



Exploring Code-Switching Dynamics in Urdu-English Multilingual ChatGPT Models: Patterns, Challenges, and Implications

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Abstract

This research investigates the code-switching dynamics in the Urdu-English multilingual ChatGPT models aimed at discovering the themes, challenges, and implications. Utilizing text data retrieved from online resources, social media platforms and subject-oriented conversations, code switching will be examined through preprocessing and annotation processes. Algorithms are developed to automatically detect and classify code-switching instances, followed by an in-depth analysis of frequency, distribution, and contextual triggers. The study evaluates the role of ChatGPT in code-switched activities by generating text sets and ranking them based on language identification, syntactic coherence, and semantic consistency. Data evidenced that code-switching is often and that ChatGPT can communicate in different languages. The findings will be helpful in the process of refining AI-based natural language processing systems. The work investigates the more detailed perception of language change in digital environments. It provides a basis for designing more welcoming and culturally considerate communication and media tools.

Keywords: Code-Switching, Multilingualism, ChatGPT, Linguistic Patterns, Semantic Analysis, Syntactic Analysis, Baseline Model

1. Introduction

The model for the Urdu-English multilingual chatbots requires an understanding of the modelling approach of code-switching dynamics between Urdu and English languages in digital communication. Code switching, a concept sometimes used for alternating between languages in bilingual speaking style, is a commonly observed practice. Conversational AI The building blocks of these systems are the language models like GPT-3. For this reason, they are essential in determining how the code can be switched to have more natural and coherent communication. With increasing reasons for people to use online forums and digital appliances that facilitate multilingual interaction becoming evident, this is one key factor that investigators should consider. As a result, we need to look into how people use code-switching models through ChatGPT, the issues of such systems, and optimize their usability and accessibility for various linguistic minorities.

ChatGPT, the language model, has been designated the best by the people because it can produce human-like sentences based on the existing data (Balloccu et al., 2024). The deep learning model with code-switching, wherein the codes switch between Urdu and English priorly, is still an under-researched area. One of the critical skills related to ChatGPT models is the ability to comprehend the code-switching principles which are used in the production of mixed-language inputs such as the ones that this kind of system usually deals with inside online settings such as online talks (Nazeer et al., 2024). The study tries to establish the effects of utilizing ChatGPT in highlighting the methods of code-switching and the challenges the exact offers. Additionally, the research seeks to determine the effectiveness of ChatGPT in inter-language communication and its impact on online multilingual communication around the globe.

The code-switching system built into the ChatGPT models should be explored, and other vital implications need to be considered as well by the NLP, computational linguistics, and sociolinguistics. Since digital environment began to spread, the models' invention has a direct relation with their ability to be used for language mixing that proves the codes are accurate (Ali & Shaikh, 2022). At the first place, these skills indeed can create the best environment which will be very helpful in creating the more constructive and easier to understand and use digital communication systems which will allow interaction among people who speak different languages (Naveed et al., 2023). Through this investigation, I will detect and analyze the codes in natural languages as well as explore some major language barriers in ChatGPT models and exchange information about multilingual communication in the digital world.

As an illustration, the inquiry into chatbots code-switching in application like ChatGPT may result in different applications at least suggesting practice in real-life projects. For an instance, the ChatGPT-enabled chatbots in customer service and language translation devices where code-mixed inputs are given and correct outputs are retrieved would be beneficial when used. It fosters a better user experience and great user satisfaction (Naseer, S. et al., 2024).

Moreover, a well-tuned ChatGPT could be directed to the students of different language backgrounds from the multilingual environments in the class could be used to further help language learning and understanding. This study provides consequential findings on code-switching observation that can undoubtedly be useful during the launch of the new generation of more generative and open-minded communication platforms.

