

FITL 2009 Internship Report

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The research internship with Dr. Drinen that was made possible through the funding from FITL in 2009 has a special meaning to me. First of all, it has helped me create a blue print for my future career as a mathematician. I has realized how much I love to do research independently, having flexible time and schedule, and above that, my passion to pursue further studying in math. In addition, working under the instruction of Dr. Drinen on the research topic brought me a primitive idea of how Ph.D. program might be like and whether I will be able to handle the workload. At the same time, my basic researching and writing skills have been improved greatly through the uncompromising help from my instructor.

The internship period officially started on June 8th and ended July 17th which spanned over 6 weeks long. The first four weeks, we concentrated on dealing with the mathematical problems. After having a substantial amount of material, we started to work on the write-up with the help of LaTeX software. The result of these six weeks is the paper that is ready to be published. Since the original idea of my research is to expand the scope of a previously published paper —*An Optimization Problem with A Surprisingly Simple Solution* into the scope of multi-dimensional space, Dr. Drinen, one of the authors of that paper, spent the first two or three days to help me get the crux of the problem. Then, we set out what we would need to do in order to generalize that paper. After some specific questions were determined, we started to solve those one by one.

A typical day of the first four weeks started at 9 am when I met up with my advisor in his office to report what I had came up from the previous working day and ask questions if needed. My advisor would normally point out my mistakes and the directions that might lead me to the target. After that, I would have the rest of the day to work on my own which was great. I had enjoyed the freedom of setting my own schedule for the rest of the day. Since the problem that we

worked on involved a lot of thinking, I used not to set myself a fixed schedule but instead to brainstorm about it for the whole day before sitting down to sketch my thoughts. The next two weeks involved typing up what we have got. After getting some tutor from Dr. Drinen and other people, I was able to put my solutions into the format of an article with complicated mathematical symbols all typed up correctly. During this period, every day my instructor helped me improved the paper step by step, which I am really grateful for.

Generally, the internship period went smoothly. We were able to generalize the main theorems of the original paper into multi-dimensional Euclidean space. However, we have encountered several computational difficulties in analytically calculating the found mathematical formula involving complicated integrating operations. Also, graphic software was only able to help us sketch out the the graph in the case of two-dimensional. In addition, we were not conclude the project at the end of interning period. Instead, it took us another ten days of intermittently working on formating the paper after the following one-month break to reach the final version. We will be be submitting the paper to a specific undergraduate mathematical journal in the next two days.

There were actually times that I felt frustrated for reaching deadlocks, but with the support from my instructor, I was able to get through all of that at the end. In fact, struggling through those frustrations has helped me imagine how a career in academic research would be. I figured out that it would be very different from going to classes or doing homework assigned by the professors. With textbook problems, everything is beautifully built with a known answer for each of them. This is not true for researching where you reach a new area that no one has known the answer and your task is to search for it. Sometimes, there will be a definite answer at the end of the road, but sometimes there will be none. The process of searching for the answer may sometimes be very lonely

and risky. For comparison to real life situation, if learning from the classroom is like to buy fish from the grocery store when as long as you have time and money, there will be fish for you; then doing research on your own will be like to go fishing in the sea when even with time and money, you can still end up with no fish at all. However, once we get the fish on our own, it will be one of the most original and rewarding moments. Accepting that as a fact about researching has brought me the passion to pursue this career.

Other than shaping my determination to pursue graduate study, the internship has sharpened my mathematical knowledge as well as researching skills. During the project, I encountered several familiar concepts such as multi-variate probability distribution, limit, or metric space, which I had learnt from several math classes. However, I came to recognize that to apply the concepts into practical problems and make sense out of those was a different level from learning the definitions from the textbook. To be able to do so, it is required an in-depth understanding which I could not get from simply reading textbook or doing homework. Now I can be confident that if I will ever being “comped” on those concepts, there should not be any problem. At the same time, I realized that it is a big step from figuring out the answers to writing it up to make others understand you. When this internship started, I had had serious writing problem. The first draft that I came up with had layers of grammatical or formatting errors that it took Dr. Drinen and me fifteen round of fixing and revising. At the end, I think that my academic writing skill was much better thanks to my instructor. Along the road, I was able to pick up some skills of using LaTeX, a typesetting software that is widely used for academic papers.

Finally, this internship will be one of the greatest academic experiences during my four years here in Sewanee. If asked, I would definitely advise undergrads to undertake this opportunity to either enhance your researching

skills or simply discover your true passion. Great thanks to the sponsors of the Funding for Innovative Teaching and Learning for your financial support, thus manifesting this project, especially in this time of economic downturn.