SCHULICH
School of Engineering

DEPARTMENT OF
GEOMATICS
ENGINEERING

Geomatics News

SPRING 2019

COMING EVENTS

June Convocation 2019
Schulich School of Engineering
Tuesday, June 4
2:00 pm
Jack Simpson Gynasium,
Kinesiology Complex

Schulich School of Engineering
Stampede Breakfast
Tuesday, July 9
CNRL Courtyard

ENGO 501
Geomatics Field Surveys
Kananaskis Field Station
August 19-28, 2019

2019 Fall Term Start
August 26

Block Week
August 26-30, 2019

Alumni Weekend
September 5-8, 2019
UCalgary Main Campus

Schulich Connects 2019-20
September 26
Where Would We Be Without
Geomatics?
Presenter: Dr. Naser El-Sheimy

Fall Term Break
November 10-16

@UofC_Geomatics

geomatics-engg-uofc

Congratulations go out to Dr. Mozhdeh Shahbazi for her Woman of Impact Tecterra Award nomination. Congratulations also go out to 3 of our students, Edmond Leahy, Katherine Pexman and Tania Khalafbeigi for their Student Leadership in Geospatial Tecterra Award nominations. Winners will be announced at NORTH51 Connect, June 5 at Teatro. Good luck!

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Dr. Mozhdeh Shahbazi was also awarded funding under the inaugural New Frontiers in Research Fund for research in Intelligent Autonomous Aerial Systems: Breakthrough Technology for Search-and-Rescue.

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Congratulations to 2011 Geomatics Engineering alumni Alex Filstein for receiving the 2019 Technical Achievement Alumni Award at the 2nd Annual Schulich School of Engineering Alumni Awards held on April 25.

Success from this year's Calgary Youth Science Fair (CYSF), staff and students from the Calgary Islamic School reached out to us to find out more about Geomatics Engineering. They organised a presentation on May 7 for their Grade 12 students who applied for the 2019-20 Schulich School of Engineering program. The presentation, given by Dr. Alex Bruton, was such a success that we were invited to return next year.

Noteworthy

Dr. Naser El-Sheimy will be presenting "Where Would We Be Without Geomatics?" as the first of the 2019-20 Schulich Connects breakfast series on September 26, 2019.

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The program began in 1979 as the Division of Surveying Engineering of the Department of Civil Engineering but became a full department in 1986 with Dr. Edward Krakiwsky as the Department Head.

The Cairn, known as one of the most extensively definded spots on Earth, was erected in the engineering courtyard during the Summer and Fall of 1987 as an Engineering Centennial Year Project. Dr. Grant MacEwan unveiled the completed Cairn during the centennial of professional engineering in Canada.

The department was renamed Geomatics Engineering on June 11, 1992 to better reflect its broad curiculum as well as national trends.

Join us during 2019-20
as we celebrate
40 years
of Geomatics Engineering
at the University of Calgary

2019 Summer Studentship Projects

Dr. Gérard Lachapelle

- Determine Precisely the Heights of High Peaks in the Canadian Rockies with High Precision GNSS Receivers - Brian Makuk, UC Undergraduate Geography Student and Richard McLennan, UC Undergraduate Kinesology Student

The focus will be on some 20 peaks that have a height of approximately 11,000 feet [3353m]. At present, such heights are not known with accuracy better than about 20m. The 50 or so 11000ers are a major goal of the scrambling and climbing community. It is not known whether at least 10 of these peaks are actually above 11,000 feet. Since GNSS heights are above the ellipsoid and heights above sea level are required, the accurate geoid undulation for each mountain will be determined with the assistance of Natural Resources Canada. Brian is a 2nd year geography student and Richard is graduating this Spring in kinesiology. Both are experienced and passionate climbers.

Dr. Emmanuel Stefanakis

- Mapping the Evolution of the University of Calgary Campus Buildings - Vanessa Chen, 1st Year UC Engineering Student
- Study Space Finder at the University of Calgary Campus - Claire Mah, 1st Year UC Engineering Student
- Mapping the Life and Work of Composer Felix Mendelssohn - Daphne Hong, 1st Year UC Engineering Student

Dr. Naser El-Sheimy

- Autonomous Navigation and Mapping using Multi-Sensor Systems - Zachary Lau, UC Electrical Engineering Student
- Smartphone App for Navigation Applications - Adam El-Gohary, Saskatchewan Visiting Undergraduate Student
- Pedestrian navigation using Portable Device - Tejus Gangadharaiah, UC Electrical Engineering Student
- Building Information Modelling using MSS - Youssef Abdelghany, Egypt Visiting Undergraduate Student

