Personal Statement

My name is Yu Xinmeng, and I am currently pursuing my Master's degree in Computer Applied Technology at the College of Information Science and Technology, Hangzhou Normal University. My current research focus is on the theoretical study of single-objective evolutionary algorithms. I am in my third year now and expected to graduate in June next year. During the past two years of my Master's studies, I have gained valuable experience in fundamental knowledge and experimental design. Through my research work, I have gradually witnessed the improvement of my logical thinking and communication skills. I have also experienced the challenges and hardships of academic research, but at the same time, I have found a sense of fulfillment and satisfaction that cannot be replaced by anything else. After careful consideration, I have made the decision to pursue a Ph.D. degree to further enhance my abilities and broaden my horizons. I hope to continue polishing my skills and acquiring more experiences and knowledge in a higher-level research environment.

Now, I would like to present my personal statement in detail.

Education Background

I took the college entrance examination in 2016 but was unable to enter my desired university due to conflicts in my application choices. As a result, I was transferred to Anhui University of Chinese Medicine to study Information Management and Information Systems. The transfer arrangement was painful for me at the time, and I often found myself immersed in self-pity and self-blame. However, after a period of low morale, I began to adjust my mindset and take action to improve myself. I persisted in daily running, focused on my academic studies, and searched for my own interests.

Review my undergraduate years, I entered the college with excellent grades, which earned me a one-year tuition exemption. In the first year, I received the *Third-class Scholarship*. In my second year, I achieved a ranking of 4th out of 44 students in my major, which earned me a *First-class Scholarship*. In my junior year, I ranked 1st in my major and received the *National Inspirational Scholarship*. Then in 2020, I successfully graduated from Anhui University of Traditional Chinese Medicine as an *Outstanding Graduate*. My undergraduate GPA is 3.33/4 and I would like to mention that during the initial phase of my university journey, I struggled to adjust my mindset and take control of my blue mood, which affected my performance in some subjects. Additionally, as my college required some compulsory courses in economics and Chinese medicine, I faced challenges in certain subjects such as "Macro- and Micro-Economics". Due to the lack of relevant background knowledge, there were very few students in my class passing this course at that time. I'm so sorry that I didn't get a higher GPA.

In addition to my academic coursework, I have always had a strong interest in English language learning. During my undergraduate years, I participated in several national English competitions and received two second-place awards and one first-place award at the national level.

The fulfilling experience in the latter half of my undergraduate studies has provided me with an unprecedented sense of satisfaction. I deeply felt that this was the kind of life I wanted to continue striving for, which led me to **pursue a Master's degree**. Unfortunately, just before the entrance examination for graduate school in my third year, I was unable to participate due to personal health reasons. After taking time to recover, I took the National Postgraduate Entrance Examination in 2021 and applied to East China Normal University as my first choice. However, I fell short of the cutoff score for the interview stage. During the adjustment phase of the graduate admissions process, I discussed with my families and considered some personal circumstances, ultimately choosing Hangzhou Normal University. With the highest score in the entrance examination and the second overall ranking, I was admitted to the Computer Applied Technology program.

As my undergraduate institution focused on medical specialties, the opportunities and platforms for computer-related majors were limited. I cherished every learning opportunity that I had encountered **during my master's studies**. In many courses, I tried my best to acquire new knowledge while filling in my previous knowledge gaps and deficiencies. In terms of academic performance, I completed a total of 16 courses during my first year of graduate studies, with an average score of 88 points. I achieved excellent results in some courses, such as the *Algorithm Design and Analysis* course, in which I scored 96 out of 100.

Experience in the field

During my Master's program, I conducted theoretical research on single-objective evolutionary algorithms under the guidance of Associate Professor Libin Hong. In the second semester of my first school year, I completed **my first experimental work**. Initially, I started with the particle swarm optimization algorithm and focused on a variant called EPSO algorithm, hoping to design a more efficient algorithm based on its structural ideas. Meanwhile, I became acquainted with the concept of cluster on my graduate courses which I found to be valuable in my own research. Then through literature research, I discovered niching method in evolutionary algorithms field shared a similar concept with clustering. Additionally, during the regular meetings of my research group, I learned about an efficient local search strategy from my classmates' literature presentations. Finally, based on the acquired knowledge and methods, as well as extensive thinking and repeated attempts, I designed a new algorithm which yielded promising performance results. A paper based on this research had already been published in *Swarm and Evolutionary Computation* this year.