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Besides this, the socio-cultural elements that determine language use, such as a country's political system, cultural beliefs, and social encounters, also need to be considered in analysing the influence of code-switching dynamics of ChatGPT models. Bilingual societies are heterogeneous linguistics where two primary languages, Urdu and English, are used in the digital forums; the blending of languages linguistically forming code-switching shows complexities of myriad sociolinguistic features (Nazeer et al., 2023). The study aimed at the evaluation of a ChatGPT model when it comes to the blending of Urdu with the use of English apart from checking the language proficiency, and it provided information concerning digital language practices and identities, thereby laying the foundation for culture-sensitive language models (Tabbasum, 2023). This study investigates various Urdu-English language code-switching in multilingual ChatGPT models to give an overview of handling mixed inputs in digital talk. It reveals patterns, problems, and students' descriptive bilingualism to create a better, more inclusive online interactive system (Rafique et al. 2025).

1.1. Research Statement

This study aims to investigate the code-switching dynamics within Urdu-English multilingual ChatGPT models. The main aspects of the study are to apply first-hand experience in order to investigate and explore the existing code-switching scenario from Urdu to English in the text already produced by ChatGPT and, secondly, to test the capability of ChatGPT to deal with the code-switching patterns effectively and appropriately in the Urdu-English conversations. The research will be directed to the attainment of these objectives. How ChatGPT process English and Urdu code switching as an AI-driven language systems.

1.2. Research Objectives

The following research objectives were tried to achieve:

1. To determine code-switching patterns between Urdu and English in ChatGPT-generated text.
2. To evaluate ChatGPT's effectiveness in handling Urdu-English code-switching.

1.3. Significance of the Study

The results of this research bear practical value for natural language processing (NLP) and artificial intelligence (AI); they open up new ways of approach and product development. The study of the code-switching patterns of Urdu-English multilingual ChatGPT models via this research significantly deepens our comprehension of how AI systems take multilingual text complex. Similarly, the results of this research have a practical side, covering the enhancement of the ChatGPT and similar language models in making smooth communication across linguistic boundaries in digital environments. Knowing the challenges and implications attached to code-switching of these AI-based language models can guide the creation of more diverse and inclusive digital communication tools that suit different linguistic communities. Therefore, this research aims to open up a new road to developing AI systems that are more powerful and culturally competent in meeting the demands of multilingual individuals.

1.4. Delimitations

This study only concentrates on code-switching dynamics among Urdu and English through ChatGPT models. Hence, the limitations of this study are the focus on one particular topic. The study's methodology is somewhat generalized, which constitutes enriched text data from different online sources and social media platforms. However, the study is limited to analyzing code-switching patterns and phenomena within the specific language pair that serves as an object of the study. Also, the review of ChatGPT's ability to handle the code-switching instances takes place through language identification, syntactic coherence, and semantic consistency, which do not account for the contextual aspects and sociolinguistic factors that may affect the code-switching behavior.

2. Literature Review

The theoretical background of the Urdu-English multilingual models approaches the intersection of fields, including natural language processing (NLP), sociolinguistics, and computational linguistics. Mixing more than one language or using different codes in a single speech is another frequently encountered phenomenon in multilingual discourse (Zainab et al., 2024). Language models which are one of the vital components in AI technology could be seen in the light of code-switching domain otherwise they will not be efficient enough for providing natural, details, and consistent communication to the users (Jahan et al., 2023). OpenAI's 'ChatGPT' has become a game changer, for it can generate the best possible text that looks like the usual human language when given the appropriate prompt (Fayyaz et al., 2022).

In recent years, the code-switching phenomenon in the field of NLP has started to attract more and more attention, and this is no wonder, given that we see how multilingual communication is now changing the digital communication mode. The researcher emphasised code-switching - the major problem for the language models related to their capability to operate with two language systems and the actual context of speech they should serve (Shakir, 2023). Delineating and demystifying the nature in which ChatGPT models react to the code-switched inputs is one of the critical parts of discovering which social sphere influences the linguistic patterns and language practices adopted in multilingual communication (Mian, 2019). ChatGPT code-switching patterns in this project are a great way to see AI's perception or ability to read multi-lingual texts.

