**Current Situation**

Are you a student taking classes? Do you work full-time? Please tell us where you are going to school or what you are working on right now.

I am a full-time student enrolled in the Region of Peel Science and Technology program at Port Credit Secondary School in Mississauga. I will be graduating in June of 2019.

**University Applications**

Please tell us which universities you have applied to and for which programs.

I have applied to a wide variety of programs in my chosen disciplines including:

* University of Waterloo - Computer Science, Mechatronics and, Computing and Financial Management
* University of Toronto - Computer Science and Engineering Science
* University of Guelph - received an early acceptance for Computer Science
* Carleton University - received early acceptance for Computer Science Honors
* McMaster University - Computer Science
* Ryerson University – received early acceptance for Computer Science

**Initiative**

What matters to you? When have you shown great initiative? Why were your actions needed? How did it impact the people around you? Describe a time when you have shown great initiative. How do you think this will apply to your computer science degree?

I am a goal and results driven person. I have learned a great deal about what motivates me from my experience in robotics competitions. In grade 10, based on my commitment to the school robotics team and my skills in manufacturing and autonomous function coding, I was asked to join the senior team to compete in the VEX Robotics World Championship in Kentucky. That success led to my being asked by the departing alumni to take on the team president position in grade 11. For our last year of high school, I and the core team members from our school team decided to take on a new challenge and start our own private team with the goal of competing again at the World Championship. While having a private team came with the challenges of starting from ground zero with no financial or infrastructure support from the school, it gave us the autonomy to build a team and compete on our own terms. That challenge and opportunity brought our team members closer and dramatically improved our performance. We have learned so much about taking an idea, building a plan and executing on our vision.

We recruited a group of twelve of the most talented and dedicated fellow students from across the school grades. Every member of the team has specialized roles based on their greatest strengths. A key challenge to running a robotics team is finances. Most of our budget was raised through sponsorships. Initial fundraising was from pitching local small businesses in our area for sponsorships up to $500. In the next phase, we developed a complete pitch presentation package and approached large corporations including IBM, Dell, Deloitte and CIBC. It took a lot of courage to come forward and ask for sponsorship. Our passion and preparation paid off. We were eventually able to raise over $10,000 for our club to purchase parts and pay competition fees. Once the finances were dealt with, the building began. We established a workshop/lab in my basement for the team to gather three to five nights a week. I continue in the role as team president, head programmer and driver. All that time and energy are translating into strong results. In a recent competition in Collingwood, we won every single match in both autonomous and driver modes, clinching the tournament Champions trophy as well as the Innovation trophy. We will be competing at the Provincial Championship next week. With good results at the provincial level we will reach our goal to compete at the Vex World Championships in Kentucky this April.

Developing a strong vision, building a great team and pushing thru challenges is what drives me. I want to take this to another level with the computer science faculty and in particular with the Shopify Co-Op program. The combination of new skills and the opportunity to work with the leader in the industry is an incredible opportunity for me to learn and contribute to my fellow team members.

**Commitment**

Tell us about your persistence. When has your commitment paid off? And what did you get out of it? Describe your commitment. How do you think this will apply to your computer science degree?

With my goal and results driven approach, I really enjoy overcoming obstacles. A great example was at the 2016 Vex World Championship in Kentucky. After the first testing day of observing the performance of top teams from around the world including; China, the US, Canada, Europe and Africa, we realized our programming was not competitive. That night my coding teammate and I rewrote all the programming. We wrote up a program 1000 lines long in 6 hours, so we could have the most efficient autonomous operation for our robot. We had to perfect PID (Proportional, Integral, Derivative) loops so the robot could drive straight within an accuracy of 1.5cm by altering the power given to motors accounting for the tolerances that exist. We had to optimize the lift, so we could throw the objects as far as possible and we had to create turning functions that could turn to a tenth of a degree accuracy. Part way thru the night we discovered an issue with our new code approach. For heavy loads on the robot, the PID loop would trip the motor load breakers. So, we developed an algorithm, that we call a “half-back loop” that could support necessary operations while minimizing the load on the motors. The algorithm was developed by leveraging logic used in A/C units. They work by having the unit on for a certain amount of time and off for a certain amount of time creating an average temperature this is called PWM (Pulse Width Modulation). We were able to develop a program that would utilize PWM as well as adjust the frequency of the PWM according to the load on the robot motors. We accomplished this as well as writing fourteen autonomous routes in one night.

