Language-based AI – Backgrounder

Language-based AI is changing how we use language to interact with machines by personalizing and humanizing these interactions.

INTRODUCTION

Language is at the core of communication. It helps us navigate within the society. In today's world where searching for information dominates our daily activities, asking machines for answers is a common phenomenon. Language-based Artificial Intelligence (AI) is becoming the backbone of such tasks where it is necessary to have human-like interactions with computers.

LANGUAGE-BASED AI

Language-based AI refers to technologies that process natural language to provide meaningful responses to users in different forms such as question-answer, language translation and audio transcription[1]. Natural Language Processing (NLP), Speech Recognition and Speech-to-Speech Translation are technologies that can provide these types of language-based service. NLP is used to help computers understand the natural language in a way we speak and write every day[2]. Speech recognition deals with processing human speech in audio format and converting it to text. Speech translation translates this text into another language.

WHY LANGUAGE-BASED AI IS IMPORTANT

Language-based AI has two main applications:

- Language Translation
- Accessibility (Assistive Technology)

[1] Researching Artificial Intelligence – Backgrounder, http://infozone/english/r2424161/solutions/bpagol-peagel/aa/rsrch/rsrchng_rtfcl_ntllgnc-e.asp

[2] NLP, www.becominghuman.ai/a-simple-introduction-to-natural-language-processing-ea66a1747b32

Language Translation

There are more than 7000 languages spoken in the world today[3]. Using AI, computers can now provide human-like translations from one language to another instantaneously. For example:

- Google has a free online translation tool, Google Translate, that supports translation for more than 100 languages. Furthermore, it can translate texts in photos for 37 of these languages and even provide real-time voice translation for 32 of them[4];
- DeepL is another powerful translation tool that can translate whole documents in 9 languages[5].

Support for Indigenous languages

There is currently no widely available translation tool to support Indigenous languages. Computational linguists have recently done proofs-of-concepts on South American Indigenous languages, in terms of speech recognition, parts-of-speech tagging and spell checking[6]. The First Peoples' Cultural Council[7] and the National Research Council (NRC)[8] have made progress in supporting Indigenous language education, translation and transcription. However, work has yet to be done on developing a fully working machine translation tool for these languages.

Multilingual chatbot

Chatbot is a computer program designed to simulate conversation with users over the Internet[9]. Although it is an emerging technology, chatbots are already widely accepted and used by businesses around the world. With the introduction of AI, chatbots can now speak to and understand people at a nearly human level. The best ones even have a sense of humour!

Deep learning, an advanced AI technology, has taken chatbots to a new level by providing them with the ability to detect a user's language, translate it into a language they understand and then translate the response back into the user's original language. In other words, modern day chatbots can now be multilingual[10]. This opens new doors to globally deploying knowledge bases such as FAQs (Frequently Asked Questions) on webpages. A chatbot that speaks only the 10 most common languages can open up

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[3] 7000 languages, www.ethnologue.com/guides/how-many-languages

[4] Google translate – Wikipedia, https://en.wikipedia.org/wiki/Google_Translate

[5] DeepL, https://www.deepl.com/pro.html

[6] Research paper, https://www.aclweb.org/anthology/C18-1006/. Accessed 9 Sept 2019.

[7] Indigenous languages at your fingertips, https://news.gov.bc.ca/releases/2016ARR0041-001103

[8] Canadian Indigenous Languages Technology Project, https://nrc.canada.ca/en/research-development/research-collaboration/programs/canadian-indigenous-languages-technology-project

[9] Chatbot, https://www.lexico.com/en/definition/chatbot

[10] Multilingual chatbots, https://help.insight.com/app/answers/detail/a_id/177/~/dynamic-language-translation-with-chatbots-%26-azure-cognitive-services

conversations to more than three billion people worldwide[11]. Figure 1 shows a bilingual conversation with a chatbot named Mitsuku. The chatbot starts its conversation in English. When the user starts sending messages in French, it eventually starts providing answers in French.

