

When I was twelve, I used to tell my father, "When I grow up, I want to become a Scientist". Back then, it was a figment of my imaginative mind that was too young to understand career or future goals. In school, the subjects Mathematics and Computer Science were my favourite. Computer Programming came naturally to me, and I felt I could visualise the problem statements as mathematical equations. I understood computer architecture. But, I wanted to go deeper into the roots of Computer Engineering and study Processor Architecture. Electronics Engineering, for me was the perfect blend of hardware and software aspects of a computer system. Choosing a branch of study, therefore, was not difficult for me.

When I started at University of Petroleum and Energy Studies (UPES), I was very curious about 'research' and my initial interaction with my professors and seniors gave me a glimpse of just how vast and diverse the applications of electronics are! I developed my interest through reading research publications and articles from IEEE. In class, I would study Control System, Electronic Devices and Circuits, VLSI Design and Technology; and simultaneously self-studied Algorithms, Data Structures and Automata Theory.

My first major breakthrough came with active participation in the CanSat Competition 2015 at Texas, USA hosted by NASA. We outperformed many renowned international universities and I was appointed as the Team Lead of ten students for CanSat 2016, where we aced in all of Europe and Asia. Business Insider (July 19, 2016) wrote about us, "Indian students presented an Epic CanSat System at Global Aerospace Competition in Texas, and it left NASA absolutely stunned". That year, I was introduced to an even bigger project. US Defence giant, Lockheed Martin, had approached the University for a Fifteen-Member Team to design a payload for the famed C-130J Super Hercules Military Aircraft. All major Indian Defence organizations were involved and I was given the opportunity to be a part of the Engineering Team. Alongside our studies, we worked on this project for months – day and night. As a result, the project was a national success! I still continue to contribute to the team, as a team member.

Looking back, I find that I had greater satisfaction in coding software and implementing digital designs on FPGA. My curiosity over high-performance mission-critical processing systems reached a level that in my third year, I applied and got selected for Research Internship at Bhabha Atomic Research Centre (BARC), India's prime Nuclear Research facility in Mumbai, which I now believe was the most resourceful summer of my life! Under guidance of Mr S K Lalwani, Head of Data Acquisition and Processing Systems (DA&PS) Section, I worked on Ultrasonic NDT of materials. I developed a software using MATLAB to test algorithms based on Information Theory, DCT, DFT and Wavelet Transforms for "Ultrasonic-Data Compression"; and tested various codes on Altera FPGA. BARC taught me the most advanced topics but also showed a clear picture that all advanced engineering originates from the basics. I was recognised among the top ten researchers of UPES (Bachelors and Masters) – Rank 8th – in 2015, and it was this research on Wireless Sensor Networks that I published my first research paper and filed my first patent.

Academics apart, I have had an immensely enriching college life. I have had the pleasure of serving as the "Discipline Committee Head" of our University and the "IT and Design Head" of the UPES – IEEE Student Chapter. Living in the Lower Himalayas, I've fallen in love with nature, enjoying the lush greenery and reading stories of Ruskin Bond. Sometimes, while applying to esteemed Universities such as TU Delft, I am countered by the notion that my grades seldom reflect me as an 'Outstanding' student. But, grades don't satisfy my appetite for knowledge. Nevertheless, ever since school days, I have always maintained my rank in the top 10 of the class.

Choosing a Major Project for final year was not difficult. My final year project is "Design and FPGA Implementation of 16-bit Microcontroller using VHDL", which I'm happy to say brought great appreciation from the Faculty. I started with learning VHDL to its depths and revising concepts of Digital Design. To dive further in, I approached my project guide, Dr Adesh Kumar, for his guidance. He instructed me to refer the books Digital Systems Design Using VHDL: Jr. Charles H. Roth, Lizy K. John and VHDL Programming by Example: Douglas L. Perry. It was an excellent introduction to State Machine design and working of digital circuits such as DRAM and UART. I have designed and tested 16-bit ALU, Comparator, Traffic light Controller and am currently working on  $2^{16} \times 8$  SRAM. Designing sequential circuits and implementing Parallel-In-Parallel-Out method is a challenge. I have to deal with timing synchronisations, latching address and data bus, implementing multiplexing for read-write operations etc. I am also working on design of UART and studying integration of the units. In the semester break, I plan to further strengthen my concepts of Processor Architecture, and once back, start working extensively on the system. I use Xilinx ISE 14.2 and ModelSim 10.0 for chip design. I look forward to testing the complete system on Spartan-6 and Virtex V5 FPGA. I will be devoting these final two semesters in doing so which carries 4+8 credits.

My fourth year is drawing to an end and I have started putting in efforts to contact each University. Given my zest for research, I was strongly advised by my project guide, Dr Ugur Guven to pursue higher studies in Europe, TU Delft being his first recommendation. Coincidentally, I had the opportunity to attend a lecture at our university by Dr Pieter Jonker of TU Delft, the very same year. TU Delft gave me a chance to study Multi-Core Processors, Computation-In-Memory, Liquid Architectures and Quantum Computing, an exposure that no other University could provide. I look at the online course structure of TU Delft and realize that this is just what I need to eventually fulfil my dream. Look, for example at two of the subjects, Advanced Computing Systems and Reconfigurable Computing Design. Wouldn't that be a research that will define the next generation of computing devices? I feel the desire to learn how to design complex computing platforms, define Architectures and Instruction Sets for processors and ASICs. I look towards using my experience in digital system design and my ability in handling super intense pressure to design mission-critical adaptive processing systems – that blends high speed, low power and precise timing. Factually, TU Delft is a decade ahead of UPES. And that is what excites me. I look at TU Delft graduates working at Google, Intel & NVIDIA as Design Engineers and feel a connection I can't establish, an inspiration that spurs me on towards my 'ultimate goal'.

I enjoy the learning process and is the reason I wish to pursue master's study in Computer Engineering with specialisation in Liquid Architectures. Being part of this next generation community of Computer Scientists has been my desire. I see reconfigurable computing as a unique platform to optimise processors into adaptable computing devices. Browsing through various topics of M.Sc. research at EEMCS Department website an idea for my M.Sc. thesis stroke my mind – "Design of Parallel and Scalable Processor Architectures in Scientific Micro-Satellites". Micro-satellites need to be developed with ever-increasing need to handle more data, thus, this project aims at more datahandling and processing capability by developing and testing parameterised processors on FPGA. Reading on research by Prof. Koen Bertels, I also considered, as a hypothetical project idea, combining the specialisations of Liquid Architecture and Quantum Computing; such as "Design of digital reconfigurable processor in Quantum-Dot Cellular Automata (QCA)". I have many aspirations and ambitions to achieve both within Computer Engineering and beyond. But right now, I am willing to come all the way to The Netherlands and pursue M.Sc. in Computer Engineering at Delft University of Technology. Thus, I pen down my Letter of Motivation with due reverence to the University and the Department.