Narrative Summary of Research

My research interests are in the fields of Big Data, Machine Learning, and Data Analytics. As often noted, Data is the new oil; while mining data can be economically valuable, this resource must be handled carefully. Using machine learning and advanced data analytics, we can extract information and intelligence from the vast amount of data being generated. However, care must be taken in how we build and use our models. If these models are going to play an important role in our criminal justice system, healthcare industry, and in maintenance of public safety, it is critical that we have a full understanding of the performance characteristics of these models.

I have been actively involved in research projects in these fields, working closely with undergraduate students in our department, and collaborating with faculty and graduate students in Clarkson University.

Since joining SUNY Potsdam, my research output has included 15 international/national conference presentations, 3 publications in peer-reviewed journals, 1 submitted for review, and 1 submitted as preprint to an open archive. I co-organized an international workshop on data analytics that was attended by over 25 researchers from reputable institutions around the world including Cornell University. I have also presented 3 department seminars in SUNY Potsdam.

A research project that is special to me is a recent one with our own undergraduate student, Brandon Beattie. This project used machine learning (ML) to automatically analyze and classify submissions made to the American Association of Aerosol Research (AAAR) conferences over 20 years. Using natural language processing, database management, and ML classification algorithms, we were able to classify publications into topics that were automatically-generated and then determine how topics evolved over time. This work was presented as a platform presentation at the 2022 AAAR conference in Raleigh, NC and is currently being written up for publication in a peer-reviewed journal.

Some of my other research projects are focused on the role of Big Data in air quality. Air pollution is one of the leading causes of global disease, and increasingly our knowledge of the neighborhood air quality is obtained from low-cost air sensor networks. The quality of this network data must be evaluated and analyzed to ensure it is acceptable for making policy. In one project, using advanced statistical analysis, we were able to show that the low-cost sensor data does not capture the contribution of all air pollution sources equally. In another project, using advanced data analytic techniques, we studied the connection between air quality exposure and severity of COVID-19 disease. Related to these projects, I published one manuscript and submitted another one for publication in a peer-reviewed journal. I have also presented research related to both these projects in several conferences, including multiple American Association for Aerosol Research conferences, Air Sensors International Conference and in Research and Projects Showcase conference in Clarkson University. Most recently, our work was presented in Air Sensors International Conference in May 2022 and in American Association for Aerosol Research conferences Oct 2022.

I have been actively looking to find funding for my research activities. I submitted proposals to several funding agencies including: NYSERDA, NSF and HEI for supporting data analysis for a

large air quality network. While those proposals did not get funded, my recent research progress in related fields as demonstrated by publications and conference presentations should place us well in an upcoming proposal we are planning.

Academic research has been a profound learning experience for me. I have honed my critical thinking and problem-solving abilities, and come to understand the significance of meticulous and in-depth investigation. Collaboration and interdisciplinary methods proved to be crucial in finding solutions, and I came to appreciate the need for ethical considerations in any research endeavor. I am grateful for the opportunity to engage in academic research, which has been a valuable learning experience.