# 98. The Transformative role of artificial intelligence and machine learning in interpreting and language services

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## Abstract

The integration of artifical intelligence (AI) and machine learning (ML) into language services has ushered in a new era of rapid communication, transcending linguistic barriers and making multilingual content more accessible. These technologies are no longer confined to mere automation but have evolved into sophisticated tools that contribute significantly to the quality, speed, and diversity of language-related tasks. However, there are a number of aspects to be taken into consideration when addressing the notion of such new technologies to grasp the topic from a holistic point of view. This article delves into the manifold ways AI and ML are being utilized in interpreting, translation, and other language services, while acknowledging the ethical and practical considerations that accompany their implementation. This study aims to provide insights into the potential benefits and challenges of using AI in the interpreting industry and contribute to the understanding of how AI can enhance language services. The research question of this article is what are the ethical and practical considerations associated with the implementation of AI and ML technologies in language services, and how can these technologies be responsibly integrated into the interpreting industry? One of the remote simultaneous interpreting platforms- Interprefy's recently launched virtual AI event interpreter Aivia will be examined and analysed in the article as a case study with possible implications for the interpreting industry and a number of suggestions for the utilization of such technologies will be shared.

**Keywords:** Artifical Intelligence (AI), Machine Learning (ML), interpreting technologies, Interprefy, virtual interpreting assistant

## Sözlü çeviri ve dil hizmetlerinde yapay zeka ve makine öğrenmesinin dönüştürücü rolü

### Öz

Yapay zeka (YZ) ve makine öğreniminin (MÖ) dil hizmetlerine entegrasyonu, dilsel engelleri aşan ve çok dilli içeriği daha erişilebilir hale getiren yeni bir hızlı iletişim çağını başlatmıştır. Bu teknolojilerin artık yalnızca otomasyonla sınırlı olmadığı görülmektedir ve dille ilgili yapılması gereken görevlerin kalitesine, hızına ve çeşitliliğine önemli ölçüde katkıda bulunan gelişmiş araçlara dönüşmüştür. Bununla birlikte, konuyu bütüncül bir bakış açısıyla kavramak için bu türdeki yeni teknolojiler kavramını ele alırken dikkate alınması gereken birkaç unsur bulunmaktadır. Bu makale, YZ ve MÖ'nin yorumlama, çeviri ve diğer dil hizmetlerinde kullanıldığı çeşitli yöntemleri incelerken, bunların uygulanmasına eşlik eden etik ve uygulamaya ilişkin birtakım unsurları da irdelemektedir. Makalede, uzaktan sözlü çeviri platformlarından biri olan *Interprefy*'nin yakın zamanda piyasaya

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sürdüğü sanal yapay zeka çevirmeni *Aivia* örnek olgu incelemesi olarak incelenecek ve sözlü çeviri dünyası için ilgili sonuçlar ve söz konusu teknolojilerin kullanımına ilişkin bir dizi öneri paylaşılacaktır.

**Anahtar kelimeler:** Yapay Zeka (YZ), Makine Öğrenimi (MÖ), sözlü çeviri teknolojileri, Interprefy, sanal çeviri asistanı

## Introduction

AI-powered machine translation engines have made immense strides in bridging language gaps, allowing for the near-instantaneous conversion of texts into different languages. Similarly, automatic speech recognition (ASR) and text-to-speech (TTS) technologies have revolutionized spoken language interpretation by facilitating real-time conversion of spoken content into text and vice versa[2]. These advancements have not only expedited communication but also played a crucial role in disaster response, diplomatic negotiations, and cross-cultural collaborations. The ability to bridge linguistic gaps is essential in our interconnected world, where business, diplomacy, education, and healthcare often involve interactions across languages. AI and ML technologies offer innovative ways to address these challenges, fundamentally transforming how language services are provided.

The integration of AI and ML in interpreting and language services marks a transformative chapter in communication and globalization. These technologies offer a high level of efficiency, accessibility, and innovation, democratizing information exchange across linguistic divides. However, the delicate balance between AI-driven automation and the need for human expertise underscores the importance of an informed and ethical implementation strategy. By embracing these technologies responsibly, the language services industry can leverage their capabilities to amplify its impact, facilitate cross-cultural understanding, and bridge the gap between languages in an increasingly interconnected world.

AI and related technologies are being utilized in various fields to enhance language and interpreting services. Some prominent areas can be summarized as such:

Machine Translation: AI-driven machine translation tools like Google Translate[3] and DeepL[4] have significantly transformed how text is translated between languages, making content accessible to a global audience instantly. However, the phenomenon of machine translation has to be taken into consideration with all the pros and cons before glorifying it on a totalistic level.

