We encounter and learn knowledge from our surroundings every day. The concept of "knowledge" first frequently emerged in one of my research projects regarding movie recommendations, and I am attracted to it immediately. In this project, I realized that daily events could be transferred to "knowledge" and help us resolve real-world problems. It guides me to consider how to efficiently connect 'knowledge' to an AI algorithm, hence better serving our daily lives. After I gained a few years of research and work experience in different research areas, including computer vision, recommendation systems, and data mining, these experiences enriched my understanding of machine learning. They shaped my interests in natural language processing(NLP), especially in natural language understanding(NLU), information extraction(IE), information representation(IR), and their connection to our real world. The texts contain rich implicit information and potential bias that is critical to help us understand our society, such as fighting against toxic online comments or gender bias. I am eager to make bigger impacts in these research areas, and there are three major guided research questions:

- **NLU:** How can we better understand the impliction and connection of text knowledge?
- **IE & IR:** How can we efficiently explore the text information and represent it?
- **Real-World QA:** How can we collaborate our models with humans or society system robustly and equivalently?

I received my Bachelor's and Master's degrees in computer science and was lucky to participate in a few relevant research projects. With these prior experiences, I am passionate about furthering my interest and pursuing a Ph.D. The following describes my research journey.

Research in Knowledge Tracing(TAL AI Lab)

As human beings, we are challenging to keep track of knowledge, and I was wondering how we can build a model to tackle this issue. My research proposed a deep knowledge tracing (DKT) model to monitor student knowledge state or skill acquisition level based on history question-answer series. Even though deep neural networks already grasp the sequential dependencies, the **intrinsic relation** of information can develop our understanding of knowledge states and advance knowledge tracing. We built a question graph based on semantic and feature-based knowledge, obtained the representation combined with graph embedding, and finally, as supervision information for DKT. This approach demonstrates the importance of the side relation information, and the proposed framework outperforms state-of-the-art baselines significantly.

In the meantime, I innovatively extend my results to another research project regarding adaptive learning, which is critical for tutoring systems. In this research, I was involved in data mining, knowledge graph, graph representation learning, etc. Eventually, we submitted a conference to *AIED 2019* (one of the top conferences in education AI). After realizing that question-answer series could be explored as the intrinsic relation and graphs could be used as a knowledge network, both of them contribute to predict people's future state precisely, this research area deeply interests me to develop more results. Hence, I am eager to bring up more research ideas in information extraction and representation by combining knowledge graphs.

Research in Semantic & Emotional NLP(Mobvoi AI Lab):

Apart from knowledge information, I also studied **language understanding** regarding semantics and emotions. In 2019, I joined an AI company (Mobvoi) as a speech algorithm engineer. Since then, I have mainly been involved in research projects that focus on **text information extraction** of text-to-speech(TTS), including semantic NLP and emotional NLP.

For semantic NLP, my work converts non-standard text into representations with accurate pronunciation, prosody, and spoken events based on crosslingual (Mandarin, English, etc.). I led the construction or optimization of these modules. I proposed the "Unified Frontend" to mitigate the problems of out-of-vocabulary, ambiguity, and performance of the online system, which combined with a pre-trained language model, multi-task training, and knowledge distillation as well as linguistic knowledge. In multi-level prosody prediction, I imposed prompt learning, a general method, to alleviate data imbalance and inconsistency, which led to a co-author conference submission to *PRML 2022*.

The emotional NLP, on the other hand, focuses on the intrinsic aspect of language understanding, such as style, stress, and emotion. These tasks are subjective without precise definitions and benchmarks. In this regard, I investigated and established the model solutions using an incremental verification approach, and covered criterion establishment, cross-validation, linguistic knowledge, and contrastive learning, etc. For instance, in text stress prediction, I proposed a two-stage pipeline to construct the coarse-to-fine model with auxiliary granularity supervision to decrease deviation and ensure global diversity. As a result, I submitted a first-author paper to *ICASSP 2023*(under review, one of the top speech conferences). Deriving inspiration from **supervision**(semi- or non-) and **linguistic learning**, I am interested in extending my experience in unstructured, **multi- or cross lingual text information extraction and understanding**.

Conclusion

In summary, I am deeply motivated and passionate about pursuing a Ph.D. In the past few years, I came across several excellent researchers and Ph.D. students, and I wish to collaborate heavily with salient researchers and contribute to my fields with fulfillment. In terms of developing soft skills, I mentored five interns, where I enhanced my teamwork and communication skills. Getting these results inspires and motivates me to seek the next career stage and develop research impact in NLP.

I am applying for Ph.D. in computer science. If you have any question or interest, please let me know it.