Personal Statement - Jessica Henning

 I was not expecting to build an academic career in computer science, let alone have a research project in mass spectrometry. I chose to attend the University of Montana in order to play collegiate soccer and had little thought of what I would choose to major in. I had a few mentors helping to push me in the right direction. My dad, being one of them, suggested computer science as a possible choice. Even though I had no idea what computer science really entailed, I gave it a shot and signed up for the introductory course. The first day of classes I walked into Introduction to Computer Science, sat through the fifty minute lecture, and walked out ready to drop the course. During the class I had texted my dad convinced that I was not cut out for this degree path. It was evident that my classmates had a hobby for computer science while I didn't even know what an IDE was let alone Java, the selected language for the course. My confidence was shaken to say the least, growing up I had always been a standout student with material and concepts coming easy to me. That changed drastically once I was introduced to the field of computer science. In a lab session later that week I embarrassingly admitted to my professor that I had no idea what he had been covering in the first lecture and I had no experience coding. He helped me write my first line of code, which was a simple "Hello World" print statement to the console. I was so proud of that one line I took a picture and sent it to my dad. The small victory in that "Hello World" print statement seems insignificant now, but it led me to pursue an undergraduate degree in computer science and mathematics.

During my first two years of undergraduate work I was reluctant to put my time into anything but the bare minimum classes and soccer. Both commitments were demanding in their own way and even though my motivation stayed high, the time balance was challenging. I spent many days running back and forth between soccer practices and my professors office hours, trying to fit everything I could into my schedule. As I started to understand the course material and got more comfortable with coding, that small victory feeling of my "Hello World" print statement was getting bigger and bigger as more of my projects were working. Time management was essential for my academic and athletic success and is one of the biggest lessons I have taken away from this experience.

At the end of my sophomore year, an injury forced me to take a step back from soccer and I ended up retiring from the sport. This proved to be a watershed moment for me. While walking away from soccer was challenging at the time, it allowed me to advance my academic career. I was now able to divulge my new found time in more classes and research opportunities in the department. It was hard to give up a sport that I had grown up playing and identifying with, but today I realize that the decision opened up a whole new side of academics for me with new opportunities.

At the beginning of my junior year, I was approached by my advisor with possible research opportunities in the department. I wasn't initially interested in research, but I wasn't entirely sure what it meant either. Rob Smith was one of my professors with a mass spectrometry research lab. I knew very little about mass spectrometry, but one of the things that drew me in was the fact that it was new and it was challenging. I knew that it was something I would have to put a lot of time and energy in to understand and contribute to. Another aspect that drew me in was the capacity the research project had to not only change the fields of chemistry, biology, and computer science, but the world as a whole. Mass spectrometry is being researched all over the world but the Smith lab is developing unique approaches on how to speed up and even automize the process of

identifying and quantifying molecules like proteins. The Smith Lab is mostly made up of computer science students, but has a number of students from other areas of study such as chemistry and biology. Bringing in students from related fields creates a diverse and creative environment to solve scientific problems. I started for Rob as a volunteer. The Smith Lab was in the process of creating software (JS-MS) to display mass spectrometry files and gather ground-truth data. I began designing front-end features to speedup the process of segmentation and improve user experience. I also spent a lot of hours segmenting these files, identifying isotopic traces and grouping them into envelopes. After a little while I became the lab manager where I supervised the growing lab, training and supervising around twenty students.

With my undergraduate degree coming to a finish, I realized there was still a lot I could do to improve our software. Therefore, because of my involvement in research, I chose to pursue a graduate degree in computer science. I had a growing passion for front-end development and perfecting the user experience, as well as improving data set and algorithm creation in the mass spectrometry field. However, I knew there was still a lot more for me to learn. As I started my Master's degree I also began working as a front-end developer for a local startup company working to improve mass spectrometry data reporting. Because of work in both academia and commercial software development my skills are continuing to grow as I prepare to complete JS-MS and publish it open source.

That feeling of success from my first "Hello World" print statement along with a lot of hard work and time has allowed me to complete an undergraduate degree in computer science and math and move on to pursue a graduate degree. I am confident with my research and role in the Smith lab. With research I found success in my undergraduate studies along with a new passion and graduate degree to pursue. My involvement in research has opened many doors for me during my undergraduate experience and has introduced me to many new possibilities in academics and my future. I am pursuing a Master's degree in computer science to continue and expand my current mass spectrometry research as well learn and grow as a developer. Im excited for the contributions I will be able to make to the Smith lab as well as the mass spectrometry, computer science, and other related fields.

Intellectual Merit: As a nontraditional computer science student I bring a variety of interpersonal skills to the program and the lab. These skills have helped me communicate and interact with my peers and my professors, as well as be a successful lab manager. With many diverse tasks as a student, researcher, and lab manager I've learned the importance of dependability and time management. Im taking on and embracing challenges outside my comfort zone. In the Smith lab, I have helped design and create a novel interface to find ground truth data in mass spectrometry analysis. The interface is constantly evolving and unique in the field. With this software, I have successfully created and published a ground truth data set for other scientists to use in order to quantitatively evaluate feature finding algorithms and design and develop new algorithms. Upon completion of the software, it will be published open source to allow scientists to view mass spectrometry data and create their own ground truth data sets. As a dual CS/math major, I have the technical and mathematical background I need to make strong contributions in this field. A strong background in mathematics will also help me successfully work further in the mass spectrometry field to, for example, find a way to accurately identify multiple mass spectrometry spectra with algorithms and matrix models.

Broader Impacts: As a female in a computer science department and a former student athlete, I have a diverse perspective and interaction with students. I want to continue my undergraduate work as a masters student and be able to encourage other women and students who dont necessarily have the traditional technology background to pursue a degree and research in a STEM field. In the field of mass spectrometry, my research, specifically the ground truth data set, will allow scientists to perform quantitative evaluations on algorithms that right now are only evaluated based on consensus results. This data set will also assist in the design and development of new and more accurate feature finding algorithms. JS-MS will allow scientists to create their own data sets, view mass spectrometry data, and accurately assess algorithm performance.

Future Goals: As a masters student I want to create a successful and feasible research plan that will contribute to the advancement of mass spectrometry and computer science. As a combined computer science and mathematics student, I see tremendous opportunity to make high-impact contributions to mass spectrometry data processing, where most current research is conducted by a small set of researchers with sufficient computer science skills to make solid contributions. The field is filled with chemists and biologists who avidly desire the better tools they need to answer currently unanswerable research questions. I want to be apart of this growing field and area of study.