Dr. Kyle O'Keefe

- Investigate the Application of Low-Cost Ultra-Wideband Vehicle-to-Vehicle Ranging to Autnomous Driving - Andreas Brown, 2nd Year UC Engineering Student

Dr. Derek Lichti

- Multi-Camera System Calibration - Wynand Tredoux, 3rd Year Geomatics Engineering Student

Dr. Quazi Hassan

- Comprehending the Influence of Environmental Factors on Human Health - Mehul Gupta, UC Undergraduate Medicine Student

Dr. Mozhdeh Shahbazi

- Vision-Based Navigation of Drones, Brazilian Visiting Undergraduate Student
- Low-Cost Geo-Referencing for UAV-Based GPR - Erica Lemiuex, 3rd Year Geomatics Engineering Student
- Mountain Peak Recognition and 3d Visualization from Smartphone Images - Kaela Johnson, 1st Year UC Engineering Student

Dr. Xin Wang

- Personalized Travelling Route Planning Based on User Movement Trajectories - Aaron Chen, 3rd Year Geomatics Engineering Student, Siddharth Basu, India Visiting Undergraduate Student and Zhenyi Tang, Chinese Visiting Undergraduate Student

Dr. Steve Liang

- Internet of Things Analytics for Geospatial - Haochen Zhang, Ontario Visiting Undergraduate Student

Dr. Alex Bruton

- Developing and validating a 'stack of competencies' that separates a successful innovation leader from less successful innovation leaders in an undergraduate engineering context. - Mabel Heffring, 1st Year UC Engineering Student
- How can we teach students to learn for mastery (not just grades and test scores) for innovation and entrepreneurship in an engineering context. - Samuel Poncet, 1st Year UC Engineering Student

Dr. Ivan Detchev

- Implementation of a Calibration System for a Hydrographic Survey Remote-Controlled Boat - Walther Johnson, 1st Year UC Engineering Student
- Calibration of Consumer Grade Cameras for Professional Use - Joey Ah-Kiow, 1st Year UC Engineering Student

Dr. Anil Gupta

- Geo-Visualization of Alberta Climate Data - Sandesh Regmi, UC Undergraduate Science Student

2019-20 Internship Placements

AssetWorks - Mitchell Brown
ATCO - Andrew Grab
CMG - Zoe Walsh
Kiewit - Carley Hopkins
NovAtel - Carter Janssen, Michael Ah-Kiow, Torri Kondics
OGL Engineering - Nicholas Malbasa
Stantec - Tanya Hegmann
TransCanada - Chris Cho
Trimble - Dongheok Cho, Mikko Orias Ramos, Sudam Dineshwara Fernando
WSP Canada - Faith Larissa Nayko

Canadian Geomatics Engineering Conference

Schulich School of Engineering, University of Calgary
February 23, 2019

The Department of Geomatics Engineering successfully organized the 1st Canadian Conference on Geomatics Engineering in February 2019. This event was part of GeoDays 2019, a series of Geomatics Engineering Events hosted and organized by students, faculty and staff from the Department of Geomatics Engineering, Schulich School of Engineering, University of Calgary.

The well-attended conference brought together faculty and students from all five Geomatics Engineering departments/programs in Canada, along with industry, associations and government to discuss on the challenges and opportunities of our programs and profession.

The program started with two Keynote Speeches on Geomatics Engineering Profession and the role of Engineering Schools by Dr. Jon Salter, Associate Director of Education and Research, Esri Canada and Dr. Georgia Fotopoulos, Professor, Queen's University.

Then, representatives from all five Geomatics Engineering programs in Canada presented the undergraduate and graduate programs available in their Schools and provided input on practices, success stories, challenges, enrollment status, trends, collaboration with industry, funding, and outreach activities. Specifically, University of New Brunswick programs were presented by Dr. Peter Dare and Dr. Robert Kingdon; York University programs were presented by Dr. Jinjun Shan and Dr. Jianguo Wang; Université Laval programs were presented by Dr. Francis Roy; Ryerson University programs were presented by Dr. Ahmed El-Rabbany; and University of Calgary were presented by Dr. Kyle O'Keefe.