Speech Recognition: Speech recognition software, such as Amazon's Alexa[5] and Apple's Siri[6], employs AI to convert spoken language into text, enabling voice commands and transcription services.

Natural Language Processing (NLP): NLP technologies analyze and interpret human language, enabling applications like sentiment analysis, chatbots, and language understanding for virtual assistants.

Automatic Speech Recognition (ASR): ASR systems convert spoken language into written text, facilitating tasks like transcription services and subtitling for videos.

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[2]    https://onpassive.com/blog/importance-of-automatic-speech-recognition-in-media-industry/
[3]    https://translate.google.com/
[4]    https://www.deepl.com/en/translator
[5]    https://alexa.amazon.com/
[6]    https://www.apple.com/siri/

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Language Analysis and Sentiment Analysis: AI is used to analyze and understand the sentiment, tone, and emotions conveyed in text, helping companies gauge customer feedback and public sentiment.

Summarization: AI-driven summarization tools can extract key information from lengthy texts, making it easier to digest large volumes of content quickly.

Language Tutoring: AI-powered language learning platforms offer personalized tutoring, adapting lessons and exercises based on individual progress and learning styles.

Virtual Assistants and Chatbots: AI-driven virtual assistants and chatbots provide instant responses to user inquiries in various languages, enhancing customer support and engagement.

Content Localization: AI tools assist in adapting content for different cultural and linguistic contexts, ensuring that messages resonate with diverse audiences.

Cognitive Computing for Interpreters: AI tools aid conference interpreters in terminology research, context comprehension, and even in providing real-time suggestions during interpretation. This field holds particularly great opportunities by which experienced and skilled interpreters could further improve their professional capacities.

Accessibility Services: AI-powered technologies offer closed captioning, sign language interpretation, and speech-to-text services, making content more accessible to people with disabilities. This is significant from the inclusivity point of view and such technologies might play a crucial role in terms of the democratization of the content and various platforms.

Legal and Medical Transcription: AI-based transcription services facilitate efficient and fast conversion of legal, medical, and technical discussions into written records, which are most useful for record-keeping and archiving purposes.

Multilingual Content Creation: AI tools assist content creators in generating content in multiple languages, expanding reach and engagement in global markets.

Quality Assurance in Translation: AI aids human translators by identifying inconsistencies, errors, and ensuring consistency in translated content.

Data Mining and Insights: AI-driven language analysis helps researchers and businesses gather insights from large volumes of textual data, supporting decision-making and trend analysis.

These examples underscore the versatile applications of AI in language-related tasks, offering improved efficiency, accessibility, and new possibilities across a range of industries under the capable and skilled human supervision. However, it's essential to balance the benefits of AI with the nuanced complexities that human language and culture entail. At this point one needs to evaluate and probe the advantages and disadvantages of such AI-related technologies.

The symbiotic relationship between AI and human interpreters and translators is pivotal. While AI tools enhance efficiency and accessibility, human expertise remains irreplaceable in capturing the subtleties of language, adapting to cultural contexts, and providing creative solutions in complex scenarios.

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Augmented intelligence, where AI assists rather than replaces human interpreters, holds the promise of producing high-quality language services while preserving the authenticity of communication.

The integration of AI and ML in interpreting and language services has opened new avenues for breaking down communication barriers. AI-powered language models can quickly process and translate spoken and written content, allowing individuals to communicate to a certain degree in their native languages. This technological advancement is particularly crucial in critical situations such as emergency response, medical consultations, and legal proceedings, where misinterpretations can have severe consequences. Machine Learning (ML) also plays a pivotal role in enhancing and complementing the accuracy of language interpretation. However, we need to note that innovations such as AI and ML do not come without their own shortcomings or 'errors'. It is known that AI-driven language models continuously learn from vast datasets, enabling them to understand idiomatic expressions, cultural nuances, and context-specific language use; which is rather promising in terms of the continuous improvement however we also have to consider that these technologies are functionally complementing the human interpreters, acting as a very operational leverage; not replacing them on totalistic level.

Rather than replacing human interpreters, AI and ML technologies serve as tools that empower language professionals. These technologies provide interpreters with resources to support their work, such as pre-translated glossaries, terminology databases, and real-time suggestions for difficult phrases. This symbiotic relationship between AI and human expertise raises the overall quality of interpretation and enables interpreters to focus on nuanced aspects of communication.

Needless to say, AI and ML thrive on data, and the field of interpreting is no exception. By analyzing patterns in language use and understanding user feedback, these technologies can refine their interpretations over time. Continuous learning and improvement mechanisms allow AI-powered systems to adapt to evolving language trends, dialects, and cultural shifts, ensuring that the interpretation remains relevant and accurate.