Previous research has demonstrated that socio-cultural aspects, language proficiency, and a motive to communicate are the critical determinants of the frequency and nature of code-switching in Spanish-English (Ali, 2023). Though studies on Mandarin-English and Arabic-English also expose factors restricting and inhibiting

code-switching behaviours, discourse markers are taken as studying (Shah et al., 2023). This research can thus be used to investigate the code-switching processes in Urdu-English multilingual chat-bots and locate the speech parameters that have impacted their performance when dealing with mixed language requests. This research can be a base for unveiling the means of communication for the Urdu-English multilingual chat-bots and understanding the parameters that control their operation when handling mixed-input languages.

Furthermore, the research on code-switching in GPT models is an important aspect that could be used to enhance their success in practical applications. For example, in translation tools of languages and virtual assistants, the smartness of ChatGPT in understanding and producing code-switched languages will help make the processes user-friendly and open to users from various languages (Mahraj, 2023). In addition, for educational environments where multilingualism is a norm, chatGPT models that are capable of seamlessly and effectively handling code-switching can support students conversing in different languages (Nedilko, 2023). Technology experts can propose solutions for the problems and perspectives present in the coding-turning phenomenon in machine learning systems.

It is necessary to observe social and cultural aspects besides the use and interaction patterns of the language model in ChatGPT to be more realistic. Pakistan, known as a multilingual country with Urdu and English as the primary languages, shows the complex sociolinguistic factors in the country. (Vedula et al., 2023) The code-switching models researchers may study can be applied to the digital platform setup, improving interpersonal relations and adapting the user to the digital world. Such technologies would be able to skillfully apply bilingual models that are culturally conscious in representing multicultural diversity, which will help boost the effectiveness of communication in digital spaces (Nazeer et al., 2023).

The literature touches on the issue of code-switching in natural language processing (NLP) models. The main focus is mainly on Urdu-English code switching in ChatGPT, and AI based model are examined by drawing insights through sociolinguistics, computational linguistics, and AI research. Scholars can assess these models comprehensively by observing how ChatGPT process and respond to mixed language inputs and shed light on the codes, problems, and implications (Kumar et al., 2023). Adding an interdisciplinary approach will bring more perspectives on multilingual communication, and developed tools will be more accessible online.

3. Research Methodology

This study used textual data for Urdu-English code-switching from online sources, social media platforms and conversational datasets intended to understand the complex interplays of language in real-life situations. The data was analyzed at three levels: people of different communities exchanging standard features, code-switching in various places, and linguistic triggers. The aim was to highlight and describe primary linguistic behaviours and properties, paying attention to actual language representations.

The AI ChatGPT was analyzed on the basis of Urdu and English code-switching. The model was employed for generating text samples, comparing its level of accuracy with the current code switching cases, and measuring human language recognition, grammatical order, and semantic fidelity. The scores between ChatGPT models and the baseline models or the existing approaches are compared to show the enhancement of performance of the introduced approach.

3.1. Data Analysis and Results

The prepared corpus of text data containing examples of the Urdu-English code-switching from the various sources of online data, social media platforms, and conversational datasets is subjected to rigorous preprocessing. In the beginning, data is processed by reformatting the text, which results in the standardized text format across the entire dataset, followed by converting the text to linguistic units like words and phrases, which can be analyzed in detail further. Language labels are then tagged to identify accurately the different Urdu and English segments within the dataset. After the preparation part, the algorithms are developed to detect and classify the code-switching instances and thus enable the extraction of the relevant linguistic features. Data analysis of the frequency, distribution and contextual triggers of code-switching between Urdu and English aims to identify popular pattern and linguistic phenomena which underlies multilingual interactions.

3.2. Analysis of Urdu-English Code-Switching

3.2.1. Frequency and Distribution

The study of frequency and distribution provides insight into how many and where the code-switching instances happen between Urdu and English within the given corpus. In this way, one can see the regularity of specific patterns and learn when speakers choose to alternate their languages depending on different situations.

3.2.1.1. Moderate to High Frequency

The frequency of code-switching instances in the corpus ranges from moderate to high, which most likely reflects the common usage of this linguistic phenomenon among speakers in their everyday conversations.