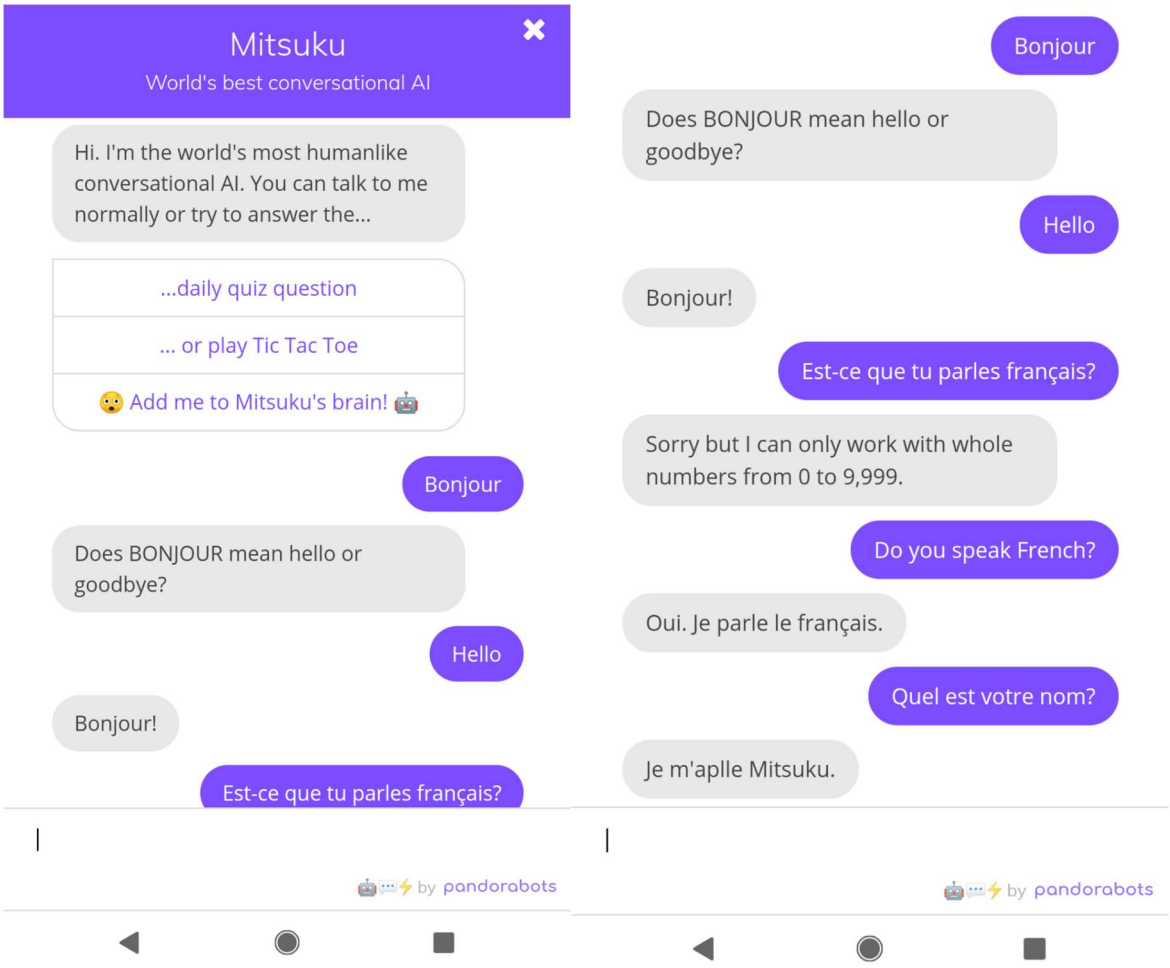

Figure 1: A bilingual chat with the chatbot named Mitsuku, the 4-time Loebner Prize[12] winner

Accessibility (Assistive Technology)

Speech recognition technology is valuable not only for users with certain disabilities, but also for people who commonly dictate notes and type on keyboards to generate

[11] How Multilingual Chatbots Will Change The Voice of Business, https://www.forbes.com/sites/forbestechcouncil/2018/08/13/how-multilingual-chatbots-will-change-the-voice-of-business/#3bb49eb423ac

[12] Chatbot 'Mitsuku' wins AI competition, https://www.wikitribune.com/wt/science/article/87585

documents[13]. Deep Learning has transformed this field by enabling modern speech recognition tools to recognize 120 languages and their variants[14]..

CONCERNS

With every new technology come concerns that require attention from the industry and directions from the government. Language-based AI technologies are not immune to such concerns as well.

Security and Privacy

Can machine translation and speech recognition tools guarantee total confidentiality? Although machine translation service providers such as Google and DeepL state that they maintain full privacy of the text sent to them for translation, there are ambiguities in how they put these clauses in their terms of service[15].

Proprietorship

Proprietorship is another concern. For Google Translate specifically, a clause in their terms of service states that by using their service, the users are giving Google the right to use and share their content[16].

Quality of translation

A machine's inability to understand cultural or linguistic context, human bias and complex grammatical structures of many languages make it difficult even for the best AI-based translators to deliver human-like service. However, Google has invented a machine translation feedback mechanism to automatically improve the translation quality of its tools[17].

NEXT STEPS

Language-based AI is transforming consumer services by simultaneously providing real-time information and solving problems in high volumes. At the same time, this technology is serving a wider range of customers more quickly than its traditional counterparts[18]. Regular human intervention will be necessary to improve language-based AI from both cultural and linguistic perspectives.

The industry predicts that the future will bring a hybrid approach in providing speech translation and recognition services. This approach will combine machine translation

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[13] Speech recognition, https://accessibility.psu.edu/video/speechrecognition

[14] AI & Machine Learning Products, Google, https://cloud.google.com/speech-to-text

[15] How (un)safe is machine translation?, http://tradosstudiomanual.com/?p=1448

[16] Google Privacy & Terms, https://policies.google.com/terms?hl=en-US

[17] Machine Translation, http://www.seobythesea.com/2008/08/google-translate-and-user-feedback

[18] Future of Chatbot in 2019, https://chatbotslife.com/future-of-chatbot-in-2019-c126973f7ee0

with human performance to achieve higher quality, volume and efficiency in consumer services[19].

Related Topics: Artificial Intelligence, Deep Learning, Machine Learning, Virtual Personal Assistant

[19] Future of machine translation, https://www.tmcnet.com/topics/articles/2018/12/26/440734-future-machine-translation.htm