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1. Introduction

1.1 Why Biomedical Engineering?

A video about brain machine interfaces in one of my lectures piqued my interest in biomedical engineering. In the video, a person wearing a headset controls a drone simply by thinking about moving his right hand, but not actually moving it!

While the video helped me to develop a passion for biomedical engineering, helping others get better has always been a passion of mine. In high school, I volunteered as a patient care provider in the Trillium Health Centre in Mississauga, Canada. I worked hard each week to friendly visit senior patients and help entertain them. I also helped feed the patients. My time at the hospital taught me that while a doctor can make people get better, the beautiful thing about biomedical engineering is that any product designed or developed can help cure many people at once.

1.2 My Passion for Research

At the end of my first year at the University of Toronto, I developed a passion for research. During my summer break, I worked in the electrical and computer engineering department with Professor Deepa Kundur to simulate the generation of packets in power systems. It was a rewarding experience and allowed me to learn about the applications of computer engineering.

I developed important skills including network programming, extracting and analyzing useful information from literature reviews, staying committed and being persistent when my work does not produce the expected results. Perhaps the most rewarding experience was writing a conference paper about my work for the 2017 Institute of Electrical and Electronics Engineers Global conference on Signal and Information Processing (IEEE GlobalSIP 2017).

1.3 Why KMUTT?

I want to work on solving biomedical engineering problems at KMUTT. I am passionate about designing innovative medical devices that would improve the diagnosis, treatment, and quality of life of patients. KMUTT, being one of the top universities in the world, is an ideal place for me to work on such a project. I will be able to work with a top professor in the field to apply and develop my design and laboratory skills while working on a meaningful problem. Finally, I would also like to explore Thailand as I have heard wonderful things about it.

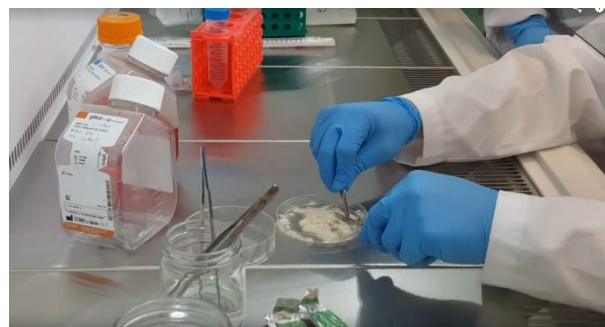
Completing a research placement at KMUTT would help me apply and better understand the concepts learned in lecture. I am also looking to pursue graduate studies in the biomedical engineering field, and the KMUTT research placement would not only help me explore my interests but also acquire new knowledge/skills that I can use to become successful as a master's research student.

2. Biomedical Engineering Research Project (Characterizing the Biomechanical Properties of Human Chondrocyte Cell Sheets on Titanium Discs)

Defects in articular cartilage, which mainly consists of chondrocytes (cartilage cells) and an extracellular matrix (ECM), are caused by repetitive or acute trauma during knee joint loading. There are several treatments currently available to repair cartilage defects, such as autologous chondrocyte implantation, scaffold-based tissue engineering, and mosaicplasty. Although such treatments show satisfactory outcomes in treating cartilage injury, there are many obstacles that are yet to be solved. For instance, biodegradable scaffolds release toxic particles that can cause inflammatory responses in patients, the number of healthy cartilage from donors is limited, and chondrocytes in the center of larger constructs can die due to lack of oxygen and nutrients [1].

The above challenges can be overcome by using cell sheet technology to transplant chondrocytes. Chondrocytes can be harvested as an intact sheet using the temperature-responsive polymer poly(N-isopropylacrylamide). Cell sheets harvested using this method maintain the organization of their ECM and have intact adhesion factors. Thus, multiple cell sheets can be stacked to form three-dimensional tissue structures without the need for scaffolds [1].

In this project, I used chondrocyte cells isolated from human articular cartilage. Chondrocytes were cultivated and then cell sheets were prepared. Lastly, I added the cell sheets to titanium discs and allowed them to attach.



I was working in the biomedical engineering lab at KMUTT to isolate chondrocytes from human articular cartilage.

Once the chondrocyte cell sheets got attached, I measured the adhesion strength between the cell sheets and the titanium discs using a centrifugation method. The preliminary results showed that the cell sheets attach very well to the titanium discs. However, more tests must be performed in the future with different shapes of titanium discs to confirm this result.

