

I am interested in pursuing research in high energy physics, mainly experiment and phenomenology. With results from the LHC coming in at a lightning pace, it is a really exciting time to be working in the field of particle physics. I would like to be part of this revolution, and contribute to the advancement of our understanding of matter.

Coming from a family of physicists, I grew up hearing about quarks and leptons. I got interested in science at a very early age, and inculcated this interest by participating in various science olympiads and exhibitions during my school days. My interest in science and technology spurred me to join the Engineering Physics program at the Indian Institute of Technology Bombay. During my stay here, I have tried to explore my academic interests through various research projects.

After my first year, I did a project with the Machine Interlocks group at CERN. Having had no prior exposure to electrical engineering, it was a great learning experience. I documented one of CERN's field buses, which had until recently been maintained by an external contractor. I learned VHDL, and gained enough competence to successfully interpret and translate a huge piece of uncommented code. I presented my findings in the form of descriptive data charts. Since I was able to complete my project 2 weeks before the originally stipulated duration, I requested another project. In this project, I was introduced to PCB design. I used Altium Designer to design a power distribution board, procured the necessary components and tested the circuit on a bread board before fabrication. My design was used as a basis for a power supply used during irradiation testing in 2009. The project was an eye-opener because of the opportunity to witness what is perhaps the biggest marvel of modern engineering. The immense complexity of the LHC, and the way all the little pieces fit together to make the most sophisticated instrument ever devised, sparked my interest in experimental particle physics.

I tried to explore this interest further when I worked with the MIT Lab for Nuclear Science group at CERN. We were working towards characterizing the quark gluon plasma by measuring the higher order flow coefficients obtained from azimuthal correlations of jets with particles. I worked on the analysis of associated yield plots in η - ϕ space and its Fourier decomposition to obtain the harmonic flow coefficients. I picked up valuable computational skills, and familiarized myself with CERN's ROOT framework. More importantly, I got a taste of what research at a world class university is like. There were times when the results we obtained matched with our expectations, and there were moments when everyone in the group meetings was momentarily stumped by the presence of a particular feature in a plot. The brainstorming that followed and the intense discussions about how we could attack the problem further, constituted the most exciting moments of the project for me.

This project inspired me to dive further into this area and I decided to work on jet finding algorithms as a part of my senior thesis. While my summer project had been about analysis, I strengthened my theoretical base during my thesis. I learnt about the various signatures of the Quark Gluon Plasma, and the role of jets in furthering our understanding of the QGP. We also studied existing jet algorithms. Having gained a more thorough understanding of the theory, I feel I can appreciate the research we had done over the summer much more. We are currently working on the analysis of the 2011 heavy ion data, and researching new jet finding algorithms.

Apart from my strong research background, the diverse experiences that I have picked up during my undergraduate education have equipped me well for graduate school. I have a strong theoretical base, and sound analytical skills. Having done courses in Electrical Engineering, Physics and Mathematics, I feel I bring to the table a background that is tailor-made for modern-day physics. I can contribute not only to theory and computation, but also to instrument design and fabrication. I feel my extracurricular activities at IIT Bombay have taught me a lot as well. As general secretary of the Physics department, I have been heavily involved in academic reforms. My experiences as a member of the basketball team have taught

me the values of hard-work, discipline and teamwork – qualities that will definitely serve me well in a research career. My interest in quizzing and word puzzles has honed my analytical ability outside of an academic environment, and helped develop my creative side.

With the skills and experiences that I have picked up during my undergraduate education, I believe I am capable of contributing to the world class research that is being carried out at MIT's Department of Physics. I am interested in the fields of particle physics, astrophysics and cosmology. Working on the CMS experiment at CERN with the experimental high energy physics group would be a great match for my abilities and interests. In particular, I am interested in the work carried out by Prof. Roland on the studies of the Quark Gluon Plasma using high pT probes. I am also interested in the work of Prof. Monroe on the development of detectors for direct detection of Dark Matter. MIT, with its vibrant academic atmosphere and stellar record of world-class research would be the ideal place for me to begin a research career in Physics.