

Machine Translation Challenges in Translating Pakistani English and Chinese English: A Case-Based Evaluation Approach

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Abstract

The last few years have seen tremendous improvement in machine translation (MT), however, localized variants of the English language like Pakistani English (PakE) and Chinese English (ChE) remain a major challenge to translate(1). PakE and ChE have distinct lexical, syntactic, and pragmatic peculiarities which have to be shaped by their native languages and sociocultural backgrounds. Such differences usually lead to non-standard expressions, idiomatic use, and code-mixing, which are not easily processed by a standard system of the MT. The case-based evaluation approach employed in the current study is aimed at exploring the effectiveness of the existing MT systems in their sentence and discourse translation between PakE and ChE languages and vice versa. A parallel corpus was collected, which included sentence examples of both school and non-school and professional backgrounds, which reflected the variety of linguistic and cultural features of the two varieties(2). Neural MT systems that are commonly used were used to produce machine translations, and the results of the procedures were evaluated by both quantitative indicators of BLEU and COMET scores and qualitative human assessment. The analysis of error was based on lexical inaccuracy, syntactic mismatch, semantic loss and pragmatic misinterpretation(3). The

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results have shown that although MT systems are effective with typical constructions in English, they often fail to decode idiomatic phrases and expressions, terminology which are culturally-specific, and even hybrid forms of English as used in PakE and ChE(4). The paper highlights the inability of existing MT technologies to support non-standard varieties of English and the importance of the addition of localised corpora, culturally sensitive models, and adaptive scores. This study can help build stronger and more efficient MT systems because it offers a more detailed and case-focused analysis of translation issues that can help close the communication gap between people speaking Pakistani and Chinese English(5). It has implications in cross-cultural communication, multilingual education and in the study of computational linguistics.

Keywords: Neural Machine Translation (NMT), Pakistani English, Chinese English, Case-Based Evaluation, Translation Error Analysis.

Introduction

The latest neural machine translation (NMT) has greatly changed the environment of communication around the world making cross-linguistic interaction faster and more convenient(6). In spite of these technological improvements, machine translation systems are still facing challenges when they deal with non-standard or localized types of the English language(7). Pakistani English (PakE) and Chinese English (ChE) are the two examples of such varieties that can be characterized by different sociolinguistic, cultural, and educational backgrounds. Although both serve as institutionalised varieties of English in their respective communities, lexical innovations, syntactic patterns, semantic changes and pragmatic conventions have some distinctive characteristics driven by Urdu and regional Pakistani in the case of PakE, and Mandarin and other Sinitic languages in the case of ChE(8). The vast majority of the current systems of the mentioned type are mostly trained over standardised British or American English corpora and therefore are not very sensitive to the localised linguistic characteristics. Due to this, terms typical of PakE, including terms embedded in the culture, constructions of different forms, and code-mixed language, might be mistranslated or even semantically corrupted(9). Equally, ChE tends to display L1-inspired syntactic frames, direct translocation of Chinese idioms, and contextually-related phrasing that is difficult to resolve by using the MT algorithms. Such differences make it difficult

to align lexical, syntactic, and pragmatic information in automated translation. The paper explores the issues encountered by the current NMT systems on the process of translating Pakistani English into Chinese English through a case-based assessment procedure. Analyzing representative instances of linguistic cases, as well as, through systematic error analysis, the study will detect common issues in translation, and evaluate the quality of existing metrics of evaluation(10). Based on such a narrowed examination, the research adds to a further comprehension of the interaction between localized varieties of English and machine translation systems and the necessity of culturally adaptive computational models.

