STATEMENT OF PURPOSE

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Personal Statement

I am Shang-Yi Chuang, a research assistant working with Prof. Yu Tsao at Academia Sinica, the national academy of Taiwan, on artificial intelligence concerning speech processing and computer vision. I am also a member of a natural language processing (NLP) group collaborating with Prof. Hsin-Min Wang, Prof. Keh-Yih Su, and other research fellows at Academia Sinica. My bachelor's degree is from National Taiwan University, majoring in mechanical engineering and minoring in electrical engineering. When I was an exchange student at Osaka University in Japan, I studied robotics and conducted research on humanoid robots with Prof. Tomomichi Sugihara.

Motivations

Computational linguistics is my passion, and I would like to leverage both my linguistic and engineering skills to build a manner-aware agent–a translation agent that can adjust manners. My interest in natural languages and communications began to grow while I was conducting research on humanoid robots and experiencing culture at Osaka University. I got lost in translation–I was able to communicate in Japanese but failed to understand the implications behind the words, and therefore, because of my culturally improper vocabulary choices, I undermined my local social network. I think that it would have been great if I had a manner-aware agent, and ergo, I am determined to devote myself to this cross-culture communication support to help people who face the same problem as I do.

Carnegie Mellon University (CMU) offers one of the most renowned machine learning and computer science programs in an extraordinary interdisciplinary environment. In addition, at the Language Technologies Institute at CMU, Madaan et al. proposed a method of politeness transfer in the paper of "Politeness Transfer: A Tag and Generate Approach" which is exactly a monolingual version of the mentioned manner-aware agent. For the reasons set out above, I would like to apply for the Ph.D. programs in machine learning and computer science at CMU.

Recent Researches

Below are two of my projects that I have been working on recently: a lite audio-visual speech enhancement system (LAVSE) and a cross-lingual QA system. With these projects, I have gained hands-on experience in various domains in artificial intelligence, including speech, computer vision, and NLP.

I have published LAVSE with Prof. Tsao and Prof. Wang at the conference of INTERSPEECH. The proposed LAVSE system addresses the problems of general audio-visual multimodal systems: additional processing costs and the privacy issue of facial images. The extension of LAVSE is called improved LAVSE (iLAVSE), and the paper presenting this system is submitted to IEEE Transactions on Audio, Speech, and Language Processing. iLAVSE further considers the data compression in the image domain, the asynchronization in multimodal data, and the problem of low-quality data. These systems are robust against unfavorable conditions in real-world scenarios, such as insufficient hardware or inferior sensors, and hence greatly improve the applicability of DL-based models on embedded systems. From these audio-visual projects, I have mastered fundamental concepts and the know-how of deep learning, while absorbing domain knowledge of both speech and visual signal processing.

In the meantime, apart from signal processing, I started an NLP project about cross-lingual transfer learning on a QA system with Prof. Su. To date, most of the datasets available are in dominant languages, leading to unfavorable inequalities. The cross-lingual transfer learning project can reduce the bias caused by limited data in minority languages. Moreover, it involves multilingual processing, which is a core technique of cross-cultural communication support. As a result, this project paves the way for my next step of realizing my manner-aware agent through machine learning or computer science programs at CMU.

Academic Interests

My ultimate research goal is to build a translation agent that adjusts the manner within speech. To be more specific, manners can vary from language to language. Thus, the agent must be able to translate not only the literal meanings between different languages but also the manners.

The task of accomplishing my manner-aware agent has three aspects: (1) evaluation standards in different cultures, (2) the monolingual manner-aware agent, and (3) the multilingual manner-aware agent. First, the existing manner evaluation methods are not yet comprehensive enough when it comes to sociolinguistics. Take Japanese as an example: students should talk to their teachers with honorifics, but students are allowed to drop honorifics when talking to their classmates. Evaluation systems must consider specific vocabulary in different situations and take care of conversational tone as well. In addition, the level of politeness varies from culture to culture, even when the cultures share the same language, such as in British and Indian English. A conceivable challenge is to maintain consistency between evaluations and target languages while avoiding stereotypes and biases. Next, the monolingual manner-aware agent, some research about affective conversational systems already exists. The systems have the potential to be extended to the third aspect, the multilingual systems, with some help from state-of-the-art machine translation models and transfer learning. Each of the three aspects is a great topic for future research, and has strong potential to improve the development of politeness-related applications. With my speech processing background, I am also interested in speech-to-speech translation, which can preserve the emotion within speech signals, and it is a prospective candidate for further improvement with the use of my manner-aware agent. Led by the unstoppable globalization trend, these innovative technologies are becoming more crucial than ever before, and they can certainly benefit people worldwide.

While research on manners in the NLP field is not yet common, scrutinizing personal webpages and publications led me to Prof. Graham Neubig, Prof. Ruslan Salakhutdinov, and Prof. Scott E. Fahlman, with whom I am delighted to work. As the artificial intelligence industry prospers, a fair and reasonable translator is naturally expected to be available in the future. I am confident that the manner-aware agent has great potential to enhance cross-cultural communication.

Conclusion

Pursuing a Ph.D. degree can significantly help me become proficient in the skills I need, for example interdisciplinary adaptability and analytic skills, and to be more capable of contributing to the manner-aware agent. Because the CMU has (1) a top-notch natural language processing group, (2) the amazing collaborative environment, and (3) remarkable professors who share my interests, I would love the opportunity to use my experience at Osaka University and Academia Sinica to offer my skills, enthusiasm, and a unique perspective to the prestigious machine learning or computer science programs. Studying in your graduate program is my top choice for a Ph.D. degree.