

## Statement of Purpose for CS, M.S. in NYU

The first time I used computer was during an information competition in the primary school when I tried to program in Pascal under the guidance of my computer teacher. As I grew up, I found the black boxes of Computer Science (CS) so common that they have dramatically changed our lives. Due to my passion in computer and talents in mathematics, I chose Software Engineering as my undergraduate major in Sun Yat-sen University. With undergraduate study, I found I still need to accumulate more knowledge and technical skills to give further play to my capability and creativity in this promising field.

In my undergraduate study, I managed to accumulate a fair amount of technical knowledge and improve my programming skills. In the first two years of my study, my coursework (100- and 200-level courses) mainly focused on the basics of mathematics and programming. I studied elementary methods to consolidate mathematical basics, and solved many rudimentary puzzles in different languages to hone my programming skills. My scores were ranked top in *Probability and Statistics*, *Data Structures and Algorithms*, *Computer Programming II* (C++), *Java and Object-oriented Design* (Java), and etc. As I've laid solid groundwork for the fundamentals, I was able to achieve high in more advanced courses afterwards. My scores were ranked the first in *Numerical Methods* (MATLAB), *Principles of Artificial Neural Networks* (Python), *Introduction to Data Mining* (Python), and etc. With these courses as the foundation, I think I am well-prepared for my further study in the Department of Computer Science and Engineering, New York University (NYU).

I firmly believe that only when applied to real-world scenarios can theory and research bring out better results. Thus, in the summer of 2018, I started my first internship in the Institute of Automation, Chinese Academy of Science (CASIA). Out of my interests in Game AI, I participated in StarCraft team to build StarCraft II Learning Environment with Tensorflow. Initially, I trained the soldiers with Advantage-Actor-Critic and Deep Deterministic Policy Gradient algorithms, but neither brought any satisfactory outcome, *i.e.*, about 2,100 and 2,600 wins in every 10,000 battles respectively. After communicating with

my advisor and colleagues, I tried to enhance my DDPG-based work by allowing the soldiers to cooperate. By referring to *Multi-Agent Actor-Critic for Mixed Cooperative-Competitive Environments*, I applied the novel Multi-Agents Deep Deterministic Policy Gradient (MADDPG) algorithm to this scenario and took more factors into consideration in the rewards. Due to this revision, the average winning rate of soldiers was improved from 26% to 43% with only 120 training epochs. As the soldiers and reapers were laid close to each other in the battles, I believe a sparser scenario will further demonstrate the effectiveness of the advanced MADDPG algorithm. From this internship, I picked up more knowledge in reinforcement learning, including traditional algorithms, training methods, evaluating criteria, and etc. Furthermore, I learned more about the business cases where reinforce learning methods are being applied, which inspires me to integrate them in other studies in the future. I think this experience shares great similarity with Professor Julian Togelius (in AI and Gaming) and Eugene Callahan (in Agent-based Modeling), and I am willing to explore these areas under their instruction.

Aforementioned experiences are just small parts of my undergraduate academic and professional journey, but they clearly demonstrate my firm will, innovative thoughts and teamwork spirits, which make me well-qualified for your program. With a prestige faculty and a wide platform, the CS, M.S. in NYU provides me with the opportunity to study in-depth specialization about this subject to achieve my dream. In addition, I think my past experience matches well to the concentration of Game AI and Deep Reinforce Learning in your department. If admitted, I am inclined to work on Deep Reinforcement Learning because of my undergraduate studies and internship in CASIA. Besides, I also look forward to exploring Machine Listening studied by Professor Mark Cartwright as a new field of study.

In the short term, upon obtaining my master degree, I expect to complete my project plan with excellent performance to broaden my horizon and consolidate the knowledge I have gained. In the next 3 to 5 years, I aspire to become a reliable researcher by pursuing a doctor degree. In the long run, I hope to work as a professor to educate future students and to promote promising technologies to better our lives. The road ahead is destined to be a bumpy ride, but I am strong-willed enough to overcome whatever challenges lying ahead to accomplish my dream.