MATC INTERN REPORT

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NEBRASKA TRANPORTATION CENTER

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This summer, a unique opportunity was offered to me in my academic and professional life. This year I experienced what it is like to work in the research aspect of my major, civil engineering. Besides, I had the pleasure to move to another city and discover American culture a little further. Under the supervision of Dr. Kim, I was part of research on advanced modeling to predict damage-dependent performance behavior of roadway mixtures and pavements at the Nebraska Transportation Center. I helped in computational simulations, image treatment, and prepared documents for Dr. You and Keyvan.

Since the beginning of the internship I noticed something: They all enjoy working here. They are very helpful, patient, and interested in what you are working on. They are always ready to give you hints about what you're doing wrong, the problems you will find, how to solve them, and their perspective about the subject. They consider how you are feeling about the things you have to work with and are very patient to teach you the different technology you will use during the program. In my case, I had to learn how to use three different software.

Since I started this internship I worked with two main projects: data collection and microstructure modeling. In data collection I had to survey the I-80 across Nebraska as part of a project that aims to replace the manual survey by an automatic one. To finish this task I had to evaluate pictures from 455 miles from the beginning of the highway in the west area of Nebraska. It was required to identify if the location given by the GPS matched with the location given in the road, the pavement type, the bridges and walkways, and to expand the data.

I spent the majority of the time working in the microstructure modeling that aims to create computational simulations for SCB tests in hot mix asphalt samples. Firstly, I worked in the collection of images and pre-processing of them to better separate matrix and aggregates during the process. For this part, I had to use a software called Avizo, and it was one of the softwares I had to learn. It's able to apply different filters to the images and create a more visible boundary between matrix and aggregates. This process reduces the time the previous models took in pre-processing, optimizing the research. The next step was to create the microstructure based on the images. Then, I used a Matlab code developed by Keyvan and the AutoCad to create the files. In AutoCad, one software I was used to, it was possible to separate the microstructure in aggregates and a matrix. Therefore, using those files, I was able to create the model and assign properties for the sample using the Abaqus and finite elements method (FEM). This software took me a while to learn how to use, and I am still learning. It is an embracing software that allows the user to create several structures and analyze them using FEM. After the model was created, the cohesive zone, that is the portion of the sample where the cracks will happen, was assigned, and the elements were added. Abaqus was required again to run simulations for that sample. The last part is the most fun and rewarding step. It's where we can see exactly how a sample tested in the lab will behave, the data related to load and reaction in each support, and the type of crack it will create.

To show all my work to my supervisors, I had to elaborate and present a summary about my internship. For me it is quite challenging because I had to deal with more than the usual anxiety, because I was showing my results to people that really understand a lot about the topics. I had to create a presentation in a language that is kind of new for

me, to speak in public, and to speak in a different language. It is really good to practice these kinds of skills if you want to pursuit a career in research in general, because you will always have to present your work and, eventually, evaluate the work of others.

Besides than the formal work, I had a really good cultural exchange. Since I am from Brazil, this whole year has been totally new for me. New language, new habits, and a new culture to learn. However, in the last two months and half I learned more about different cultures that are not present in this country. In the Infrastructure Department there aren't Americans. We have Brazilians, South Koreans, and Iranians. So Keyvan, Dr. You, and I had a few good discussions about politics, religion, education, languages, history, economy, and general culture in our home countries. Also, I learned how to better communicate, not only enhance my English skills, but how to talk with important people in research in the United States.

To sum up, this summer was an incredible opportunity in my life. On my way back to Brazil I will carry not only an internship, but the people I worked with, the knowledge, the new culture I was exposed to, the hard work, and the understanding about what engineering can be, even when you are not in the field.