The conference program continued with a Panel on Geomatics Engineering Programs and the Profession in Canada. Five panelists, representing the Industry (Dr. Chris Goodall, Managing Director, InvenSense; and Sandy Kennedy, VP Innovation, Hexagon PI), Academia of both Universities and Polytechnic Colleges (Dr. Yang Gao, University of Calgary; Dr. Sameh Nassar, Instructor, SAIT), and the Profession (Marie Robidoux, Registrar, CBEPS). The conference completed with a thorough Q&A session where participants expressed their reflections on the panelists' insights.

This conference, the first of its type, has offered the opportunity to delegates from all five Geomatics Engineering Departments/Programs in Canada (UNB, ULaval, YorkU, Ryerson, UCalgary) to meet, exchange ideas, and foster the inter-department collaboration for the benefit of the students, programs, and the profession. At the Faculty meeting that followed the conference the same day, it was agreed to pursue a full-fledged Canadian Geomatics Engineering Conference on an annual basis. A conference that will include a scientific program, while at the same time will offer the opportunity to the academia and industry in Canada to meet on a regular basis, stay connected, and join forces to face future challenges and take advantage of the emerging opportunities. We are looking forward to the 2nd Canadian Conference on Geomatics Engineering in 2020. Stay tuned…

The second ever National Geomatics Competition (NGC) was hosted by the University of Calgary (UofC) in February this year, and it was an enormous success! Geomatics Undergraduate students from across Canada convened in the new SSE Canadian Natural Resources Limited Engineering complex at UofC to compete in a consulting-style competition that would test their geomatics problem-solving along with their intuition to come up with a solution to a real-world problem.

After the success of the inaugural competition hosted in Fredericton, New Brunswick in 2018, the Organizing Committee for this year's event in Calgary were excited to continue that success and enable the competition to progress into a well-defined and annual event. The NGC Organizing Committee this year was made up of 9 University of Calgary's Geomatics Engineering students. For nearly 12 months, they volunteered their time to organize the logistics of hosting such a large event. This hard work and dedication manifested in a well-organized 4-day event that went off without a hitch.

This year, 12 teams from 7 schools across the country converged on the UofC for the 2019 NGC, as Université Laval joined in the festivities along with the original six schools from last year: University of Calgary, University of New Brunswick, University of Waterloo, York University, Southern Alberta Institute of Technology and the British Columbia Institute of Technology. Each school produced 1 or 2 teams of 3 students each, making a field of 36 competitors in all. All of the competitors were incredibly enthusiastic and dedicated to their work, which made for some difficult decisions during judging deliberations - as the competition, was so strong across the board.

The teams this year were tasked with coming up with a solution to a current real-world problem: the displacement crisis in Columbia. Colombia currently is faced with the highest number of internally displaced persons (IDPs) in the world (approx. 7.5 million). Many of them have been forced out of their farmland, relocating to informal settlements on the outskirts of the country's major towns and cities. This uncontrolled burst of migration to urban areas has resulted in poor living conditions, high unemployment rates, a deflating agricultural economy, and a loss of security among the displaced.

The delegate teams were given 6

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2019 NGC Organizing Committee
Back Row L to R: Erica Lemieux, Edmond Leahy, Camilo Cortes, Paul Gratton, Jeffery Plett, Calvin Bochulak
Front Row L to R: Mairin Rockliff, Dawood Nadeem, Zoë Walsh

2019 NATIONAL GEOMATICS COMPETITION

February 22-25, Calgary, Alberta

Working closely with the Geomatics Engineering Student Society (GESS), the NGC Organizing Committee raised over $50,000 in industry sponsorship. Thanks to this generous sponsorship the organizing committee was able to host a successful competition and conference.

hours to come up with their best innovative solution to the problem, and come up with a plan on how best to present their solution to the judges. The seven judges comprising entirely of industry members from the Platinum event sponsors *(NovAtel, Trimble, WSP, Stantec, McElhanney Surveying and Mapping, Challenger Geomatics Ltd, and Professional Surveyors Canada)* watched all 12 presentations, using a marking rubric from the NGC committee. Each delegate team had only 15 minutes to present their solution and pitch to the panel of judges why their solution was the best one.

After all the presentations were judged, the judges deliberated on the outcome and after an hour of deliberation, they came to their conclusion.

The **key topics** for he *competitors* to hit were:

- location of re-establishment of the IDP's,
- how to manage ownership of land,
- geospatial plan and maintaining Cadastral information,
- Exit Strategy: Who will take over when you leave?