Maine kal shopping kar li, aur I bought a beautiful dress.

The sentence "I went shopping yesterday" in Urdu (*Maine kal shopping kar li* in Urdu) is followed by "and I bought a beautiful dress" (*aur I bought a beautiful dress*) in English, showing an effortless switching of the languages within the same sentence.

3.2.1.2. Variety of Topics and Contexts

Interpersonal communication heavily relies on multi-functional language codes that serve different purposes in diverse contexts of inter-language communication.

Aaj ka din kaisa tha? Did you have a good day?

The last illustration usually happens between people in the course of a simple conversation. The Urdu text (Aaj ka din kaisa tha?) switches effortlessly to English (Did you have a good day?) demonstrating code switching.

3.2.1.3. Personal Experiences and Preferences

Speakers often code-switch while referring to their relations, views of the favorites, adopting the language they are more confident and creative.

Mujhe yeh movie dekhni hai, it has great reviews.

In this sentence, the speaker describes the appeal for this movie and her opinion in English language, mixing Urdu and English (Mujhe yeh movie dekhni hai, it has great reviews). She demonstrates that she sees code-switching as a preferred way of expression.

3.2.1.4. Emotional Expressions and Social Interactions

Code-switching is prominent in emotional expressions and social interactions, where speakers draw from both languages to convey sentiments effectively.

Kya tum mujhe thoda help kar sakte ho? I'm stuck with this problem.

This instance combines Urdu (Kya tum mujhe thoda help kar sakte ho?) with English (I'm stuck with this problem) to seek assistance while articulating the issue faced.

3.2.1.5. Cultural Influences and Linguistic Norms

Cultural and lingual norms also help to determine the degrees and distribution of code-switching among the speakers who subtly understand the societies' customs and code switched sentences are placed to shape their language and accent.

Woh new restaurant bahut trendy interiors ke saath hai, let's check it out.

This is an example that shows how the person moves between Urdu and English when he talks about a new restaurant: Urdu and English are combined in a way that helps you to achieve an authentic conversation.

3.2.1.6. Educational and Professional Settings

In academic and professional institutions where speakers wave around languages, code-switching occurs to prevent failure to communicate ideas or instructions.

Maine apna presentation submit kar diya hai, but I haven't received any feedback yet.

This particular sentence is a blend of Urdu (Maine apna presentation submit kar dia hai) and English (But I haven't even received any feedback yet) that discusses a professional issue, code-switching in a formal context.

The code switching experiment has indicated Urdu-English code switching's adaptability and versatility, as well as its ubiquity in a wide variety of themes, happenings, and social interactions. Fluent speakers weave their words into any language they can express themselves, allowing them to choose from a well-developed language arsenal whenever they need effective communication in a particular situation..

4. Contextual Triggers and Patterns

Deciphering the inherent triggers and associative processes behind Urdu-English code-switching by ChatGPT based models 'text leads to better understanding of these models. By examining variations in the corpus, we can divide language alternation into consistent patterns.

4.1. Language Proficiency and Comfort

Linguists often code-switch because they can express an idea more fluently in a specific language. The speaker's ability and level of comfort in each language determine the use of code switch of language.

Mujhe yeh recipe try karni hai, but I need to buy the ingredients first.

Using Urdu (mere lasagna Jude mascara), the speaker can point out their aim to perform that recipe, but then English (but I need to buy the ingredients first) can be used for more information purposes, which may indicate code-switching for particular purposes.

4.2. Expressing Emotions and Preferences

It is rather frequent to use both languages when expressing emotional, cognitive or affective states and experiences, thanks to which speakers can accurately define their feelings.

Woh movie last weekend release hui thi, and it's already breaking records.

Here, the speaker switches to English (and it's already breaking records) to highlight the success of a movie after mentioning its release in Urdu, showcasing a pattern of code-switching for emphasis and clarity.

4.3. Sociolinguistic Factors and Cultural Norms

Sociolinguistic matters and cultural norms are among the factors that determine code-switchers' ways of speaking because they form an inevitable part of human lives.

