːŋsŭnjàtsɛ̄ːn* Zhongshan Mausoleum, Memorial of Sun Yat-sen, to supplement its historical value and commemorative significance. Similarly, *Fūzǐmiào* Fuzimiao was translated as *wátfuːtɕ͡ìː*, which preserves the phonetic transcription of *Fūzǐ* but fails to convey its Confucian cultural symbolism as a Confucius Temple. A more accurate rendering should be *fūːtɕ͡íːmîa̯w săːntɕ͡âwhèŋ kʰŏŋ tɕ͡íː* Confucius Temple, Shrine of Confucius, ensuring that readers not only recognize the name but also accurately comprehend its cultural and historical context.

Additionally, *Míngxiàolíng* Ming Xiaoling was merely translated as *sùʔsǎːnmǐŋɛiâw*, without reflecting its role as the mausoleum of Emperor MingTaizu (Zhu Yuanzhang) and its significant historical value. The correct translation should be *mǐŋsìaʷliŋ sùʔsǎːn tɕ͡àk.kʰrá.pʰát hŏŋ ʔûː tɕ͡ûː jŭan tɕ͡aːŋ* Ming Xiaoling, Mausoleum of Emperor Ming Taizu, to fully represent its historical status. These results indicate that while ChatGPT is capable of performing linguistic translation, it fails to fully consider the cultural, historical, or regional background of place names. In certain cases, ChatGPT does not accurately convey the unique cultural significance embedded in specific place names. The presence of cultural background omissions reveals a knowledge gap in ChatGPT when translating place names with deep cultural and historical significance. Although the system can generate literal translations at the linguistic level, its understanding and application of historical heritage and cultural connotations remain insufficient. These findings suggest that ChatGPT needs more comprehensive knowledge integration and contextual analysis when processing place names with strong cultural and historical implications. Enhancing its ability to incorporate cultural background and historical context would improve the accuracy and cultural adaptability of AI-driven place name translations.

4.4 Grammatical structure errors 4.23%

Grammatical structure errors account for 4.23% of all translation errors. Although this percentage is relatively low, it remains a noteworthy issue. This finding suggests that ChatGPT has not fully adapted to the grammatical differences between Chinese and Thai, leading to syntactic errors, particularly when handling place names with complex grammatical structures, resulting in mistranslations or omissions. The presence of grammatical structure errors indicates that ChatGPT encounters challenges in syntactic conversion between Chinese and Thai. When processing place names with intricate sentence structures, the system fails to effectively manage the grammatical discrepancies between the two languages, leading to inaccurate translations. To enhance translation quality, ChatGPT must improve its understanding and application of grammatical rules in both languages. In particular, when dealing with complex grammatical structures, further optimization of syntactic transformation capabilities is required to ensure greater accuracy in place name translation.

One typical error case is the translation of *Nánjīng Chángjiāng Dì'èr Dàqiáo* Nanjing Yangtze River Second Bridge, which was incorrectly rendered as *sà.pʰāːn jāːw jāːw tɕ͡āːŋ tɕ͡ɪaŋ sɔ̌ːŋ nǎːn.tɕ͡ɪŋ*. This translation exhibits three major grammatical issues: *Redundant and Unnatural Word Usage.* The phrase *jāːw jāːw* literally means long long or very long bridge. However, this kind of repetition is unnatural in Thai. In Thai, the correct way to express a big bridge is *sà.pʰaːn jài* rather than repeating the word long. *Inaccurate Phonetic Transcription of Chángjiāng* The translation *tɕ͡aːŋtɕ͡ɪaŋ* does not align with Thai conventions. In Thai, the Yangtze River is commonly referred to as *mɛ̂ː.náːmjɛ̄ːŋ.sīː*, which not only preserves the river's name but also follows the standard linguistic practice familiar to Thai speakers. *Incorrect Use of Ordinal Numbers* The word *sɔ̌ːŋ* in Thai typically denotes the numeral two. However, when expressing *Dì'èr* second as an ordinal number, it is necessary to use *hɛ̀ŋtʰîːsɔ̌ːŋ* to conform to Thai grammar rules.

