

Title

Investigate the use of deep learning to achieve an optimum eastern language learning experience in increased fluency of productive aural skills

Background

Learning a new language in the traditional fashion is hard because it relies heavily on rote memorization using a stream of flashcards and nouns. In recent years, Artificial intelligence has been used in the language domain to provide a more optimum learning experience for people with different abilities.

Cognitive theories such as the space repetition model state that people learn better through short study periods spread out over time. Spaced repetition is useful for vocabulary training, writing/listening skills and pronunciation (Settles & Meeder 2016). Pattern matching can be used to find patterns that create a learning experience closer to reality. A few sentence patterns are learnt for becoming fluent in a language and this is improved upon by added further vocabulary.

In recent years, various artificial intelligence techniques have been used in language tutoring systems. The language curriculum needs to build the learner confidence and be suitably challenging at the same time. Artificial intelligence techniques can be used to develop adaptive curriculum to suit the learner level. Machine learning and natural language processing are two techniques that lend themselves to language learning. Machine learning algorithms support adaptive and personalized learning, while natural language processing technologies help with the challenges associated with understanding and translating human language. Statistical Machine Translation approaches have been used for transliteration of resources from Panjabi to English (Kumar & Kumar 2013). A machine learning technique called “transfer learning” allows systems to learn using one set of data and to then apply this knowledge in another. Further exploration of multi-language Deep Learning is required because according to Abdel-Hamid et al (2013), deep learning has potential to improve speech recognition.

Motivation

Most language learning tools offer a learning experience in Western languages but the resources for learning an eastern language such as Panjabi are scarce.

Language is not only a communication tool but a part of culture, heritage and identity. It is the source of education and progress. Third generation immigrants speak English as their first language and struggle to speak in their mother-tongue. According to UNESCO, a language is endangered when its speakers cease to use it, use it in an increasingly reduced number of communicative domains, and cease to pass it on from one generation to the next. The decreasing number of Punjabi speakers in the British diaspora is a concern.

Previous methods use outdated methods such as translation method or pattern drills because these highly schematic formats are easier to model. Dialogue systems such as chatbots help the learner to communicate intuitively in natural language. However most systems respond to keywords and struggle to check the correctness of the grammar or appropriateness. Work in predefined scenarios with predictable dialogues. Outside the scripted application areas, dialogues with chatbots and agent systems are erratic, incoherent and prone to error. Improvement is needed if chatbots are going to be used by foreign

language learners. Learners need to be able to creatively and spontaneously formulate their own discussion contributions. The research should use suitable techniques (such as MAP fluency reading app, Pearson's VERSANT test and Carnegie's speech assessment) to assess the language level proficiency of the learner. The learner should be able to understand and produce new utterances to deal with novel situations.

Proposed Research

Aim – use of deep learning in speech recognition to enable an improved experience in learning an eastern language such as Panjabi.

1. Investigate the issues currently being faced in the use of speech recognition systems to learn a language.
2. Investigate related artificial intelligence techniques being used in the language learning domain and their limitations.
3. Develop a deep learning based novel solution to assist users in learning to speak an eastern language and overcome the identified barriers.
4. Use suitable techniques to evaluate the oral skills gained by the learner

Potential Impact

- Improved language learning experience without the fear of being judged
- Improved communication in personal life and increased opportunities in professional life.
- Stronger identity and heritage
- No need for interpreters who might make translation errors, can have direct conversation

References

Abdel-Hamid, O., Deng, L. and Yu, D., 2013, August. Exploring convolutional neural network structures and optimization techniques for speech recognition. In *Interspeech* (Vol. 11, pp. 73-5).

Kumar, P. and Kumar, V., 2013. Statistical machine translation based punjabi to english transliteration system for proper nouns. *International Journal of Application or Innovation in Engineering & Management*, 2(8), pp.318-321.

Kurohashi, A.T.S., 2017. Kotonoha: An Example Sentence Based Spaced Repetition System.

Neri, A., Cucchiarini, C. and Strik, H., 2003, August. Automatic speech recognition for second language learning: how and why it actually works. In *Proc. ICPhS* (pp. 1157-1160).

Settles, B. and Meeder, B., 2016, August. A trainable spaced repetition model for language learning. In *Proceedings of the 54th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)* (pp. 1848-1858).