CS410 Technology Review

Natural Language Processing (NLP) Startups in Education and Entertainment

Yanyue Wang

Intro

Natural language processing (NLP) is a computer science research area that originates from the Turing test in 1950[1], where Alan Turing proposed a task as a criterion of intelligence. In this task, the machine is required to interpret and generate natural language just like a human being. NLP is a dynamic integration of linguistics, computer science, and math. To excel in this field, a scientist has to understand the structure in a sentence, the methods to map information from text, and how to build statistical models to generate text. In recent years, NLP research is being led to a domain where high-throughput real-life text needs to be processed in the system and truly useful information needs to be extracted from the system. It is a result of rapid computing power improvement and the growing need for big data analytics. Today, the concept "NLP" does not solely appear in conference papers, but also in business journals, apps, and even billboards.

NLP itself, being a technology and not a product, is not commercializable. However, there are many startups that develop solutions or products based on NLP, including Pager in health tech, AlphaSense in fintech, and Xoro.ai in security[2]. In this technology review, we will focus on the products and impact of NLP startups in education and entertainment. These are the two areas where the audience are not restricted to just scientist, engineers, and other professionals. On the contrary, the service and products are used mostly by the mass public in their everyday life.

Body

There are various approaches to apply NLP in education and entertainment, the most obvious one being language education tools. Many people are familiar with Google Translate that process words and characters from 108 languages. This is an example where a product extracts information from the text in one natural language and generate text with the same meaning in another language. If we expand the horizon from using language to learning language, then there are many more things we can do.

In 2019, there are 1,095,299 international students enrolled in US colleges, many of which are not native English speakers[3]. It is very essential for them to acquire proficiency in English writing to pass exams and finish essay papers. Grammarly, as advertised to be the world's most accurate online grammar checker, has attracted attention from education researchers. This company has applied many existing core NLP technologies to parse and process natural language texts, for example, splitting sentences[4]. Most NLP frameworks and libraries have tools to perform this activity based on statistical inference, regex-based rules, and first tokenizing. With improvements coming from corpus training and algorithm optimization, they were able to reach a 1.6% error rate.

Their product, Grammarly.com, has also proved to be a helpful tool in several studies. The paper presented by Ghufron et al. in 2018 has demonstrated that students who got their work evaluated by Grammarly are less prone to make mistakes compared with students evaluated by the teacher[5]. For students who are skillful enough to operate Grammarly

independently, this direct corrective feedback mechanism is suggested as an alternative assessment for students' writing. In 2019, O'Neill et al. monitored students from different groups and compared how they respond to the feedback from Grammarly and from the Academic Learning Centre (ALA) at the CQUniversity[6]. The results showed that English-learning students "taught" by Grammarly combined with ALA were more satisfied in aspects of grade improvement, writing ability development, and confidence in writing, etc. Students are less afraid to make mistakes when they are facing software than facing a human being.

Aside from Grammarly, there are many other NLP startups that are helping people in their language learning. Liulishuo is a Chinese science-driven education company founded in 2012. With the help of their artificial intelligence (AI) team, this company has recorded more than 3 billion minutes of English dialogue spoken by Chinese people. They have developed oral and written English evaluation systems especially for Chinese people based on this huge dataset[7]. Another example is Poodll, a registered company based in Japan. They have developed an English central where students can take classes, speak English, and get real-time feedback.

About NLP startups in entertainment, there is a growing market even though these two topics seem less related. A lot of music streaming services these days, including NetEase Music and KuGou, are providing functions where the app recognizes the song played or hummed through the microphone. The most widely used app is developed by SoundHound, an audio and speech recognition company founded in 2005. The SoundHound app is backed by speech recognition, natural language understanding, sound recognition, and search technologies[8]. After recognizing the song, the screen will show a live lyrics page so people can sing along in the car, in a market, or at a concert.

Compared to similar products, SoundHound has a leading advantage. First, it is a free product with a million-sized database, as opposed to NetEase Music where users only have access to limited songs if they are outside China. Second, it provides related information about a recognized song (album cover, artist, release date, etc.). Users can also discover new music while browsing. Besides the benefits, there are some limitations of SoundHound and its competitor Shazam, they do not always play the correct song, and while Shazam does not include a hum/sing search feature, SoundHound sometimes fails to generate an output when the user is humming a song.

Conclusion

In conclusion, the emerging NLP, machine learning, and AI technologies have become the catalyst of a variety of startups, each functioning in different aspects of life. Students and music lovers can not only discover the meaning of life through words and sounds but also do it in a "smarter" way. Today's language learning products provide feedback with high accuracy and strong timeliness, and song recognizing apps help people avoid situations where they are stunned by a song but don't know the name. It will not be long before we can see people learning languages by talking to a machine and international travelers enjoying local food with the help of a virtual friend.

References

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