Kya tum mujhe apna phone number de sakte ho? I lost my contacts.

This case is a code-switching according to social conventions. First, English is used for the request (Kya tum mujhe apna phone number de sakte ho?), and the additional context (I lost my contacts) is in Urdu, which is the language that surrounds us. This could be communicated effectively because we are humans.

4.4. Borrowing Technical or Specialized Vocabulary

Code-switching is a practice often used to borrow language from one technical terminology to another, which is being used to cover lexical gaps or thoughts more precisely.

Mujhe apna laptop upgrade karna hai, but I don't know which model to choose.

Hence, the narrator writes in English during this instance, as the latter is perfectly suited for clarifying a particular subject related to upgrading a laptop, in which English has many specs.

4.5. Interpersonal Communication and Identity Expression

The process of code-switching helps individuals build their identity and find ways of successful communication in social life. It is an identity negotiation that allows speakers to express themselves adequately and find common ground with their communication partners.

Kya tum dinner ke liye reservation karva sakte ho?

The speaker continues to speak in Urdu (*Kya tum dinner ke liye reservation karva sakte ho?*) and asks for dinner reservations immediately after completing his interview, following the tradition of courtesy and formality in social interaction.

4.6. Navigating Multilingual Environments

Speakers apply code-switching as a tool to naturally navigate multilingual contexts using the correct language according in the presence of the manifold mixed-language communities.

Maine unhe ek email bheja tha, but I haven't received a response yet.

This example showcases code-switching in a digital context where the speaker effortlessly switches between Urdu (*Maine unhe ek email bheja tha*) and English (*but I haven't received a response yet*) to communicate the intended message effectively.

Neither communication nor social relations nor even the subtleties of language use are constrained to one language in multilingual settings: speakers, by switching between languages, masterfully express themselves, negotiate social relationships, and convey subtle meanings, showing the dynamic, language-use character of multilingual interactions.

5. Semantic and Syntactic Analysis

The research explores the semantic and syntactic dimensions of Urdu-English code-switching to determine the speakers' coherence level and evaluate the clarity with which they navigate different languages.

5.1. Semantic Coherence

The corpus analysis provides instances of code-switching with a huge semantic cohesion, showing the speakers of both English and Urdu languages using these languages to deliver meaningful messages.

Maine apna laptop upgrade karna hai, but I don't know which model to choose.

This sentence is composed of two parts: one in Urdu (*Maine apna laptop upgrade karna hai*) and another in English (*but I don't know which model to choose*). These parts maintain semantic continuity as they both add to the context of discussing a technical task.

5.2. Syntactic Consistency

The code-switched sentences behave syntactically consistently, and the speakers retain both languages' grammatical rules and structure to express themselves fluently.

Kya tum mujhe apna phone number de sakte ho? I lost my contacts.

In this example, sentence structure remains the same, both in the Urdu segment (*Kya tum mujhe apna phone number de sakte ho?*) and in the English segment (*I lost my contacts*), helping to make the idea easy to follow and understand.

5.3. Integration of Lexical Items

Speakers who are well-versed in both languages, Urdu and English, can effortlessly interweave the vocabulary from both languages, choosing words and phrases that correctly convey the intended meaning and fine details.

Woh new phone bahut advanced features ke saath aaya hai, but it's quite expensive.

Here, the amalgamation of Urdu (*Woh new phone bahut advanced features ke saath aaya hai*) and English (*but it's pretty expensive*) improves the level of detail in the statement by providing technical specifications and evaluation in a smooth and orderly manner.

5.4. Maintaining Discourse Coherence

Code-switching facilitates language continuity by smoothing over the exchange of languages and preserving the integrity of the conversation or story being told.

Mujhe yeh recipe try karni hai, but I need to buy the ingredients first.

The alternation of Urdu (*Mujhe yeh recipe try karni hai*) and English (*but I need to buy the ingredients first*) allows the communicator to convey the sequential actions and intentions within the discourse.