2019 NGC Winners
Back Row L to R: Edmond Leahy, 2nd Place - Benoit Chevrette, Katie Conconi, Meghan McLellan, 3rd Place - William Pomerleau, Vincent Patenaude, Benjamin Lauzière
Front Row L to R: 1st Place - Morgan Moe, Jamie Horrelt, Kiera Fulton

	University of Calgary	BCIT	Université Laval
FIRST	Jamie Horrelt Kiera Fulton Morgan Moe		
SECOND		Benoit Chevrette Katie Conconi Meghan McLellan	
THIRD			Benjamin Lauzière William Pomerleau Vincent Patenaude

National Geomatics Competition 2020

will be hosted in Ontario for the first time, at the University of Waterloo.

We are looking forward to seeing how the competition progresses!

Geomathon

Geospatial Graduate Design Hack-a-thon

February 23-24, 2019
Schulich School of Engineering, University of Calgary

Top *(from left to right)*: Mostafa Sakr, Chandra Tjhai, Eric Tzyy-Haur Wang, Rodrigo Augusto de Oliveira E Silva
Bottom *(from left to right)*: Sandra Simeonova, Yuting Gao, Sharareh (Asal) Naghdi

The Department of Geomatics Engineering's Geomatics Graduate Group (G^3) successfully organized a hack-a-thon competition for graduate students in geospatial related fields, Geomathon, for the first time in Canada. This event was part of GeoDays 2019, a series of Geomatics Engineering Events hosted and organized by students, faculty and staff from the Department of Geomatics Engineering, Schulich School of Engineering, University of Calgary.

Geomathon competition was divided into three sessions: idea sprint, hacking and presentation/judging. Each of the participating teams was made up of 2 to 4 graduate students in the engineering field. Each team could select any available sensors provided by the sponsors such as TDK's motion sensors, Occipital's Structure Core and Hemisphere's GNSS receivers.

The idea sprint session, developing and hacking were accomplished during the first day of competition. The competition started with the idea sprint led by Prof. Alexander Bruton, Geomatics Engineering faculty specializing on Engineering Entrepreneurship. The idea sprint was an ideation session for each team to have their ideas be reviewed by a panel formed by industry representatives. The goal was to make sure that all ideas had high impact and were highly feasible. After finalizing their ideas, all participating teams began to do hacking, developing and prototyping their products or services. During this session, there were mentors from industry and post doctoral fellows to help and provide supports to all teams.

On the second day, each team were given 15 minutes to present their results to industry representatives, the other participants and the three judges, Dr. Emmanuel Stefanakis (Dept Head), Dr. Alexander Bruton, and Walid Abdelfatah (representative from PPI). After each presentation, there was a question period. The judges evaluated each team based on five different criterias: idea and innovation, technical solution, demonstration, user friendly design, and pitch.

Geomathon also provided opportunity for all graduate students to attend industry presentations from our sponsors and supporters. The participants were also given employment opportunity interviews as selected by the sponsoring companies.

With the experience gained, we plan to organize the next geospatial graduate design hack-a-thon for Spring/Summer 2020.

Special thanks to our sponsors TDK, Centre de géomatique du Québec (CGQ), Hemisphere, Profound Positioning Inc. (PPI), Occipital and support from SSE Graduate Engineering Students Consortium (GESC) and UC Graduate Student Association (GSA).

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First

Safeguard (Fall Detection)

Randy Ho, Brandon Wong, Changlin Yang, Cheng Huang
https://youtu.be/9VZI5hV_Pog

Summary: Our design consists of creating wearable bracelets used for fall detection, which integrates accelerometers, and pressure sensors directly into the bracelet and cameras in the room to robustify detection. The purpose of these sensors is to act as multiple detection methods, reducing the chances of false positives or negatives that could occur. The design has a target demographic of nursing homes, where the cost of our product could be minimized by monitoring more than a single person at a time. It was both a hardware and software integration design; software wise we proposed using k-means clustering to determine classifications of the accelerometer and pressure data, and motion history imaging technique for the camera footage as a secondary check. The sensors used are the TDK ICM-20789, and Occipital's Structure Core, but the bracelets would utilize low cost MEMS IMU with pressure sensors. The end goal is to design a product that can make sure users get the help they needed if a fall had occurred and make it accessible as well as cost efficient.