However, as highlighted earlier, the incorporation of AI and ML technologies into language services brings to the forefront a multitude of dimensions that must be meticulously considered. In this era of technological advancement, where the boundaries of innovation are continuously pushed, ethical and cultural considerations emerge as essential pillars that shape the responsible development and deployment of these technologies. Ensuring that these technologies respect diverse linguistic and cultural norms is imperative. Developers must invest in training datasets that represent a wide range of linguistic contexts and cultures, reducing biases and enhancing the inclusivity of interpretation services.

As AI and ML permeate language services, the fundamental principle of respect for diverse linguistic and cultural norms takes on an elevated significance. The pivotal question revolves around how these technologies can harness their potential without inadvertently perpetuating biases or cultural insensitivity. To navigate this intricate terrain, developers and stakeholders alike bear the responsibility of crafting an environment that upholds the values of inclusivity and equal representation.

To achieve this ambitious goal, a multifaceted approach must be embraced. Developers must immerse themselves in the intricacies of linguistic contexts and cultural nuances that span the global tapestry. This endeavor requires an investment in training datasets that mirror the rich diversity of languages and cultures. The broader the spectrum of linguistic inputs, the more adept AI and ML systems can become in understanding the intricacies of languages beyond the mainstream.

Inclusivity must extend beyond superficial representation. It necessitates a deep dive into the socio-cultural fabric of languages, encompassing idiomatic expressions, colloquialisms, historical references, and context-specific meanings. A well-rounded dataset ensures that AI and ML technologies do not inadvertently perpetuate stereotypes or favor particular linguistic groups, but rather provide equitable and accurate interpretations across the spectrum.

Yet, the journey towards inclusivity and cultural sensitivity extends beyond the confines of data collection. It entails a comprehensive examination of algorithms and models that underlie AI and ML systems. Rigorous testing and validation processes must be implemented to detect any hidden biases that might emerge during the learning and adaptation phases. Continuous refinement, guided by input from linguists, cultural experts, and end-users, is paramount to ensuring that these technologies uphold the principles of unbiased interpretation.

In the grand tapestry of language services, AI and ML technologies stand as promising threads that can weave together a world without linguistic barriers. However, this transformative potential can only be fully realized when harnessed within a framework of ethical responsibility and cultural mindfulness. By embracing these considerations, the developers and proponents of AI and ML technologies can contribute to a future where interpretation services are not only accurate and efficient but also reflective of the diverse linguistic and cultural mosaic that defines our global society.

While artificial intelligence (AI) and machine learning (ML) have demonstrated remarkable capabilities, challenges still persist. Maintaining linguistic nuances, cultural sensitivity, and subject-specific terminology poses ongoing difficulties for these technologies. The "black box" nature of many AI algorithms also raises concerns about transparency, accountability, and the potential biases embedded within the systems. Ethical dilemmas related to confidentiality, privacy, and the impact on traditional language service providers must also be addressed as technology evolves.

In scenarios where immediate and accurate interpretation is crucial, such as medical consultations, business negotiations, or international conferences, AI-powered virtual interpreters can play a transformative role. These systems use AI and ML technologies to interpret spoken language in real-time, enabling effective communication between parties who do not share a common language. Some of the advantages of these innovative technologies could be summarized as follows:

Automatic Speech Recognition (ASR): AI-driven ASR technology converts spoken language into text. This initial step is essential for the virtual interpreter to understand the spoken words accurately.

Machine Translation (MT): After converting speech to text, the system employs machine translation techniques to translate the text into the desired language. Neural Machine Translation (NMT) models, which leverage deep learning, enable more accurate and contextually relevant translations.

Natural Language Processing (NLP) algorithms process the translated text, ensuring that idiomatic expressions, cultural nuances, and context-specific meanings are appropriately conveyed.

Once the translated text is processed, the system generates synthesized speech in the target language. This step allows the virtual interpreter to convey the translated message audibly to the receiving party.

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At this point, the notion of reduced bias is an important topic which needs to be considered in this context. When properly trained on diverse and unbiased datasets, AI-powered interpreters can offer interpretations that might be as neutral and unbiased as offered by the human interpreters.

Overall, AI-powered virtual interpreters exemplify the potential of AI and ML to revolutionize interpreting services. They could provide efficient and accurate language interpretation, contributing to effective communication in various contexts where language barriers would otherwise hinder collaboration and understanding. This might be a great tool which might be utilized by conference and community interpreters to enhance and contribute to the final interpretation rendering.

