STATEMENT OF PURPOSE - KANU SAHAI
Applicant for the M.Eng. Program in Computer Science

I wish to pursue a M.Eng. degree in Computer Science at the Cornell University, owing to my interest in pursuing a career in cutting-edge technological field. Throughout my life I have always found myself very interested in any application of logical analysis and reasoning whether it is in studies or real life. Since my formative years in school, I have actively participated in Science Olympiads and quizzes and have been a keen student of Mathematics and Computer Science. Such an interest led me to opt for the Bachelor of Technology (B.tech) program in Mathematics and Computing at the Indian Institute of Technology (IIT), Guwahati as my choice for undergraduate education.

My coursework over the last four years has been a unique blend of mathematics – pure and applied – as well as computer science. A wide plethora of topics have been covered in these four years giving me a wholesome perspective into mathematics with courses on Discrete Mathematics, Theory of Computation, Probability Theory and Random Processes as well as computer science with courses on Object-Oriented Programming, Computer Architecture, Algorithms, Operating Systems, Data Communications, Computer Networks, Databases and Semantics of Programming Languages. A solid foundation in mathematics and such an engineering background clubbed with my education has helped me develop an analytical bent of mind with a keenness to apply theoretical knowledge and skill set.

I believe I have had some wonderful opportunities to gain first hand research experience in application of mathematics with computational emphasis at places that provided state of the art facilities and research support. In the summer after my second year, I was one among a few people who were awarded Indian Institutes of Science Education and Research (IISER) Summer Research Fellowship. I worked under the guidance of Dr.Soumen Maity at IISER, Pune. The chief aim of my project was to study the construction of Covering Arrays using the concepts of Group Theory and to improve some of the current best known upper bounds on their size. Construction of efficient Covering Arrays has important applications in the testing of hardware and software. I had just completed a course on Abstract Algebra in my second year and that was the first time I got a hands-on experience on how pure mathematics can find such significant applications in the technological field. Using my theoretical knowledge for practical applications was fascinating to me. I began with re-strengthening my knowledge of Group Theory and Field Theory. A lot of research had already been done on construction of Covering Arrays of strength-2. After thoroughly going through some research papers on the same, I worked on extending the concept to Covering Arrays of Strength-3. In the subsequent weeks I developed C++ codes for construction of Covering Arrays of Strength-3. During the course of my two month internship I gained valuable insights into the research industry. I continued my association with IISER, Pune through an online collaboration with Dr. Soumen Maity for a few more months after my internship got over and presented a seminar on this topic at IIT, Guwahati.

My third year internship, as it happened, had me as one of the three people selected for internship at the Quantitative Finance group under the R&D Flagship of Tata Consultancy Services (Largest India-based IT services and business solutions company). My project involved simulation of Stochastic Volatility Models and pricing of options using these models. MATLAB

was extensively used for this project. From my readings of review literature I learnt a lot about how various models have been given to simulate the price of an underlying asset and how option prices come out to be for different models. I generated stock price paths for various models using Monte-Carlo Simulation. Then I went on to calculate option prices from simulated stock price paths (Monte-Carlo method) as well as from the analytical solution of price given for that model. My project taught me about how derivative pricing is an integral part of financial world. The other aspect of my internship apart from gaining knowledge of my subject was the sense of satisfaction and enjoyment I got in living independently in a new city. I learned to fend for myself and manage my own life.

My interest in Computer Science was spurred during my fifth semester through a term project on Pintos-a simple operating system framework. It was through this project I gained a deeper understanding of the fundamentals and working of an operating system (OS). Task at hand was to improve bare bones OS kernel-Pintos. We implemented various advanced OS constructs like Process Synchronization Primitives. Next, we were asked to implement schemes for running programs in both kernel and user modes. Looking into the design of file management system in Pintos was particularly very interesting. An understanding of working of a computer at this level was highly enriching. It made me realize the level of complexity associated with the OS which are in use today.

I also took great interest in the Databases course which we had in our 7th semester. I, then, chose to take up a project on 'Online Examination System' wherein I can put into use my knowledge of Databases. A complete novice to web development, I learnt HTML and PHP from scratch. After implementing a user authentication system, I developed a timed online test taking system for a user. The sense of satisfaction I got in completing my project and learning new things has led me to work on another such project on my own. I am trying to build an automation software for the institute guest-house using JSP, HTML and MySQL. Designing is being done in UML.

Believing that a well-rounded development would be important for success in any future endeavours I take, I have ensured a healthy balance between my academics and extra-curricular activities. I am an active member of the Robotics Club. During my initial years into the college I participated in manual and semi-autonomous robotics events. I and my team mates pulled an all nighter to build our robots. The semi-autonomous robot was designed to follow shortest path using Dijkstra's Algorithm and to play soccer using images taken by overhead cameras. It gave me immense pleasure to watch my robots work in the arena. In my pre-final year, I went on to being a member of the core organizing team of the annual technical festival of IIT, Guwahati.

My research experiences and course work undertaken so far have motivated me to pursue an application oriented career in Computer Science. Studying with competitive peers I have imbibed adequate skills that would allow me to succeed in graduate curriculum. The Masters program in Computer Science at the Cornell University perfectly blends with my interests and career aims. Cornell University with its prestige and a work culture that inspires innovation promises to provide a wholesome and dynamic study environment and would be a perfect stepping stone towards the application oriented career in Computer Science that I have envisioned.