While conducting comparative experiments in my first experiment, I observed the excellent performance made by one of the compared algorithms. This led me to want to further understand this algorithm and delve into its structure and ideas, thus starting **my second experiment**. Based on my previous experience and related knowledge, I modified two major mechanisms of the original algorithm and proposed an improved algorithm that far exceeded the original algorithm. The main idea was to use particle swarm optimization for global search and then proceed with a mechanism involves sequential quadratic programming methods for local search. Currently, a paper based

on this algorithm has been submitted to the journal *Complex & Intelligent Systems* and is in the second review stage.

The academic life and scientific research during my Master's program brought me a significant growth and great accomplishment. During the two years of studying in the research group, I have made tremendous progress. Initially, I had limited experience in programming, but later on, I quickly learned a new programming language (Matlab) and gradually became proficient in programming and debugging. I also participated in several programming competitions and even built my personal website by myself. Furthermore, I overcame my fear of expressing my opinions in front of public and I'm able to share my thoughts with my professors and peers now. Additionally, my English reading capability, information retrieval skill and logical thinking ability have greatly improved, too. These **personal growth** have not only benefited my academic and research endeavors but have also had a significant impact on my daily life and decision-making processes.

Motivation of applying for further education

During my previous study, I focused on the theoretical research of single-objective optimization evolutionary algorithms. A few months ago, I had the opportunity to collaborate with other group in my school on program of applying evolutionary algorithms to solve the parameter optimization problem in neural network models. In fact, before this project, I had little experience in algorithm applications. During the process of searching for relevant information, I gradually realized that, compared to single-objective optimization problems, multi-objective optimization problems are relatively more representative of real-world problems. Additionally, evolutionary algorithms often better demonstrate their characteristics and strengths in the field of multi-objective optimization.

During my exploration of related knowledge, I was fortunate to encounter excellent ideas of multi-objective algorithms such as MOEA/D, NSGA-II, etc. However, my understanding of these concepts and knowledge is still limited, and I have many questions and doubts at that moment. I don't want to stay at the superficial level and hope to conduct in-depth exploration of more areas of evolutionary algorithms in my future research. Currently, I am interested in researching and improving multi-objective Particle Swarm Optimization algorithms and want to try to integrate the techniques and methods I learned in the single-objective optimization field into multi-objective optimization. In addition, in my previous research, I observed that traditional optimization methods have irreplaceable advantages in single-objective problems. Therefore, I also want to learn more about traditional optimization methods and study whether they can be combined with multi-objective evolutionary algorithms and how to introduce them into existing algorithm frameworks. Furthermore, I also hope to have the opportunity to participate in the practical application of evolutionary algorithms. For example, I want to learn more about the knowledge of genetic programming and symbolic regression fields and explore how abstract real-world problems can be better transformed into expression form, which can assist in generating the models of processed real-world problems by evolutionary algorithms (more details can be found

in my Research Proposal). I really hope to gain a better understanding and insight into these aspects during my doctoral studies. At the same time, I am willing to join the programs of the research group and explore new knowledge areas with the team.

A summary

As I mentioned earlier, my two educational transitions were not really smooth. At this time, I am more cautious in making choices and have prepared more thoroughly. I have learned to cherish every opportunity around me. Although there may still be pressure and anxiety in my future research life, I think I have acquired strategies of self-regulation to face setbacks and developed determination to overcome challenges. In addition to psychological preparation, my self-discipline and self-directed learning habits developed during my undergraduate studies, as well as the academic research and programming knowledge I learned during my Master's program, have laid a solid foundation for my future research life. I believe that these experiences will help me go further on the path of scientific research in the future.

This is my personal statement as well as a summary of my personal learning and life since adulthood. Thank you for your review!