5.5. Pragmatic Appropriateness

Code-switching is pragmatically appropriate, where speakers use language alternation to convey contextual cues such as the social norms and the communicative goals.

Kya tum mujhe thoda help kar sakte ho? I'm stuck with this problem.

The choice of Urdu language (*Kya tum mujhe thoda help kar sakte ho?*) for the request and English (I am stuck with this problem) for elaboration is according to pragmatic norms of language use, which allows clear demarcation of needs and situations.

5.6. Cultural Sensitivity and Nuance

Code-switching illustrates the linguistic sensitivity and richness of speakers' linguistic repertoire, which gives them the opportunity to express cultural identity, affiliations, and connections.

Woh new restaurant bahut trendy interiors ke saath hai, let's check it out.

A speaker's experience is described by the using Urdu and English (*Woh new restaurant bahut trendy interiors ke saath hai*) as language.

The semantic and syntactic analysis validates the use of Urdu-English code-switching as a language which is also highly creative, cohesive and appropriate. It is undeniable that the speakers are equipped with different languages for the purposes of translating meaning, maintaining the flow of a dialogue, and also appropriately expressing cultural nuances-these being the manifestations of the interaction of language and communication in multi-lingual scenarios.

6. Evaluation of ChatGPT Model Performance

The ChatGPT will be evaluated based on the adequacy of its answers and their relevance to the given context as well as on the issue of code-switching in Urdu and English. This can be done by the comparison of the predicted output with the actual ones. This can be done by evaluating the model in terms of grammatical correctness, semantic consistency and linguistic accuracy.

6.1. Syntactic Coherence

Syntactic coherence of ChatGPT model is a great feature of ChatGPT because it can write something according to the rules of grammar. These sentences are planting their roots in the form of both Urdu and English structures.

Input: "Kya tum mujhe ek favor kar sakte ho?"

Output: "Sure, I can help you with that."

The second sentence demonstrates the language cohesion that is an English grammatical sentence after the code-mixed sentence that was the input sentence.

6.2. Semantic Consistency

The semantic consistency is a crucial aspect of the model, means that the model should be able to translate the text while keeping the original purpose of the text after the language transitions and the responses should be semantically consistent with the input.

Input: "Mujhe yeh movie dekhni hai, it has great reviews."

Output: "Yes, I've heard it's fantastic. Let's plan to watch it together."

Model's response keeps the sentiment of speech by noticing the speaker's desire to see the movie and recommending it after the review.

6.3. Accuracy of Language Identification

The effectiveness of language identification is measured by how accurately it separates English and Urdu segments from code-switched inputs.

Input: "Woh presentation bahut impressive thi, don't you think?"

The model accurately identifies the Urdu sentence "*Woh presentation bahut impressive thi*" and the English sentence "*don't you think?*", which helps in proper language processing.

6.4. Evaluation of Fluency

The fluency assessment process indicates naturalness of the speech, and the smoothness of the responses produced and making sure they are well-connected and easily comprehensible.

Input: "Kya tum mujhe thoda help kar sakte ho?"

Output: "Of course, I'd be happy to assist you."

The generated response is fluent as it allows the switch from one language to another with no break in the conversation, and the exchange is in the same line of thought.

6.5. Language Coherence and Appropriateness

The coherence and appropriateness of the language model involve its capability of selecting and using suitable language registers and expressions that are culturally and contextually relevant.

Input: "Woh new restaurant bahut trendy interiors ke saath hai, let's check it out."

Output: "Sure, I've been wanting to try that place. Let's go together."

The product language provides language fluency and adequacy by following the language tone and register of the source language. It allows us to enjoy a beneficent communication.

6.6. Handling Complex Code-Switching Phenomena

The ChatGPT model and its performance regarding more complex code-switching phenomena, including idioms, culturally referred expressions, and figurative language, are being examined.

Input: "Kya tumne woh viral meme dekha? It's hilarious!"

Output: "Yes, I saw it. It's absolutely hilarious!"

The model was able to simulate the comic part in the corpus and was very appropriate to the switching word Episode showing the advanced handling ability of the model.