Second

A Novel Way of Tilt Survey

Zhitao Lyu, Kaixiang Tong, Wei Ding, River Jiang
https://youtu.be/ct0UQJKWzG4

Summary: In less than 12 hours during the competition, this team tried to evaluate their new idea for the problem of Tilt Survey using the sensors provided by Hemisphere (ATLASLINK GNSS Smart Antenna) and TDK (DK-20948 eMD-SmartMotion). The idea is full of imagination with a relatively straightforward principle. The position information of the GNSS receiver can be obtained by RTK technique. By measuring a series of coordinate values which were obtained simultaneously of waggling the range pole, the position information of the spot for tilt survey can be resolved by a Least Squares process. The acceleration measurement by DK-20948 can be used for improving the positioning result. It is worth mentioning that this team successfully resolved the problems of the data synchronization from the different types of sensors. The idea is useful for a quick tilt survey since there is no need to centre the leveling bubble. Moreover, the proposed method can also avoid the interference to the magnetometer. The results were positive and inspiring and is worth in-depth study in the future.

Third

Parking Detection System

Emad Ghaleh Noei, Bahareh Yekkehkhany, Mohammadreza Rahimi
https://youtu.be/M8ggGs-dT3L8

Summary: Most of the time, finding a vacant parking slot, especially in a crowded area, is overwhelming drivers. Parking spaces in the downtown of a city can be divided into two groups as parking lot and street parking. While RFIDs, cameras, and some applications are using in parking lots to show the vacant capacities, they are not applicable to be installed on the streets. These instruments have short ranges, so it becomes expensive to install several of them along the streets. Our idea is to install cameras on public transportation. They pass through most of the streets in downtown regularly in short intervals of time. Their cameras can scan free parking spots and update them on Google Map to create a kind of real-time map of parking spots on the downtown area. There is a similar map provided by the City of Calgary, but it does not show a real-time map of street parking.

Fourth

Outdoor/Indoor Seamless Tracking/ Detection System Based on INS/GNSS/Vision Techniques

Yiran Luo, Ilyar Asl Sabbaghian Hokmabadi, Chunyang Yu, Guang-Je Tsai
https://youtu.be/2rAIXHKL-gUo

Summary: In this project, the TDK DK-20948 SmartMotion Platform, Occipital structure core and the Hemisphere S321 are integrated to provide a smooth and accurate Outdoor/Indoor pedestrian Tracking/Detection System. INS/GNSS/Vision Technique are fused and integrated to achieve this goal. PDR method, Image fingerprinting method and RTK method are used to compute the user' position. The IMU threshold method, camera based-skeleton motion detection and Double-GPS attitude detection method are used to detect the user's motion. Seamless Tracking/Detection System can be further improved and applied for pedestrian safety service, such as hikers, skiers, site workers and miners.

Photos by Hani Mohammed

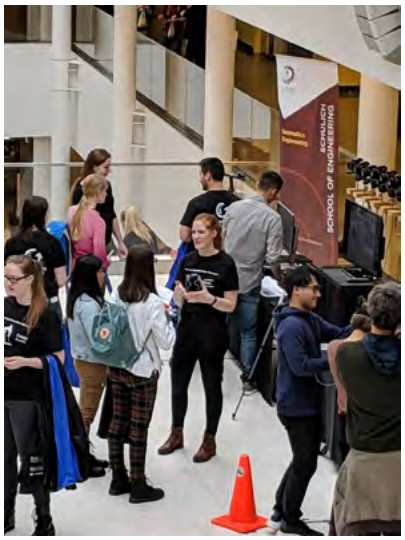
Geomatics Exposition 2019

Monday, February 25, 2019

The Geomatics Engineering Students' Society (GESS) closed off GeoDays with their annual Geomatics Exposition. The event was held in the new SSE Canadian Natural Resources Limited Engineering complex atrium for the first time. The event hosted undergraduate and graduate students from across the Schulich School of Engineering as well as the participants from the National Geomatics Competion. 28 companies from Canada and the USA took part which included interative information sessions and potential industry interviews. The full day event allowed students to explore potential industry opportunities and network with potential employers.

Women in Engineering Day

February 20, 2019



Faculty and students once again participated in the annual SSE Women in Engineering Day. The event provides high school girls the opportunity to come and explore different fields of engineering through demonstrations and conversation. It provides the department a moment to showcase research projects and create awareness about geomatics.

Women in Data Science Conference (WiDS)

March 4, 2019

The department was proud to have Dr. Mozhdeh Shahbazi (co-chair) and Dr. Xin Wang (keynote speaker) participant, on behalf of the Schulich School of Engineering, in the largest data science conference in the world - Stanford's WiDS. The live streamed conference focuses on work being done by women in the field.