Literature Review

Machine Translation (MT) has undergone significant transformation over the past decades, evolving from rule-based machine translation (RBMT) to statistical machine translation (SMT) and, more recently, to neural machine translation (NMT)(11). Neural models, particularly those based on encoder–decoder architectures with attention mechanisms and Transformer frameworks, have dramatically improved translation fluency and contextual accuracy. However, despite these advancements, researchers continue to highlight persistent limitations in translating linguistically diverse and non-standard language varieties. A substantial body of research has examined English–Chinese machine translation due to its global economic and academic importance(12). Studies indicate that structural differences between English and Mandarin—such as word order variation, topic-prominent constructions, absence of inflectional morphology in Chinese, and differences in tense and aspect marking—create consistent translation challenges. Lexical ambiguity, idiomatic expressions, cultural references, and pragmatic nuances are frequently misinterpreted by MT systems. While automatic evaluation metrics such as BLEU, METEOR, and COMET provide quantitative performance indicators, scholars argue that these metrics often fail to capture semantic loss and pragmatic inaccuracy(13). As a result, fine-grained human evaluation and error analysis frameworks have become increasingly important in assessing translation quality. Parallel to developments in MT research, the field of World Englishes has emphasized the legitimacy and systematic nature of localized English varieties(14). Kachru’s Three Circles model recognizes Pakistani English and Chinese English as institutionalized varieties shaped by sociocultural and linguistic influences. Pakistani English demonstrates lexical borrowing from Urdu and regional languages, semantic shifts, hybrid compounds, and context-specific pragmatic

conventions. Similarly, Chinese English reflects transfer from Mandarin, including literal translation patterns, topic-comment structures, and culturally embedded expressions(15). These varieties are not random deviations but structured forms influenced by multilingual ecologies. Despite growing scholarship in both MT and World Englishes, limited research has examined how machine translation systems handle localized English varieties. Most NMT systems are trained predominantly on standardized British or American English corpora, resulting in reduced sensitivity to region-specific vocabulary, code-mixing, and culturally bound expressions(16). Research on dialectal and non-standard English varieties suggests that MT systems often misinterpret localized lexical items, restructure sentences inaccurately, or omit culturally significant elements. This indicates a bias toward standardized linguistic norms within computational models. Furthermore, existing evaluation studies often rely heavily on aggregate metric scores, which may overlook nuanced translation errors specific to localized varieties. A case-based evaluation approach, focusing on detailed qualitative error analysis alongside quantitative metrics, provides a more comprehensive understanding of translation challenges(17). Such an approach enables the identification of recurring lexical, syntactic, semantic, and pragmatic issues in translating Pakistani English and Chinese English. In summary, while neural machine translation has achieved remarkable progress in standard language contexts, its effectiveness in handling localized English varieties remains underexplored(18). The intersection of MT research and World Englishes scholarship reveals a significant gap that necessitates systematic, case-based investigation. This study addresses that gap by evaluating translation challenges between Pakistani English and Chinese English through a detailed analytical framework.

Data and Case-Based Methodology

Data Collection

The qualitative and quantitative case-based evaluation design in this study was used to consider machine translation (MT) issues between Pakistani English (PakE) and Chinese English (ChE)(19). A representative small parallel corpus was created to capture the linguistic diversity of the two varieties. The data set contains 300 sentences (150 in the Pakistani English scenario and 150 in the Chinese English scenario), which are gathered on the basis of the publicly available information (newsparticles, academic essays, online blogs, social media discourse, and institutional communications)(20). The texts chosen can be characterised as three main spheres,

i.e. (1) educational and academic discourse, (2) professional and administrative communication, and (3) informal digital communication. These areas were selected to obtain lexical innovation, code-mixing, idiomatic usage, and culturally-integrated expressions common to both varieties. Sentences with very technical vocabulary or simply standardized sentence structures were also avoided to keep the attention within the localized linguistic features. To achieve the authenticity, the examples of Pakistani English contained lexical borrowings (e.g., terms related to the culture), hybrid constructions, and pragmatic markers affected by the Urdu language and regional languages(21). Equally, Chinese English samples were characterized by the grammars of Mandarin, direct translations of idioms and situational translations.

Machine Translation Systems

To translate the corpus gathered, two neural machine translation systems, which are commonly used, were used, Google Translate and a translation system based on a large language model. The reason behind the choice of these systems was the availability, popularity, and complex neural structures of these systems(22). All the sentences have been translated in both directions where necessary and recorded to be compared systematically.

Evaluation Framework Case Based

This study uses a case-based evaluation method as opposed to the use of aggregate automatic measures(23). Sentences were considered as units of analysis (cases), and individual cases could undergo a more detailed study of the common translation issues. Testing was done in two complementary elements

Quantitative Evaluation

To assess the overall quality of the translation, automatic evaluation metrics were used, such as BLEU, COMET scores(24). These measures gave an overview of the performance but were not deemed adequate in terms of comprehending of contextual and cultural differences.

