Personal Statement

I am Bingbing Feng, a PhD applicant from China. I am an Algorithm Researcher in the Speech Research Group at eMeet. I obtained my B.Sc. degree and M.Sc. degree both in computer science from the College of Information Engineering, Xiangtan University, China in 2015 and 2018, respectively. I am mostly working on speech recognition and speech augmentation problems, and have broad interests in nonlinear dynamics, complex network analysis as well. I am a winner of 2022 IEEE Transactions on Circuits and Systems Guillemin-Cauer Best Paper. Besides of academic studies, I am also fond of reading and cycling, devoting a majority of spare time to them.

Education Experience

In the course of undergraduate and postgraduate study, I have been exposed to such disciplines as Discrete Mathematics, Mathematical Analysis (90 out of 100), Linear Algebra (100 out of 100), Probability and Mathematical Statistics (100 out of 100), Complex Function and Integral Transform (99 out of 100), and so on. From these two stages of learning, I have mastered sound fundamentals of mathematical knowledge, and you can see on the undergraduate and postgraduate transcripts of records that I have done very well in math-related subjects.

Academic Experience

During my master's degree, I mainly engaged in frontier research at the intersection of nonlinear dynamics and information science, focusing on the basic theories and key methods of complex network analysis, which has always been my research interest, and participated in the research on dynamical degradation mechanism of digital chaotic systems via mapping networks, which was presided over by my master's supervisor, Prof. Chengqing Li. Under the careful guidance of my supervisor and the positive influence of the good academic atmosphere of the laboratory, my academic ability has been significantly improved, grasping the methods of literature retrieval and data processing, as well as the skills of scientific paper writing, and my related research achievements have been published in IEEE Transactions on Circuits and Systems-I, IEEE Transactions on Computers, and IEEE Access. Among them, the paper "Dynamic Analysis of Digital Chaotic Maps via State-Mapping Networks" has won the 2022 IEEE Transactions on Circuits and Systems Guillemin-Cauer Best Paper for its first use of a fixed-point arithmetic to explore the dynamical properties of digital chaotic maps, taking the Logistic map and the Tent map as two representative examples, from a brand new perspective with the corresponding state-mapping networks, and another paper "The graph structure of the generalized discrete Arnold's Cat map" has been selected as ESI Highly Cited Paper for disclosing the elegant structure of the 2-D generalized discrete Arnold's Cat map by its functional graph with some elementary mathematical tools. In my master's thesis "Network Analysis of Dynamics of Chaotic Systems in Digital Domain", the second and third chapters are based on the technical content of the above award-winning paper, and the fourth chapter is based on the technical content of the above ESI highly cited paper.

Work Experience

After my master's degree, I have worked in the artificial intelligence (AI) industry for nearly five years, working for two Chinese unicorn companies, where commercial business attaches great importance to artificial intelligence (AI), which is consistent with my research interests. During the

period of working in Silver Star, I have mainly engaged in VSLAM (Visual Simultaneous Localization and Mapping) for floor mopping robot, and have obtained two authorized national invention patents. During my time as an Algorithm Researcher at eMeet, I have mostly worked on end-to-end ASR (Automatic Speech Recognition), improving AED (Attention-based Encoder-Decoder) model with chunk-wise self-attention and speech enhancement for robust streaming ASR, developing important production-oriented features ranging from ITN (Inverse Text Normalization), Punctuation Restoration, Contextual Biasing and Endpoint Detection, as described in the project of AlphaSpeech on GitHub. Apart from that, I have also led a four-person algorithm team, which has developed and improved my team building and management ability to some extent. In the process of pushing forward the implementation of the project, my theoretical research and engineering application ability has been further improved, acquiring proficient programming skills, such as MATLAB, Python, C/C++, Linux, Bash, Git and so on, which lays a solid academic foundation and cultivates strong practical capability for my future research.

Research Motivation

After working in industry for many years, there are two main reasons that motivate me to actively seek opportunities to return to academia. First of all, although the company encourages research, its ultimate goal is to generate revenue. It's all about business, and priorities change all the time, which makes it difficult to make long-term research plans, however I hope to be able to do more basic research based on my previous academic experience. In addition, research in industry tends to focus on patents rather than publications. In industrial labs, you have to get verification from the intellectual property (IP) team before submitting a paper, and since there are so many people working on related research in the field of artificial intelligence (AI), even a short delay could have a significant impact on me. The experience in industry has not only changed my view on scientific research, but also made me figure out what I really enjoy doing and what drives me. Although there are indeed many frustrating things in the process of doing scientific research in academia, the process of creating new knowledge and publishing papers makes me find pleasure.

Research Interest

At present, I personally pay more attention to the cutting-edge research in **the intersection of complex systems and complex networks with artificial intelligence (AI)**, focusing on **the application of basic theories and key methods of complex networks analysis in the field of social and economic complexity**. The introduction of small-world networks and scale-free networks has made many researchers realize the important role of using complex networks as a means of abstract modeling of complex systems. Artificial intelligence technology provides cutting-edge methods for complex system research and has significant advantages in improving the accuracy and computational efficiency of solving related problems. Especially in the current context of massive data, considering the high dimensionality, strong noise, sparsity, heterogeneity and other properties of data, artificial intelligence technology can effectively enable important links such as data collection, processing and extraction of complex system features and elements. However, real systems in the real world are characterized by variable features, dynamic evolution, and unpredictability, and have higher requirements for efficiency, accuracy, and cost. In this case, how to develop more realistic complexity science theories and methods and effectively apply them to real systems still requires further research and practice.

With strong desire for knowledge, curiosity and passion for scientific research, I firm my determination to study a PhD program. After earning my PhD, I would like to continue to engage in theoretical research in related fields and cross-fields in scientific research institutions or universities, doing my best to push forward the engineering application of theoretical research achievements. I have carefully learned achievements of your research group on complex networks, full of creativity and utility. In all sincerity, I would like to study for my doctoral degree in your research group, and believe that through my own efforts, I can complete the research tasks well during the doctoral period. I hope you can take my application into serious consideration, and I shall appreciate you if you grant me an opportunity for further studies.