We had worked so hard to qualify for the world championship. When we realized that we were facing a whole new level of competition and a unique set of problems, we rallied together to develop new solutions. When our solution had issues, we didn’t throw in the towel, we doubled-down and came up with a new innovative approach. The feeling of accomplishment for the whole team was tremendous. For my computer science degree and my hopeful Co-Op engagements, having a collaborative mindset that embraces new ideas and innovative approaches to solving problems will be key to my success.

**Teamwork**

Tell us about your collaboration skills. When have you worked with a team? What challenges did you face? What were you able to achieve while working with a team? Describe any teamwork experience you have had and how you think it will be relevant to your computer science degree.

In May of 2018 I competed in a hackathon event known as PCHack day hosted at a local school. It was a full day event in which each team was given a list of categories and we were challenged to develop some sort of technology or device to solve a real-world issue in that field. On my team were three fellow students who all excelled in different fields, from business to marketing to brainstorming. My role was to develop the technology while my team members focused on perfecting the presentation for the judges and developing the perfect pitch. We decided for our application to develop a system to enable access to the internet on a mobile device without using a data plan. Our solution involved the mobile device SMS/Text functionality. This has numerous real-world applications including; when you are lost in a remote location and need directions and for people in countries that lack the necessary infrastructure for mobile data. Over the eight-hour event, I developed the system and supporting applications with a focus on lowering latency times and improving the user experience. By the end of the day we had a highly functional prototype. Our team presented the application and the pitch package to the judges and we won second place. The judges were so impressed with our technology, teamwork and organization, that they asked us to join their organization to plan a hackathon for next year.

Over the last eight months we have been collaborating with the PCHack club executive to plan the 2019 event. We have meet with representatives from various public and private conference facilities including Sheridan College and Bank of Montreal. We are currently in the process of securing facilities at the University of Toronto Mississauga campus, with the intent to host Canada’s largest high school run hackathon in May 2019. With our experience in fundraising and advertising from our private robotics team, we now move into our next phase to promote and fund what we are sure will be a terrific event and an important opportunity to support high school STEM development in our region.

I feel as a computer science student taking a proactive approach to building new teams and promoting collaboration is critical. Teams are like a system. You have to view the system as a whole rather than viewing it as a set of component parts. When you work as a team you are given a task but you also must understand the tasks of others and how they all fit into a final product.

**Volunteering, Extracurriculars, Work Experience**

Tell us about what keeps you busy. What are you involved in? What communities are you a part of? Describe your involvement and how you think it will help you with your computer science degree.

Though I am a hard-working student I also spend a lot of time volunteering, working and participating in extracurricular activities.

My largest current project is the planning for a hackathon at the University of Toronto Mississauga. We plan to host Canada’s largest high school run hackathon with over 200 competitors. With the date and location booked the rest of the year will be spent fundraising and advertising.

I'm a member of the school’s Reach for the Top team. Reach for the Top is a competitive trivia game where teams from each school compete at the regional, provincial and finally to the national championship.

I am also a part of the Mock Trial team at my school which competes in OJEN (Ontario Justice Education Network) tournaments. We will be working with a lawyer to develop a full case including opening/closing statements and questioning of witnesses. We will then compete at courthouses and schools in tournament style events.

I volunteered at a summer day camp run by the local community organization. The camp is for kids ages 6 to 12. I get the most out of running activities for the youngest kids. It gives me the opportunity to use my imagination, creativity and energy to come up with fun games to keep the kids active and entertained. I have learned so much by working with these kids, from leadership to working with others but most importantly learning to give back to the community. When we are younger, we take for granted activities like summer programs, school extracurriculars and sports teams. I've come to realize now the importance of giving back to help pay it forward for the next group of kids.

I worked part time at a data mining company called Liberty Metric Inc. The company gathers competitive intelligence and customized data reports. The work involved primarily data entry, but it did give me the opportunity to get some work experience.

Lastly, I worked as an umpire over the summer umpiring Rookie Ball and T-ball games. This taught me a lot about working with difficult people and managing in high stress situations. On several occasions, a coach or set of parents would be upset with a call or a play. In some cases, there were coaches who would yell and argue and it was our job as the umpires to diffuse the situation and figure out the best option in this high intensity situation.

**Technology**

Tell us why you are choosing a degree in computer science. Why are you interested in technology?

Ever since I was a young child I have always been interested in cutting edge technology and its applications in our everyday lives. Being born in 2001 I have seen the computer go from the workstations running Windows XP through the release of the first iPhone to the point we are at now where we have computers on our wrists and can access the internet from anywhere in the world. We are in a unique era where technological advances are happening at an exponential rate and with the ubiquity of the modern internet everybody has been given the ability to contribute and engage in this technological progress.