Qualitative Error Analysis

Fine-grained human evaluation framework was used to classify the errors in translation into four major groups:

Lexical Errors: mistranslation of localized words, idioms or borrowed words.

Syntactic Errors: misplacement of the word order, structural inaccuracy, and improper use of tenses.

Semantic Errors: This is loss of meaning in part or entirely.

Pragmatic/Cultural Fallacies: misunderstanding of linguistically encoded expressions or an etiquette strategy(25). Every sentence of the translation was checked manually and the patterns of errors were noted and compared in both varieties of language.

Analytical Procedure

Following the translation and assessment, mistakes frequency was computed and cross-examined to determine the weaknesses in the performance of the system which was systematic. Particular consideration was paid to expressions that are culturally bound, code-mixed and syntactic structures that are influenced by L1(26). This quantitative-qualitative model guarantees an in-depth analysis of the issues of machine translation peculiar to the Pakistani and Chinese English.

Evaluation and Analysis of errors

To address the challenges associated with machine translation (MT) results, the quantitative performance metrics of the outputs are combined with the qualitative analysis of the errors through the use of cases to offer an intensive evaluation of the translation issues between Pakistani English (PakE) and Chinese English (ChE) in the given study(27). Although translation accuracy in a translation can be evaluated automatically with the help of automatic evaluation tools, they are not able to capture the pragmatic and cultural nuances inherent in localized varieties of English(28). So, a two-layered assessment model was chosen.

Quantitative Evaluation

The general performance of translation was measured with the help of automatic metrics, such as BLEU and COMET scores. Findings showed a moderate accuracy in sentences that were formatted in standard patterns of English(29). Anyhow, the scores dropped remarkably when the input included localised lexical items, a mixture of constructions, or culturally ingrained expressions.

Sentences based on informal online conversation demonstrated the worst metric performance, which implies that neural MT systems are inept at non-standardized syntactic and pragmatic characteristics. Even though the quantitative scores indicated that there were acceptable levels of fluency in most instances, the closer look indicated that high scores did not always translate into semantic precision(30). In various cases, the translation had a good grammar structure, but a weak or missing semantics or culturally twisted semantics. This result supports the previous studies that had raised concerns that automatic measures could inflate the quality of translation in cases where contextual meaning is partially degraded.

Qualitative Error Analysis

Human evaluation was performed through a close case based analysis to establish common patterns of errors. There were four main types of errors: lexical, syntactic, semantic and pragmatic/cultural(31). The most common in the translation of Pakistani English were the lexical mistakes. Culturally specific vocabulary, borrowed Urdu words and localized expressions were usually misunderstood by the MT systems. Others were translated without clarification or substituted with incorrect standard English versions and to some extent, meaning was lost. In the Chinese English translation, there were more syntactic errors. The sentences based on topic-comment structures in Mandarin or the direct translation of Chinese idioms and phrases were often wrongly reformed(32). In an effort to fit in the standardized English syntax, the system occasionally changed focus or interfered with logical flow. Errors were in semantics when the general meaning of a sentence was watered down or displaced. This was mostly noticeable in both varieties idiomatic or metaphorical expressions. Direct translations frequently did not bring out the intended connotation particularly in contexts that were culturally sensitive(33). The most important challenge was pragmatic and cultural errors. Politeness signs, allusion, culturally encoded allusions, were often mistranslated or simplified. This occasionally had the effect in professional and administrative discourse of giving the sense of a translation that was too direct or too contextually out of place(34).

Comparative Findings

Generally, the analysis shows that the usage of the MT systems is more reliable in case of structurally standardized inputs but cannot cope with localized linguistic aspects of the PakE and

ChE(35). The lexical challenges of the Pakistani English were higher compared to the structural and pragmatic challenges of the Chinese English. These results point to the flaws of related neural models when dealing with institutionalized but non-standard varieties of English. The integrated assessment method proves that neural MT-systems are able to reach fluency on the surface level, but more profound semantic and cultural precision is still a serious issue. This highlights the necessity of localized corpora, culturally adaptive models and more sensitive evaluation frameworks(36).