### The Case of Aivia: Interprefy's AI-powered virtual interpreter

While it might seem a rather futuristic and dystopian notion; the AI-powered interpreters started to be a part of the language industry reality; which could be exemplified by Interprefy's newly launched AI-powered virtual interpreter Aivia. However, before delving into the case study of this paper, it is vital to note that Aivia is not an interpreter, as stated in the address made by Interprefy Commercial Director Richard Roocroft[7] , it a mere conveyor of what is being uttered without any interpretation. It offers simultaneous rendering in more than 24 languages and regional accents, both in male and female voices which sound natural. According to Andrey Schukin, Interprefy CPO, Aivia also offers machine translation captions, speech to text captions in more than 140 languages, from more than 30 languages on the floor. The caption files can also be downloaded after the event. As to how to use the service, users can use Interprefy mobile app, either read the captions or listen to the interpretation, either on-site or remotely. Aivia interpreting service could be also combined with human interpreters: while the human interpreters interpret from language A to language B; Aivia could convey the speech into other; perhaps more 'exotic' languages.

After having listened to the live demo of Aivia which took place live during the Aivia launch from Spanish to such languages as English, Arabic, German, French etc; one can still feel that one is listening to a 'virtual sound' rather than a natural-sounding interpreter. The topic which was interpreted was about gardening and the different aspects of gardening; so, it is safe to say that the virtual interpreter assistant was quite accurate and functional. However, one cannot help but assume that if and when the subject matter gets more complicated, with the speakers' sentences incomplete, perhaps sometimes incoherent or in the case that the terminology of the speech is very technical or niche, the virtual interpreter might fail or might not be able to keep up with the speaker, hence omissions, gaps in the interpretation and/or inconsistencies in the flow of the communication.

While the initial version and the idea is clearly very promising; there is room for further improvement in terms of being ready to be fully functional. It is important to note that the 'product' could prove to be rather useful for speech to text captions and automatic subtitle generation.

### Conclusion

In conclusion, the integration of Artificial Intelligence (AI) and Machine Learning (ML) technologies into the realm of interpreting and language services represents a transformative leap forward in breaking down linguistic barriers, enhancing accuracy, and facilitating real-time communication. These

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[7]     https://www.interprefy.com/resources/meet_interprefy_aivia_webinar?submissionGuid=ca4d26b1-3fc4-4223-97d1-2ae383f64c86 .

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technologies have showcased their potential to revolutionize global interaction, offering efficiency and accessibility to users across diverse linguistic backgrounds. However, it is imperative to acknowledge that alongside their merits, AI and ML technologies bring forth certain limitations that necessitate careful consideration and mitigation.

The shortcomings of AI and ML in interpreting and language services predominantly revolve around their potential biases, cultural insensitivity, and limitations in handling complex linguistic contexts. While AI systems strive for accuracy, they might inadvertently perpetuate biases present in training data, leading to unequal or misleading interpretations. Cultural intricacies and linguistic nuances that characterize human interpretation might pose challenges for AI systems, limiting their capacity to fully grasp the depth of certain expressions and contexts.

To address these limitations and achieve a balanced and effective approach, the integration of AI and ML technologies with human interpreters emerges as a viable solution. Combining the capabilities of AI with the expertise of human interpreters creates a synergy that capitalizes on the strengths of both. Human interpreters offer a nuanced understanding of cultural subtleties and context-specific language use, mitigating the risk of misinterpretation due to biases or lack of cultural awareness.

There is a clear need to improve the synergy between AI technologies and human interpreters which could be summarized as follows:

Hybrid Models: Implementing hybrid models that involve AI-generated suggestions and context analysis alongside human interpretation can lead to more accurate and culturally sensitive outcomes.

Ethical Training Data: Developers should meticulously curate training datasets to minimize biases and encompass a diverse range of languages and cultural contexts. Ethical considerations should be at the forefront of data collection.

Continuous Feedback Loop: Establishing a feedback mechanism between AI systems and human interpreters allows for ongoing refinement. Human interpreters can identify instances where AI systems might fall short, leading to iterative improvements.

Algorithm Transparency: Ensuring transparency in AI algorithms is vital. Users, including human interpreters, should understand how AI-generated interpretations are derived, making it easier to identify and rectify biases.

Specialized Training: Collaborative training programs that familiarize interpreters with AI systems can facilitate effective collaboration. Interpreters can guide AI systems in handling complex linguistic or cultural scenarios.

Quality Assurance: Human oversight remains indispensable. Human interpreters can validate AI-generated interpretations to ensure accuracy and cultural sensitivity.

In essence, the integration of AI and ML technologies in interpreting and language services is not a replacement of human expertise, but rather a complement that, when wielded effectively, can transcend the limitations of each approach individually. As technology evolves, the trajectory towards refining AI systems to match the precision of human interpreters, coupled with human oversight, holds the promise of a more inclusive, accurate, and culturally aware future of global communication. The combined efforts

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of AI and human interpreters pave the way for a harmonious coexistence, where the richness of human understanding is augmented by the capabilities of cutting-edge technology.

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