

Education is one of the most pressing social issues we face today. It is the key to ending poverty, resolving inequality, and improving public health. My goals are to ensure that all children have access to equal, quality educational resources and to create Educational Technology (Ed-Tech) tools that personalize the student learning process. Throughout my college career, I have seen the power of computer science and the ability to change lives with technology. My interests have guided me to apply for the doctoral program at Rice University, which has one of the most prestigious research labs in the artificial intelligence field.

My first encounter with Ed-Tech was the summer after high school when I interned at an Ed-Tech startup in China. I traveled to three different villages to talk to elementary and secondary school teachers about their Ed-Tech software needs and requests. During the trip, I discovered that even though the local government had provided schools in developing areas with full Wi-Fi coverage and computers, their education system was challenged by a severe lack of teachers; young adults sought opportunities in big cities instead of returning to the villages to teach. To improve this situation, my company and I worked with the government to design and build “smart classrooms” for each community. We attached iPads to the classroom walls with built-in tutorials, practice, and other learning materials for students to teach themselves in all subjects, and incorporated augmented reality and gamification components into the tutorial systems to increase user engagement. I saw how the systems could help teachers improve teaching quality: the homework system provided teachers with class performance reports for each assignment; teachers could redesign their in-class teaching materials and activities based on these statistics. From this experience, I realized that technology could lead to a revolution in the traditional classroom setting, and I began to focus on the field of Ed-Tech.

When I was reading books and research papers about Ed-Tech, I came across Professor Xiangen Hu’s research on intelligent tutoring systems at the University of Memphis. I reached out to Professor Hu and joined his lab this summer. Working on large systems like *AutoTutor* (an intelligent tutoring system) and *GIFT* (Generalized Intelligent Framework for Tutoring) significantly improved my coding and problem-solving skills. My biggest takeaway from this internship, however, was understanding how psychological principles were applied in such systems. I learned how *AutoTutor* evaluated student answers through natural language processing and how the system guided students towards the correct answer. The pedagogical models were incredibly eye-opening because I had no prior background in psychology or education. Moreover, I came to understand that although these teaching methods made sense intuitively to human teachers, it was hard to put them in code and to teach a robot to perform in a similar manner. Furthermore, because *AutoTutor* was implemented in English and Chinese, I gained insight into the challenges faced by natural language processing techniques for different languages. This indicates that language is a barrier for developing intelligent systems that are available to everyone. Students who speak an unpopular language will have little or no access to existing resources.

Finally, my work at the University of Memphis shed light on software usability and user engagement. As I helped psychologists in my lab to solve technical problems with the system, I realized the importance of creating tools that everyone could use. Therefore, after my program in

Memphis was over, I returned to Boston and started a research project on user engagement in *Application Programming Interfaces* (APIs) by partnering with the MIT Museum. My teammates and I are currently holding workshops at Simmons University to teach non-Computer Science students how utilizing APIs and other available technical tools will enhance their research. I am genuinely fond of teaching people about Computer Science because I have the ability to use different approaches to explain concepts and problems clearly based on an individual's preferred learning method. This strength has allowed me to do well in experiments that have involved human participants and made me a great tutor at work. Many of the students I tutored have often encouraged me to become a teacher in the future and have expressed to me that I would make an excellent one.

My long-term career goal is to become a professor after graduate school for three main reasons. First, I want to continue working for as long as I can; just like my grandmother who is a distinguished and esteemed college English professor in China and is still working today at the age of 81. Second, I am looking for work that will continue to challenge and excite me for many decades, in a field that offers continuous growth and opportunities. Last but not least, I am passionate about research and I want to devote myself to working on high impact research projects for the rest of my life.

My short-term goal is to find a Ph.D. program that aligns with my interests. I am particularly interested in Professor Devika Subramanian's work on *Computational Systems Biology*. Her aspiration to apply artificial intelligence to disciplinary research speaks to me. By joining Dr. Subramanian's group, I hope to continue exploring the intersection of artificial intelligence, neuroscience of human learning, network analysis, and data analytics. Dr. Lydia Kavraki's research on robotics fascinates me as well. I wish to contribute to her projects by bringing my relevant experience in random processes, programming, and mathematical modeling. In alignment with Dr. Kavraki's work, I am also interested in creating personal learning robots that will build relationships with students throughout their education career. The robot will be able to identify students' strengths and weaknesses, and help them discover the learning methods that work best for them. In addition, the robot will share the cultural background with the student in order to preserve individual cultural traditions and values in our education system. Growing up in different countries, I have experienced cultural conflicts in my education and sometimes felt confused about my cultural identity. I believe it is essential to address cultural issues in educational technologies. I also enjoyed reading Dr. Luay Nakhleh's projects *Modeling Biological Networks* and *Bacterial Genomics and Epidemiology*. Indeed, my previous research involved constructing a language network using natural language processing techniques and I utilized this language network to simulate the structures of human social behavior and other real networks.

I am aware your high caliber Ph.D. program requires perseverance, self-motivation, time management skills, and team spirit to thrive. My academic record shows that I have been working hard to hone all these skills. One physical example of this is my research paper *Life in the Semantic Space: Structures of the Language Network*, which received the runner-up of the Castellan Award for the best student presentation with special recognition at the Society for

Computers in Psychology 48th Annual Meeting, New Orleans, LA. Another paper of mine, *Data Mining in Sports: the Relationship Between Anthropometric Characteristics of Collegiate Female Rowers and Pacing Strategies on a 2000-meter Ergometer Test*, was published in the Proceedings of the 2018 IEEE MIT Undergraduate Technology Research Conference. In this research, I applied data mining algorithms to analyze how rowers' body measurements and muscle qualities affect their pacing patterns. My findings with the novice rowers contradicted what the general rowing community believed. To recognize my research accomplishments in Computer Science and Mathematics, I have been inducted to the Sigma Xi International Scientific Research Society and Pi Mu Epsilon National Mathematics Society. Additionally, I am a member of the ACM and IEEE. While being active in academic pursuits, I highly value my participation and time with the Simmons Crew Team. The athletic experience has taught me to constantly push myself and never give up. Thank you for considering my application. It would be a dream come true to join Rice University's professors, students, and researchers who share my passion to innovate and to create technology that empowers and transforms the world around us.