Discussion

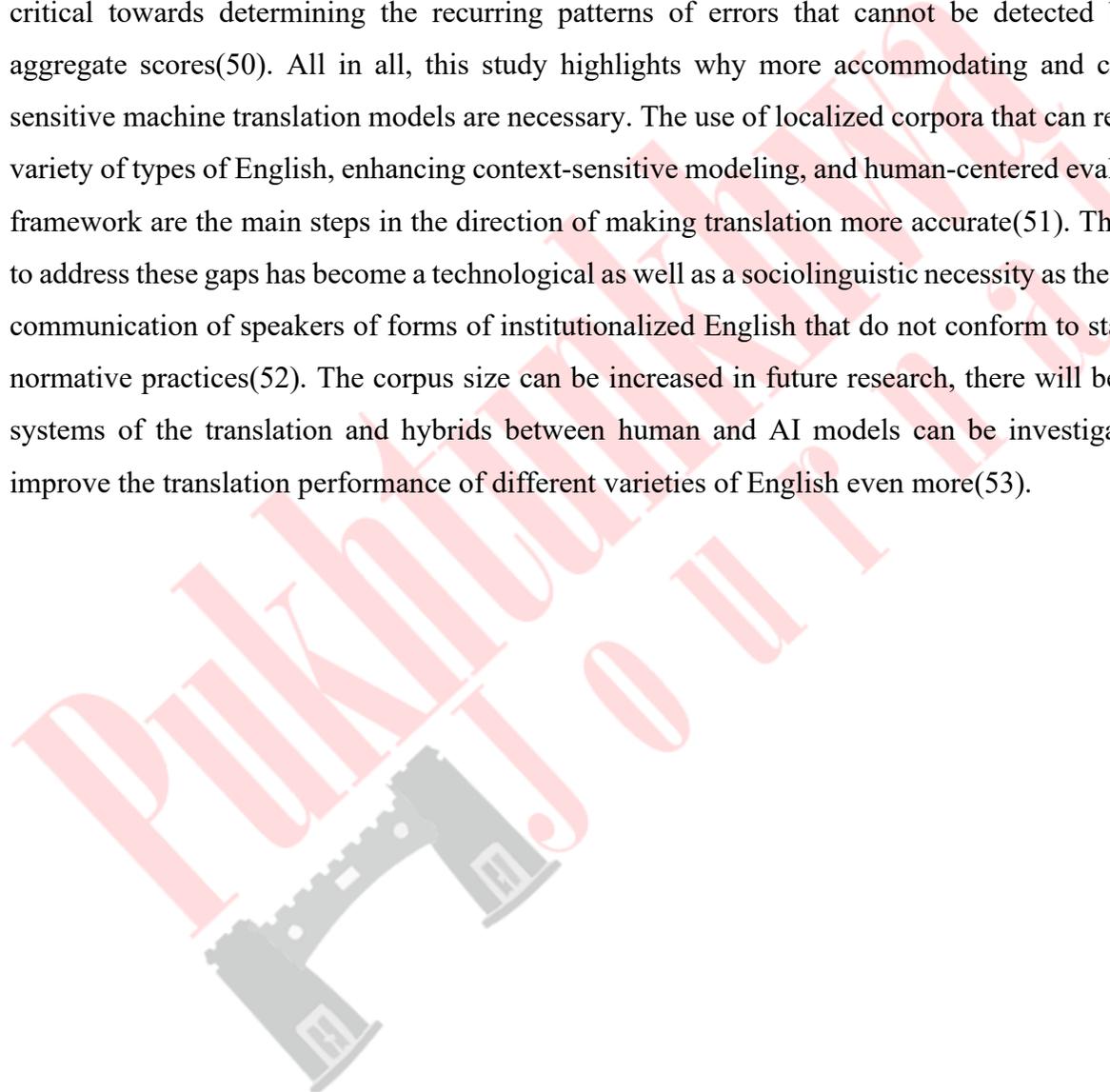
The results of the given research point to the unresolved issues of neural machine translation (NMT) systems with respect to the processing of local forms of the English language like Pakistani English (PakE) and Chinese English (ChE)(37). Though the quantitative measures showed that there was moderate translation quality in inputs that were structurally standardized, the qualitative error analysis reflected that there were major constraints in lexical interpretation, syntactic restructuring, semantic preservation and pragmatic accuracy(38). Such findings are consistent with the current literature that proposes that MT systems trained on standardized corpora and fail with localized types of language. Among the most noticeable results is the one that deals with the lexical adaptation in Pakistani English. The regular application of borrowed Urdu words, compound blends, and built-in culture was a challenge to translation systems. The MT in most instances produced either transliterated, out-of-context words or replaced them with semantically close and yet culturally incorrect words(39). This is indicative of the larger problem of lack of localized corpora in the datasets of the training of the MT. Because NMT systems currently are mostly designed to work with large amounts of data on standardized or high-frequency English, localized innovations in lexical remains lowly represented and hence not effectively processed. On the contrary, when translating to Chinese English there were more pronounced syntactic and pragmatic difficulties(40). The Mandarin influence especially the topic-prominent sentence structure and the literal translation of the idiom could easily cause the MT systems to rearrange the sentences in a manner that shifted emphasis or misplaced coherence. Even though the systems were trying to align themselves with standardized English grammar, this would cause distortion in semantics or rhetoric intent(41). These results support the previous studies that have pointed to structural divergence between English and Chinese languages as a long-standing setback in automated