The primary issue in ChatGPT's translation lies in its syntactic structure, which does not align with Thai grammatical conventions, making the translation sound unnatural and even difficult to understand in the Thai context. This error reflects a fundamental problem in cross-linguistic syntactic conversion, where ChatGPT demonstrates a tendency towards mechanical literal translation. In particular, it struggles with numerical expressions, modifier order, and the translation of proper nouns, failing to accurately adapt to the grammar rules of the target language. This issue becomes especially pronounced when translating place names, as they often have fixed expressions that require a deeper

understanding of linguistic norms rather than mere phonetic transcription. To ensure translation accuracy and readability, the correct Thai translation should be: *sà.pʰaːn kʰâːm mɛ̂ː.náːm jɛ̄ːŋ.sīː hɛ̀ŋ tʰîː sɔ̌ːŋ nai năːn.t͡ɕīŋ.*This version not only follows Thai syntactic rules but also accurately conveys the geographical and structural information, maintaining both clarity and cultural appropriateness.

4.5 Lack of Referential Function 2.82%

Errors related to the lack of referential function account for 1.41%, indicating that ChatGPT, in some cases, fails to accurately convey the spatial information, directional features, or administrative division relationships embedded in the place name. These errors primarily manifest in the inability to correctly express the geographical referentiality of the name, making it difficult for the target language readers to identify the actual location.

For instance, when translating place names that involve directions, orientation, or administrative region indicators, ChatGPT may omit crucial information or fail to properly arrange word order according to the conventions of the target language, thereby reducing translation accuracy and readability. In translation errors related to the lack of referential function, *Nánjīng Nánzhàn* Nanjing South Railway Station and *Dōngnán Dàxué* Southeast University serve as typical examples, reflecting that ChatGPT fails to accurately convey the spatial orientation of the original place names. ChatGPT translated *Nánjīng Nánzhàn* Nanjing South Railway Station as *sà.tʰăː.nīː rót.fai năːn.t͡ɕīŋ tâi.* Similarly, *Dōngnán Dàxué* Southeast University was translated as *má.hăː.wít.tʰá.jāː.lăj tàˋ.wan.ʔɔ̀ː.k t͡ɕʰĭaŋ tâi.*Although these literal translations seem reasonable on the surface, they lack clarity in spatial positioning or referential function, making it difficult for Thai users to precisely understand the specific location indicated by the place name. The correct translation approach should follow the structure of generic noun (category) + phonetic transcription, meaning that a generic Thai noun (such as university or station) should first indicate the category of the place name, followed by the phonetic transcription of the proper name. This structure ensures that the translation not only clearly indicates the spatial location but also preserves the original name, allowing readers in the target language to accurately grasp the geographical referentiality. Nanjing South Railway Station should be translated as *sà.tʰăː.nīː rót.fai năːn.t͡ɕīŋ năːn* Station+Nanjingnan.Southeast University should be translated as *má.hăː.wít.tʰá.jāː.lájtoŋnăːn* University + Dongnan. This method maintains both clarity and accuracy, ensuring that the referential function of the place name is preserved.

The presence of referential function errors suggests that ChatGPT has limitations when translating place names that require clear geographic positioning or directional references. This shortcoming reveals that the system's understanding of spatial information and referential meaning in place names is not sufficiently developed. To enhance translation accuracy and usability, ChatGPT must improve its ability to process geographic and locational information, ensuring that place names maintain their intended referential function in the target language.

Through the probability analysis of different types of errors, it can be concluded that phonetic transcription errors account for a significant proportion of ChatGPT's place name translation errors, highlighting challenges in applying phonetic rules and handling pronunciation conversion. Translation deviations and cultural background omissions indicate that ChatGPT has certain limitations in processing the contextual and cultural connotations of place names, while grammatical structure errors and improper word choice reveal deficiencies in linguistic expression, affecting translation accuracy and readability. Overall, these findings suggest that ChatGPT needs further improvement in its understanding and application of complex grammar, cultural background of place names, and referential functions to enhance its translation accuracy and contextual appropriateness.

5 Enhancing ChatGPT's Accuracy in Place Name Translation: Cultural Adaptation and Contextual Processing

Machine translation (MT) systems, including ChatGPT, face significant challenges in accurately translating place names, particularly in maintaining cultural relevance, phonetic accuracy, and grammatical correctness across languages. To improve ChatGPT's performance in this area, a structured approach integrating cultural knowledge bases, phonetic optimization, grammar refinement, specialized translation modules, and human-machine collaborative review is proposed. These improvements align with existing research in computational linguistics and translation studies, particularly in cultural adaptation (House, 2015), phonetic modeling, and post-editing strategies (Vieira, 2019).