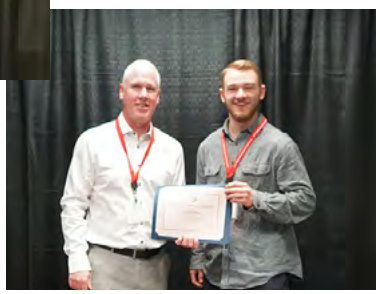
STUDENT AWARDS NIGHT

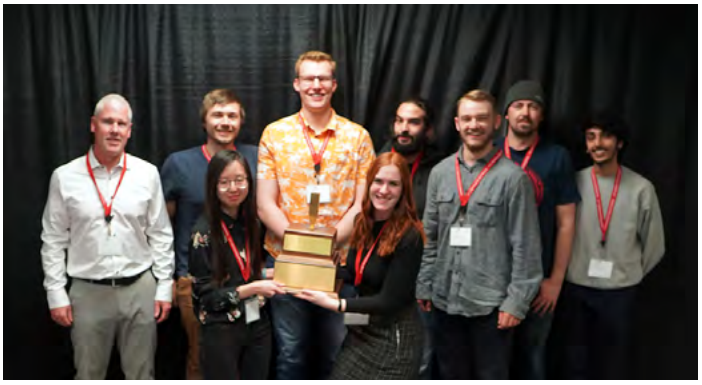
A fun evening was had by all at the annual Geomatics Department Award Night, Thursday, March 14. Congratulations to all the winners and thank you to all the donors for contributing to the success of the Geomatics students and we look forward to seeing everyone again next year!

Right: *B.C. Land Surveyors Foundation Kenneth K. Wong Memorial Land Surveying Scholarship awardee Zorondras Auroron Rodriguez with donor Walter Johnson*

Left: *WSP Geomatics Engineering Bursary awardee Andrew Grab with donor Damian Gillis*

Right: *Green MacPhee Endowed Scholarship awardee Jeffery Stuart Plett with donor Craig White*



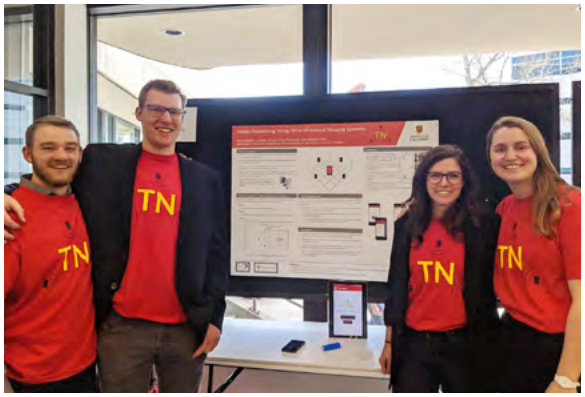


The Green MacPhee Lost Peg Competition Awardees
L to R: Craig White (donor), Edmond Leahy, Lingyu Cui, Paul Gratton, George Barnhardt, Jeffery Stuart Plett, Tyler Greene, Dawood Nadeem

Capstone Design Fair 2019

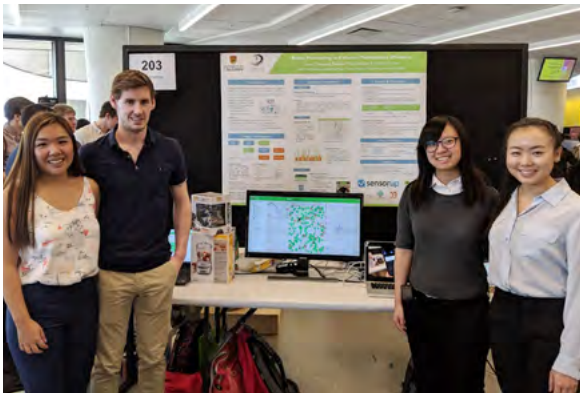
April 2, 2019

First Place Winners



Indoor Positioning Using Ultra-Wideband Ranging System
Left to Right: *Jeffery Plett, Paul Gratton, Jamie Horrelt, Katherine Pexman*

Second Place Winner



Robot Monitoring to Enhance Maintenance Efficiency
Left to Right: *Deanna Ip, Lucas Hossack, Ching Kwang Tam, Shuet-Ching Christina Lo*

A huge thanks to all
the graduate students
who volunteer to give up
part of their Saturdays to help out
the department at the various events.

