Statement of Purpose

Short-term goal: to engage in research leading to a PhD in computer science. My areas of interest broadly lie in the fields of Artificial Intelligence, Data Sciences, Deep Learning and Data Mining.

In the long term, I see myself as a researcher in AI who would provide cutting edge solutions to complex problems. (It's hard to say now where a few years of grad school would lead me.)

A Master of Science program in Computer Science is the first obvious step, but I would also want to keep the PhD qualifying exam in mind.

My understanding is that the problems being tackled in my areas of interest are of a complex nature, and they are going to be even more so in the future—take simple examples: driverless cars run into accidents, Siri gets triggered by the word 'Syria', etc. The astounding progress that we have seen in the field of AI is the beginning of quite a mind-boggling narrative. With this understanding, I want to get a proper foundation—academic, practical as well as research-oriented—for a productive research career.

My passion is to build smart software and deliver tangible results to the stakeholders of my research work, and I have been self-motivated to a great extent in my studies outside the classroom. I have completed around 22 MOOC certifications, with their assignments and quizzes, in machine learning, data sciences and deep learning on Coursera, offered by well-regarded American universities. This study was alongside the workload of a full-time job or full-time education. After completing these courses, I volunteered as a mentor at Coursera, to help fellow students with machine learning concepts (and sharpening my own understanding along the way). I have implemented over a dozen "pet projects" in topics of my interest, some of which are listed in my resume. Here I want to mention that the most exciting of all the projects was the one where I implemented a convolutional neural network (CNN) from scratch, along with the back-propagation algorithm. My evaluators could verify that I had been doing these kinds of projects during all my academic years.

I had my first research experience during my 18 months at Symantec Corporation, as an intern for six months and as a full-time employee for 12 months. I was privileged to gain access to the world's biggest cyber security database at Symantec, based on which I implemented several projects related to machine learning. In one, I performed data analysis and trained a XGBoost model to detect ransomware, which was so effective that it detected the infamous 'Wann cry' ransomware on day zero. This work later became my first international publication. In another research project, I performed detailed research about PUAs (potentially unwanted applications), and used computer vision, by training a CNN to detect PUAs from clean software files. This research was presented at the annual innovation conference in 2018 at Symantec.

Background: I received a conventional 4-year undergraduate education in computer science and engineering, in a well-established college with a good local reputation. Algorithms and Data structures, Discrete Mathematics, Design and Analysis of Algorithms, System Software and Artificial Intelligence were some of my favorite courses. I taught myself Python (not a part of the regular college curriculum) even before I joined college. Such explorations helped me build a solid foundation in programming logic that later helped me gain proficiency in orthodox languages like C, C++ and Java. I'm also a self-taught Android developer and a web developer. Using these skills, I ventured to run a small startup in my college days. I developed a 'socially networked music player', as one of my academic projects at college, for which I designed and implemented an algorithm based on fuzzy systems, to find people with similar tastes in music. This project was a super-hit among my friends and got good grades from my evaluators.

My parents are teachers who always kept my education as their top priority. With an educational background at home and an industrious attitude, I have always excelled in school. We have something called 'ranks' in India: I stood 1st in my secondary school, 1st in my higher secondary school (we call it junior college) where I stood 2nd in the divisional board, with roughly 1,50,000 students. For this achievement I was awarded the prestigious Dhirubhai Ambani Foundation scholarship : full funding for my 4-year undergrad education (Mr Ambani is 20th century India's Rockefeller). I also received a scholarship from the Maharashtra State Government for the same the purpose. I was good at algebra from childhood. I taught myself linear algebra and calculus by watching videos and completing assignments at Khan Academy. I loved it and was good at it.

This pleasant journey with computers started when I got a computer at 16 (earlier than average for small-town in India). Tinkering with operating systems became my hobby, and I had explored around 7 Linux distributions. To fulfill my curiosity about operating systems and how computers worked, I took a YouTube course by Prof. John Kubiatowicz of UC Berkeley. That was before I attended college. As I had already developed an interest in OS, I opted for computer science. Later I took several courses in Data Structures, System Software, etc. by Prof. Richard Buckland (U of New South Wales) and Prof. Alex Aiken (Stanford). They kept me well ahead of my curriculum and made time for me to learn new skills and implement interesting projects. While taking my System Software course, I partially implemented a small compiler, to compile COOL (classroom object-oriented language), a small programming language designed by Prof. Aiken. It was a very stimulating experience for the experimenter in me.

Working at a multinational like Symantec has been a good learning experience, but I'd rather be in grad school, laying the foundations for a research career. The academics at University of Southern California are a good fit with my areas of interest. Therefore, with the knowledge about the fundamentals of computer science and my areas of interest in hand with the current research at USC, I think that I'm ready to take a graduate level course in Computer Science. My efforts outside the classroom to get answers for technical problems, and my urge to experiment are conducive habits for a good researcher. I understand the gravitas of graduate education and I'm confident that I can measure up to faculty expectations. I feel that I have the potential for performing quality research, given the right opportunities. Financial aid in terms of scholarship or assistantship would help me focus more on producing quality research. Therefore, I request the admissions committee to kindly consider my application.

Yours sincerely,
Niranjan Agnihotri