5.1 Integration of Cultural Knowledge Bases

One major limitation of MT systems in place name translation is the omission of historical and cultural contexts. Integrating a cultural knowledge base (CKB) into ChatGPT's translation model would enhance its ability to recognize culturally significant locations and adapt translations accordingly. Prior research has demonstrated that context-aware translation models improve cultural accuracy by embedding socio-historical data into machine learning frameworks. By linking place names to historical events, social significance, and regional identity, a CKB can prevent literal translations that strip names of their cultural essence. For instance, neural translation models incorporating external cultural metadata have been shown to outperform purely statistical approaches in preserving cultural integrity in translations (Yao, et al., 2016). Implementation: Develop a structured knowledge repository of cultural and historical contexts. Implement metadata tagging to associate place names with relevant cultural narratives. Train context-aware translation models that prioritize meaning retention over direct transliteration.

5.2 Optimization of Phonetic Transcription Algorithms

Phonetic inconsistencies account for 33.80% of translation errors in place name rendering. Research in phoneme-based machine learning suggests that integrating phoneme-to-phoneme mapping techniques can significantly improve pronunciation accuracy across languages. ChatGPT's phonetic model should be optimized using contrastive phonology, which compares source and target language sound systems to ensure more natural phonetic correspondence. Implementation: Utilize a model that converts Chinese pinyin into Thai phonemes, refining sound adaptation. Use text-to-speech models to refine phonetic transcription based on spoken language data, reducing artificial transliterations. Utilize large-scale datasets of Chinese-Thai transliteration pairs to improve phonetic accuracy.

5.3 Strengthening Grammar Rule Training

Grammatical structure errors contribute to 4.23% of inaccuracies in ChatGPT's translations. Research in contrastive linguistics (Koehn & Knowles, 2017) indicates that MT systems struggle with modifiers, determiners, and word order mismatches when translating between typologically different languages. Chinese and Thai have distinct grammatical structures, particularly in adjective-noun positioning, attributive clauses, and syntactic dependencies. Implementation: Implement syntactic transfer models that map Chinese sentence structures onto equivalent Thai patterns. Develop a grammar correction engine that adjusts word order, modifiers, and determiners post-translation. Utilize dependency

parsing algorithms to ensure grammatical correctness in modified sentence structures. Recent studies emphasize that syntax-aware neural machine translation (Sennrich & Haddow, 2016) reduces misalignment errors in phrase-structure-dependent translations. Applying these methods to place name translations can significantly enhance syntactic fidelity and readability.

5.4 Development of a Place Name-Specific Translation Module

Place name translation requires a unique processing model distinct from general text translation, as evidenced by research in named entity translation. Machine learning-based translation models often misinterpret place names as common phrases, leading to errors in phonetic consistency and referential accuracy. A dedicated place name translation module can be integrated into ChatGPT to handle location-based references with specialized linguistic rules. Implementation: Develop a named-entity recognition filter to identify place names and apply specialized translation rules. Create a phonetic and semantic rule set tailored for geographical name translation, preventing misclassification as regular nouns. Incorporate hierarchical place name disambiguation: Distinguish between city names, historical sites, and administrative regions to apply correct translation frameworks. Studies on domain-specific translation models (Wassie, et al., 2024) confirm that customized modules outperform generic NMT frameworks in handling domain-constrained translations, reinforcing the need for specialized place name translation training.

5.5 Human-Machine Collaborative Post-Editing

Machine translation systems, including ChatGPT, still require human post-editing to achieve high accuracy, particularly in specialized domains like geographical and historical translations. Research in Post-Editing Machine Translation (Koponen, 2016; Vieira, 2019; Carl & Hansen-Schirra, 2015) demonstrates that human-in-the-loop correction models improve translation accuracy by refining phonetic adaptation, grammatical coherence, and contextual alignment. Implementation: Develop a feedback loop where human reviewers correct AI-generated translations, feeding improvements back into the system. Use translation memory systems to store human-edited place names for consistency. Automate post-editing suggestions: Employ linguistic validation models that flag potential phonetic, grammatical, and cultural mismatches for human verification. Research in adaptive post-editing shows that incorporating human corrections into AI-driven translation memory results in long-term improvements, particularly for low-resource language pairs like Chinese-Thai.

6 Conclusion

To enhance ChatGPT's place name translation accuracy, an integrated approach is required, addressing phonetic modeling, grammatical adaptation, cultural knowledge integration, and post-editing mechanisms. By leveraging cultural knowledge bases, phoneme-matching algorithms, grammar-aware NMT models, specialized named-entity translation modules, and human-in-the-loop review, the translation process can achieve greater linguistic precision and cultural fidelity. Existing research in computational translation strongly supports hybrid AI-human collaboration, ensuring that historical, phonetic, and grammatical intricacies are preserved in place name translations. These advancements will significantly improve ChatGPT's ability to handle linguistically and culturally complex geographical references, contributing to a more robust and reliable machine translation system.

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