We appreciate your constant willingness to help promote the department!

Calgary Youth Science Fair

April 6, 2019 ● Olympic Oval, University of Calgary

Once again the department showcased at the annual Calgary Youth Science Fair (CYSF) promoting the importance of geomatics engineering to 1000 students from grades 5-12. This year's demonstrations included Prof. Mozhdeh Shahbazi's vision-guided, intelligent unmanned systems and a total station. Our booth continues to be popular with the students curious to know more about Geomatics Engineering.

The mission of the Calgary Youth Science Fair Society is "to promote an appreciation for scientific principles and method in the youth of Calgary by means of an annual science competition".

APEGA Science Olympics

May 4, 2019 ● Winsport Arena

Another team of staff and students attended the APEGA Science Olympics to promote Geomatics Engineering to hundreds of students from grades 1-12. The students are provided a problem-solving challenge to demonstrate the fun side of engineering and geoscience. The challenges are related to the Alberta school curricula.

You at UCalgary

May 4, 2019

The department, for the first time, was invited to showcase at the university-wide You at UCalgary event. High school students admitted to the university for Fall 2019 were personally invited for an interactive preview of what's to come when they join us for the Fall. The department showcased research from land surveying, 3D modeling and virtual reality augmentation.

Explore STEM

May 15, 2019

The department continues to support Women in Engineering by offering a preview of what Grade 9 girls would learn in geomatics engineering. Dr. Shahbazi and her research team

After months of planning, the 2019 edition of the GESS-led Switzerland Trip was finally underway with a late-afternoon departure on April 29th. You could really feel the excitement in all 27 students and the 1 professor, Dr. Mozhdeh Shahbazi, as we all gathered together at the Calgary International Airport, all new faces, ready to experience the 12th trip in 13 years.

This 10-day trip across Switzerland was one to remember for each and every person on board. Although the locations mostly remain the same, the group is what makes each trip unique and special, with a healthy and very encouraging mix of 2nd, 3rd, and 4th year students.

The first day of this trip started off quick, with a delayed flight entering Geneva, the group rushed to collect their bags, lock them up and head straight for a 4 pm tour at the United Nations Office at Geneva. We received a very enthusiastic tour throughout every conference room. From the newest assembly room opened in 2016, to the first rooms used by the League of Nations, students visited and learned about the history and current affairs conducted by this world organization. The tour would mark the first of 3 days in Lausanne/Geneva.

The second day was another exciting one with a visit to the Swiss Polytechnic School in Lausanne (EPFL). Our visit began with an extremely warm welcome by Dr. Jan Skaloud, Dr. Bertrand and a number of PhD students. Dr. Bertrand was so kind as to provide the "best croissants in [his] Canton" before jumping right into the presentations. Here, students learned all about the research of several PhD students at EPFL. Topics included: accuracy prediction using drone mapping, the autonomous navigation of drones, and my personal favourite, the dual drone mapping concept where GNSS is not possible. Our visit was capitalized with a tour of the lab, where these drones are built and tested, and an excellent lunch at the campus cantina.

Following the EPFL visit, we hopped on a train to the EPFL research park where we visited senseFly. One of the leading mapping drone makers, senseFly presented us with their latest product, the eBee X and even provided a live demo. What makes the drone so interesting is that all it needs is a shake and a toss to get going before it automatically follows the flight path pre-programmed within senseFly's own software.

Our final day in Lausanne was used to return to Geneva and visit the CERN facilities, possibly many of the students' favourite so far. We were fortunate enough to receive a presentation, and have all of our burning particle physics questions answered, by an MIT professor and scientist. From here, we received a tour of the Antimatter factory where, as the name suggests, antimatter is "made" and studied. Fortunately, all tests were shutdown at the time of our visit so we were even given a tour inside the tunnel containing one of the larger accelerators. Finally, we visited the data centre and learned about the history of how the massive amounts of data created by this state-of-the-art facility were, and are currently managed.

Our next day began with a visit to the Swiss capital, Bern. We immediately headed for the Swiss Federal Office of Topography, swisstopo. There, Dr Elmar Brockmann provided us with incredible insight into the history of this organization and how they managed to map the entire country with very fine detail, something that may remain only a dream (for now) for Canada due to its massive size. Students learned about how this process was done, and the current projects that swisstopo is working on, like adding street names to their system (not as trivial as it seems). Dr. Brockmann then led us to the observatory in Zimmerwald, which also holds the location of the reference point for the entire country's surveys. We were given a tour of the observatory and were even taken up to see two of the 4 large telescopes housed here. Many students found

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this day to be their favourite, rightfully so.

