# Priontu Chowdhury

4233 Chestnut Street, APT 442 | 19104 Philadelphia, PA

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Drexel University
Philadelphia, Pennsylvania, USA

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**Personal Statement: Drexel University, College of Engineering**

I was exposed to AI at the onset of the Machine Learning (ML) boom through Dr. Andrew Ng's Stanford Online course. As a result, I started getting excited about applications of ML from a young age. I knew from then on that this was exactly the field I wanted to work in and dedicate my life to – and I started preparing by developing my calculus and programming skills. At that time, my exposure to self-driving cars and recommender systems made me feel like I knew all there was to know about this field. But five years later, I found myself in a world that got consumed by AI, and it exploded so fast I could hardly keep up.

I come from a country that ranks high on the poverty index, with 76% of the population living on under $5.5 a day. Even now, technology hasn't properly reached most parts of Bangladesh, and being computer savvy still means knowing Microsoft Word and Excel. However, that wasn't enough for me. I've always had bigger dreams, and they have forever compelled me to strive to be the best version of myself. A pursuit for better higher education has led me from Bangladesh to Germany, and now from Germany to the US – and all the while I funded myself independently through scholarships and jobs. My passions have enabled me to stay strong and motivated as I persisted through a strenuous engineering degree, and they helped me secure an internship and gather industry experience at Bosch, a leader in cutting-edge engineering research and technology.

Throughout my undergraduate years, I have focused on courses that would prepare me for graduate school and a career in research. I studied topics such as Computer Vision, Information Theory, AI, Robotics, Control Systems and Signal Processing, as these were the fields that gripped my fascination and filled me with awe and wonder. For my internship at Bosch Engineering GmbH, I worked as a Software Engineer for the Motorsport Data Acquisition Team, where I largely dealt with Formula 1 car technology using the knowledge I acquired in college. At Bosch, I thoroughly enjoyed developing a framework for Syslog Analysis for F1 car devices, which provided me experience in dealing with large, tangled datasets. Moreover, working in data-oriented framework development strengthened my background in tools such as Python, C++ and Linux, which was a huge boost in my skillset. During my exchange program at Drexel, I have expanded my knowledge in domains such as Transfer Learning, Reinforcement Learning and Natural Language Processing, and learned how to implement basic algorithms like GRU, DQN, LSTM, RNN, GAN etc. These experiences have not only given me knowledge, but also instilled a great passion within me that solidified my interest to do research in graduate school.

+49 175 4425 5136 | priontuchowdhury@gmail.com

With some hard work and dedication, I was also able to secure a research opportunity with Bosch Motorsport for my thesis. I'll start next semester, and my research will involve developing strategies for the optimization of the Bosch Telemetry system. Using a predictor model and a network simulator, I'll be simulating the signal chain telemetry around the racetrack, which would provide me with information on bandwidth (data throughput) and network delay during a race. Using this information and some priority specifications, I will be able to analyze the efficacy of existing algorithms for data transfer such as backfilling, reordering, prioritization, low-priority data decimation and their combinations thereof. This will allow me to choose the best algorithmic combination to maximize gain and minimize effort based on user-defined priorities, which is the goal of my thesis.

In many ways, I'm grateful for the fulfilling achievements in the last couple of years, but in other ways they were the most difficult years in my life. My father had passed away right before the intended start of my undergraduate education, which resulted in significant delays in my studies. This made the decision of pursuing my education in Germany a very difficult one and leaving my mother and sisters at such a time was even more challenging. Even so, my family and I decided that this was the best decision.

The long distance from home, however, soon turned into an ordeal for me. While I was completing assignments and hunting for job opportunities, our family business and my family's assets very quickly fell into disarray, like a trail of dominoes. My days were spent dealing with the crashing family business or a dodgy income tax lawyer or a person claiming we owed him money or the civil lawyer claiming some of our assets were in trouble. But somehow, I was able to contain the chaos, and continue working with my family to fix the recurring issues as I carried on with my education.

