Statement of Purpose
of Muhtasim Noor Alif (PhD applicant for Fall—2024)

My primary research interest lies in the fields of Machine Learning, Artificial Intelligence, Data Mining and Human Computer Interaction. My long-term career goal is to be actively involved in research as a faculty member or as a researcher. Pursuing an advanced degree is the initial step toward achieving my long-term goals. Through my research, I want to find solutions to real-life socio-economic problems or problems arising in different branches of science. At the same time, I want to explore ways to make such solutions highly effective and useful to the target audience. I believe my academic and research journey has enabled me to dive deep into a concept, and visualize its possibilities and challenges. I am good at mathematics and adept at programming, so I can logically formulate my solutions and give them a concrete form. I am also a fast learner; I can grasp the fundamentals of any idea, framework, or tool quickly and use them effectively to solve problems. I am accustomed to learning through trial and error, which I believe is one of the key components of research. I am confident that my educational and professional pursuits have prepared me to pursue a career in research.

In my undergraduate years, I went through a range of theory and lab courses. In almost every week I had multiple assignments due, which enhanced my ability to organize and manage pressure across different subjects. The assignments from various courses and maintaining their deadlines have taught me to effectively manage my time, optimize my productivity, and confidently tackle challenges, even when starting with limited prior knowledge. I started to explore Machine Learning during the COVID pandemic, when I had some free time to explore topics of personal interest. I completed the deep learning specialization course on Coursera offered by Dr. Andrew Ng during that period. It was my first time working with ML and DL, and I vividly enjoyed the assignments. During the later years of my undergraduate studies, I had the opportunity to study in detail in the courses on 'Artificial Intelligence' and 'Machine Learning'. The courses had various interesting assignments. In the AI lab, I got to make an AI agent for a two player game using adversarial search, predict the position of a ghost in a grid using hidden markov model, and perform many other tasks. In the ML course, I had to dive deep into various fundamental ML theories like linear/logistic regressions, support vector machines, clustering algorithms, etc. I also learned about some of the cutting-edge deep learning models like GANs, Transformers, etc. I hands-on implemented Logistic Regression with Ensemble methods, the Expectation-Maximization algorithm, a CNN from scratch, and numerous other key ML concepts. I did a project as well where I developed a Bangla news classifier using BERT. All these coursework and assignments made me even more interested in the fields of ML and AI, influencing me to dedicate my focus to these disciplines.

I grew a knack for research while I was working on my undergraduate thesis under the supervision of Dr. Tanzima Hashem. In my thesis, I worked on conducting a comprehensive analysis and comparison on the state-of-the-art deep learning based crime prediction models. Inspired by the lack of experiments in a unified setting and the need to assess the applicability in different real-life scenarios, we designed various systematic evaluations to be conducted on the models. We picked the Chicago crime dataset available on the city portal as the input for our models after careful deliberation. During dataset analysis, I identified notable variations in crime density among regions, strongly correlated with external factors like traffic patterns, points of interest, etc. In addition, the models employed varied architectures, integrating components like diverse Graph Neural Networks, Attention Mechanisms, Convolution and Diffusion Modules, Recurrent Modules, etc., for the task of space-time aware crime prediction. As a result, I conducted numerous experiments on the models, altering the data sparsity, prediction timesteps, ablation study of external features and different model components. In the course of this research, I was introduced to the extensive domain of Data Mining, further fueling my interest in ML. I came to understand that with systematic analysis and effective modeling, we can reveal novel insights and predict a range of phenomena that were once hard to understand.

After my graduation, I joined a research project under the guidance of Dr. A. B. M. Alim Al Islam, and I am currently working on it. Our goal is to assess and enhance the applicability of ChatGPT in the context of English as a Foreign Language (EFL) education among young learners. We aim to build a system designed

exclusively for students in school, employing a personalized mobile app. Through the app, we provide the students English language learning assignments, record their responses, and give them ChatGPT generated feedback so they can rectify their mistakes. We plan to refine our system continually, analyzing the data students provide through the app. I have had experiences of developing web-based systems before, but this was my first experience developing a mobile app. Thanks to my undergraduate studies, it has prepared me to quickly learn new things and apply the knowledge efficiently within a short amount of time. As I incorporated ChatGPT into the system to provide the students with feedback, I discovered several issues with enabling direct student interaction with ChatGPT. The interactions may lack relevance to the problem, and there is also a need to filter for potential toxicity. These issues led me to engineer the prompts for ChatGPT carefully, so that any unpleasant result can be avoided and high-quality feedback can be ensured. While developing the system, I prioritized simplicity for features like registration and submission, keeping in mind our users are school-goers. Doing this research, I realized that while modeling and building intelligent systems is needed, the interactions that ordinary individuals have with these systems are equally significant. To get the best results from these advanced technologies, we need to carefully assess their impact on people's lives. Therefore, I see significant research opportunities in designing AI-assisted systems that are both safe and effective.

Motivated by my ambition for an academic career, I currently serve as a lecturer in the Department of Computer Science and Engineering at the University of Asia Pacific. While teaching, I actively look for ways to ensure students attain a solid understanding of the subject, craft problems that allow them to apply their acquired knowledge effectively, and enhance the overall enjoyment of the learning process. I have a genuine passion for teaching, and I like to think of it as a two-way experience; as I share my knowledge, I am also continuously learning along the way. I believe these teaching experiences will help me achieve my dream of becoming a faculty member in the future.

I consider the Department of Computer Science at Rochester Institute of Technology one of the most suitable places to pursue my Ph.D. because of its welcoming atmosphere, top notch lab facilities, and consistent and unique contributions to the fields of my interest. There are many esteemed faculty members and researchers here who are consistently making impressive contributions, and I intend to be a part of that community as well. I am particularly enthusiastic about the prospect of collaborating with Dr. Qi Yu in the Mining Lab, as his lab's work aligns closely with my interests. I am also familiar with Dr. Zhiqiang Tao's contributions to Machine Learning, and I am eager to explore potential collaboration with him. I look forward to collaborating with Dr. Dongfang Liu as well, to design AI solutions that address practical problems. I am equally open to working with other faculty members who share a similar research interest with me. I believe an opportunity to pursue my Ph.D. at Rochester Institute of Technology will enable me to conduct impactful research and help me to advance towards a research-oriented career in academia.