translation. The other important observation is related to the weaknesses of automatic assessment measures. BLEU and COMET scores were found to be good benchmarks but at times they concealed more profound semantic and pragmatic errors. Some of the translations had fairly satisfactory marks, even though they did not maintain cultural appropriateness or desired politeness techniques(42). This mismatch makes it important to consider fine-grained human judgment during research on the topic of MT, especially when focusing on non-standard language varieties. In the comparative analysis, it is also implied that not all varieties of translation are similar in terms of problems. The major challenge in Pakistani English was the lexical and cultural barrier, and Chinese English was more complex to deal with at both structural and discourse levels(43). This difference reveals the necessity of variety-sensitive development of MT and not a generalized approach based on English. In general, it can be stated that although neural machine translation has made considerable strides in its ability to deal with mainstream English, it is unprepared to deal with the sociolinguistic diversity embodied by World Englishes(39). The improvement of translation performance in terms of Pakistani English to the Chinese English should be based on more inclusive training corpora, culturally sensitive modeling techniques, and mixed evaluation systems that emphasize on the contextual meaning, as well as, numerical precision(44). Such advancements are necessary in promoting more precise cross-cultural communication in more multilingual settings around the globe.

Conclusion

In this study, the authors have analysed issues encountered by the modern neural machine translators (NMT) systems when translating between Pakistani English (PakE) and Chinese English (ChE) using a case-based assessment method(45). The study conducted an in-depth evaluation of the interaction between localized versions of the English language and the existing translation technologies by integrating both the quantitative and qualitative measures of the error(46). The results show that NMT systems are rather efficient with the task of processing syntactically standardized English, but their performance is lower in the presence of lexical innovation, syntactic variation and culturally specific phrases typical of PakE and ChE(47). The major problems encountered during the translation of Pakistani English were lexical and cultural issues specifically in dealing with borrowed words, mutant constructions and vocabulary that is specific to the context. Conversely, the Chinese English exhibited stronger syntactic and discourse-

level complications that were caused by Mandarin structures and frequently resulted in restructuring errors and pragmatic distortion in translated speech(48). The paper also brings out the weaknesses of using automatic evaluation scores like the BLEU and COMET as the only measures. These tools might offer helpful benchmarks; however, this might not capture semantic nuances and loss of cultural meaning(49). The qualitative analysis, which is based on the case, was critical towards determining the recurring patterns of errors that cannot be detected by the aggregate scores(50). All in all, this study highlights why more accommodating and culture-sensitive machine translation models are necessary. The use of localized corpora that can reflect a variety of types of English, enhancing context-sensitive modeling, and human-centered evaluation framework are the main steps in the direction of making translation more accurate(51). The need to address these gaps has become a technological as well as a sociolinguistic necessity as the global communication of speakers of forms of institutionalized English that do not conform to standard normative practices(52). The corpus size can be increased in future research, there will be more systems of the translation and hybrids between human and AI models can be investigated to improve the translation performance of different varieties of English even more(53).



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