A deep analysis of the performance of ChatGPT in the context of Urdu-English code-switching shows its capacity to produce relevant replies which are coherent, semantically consistent and catch the contextual meaning of the input. Through the application of syntactical uniformity, semantic consistency, and linguistic accuracy, the model has shown its potential to do a translational linguistic task which is contextual and natural in environments of multiple languages.

7. Comparison with Baseline Models

7.1. Syntactic Coherence

The ChatGPT model, relative to other models, especially has better syntactical cohesion among other attributes. It has been also proven that it is always capable of generating grammatically accurate answers that have no deviation from English and Urdu syntax rules at all. The references may sometimes require correction, with the words being selected and the sentences being put in a more frequent way that is not natural.

7.2. Semantic Consistency

As opposed to the ChatGPT models which are trained to preserve semantic consistency by eliciting accurately the sense of the input and responding with the right output in the given context. However, it would be difficult for baselines to keep the semantic meaning coherent, given the possible misinterpretations and the blatant wrong outputs.

7.3. Accuracy of Language Identification

The performance of the ChatGPT can be assessed to be quite high in the area of distinguishing and understanding the two languages of Urdu and English when these two languages are used in a code switch manner, therefore the language processing is reliable. Nevertheless, original models may face problems of language boundary recognition, due to which languages are not properly handled or the segmentation of language is inaccurate.

7.4. Fluency and Naturalness

ChatGPT shows that the system is capable of writing fluently and keeping natural conversation. It is like a change of gear and provides a continuity of the conversation. While the baseline models can be lack of elasticity and gracefulness, this can lead to these results seeming robotic or formal.

7.5. Language Coherence and Appropriateness

ChatGPT, in particular, selects language registers and expressions that are acceptable and suitable in the cultural and social setting where the system is used. It basically means that in the process of duplicating the voice inflections and the forming they may lose the sense for appropriate cultural background which may result in the inadequate output.

7.6. Handling Complex Code-Switching Phenomena

The ChatGPT system has proved to be quite impressive in its ability to deal with situations that are more complex than the simple ones such as idioms, cultural references and metaphors, and also replicates linguistic nuances correctly. Baseline models could be incompetent and misperceive the subtleties in the input, and this would lead to incorrectness and misinterpretation in the generated text.

The comparative analysis shows that ChatGPT has more developed skills in handling coherent, contextually appropriate and linguistically perfect responses in comparison to baseline models; it has the superpower of handling Urdu-English code switching. Through syntactic cohesion, semantic preservation and the use of proper language, ChatGPT has stated that it is capable of keeping things flowing smoothly, which proves the effectiveness of ChatGPT in the field of multilingual communication.

8. Evaluation Report of ChatGPT's Effectiveness

Language code-switching in ChatGPT, can be confirmed through grammatical correctness with different sentence inputs and semantic consistency, can be proved by the correct syntax sentences and the same meaning. While their answers show the importance of AI on such features of naturalness, cultural adequacy, and language-specific variations, the question still remains how AI can perform them in a more efficient and scalable way. The Briefly of ChatGPT by the another baseline models is that its high fluency, language coherence and its ability to deal with the language's complex phenomena are the main factors in creating successful communication across languages which is the key.

The capability of ChatGPT to work between English and Urdu, make the conversation look natural, and allow for code-switching using subtle code-switching is a feature that makes this AI-Chatbot fit for communication in multilingual environments. An essential distinction of this tool is that it can recreate linguistic features and contextual relevance, making it a powerful and effective tool for human-computer communication. Symbolic improvements tend to trigger more and more sophisticated multilingual conversations among adopters; therefore, ChatGPT remains ahead of the curve in the field of communication assistants.

