STATEMENT OF PURPOSE

"Arise awake and stop not till the goal is reached."

Swami Vivekananda

I first felt the thrill of pursuing dedicated scientific research when I read the book *"Wings of Fire"* by Dr. APJ Abdul Kalam during my first year of undergraduate study. His extraordinary journey has always motivated me and instilled a passion to *excel* and *innovate*. My primary interests are in Analog VLSI, Mixed Signal IC Design. I have also taken baby steps in the field of Neuromorphic Computing.

My Academic and Research Background:

Problem-solving has always been a source of great fun to me. Physics was my favorite subject in school. My first encounter with diodes and BJT was in high school when I was preparing for the Joint Entrance Examination. I was so drawn into it that I gave it more heed than any other topic. My confidence was boosted when I qualified **Kishore Vaigyanik Protsahan Yojana** (**KVPY**) in 2021 and ranked **8th** in **West Bengal Joint Entrance Examination**.

I got an excellent opportunity to study at the **Indian Institute of Technology, Kharagpur**, one of the premier engineering institutes in India, in my desired discipline of *Electronics and Electrical Communication Engineering*. Since joining the department, I have focused on my academics, culminating in my high CGPA (9.49/10.00) at the end of my second year of undergraduate study.

My first exposure to VLSI was in the winter of 2022 when I was selected for a workshop at the **Advanced VLSI Laboratory, IIT Kharagpur**. I learned about the challenges of designing a complex analog VLSI circuit and got exposed to the various CAD tools. The following paragraphs list my significant endeavors that shaped my interest.

Summer Internship 2023: I did my summer internship under **Prof. Mrigank Sharad** at the **Indian Institute of Technology, Kharagpur**.

I worked on designing a novel voltage-controlled oscillator in 180nm CMOS, which is suitable for space applications. This is a part of the serializer-deserializer module for ISRO. The oscillator provides frequencies ranging from 500MHz to 1.5GHz for control voltages from 0 to 1.8V. It has four stages, each split into 16 layers to mitigate single-event effects. Parameters like phase noise and jitter were considered before finalizing the design. The VCO was also tested in a PLL to test its efficacy. The entire layout was designed in Cadence Layout Suite. Parasitic extraction was done, and post-layout simulation was carried out to note the degradation in performance. Finally, input and output pads were integrated to make the design ready for fabrication.

Winter Workshop 2022: Under the guidance of **Prof. Mrigank Sharad** at the **Indian Institute of Technology, Kharagpur**.

The workshop was organized to teach us the fundamentals of analog VLSI and mixed-signal IC design. It went longer than scheduled. I designed a frequency counter type 7-bit ADC using basic building blocks like OP-AMP, voltage to current converter, current controlled oscillator, comparator, and register. The simulations were done using 180nm PTM models in LTSpice. After this, I proceeded to work under Prof. Sharad in the summer of 2023.

Current Research Interests:

During my active involvement in these projects, I developed a keen interest in analog and mixed-signal IC design and analog VLSI. I have decided to pursue graduate studies to gain deeper insight into these areas.

After listening to an institute lecture by **Prof. T. Venkatesan** of the University of Oklahoma on *"Recent Advances in Memristors for Neuromorphic Circuits"* I felt that with the advent of artificial intelligence, there is an ever-growing need for higher computing power. Devices like neurons are required to offer higher computing/ storage density with low energy consumption. We also need memristors to overcome the von Neuman bottleneck by co-locating the memory and computing functions on the same device, as in neuromorphic computing.

My Extra-curricular Interests:

Besides academic attachments, I also engage in sports like table tennis (represented my hall of residence in the General Championship in the institute). I was also associated with yoga and wellness through my participation in the National Health Organization. Besides, I have a strong interest in automobiles. I was a member of the electronics subsystem at TeamKART, the official formula student group of the Indian Institute of Technology, Kharagpur.

My Aim:

As an Indian student of technology, my primary focus is to develop something that is low-cost, fitting to our national mindset, and targeted to serve Indian necessities, e.g., projects like *Covirap* and *Sanyog* in IIT Kharagpur are worth mentioning in this context. I enjoy doing independent research.

Saptashwa Bhattacharjee