References

[1] S. Wongin, S. Waikakul, P. Chotiyarnwong, W. Siriwatwechakul and K. Viravaidya-Pasuwat, "Effect of Cell Sheet Manipulation Techniques on the Expression of Collagen Type II and Stress Fiber Formation in Human Chondrocyte Sheets", *Tissue Engineering Part A*, vol. 24, no. 5-6, pp. 469-478, 2018.

3. Side Project (UReka)

Besides my biomedical engineering project, I worked with my fellow Canadian interns and Thai master's students on an idea for a start-up company. We aimed to develop a chat bot for the fashion industry capable of tailoring its messages according to the customer's emotions. The main purpose of the bot was to provide high-quality customer service to improve customer retention.

The idea was accepted at UReka—a competition for start-up companies—where my team participated in workshops and attended presentations by the owners of successful start-up companies in order to develop and improve our idea.



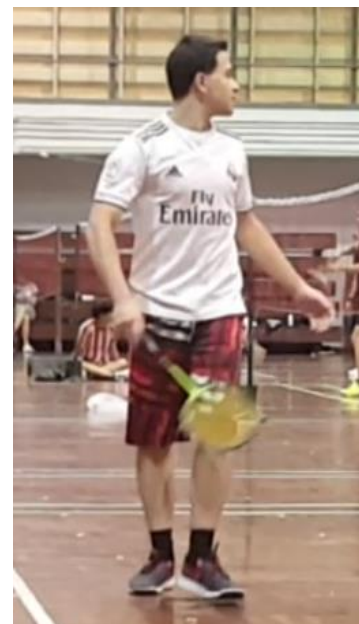
4. Leisure Activities

As someone with a strong passion for sports, I spent most of my free time playing sports with friends. I also made sure to spend some time visiting some of the famous tourist attractions in Thailand. I have listed some of the activities I have enjoyed during my time in Thailand along with a few pictures.

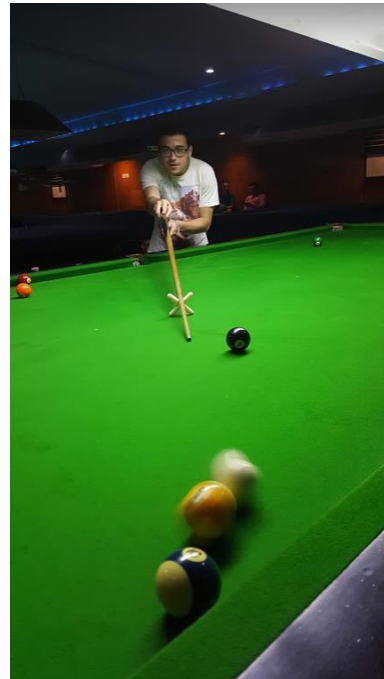
4.1 Football



4.2 Badminton



4.3 Billiards



4.4 Tourist Attractions

4.4.1. Muangboran The Ancient City

Muangboran the ancient city has replicas of some of Thailand's most ancient temples and palaces. I learned a lot about Thailand's cultural heritage during my visit.





The “Ananda Fish of the Cosmic Ocean”. It is believed that the Ananda fish is one of many gigantic water creatures living in the Cosmic ocean.



Sanphet Prasat Palace, Ayutthaya. This was the principal palace in the early Ayutthaya period during the reign of King Phra Baromatrai Lokanat.

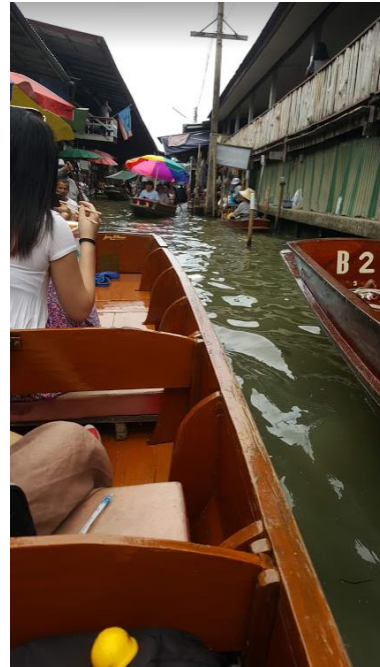
4.4.2 ThipSamai Pad Thai

ThipSamai is one of the most famous pad thai restaurants in Thailand. I waited in a long queue outside the restaurant with my colleagues to enjoy ThipSamai's famous pad thai.



4.4.3 Floating Market

I also enjoyed visiting one of Thailand's biggest floating markets.



4.4.4 Pattaya City

I briefly visited Pattaya, one of Thailand's most famous tourist attractions.



4.5 Marathon

I really enjoyed running my first ever marathon (15 kilometres) in Prachinburi. I had a great time with my colleagues and friends.