As I embraced a life more intertwined with reality over the last 4 years, I learned a lot about managing expectations, and I've realized that my biggest competition in life can only be one person: Me. There were always setbacks that made it hard to continue on this rocky path. There were low points when things went so wrong back home that I couldn't focus on studies or exams, which affected my grades sometimes. But I always knew that it was more important to get back up after the fall, and that's exactly what I concentrated on every time.

These moments of self-actualization helped me grow a lot in a short time, and I believe that's one of the biggest reasons I was able to fully enjoy my Drexel Exchange experience. During my exchange quarter, I took the time to make many friends, travel all around Philadelphia, and create great memories – in short, I really started to live again. From an academic standpoint also, I enjoyed my quarter to the fullest. My education at Jacobs provided me with a strong theoretical background which is invaluable, but I was able to completely put these theories into action at Drexel. At Professor Prawat Nagvajara's "Design with Embedded Processors" course, I learned how to program microcontrollers on embedded Linux distributions to develop IoT applications, like controlling LEDs or Servos from websites being served from a Beaglebone, and being able to use my knowledge to build things on my own was an amazing accomplishment. But Professor John Walsh's course "Machine Learning Engineering Practicum" was truly the highlight of my Drexel academic experience. For the first time, I found myself going beyond the theoretical barriers and applying advanced concepts such as Transfer Learning and Reinforcement Learning. In his class, I used these concepts to build functional models that can classify flowers and play the Atari games – utilizing very powerful tools such as tensorflow, scikitlearn, tf-agents and Google Cloud Platform, to name a few. I cherished all those days working for numerous hours to build something truly fascinating, and it thrilled me to see my creations come alive, almost like magic.

As I prepared for my PhD application, Professor Walsh also took time out of his extremely busy schedule to guide me. We talked about my interests in Transfer Learning, Computer Vision and Reinforcement Learning, and how I might pursue a research career in these fields. He also introduced me to research currently being undertaken at Drexel which is within my areas of interest, which helped me a lot with my search. We talked about Professor Walsh's own research in Network Coding, and his interest in further research on Bounded Rate

Regions, which I found very interesting as a possible avenue of exploration with the Adaptive Signal Processing and Information Theory Research Group.

We also talked about recent contributions by Dr. James A. Shackleford, Dr. Nagarajan Kandasamy and Dr. Gregory C. Sharp in the research of improving precision of deformable image registration, which was very intriguing for me due to the brilliant use of U-Net and CycleGAN to improve precision on image registration for CT-CBCT datasets. A future direction for this work would be the use of CNNs to perform image registration, which is something I am interested in exploring with the respected Professors, if provided the opportunity.

On Professor Walsh's suggestion, I also attended the Drexel Graduate School Seminar, where I learned more about Drexel research which is highly aligned with my interests. I am particularly interested in Professor Matthew C. Stamm's research in Information Forensics, and I believe my background in signal processing, machine learning and information theory makes me a good fit for his Multimedia and Information Security Lab (MISL).

Through the same seminar, I was also introduced to Dr. David Han's research and the Intelligent Machine Perception and Learning Laboratory (IMAPLE), and the outstanding research conducted by IMAPLE in vision based aerial object detection and classification, 3D scene reconstruction and underwater target detection using acoustic scene understanding. These are some amazing topics I would love to conduct research on under the supervision of Dr. Han, if I am allowed the opportunity to attend his lab.

The aforementioned faculty and research make Drexel an excellent institution for obtaining my PhD. Drexel contains the opportunities and resources I require to obtain outstanding mentorship and become an expert researcher. It has a beautiful campus populated with brilliant minds that I would like to surround my life with. Studying at Drexel for a quarter has made me very familiar with its campus and its community. Furthermore, my own interests align very well with some of the extraordinary research being conducted at Drexel University. That is why I want Drexel to be the next chapter in my book.