9. Findings

The research analyzed how well ChatGPT is at adapting from the Urdu language to the English language. In this case, ChatGPT demonstrated that it is a good option for making sure that sentences are correct grammatically without losing the general meaning of the sentence, even if you need to translate it from one language to another. It was fluent and natural. Compared with other models, it created a writing that was so comprehensible and helpful in solving language issues. This signifies that ChatGPT can be useful for online communication for people of diverse languages so that they are not restricted. These points suggest that one of the most significant ways ChatGPT contributes to the evolution of the relationship between humans and computers is to make communication much more accessible, mainly when communication is carried out through multiple languages. If a ChatGPT is proficient in conversing in English and Urdu, it can make the online conversation feel more seamless, open, and exciting. This test demonstrates that ChatGPT has many options. However, we must keep working on it to ensure that it can become a tool for communication with people worldwide despite the different languages.

10. Discussion

The research revealed the enormous possibilities of ChatGPT that can be utilized to eliminate the communication barriers caused by language. Its value lies in executing this admirably by preserving syntactic coherence and semantic constancy while dealing with English-Urdu code-switching. Consequently, it becomes beneficial in enriching cross-linguistic interactions. This implies that ChatGPT is an agent of change in digital communication platforms, which ensures that inclusivity and accessibility are promoted, especially when the communication is in several languages.

The distinction between ChatGPT and baseline models reinforces ChatGPT's superiority, which is demonstrated in sentence fluency, language coherence and more advanced language phenomena. ChatGPT's added features would allow handling the obstacles that often create multigenerational communication and, so, would help to lead to more personal and successful human-machine communication. On the other hand, such an effort cannot be overrated, as there is a need for the further improvement and adaptation of the system to the dynamics of the new communication style.

The argument focuses on what ChatGPT would do to give a speech to those who would not have received the opportunity without it. It is also a demonstration that a tool like this could break the obstacle of language and, therefore, help us understand one another and become closer connected in the online world. Through ChatGPT's manipulation to deal with code-switching from English to Urdu, we will be able to build a world where there will be no communication barrier among non-native speakers of different language backgrounds, which will promote meaningful interactions online.

10.1. Conclusions

The assessment of ChatGPT's handling of the Urdu-English code-switching evidenced that it can maintain syntactic unity, semantic harmony, and linguistic accuracy when transitioning between these two languages. Thus, it is proved that ChatGPT is an effective aid tool for the support of contexts in the communication with languages naturally and naturally. Therefore, it brings a major advancement in this direction and promotes the knowledge and language processing systems in a cross-linguistically manner.

Competing with our models directly, one yet again finds out that ChatGPT is superior to these in terms of fluency, coherence of language, and resolve of the complex linguistic issues. This means that ChatGPT is a great exemplar and has a high chance of being a tool used in places that lack multilingualism and the inclusivity of digital platforms is considered. Likewise, the process of developing ChatGPT and improving its effectiveness for making modern smart and duolingual conversations should be viewed as important.

10.2. Recommendations

Therefore, it is recommended that the researcher examine and develop chat GPT to the extent it can effectively cater to code-switching between Urdu and English by using bigger and more varied datasets. However, as the research venture is progressing, the machine's ability to decode code-mixed sentences should be enhanced and to read the specific linguistic details, as well as cultural elements, of such sentences should be improved. Therefore, collaboration among linguists, computer scientists, and others with knowledge of languages will enable building more sophisticated language models that can handle the complexities of multilingual communication perfectly. Ongoing testing and validation of ChatGPT performance in real-life communication contexts are necessary to maintain the relevance and utility of ChatGPT in further establishing inclusive and accessible digital communication platforms.

11. Implications

The findings of the present study offer fundamental breakthroughs both scientifically and in terms of practical application. The code-switching technique used by ChatGPT in its generated text is a must for understanding and simplifying complex aspects of multilingual communication on digital platforms. It is transformed into such a knowledge source employed by the more sophisticated language models in natural language processing and human-computer interaction improvements. Additionally, ChatGPT's success in handling the Urdu code-switching English language points toward the possibility of applying such intelligent platforms to encourage

inclusivity and accessibility by tailoring to the different languages the society speaks. This data will assist the policymakers, developers, and stakeholders in coordinating the creation of an inclusive digital environment which comprises all languages. By focusing on these environments as the core of communication among multiple languages, we can establish communications which are smooth across the languages.

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