I am pursuing a computer science degree as we are in a world that is constantly changing, and it is the computer scientists who are the pioneers of this new world. A computer science degree in this new world provides so many different opportunities to work on with projects of all different scopes and scales. Computer scientists are the backbone of our society, maintaining the luxuries of nearly every aspect of our lives, from the cars we drive to the media we consume. Without computer scientists there would be no Automatic Braking Systems in cars, no modern airbags or traction control in cars. Without computer scientists there would be no Netflix, no longer would we be able to access news at such a rapid pace. We take for granted all the luxuries in our modern-day life that come from computer systems that have been programmed and built by computer scientists.

Recently after being inspired by the self-driving car projects from companies such as Uber and Google I decided to see if I could attempt something similar. Using OpenCV and Python I decided to challenge myself and see if I could make a self-driving car program which would analyze the roads and identify objects as well as lanes without using the modern sensors that come with self-driving cars such as LIDAR and ultrasonics. Through many attempts and many hours spent trying different methods I was able to develop a prototype, which had impressive results given the complexity of the problem. This project taught me a lot of technical skills but what it taught me above all was that you can do anything you put your mind to if you are willing to invest the time and focus your energy.

Link to Github: https://github.com/123p10/OpenCVSelfDrivingCar

**Question 1**

A company selling hand-crafted protractors is running a contest to extend their brand awareness. They need to ask a skill testing question of their customers who participate. They ask the following question: What is the angle between the hands of a clock at 4:30pm?

Minute hand at 30 minutes: 360/12 \* 6 = 180 degrees

Hour hand, half in between 4 and 5, 360/12 \* 4.5 = 135 degrees

Angle between the two hands = 180 degrees - 135 degrees = 45 degrees

**Question 2**

A picture printing company sells photos, mugs and posters with their customers pictures on them. Photos ship in envelopes, which cost $2. Posters ship in tubes. A tube plus 2 envelopes costs $12. Mugs ship in boxes. A ½ box is equivalent to a tube. What is the value of two boxes and a tube, divided by a tube and an envelope?

**Given**

Envelopes = $2

Tube + 2 Envelopes = $12

½ Box = 1 Tube

**Solution**

1 Tube = $12 - 2 Envelopes

1 Tube = $12 - 2\*($2)

1 Tube = $8

½ Box = 1 Tube

1 Box = 2 Tubes

1 Box = 2\*$8

1 Box = $16

(2 \* ($16) + $8) / ($8 + $2)

$40 / $10 = $4

**Question 3**

Draw a 10 x 10 grid. From the top left, label the horizontal squares A through J. These are your X coordinates. Label the vertical squares 1 through 10. These are your Y coordinates.

You can locate a square using it’s XY coordinates. The top left square is A1. Up is North.

Start in square E5 facing East. Move 2 squares forward

Turn 90 degrees clockwise, move 3 squares forward

Turn 180 degrees anticlockwise. Move 5 squares forward

Turn 90 degrees anticlockwise. Move 4 squares forwards.

Turn 90 degrees clockwise. Move 2 squares backwards.

What is the XY coordinate of the square you are now in?

**Question 4**

Using an alphabetical cipher, if SKU = TLW, SHIP = TIKS, SHOPS = TIQSX, and STORES = TUQUJA what is the value of UNICORN?

ABCDEFGHIJKLMNOPQRSTUVWXYZ turns into numbers so

1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26

Therefore

SKU = TLW

Is

19,11,21 = 20,12,23

STORES = TUQUJA

19,20,15,18,5,19 = 20,21,17,21,10,1

The differences between each character can be represented as well

SKU = TLW

1,1,2

STORES = TUQUJA

1,1,2,3,5,8

This is Fibonacci

So UNICORN = 21,14,9,3,15,18,14

Then 21+1,14+1,9+2,3+3,15+5,18+8,14+13

22,15,11,6,20,26,27. We modulus all these numbers by 26 to get the character code in case we have a character code above 26

VOKFTZA

**Other Community Programs**

Are there any other community programs you have participated in that have supported your interest in math or computer science?

Last summer I was accepted into the SHAD McGill program in Montreal. I spent the month of July with 63 other high school students from across Canada and around the world. We lived in residence, attended lectures, workshops and team building activities with topics from across the STEM field. It was an incredible opportunity to build lasting friendships with students from diverse backgrounds from across Canada and around the world. The highlight of the experience was speaking via Skype with a Canadian astronaut on the International Space Station.