The fifth day of our trip finally allowed everyone a much-needed rest. With a visit to the beautiful mountain town of Grindelwald. Many decided to embark on some hikes into the surrounding Alps. An 8.5 km, 3 hour, 1100m of elevation gain hike later, we reached our final destination, Kleine Scheidegg. This was the 3rd checkpoint along the trail up to the Jungfraujoch point and the so-called, "Top of Europe".

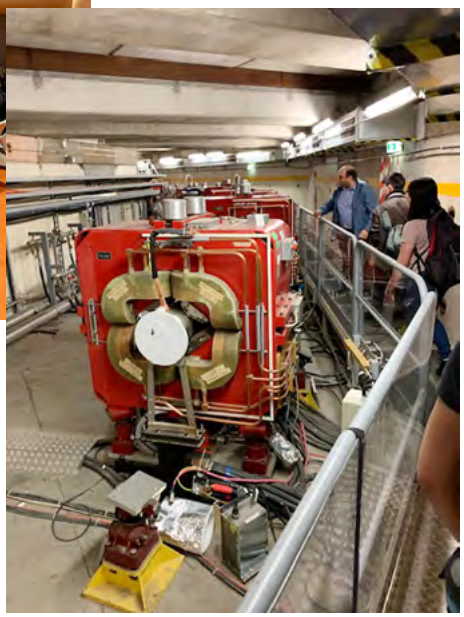
An early 6th day was in order as we checked out just in time to escape a foot of snow falling in our mountain getaway. This day was used to visit the Swiss Museum of Transport of Luzern. This amazing museum contained the entire history of trains, cars, boats, planes, gondolas and more across Switzerland. We would finish the day checking into our final destination, Zurich.

The first day in Zurich began early in order to catch a train to Heerbrugg, 2 hours away. Despite being so far from one of Switzerland's major cities, it was an extremely important destination as it holds the headquarters of Leica Geosystems. Here, we were given a tour of the showroom and shown all of the state-of-the-art equipment Leica has to offer. We were also given another exciting tour throughout the factory and assembly lines, seeing how the equipment we use back in class gets made. This exciting day was capitalized with a visit and presentation from Nathan Mayer, a 2013 graduate from our very own department. Now a UAV Application Engineer at Leica Geosystems Calgary, Nathan experienced this trip a few years before finding himself working in the same office that we were visiting. Nathan presented to us the latest Leica hexacopter drone. The remaining portion of the day was used to explore St. Gallen, arguably a great culture hub for Switzerland.

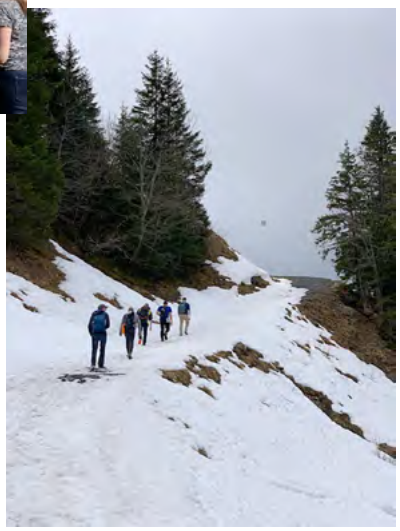
The next two days were again used to freely explore Switzerland and immerse ourselves in its rich culture. Many took the opportunity to visit Bellinzona and Lugano, two towns near the Italian border.

The final day was used to visit another top university, ETH Zurich. Once again, we had the great pleasure of receiving research presentations from PhD students of this world-renowned facility. Topics here included: GPS networks for landslide monitoring, LiDAR point-cloud matching via deep learning, and ground RADAR for deformation monitoring. Following the presentations, we were led to the calibration lab where we learned about the ongoing projects conducted in the lab, which also happens to contain a ~50m baseline used for calibrations.

With the trip finally at a close, here is no doubt that all students made many lasting memories that they will NOT soon forget. So much was learned and so many things were enjoyed that it almost feels like the trip came to an abrupt halt. This could only mean that the trip was a resounding success.



Left: *UN Tour*
Bottom: *CERN Tour*



Top: *EPFL Lab Visit*
Top Left: *senseFly Live Demo*
Bottom Left: *swisstopo Telescope Tour*
Bottom: *Grindewald Hike*