Annual Report

University of Alberta Student Chapter
2018-2019
SPIE University of Alberta Student Chapter

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University of Alberta
Edmonton, Alberta
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2018 - 2019 Chapter Executives

Liam McRae, President
ldmcrae@ualberta.ca

Kyle McKee, Vice-President
kimckee@ualberta.ca

Ryan Boehnke, Treasurer
rboehnke@ualberta.ca

Esaias (Bertus) Schalekamp, Secretary
schaleka@ualberta.ca

Dr. Abdulhakem Elezzabi, Faculty Advisor
elezzabi@ualberta.ca
2019 - 2020 Executives

Liam McRae, President
ldmcrae@ualberta.ca

Esaias (Bertus) Schalekamp, Vice-President
schaleka@ualberta.ca

Eric Hopmann, Treasurer
hopmann@ualberta.ca

Currently Vacant, Secretary
(We do have a student ready, but they are not a full member of SPIE currently.)
Member Roster

(9 Members as of May 2018)

Brett Carnio
Curtis Furby
Timothy Harrison
Eric Hoppman
Bernal Manzanilla Saavedra
Saywer McPherson
Liam McRae
Esaias Schalekamp
Tyler Zimmerman

Alumni Roster (11 Alumni)

Glenda Delos Reyes
Parsin Haji Reza
Vedran Jelic
Dileepan Joseph
Sean Molesky
Travis Schoepp
Peng Shao
Dan Sirbu
Orit Skorka
Locke Spencer
Roger Zemp
2018-2019 Activities

Promotional Events

University of Alberta Clubs Fair
At the start of this school year we sent out a contingent of members to attend the University of Alberta Clubs Fair to represent SPIE to the student population. This club fair is attended by the general student population, including arts, sciences, and engineering students, and accordingly has the largest student presence at the events. We sent students with a variety of expertise to the event, and used the event to showcase what our chapter’s SPIE club does, what it has to offer to the students, and some of the cool science in the field. We encouraged all student to attend a meeting so that they could decide if they wanted to join the club, and allowed students who attended to borrow a test arduino to begin experimenting. All in all, the event was a very good way to advertise the clubs presence at the university.

University of Alberta Science FUNdamentals Science FUNDay
The Science FUNDay is an annual event hosted at the university of Alberta by the student group Science Fundamentals. At this event, kids typically under the age of 12 are invited to an event where many of the student groups, and faculties of science and engineering, present interesting demonstrations of technology and scientific principles. This event attracted approximately 800 unique individuals, including both parents/guardians, and kids. Our group attended this event with once again a modified laser game, which uses eye safe laser sources and plane mirrors on a chessboard to demonstrate reflection in an easy and fun way. We also brought a Makey Makey, which is a simple electronics board that acts as a simple game controller, and is intended to demonstrate how conduction occurs with different materials. Using paper and a pencil, we were able to show that, when the children held a lead in their hand, that they could control a simple video game, pacman, by touching graphite with their hands, and how when erased they were unable to play the game. The event was a great way to demonstrate easy science and technology principles, and was a great way for our chapter members to go and have fun while also teaching potential future scientists and engineers.
NASA Speaker Event: Part 1 Lecture

For the past four years we have been working very closely with JPL scientists to organize our annual NASA Speaker event. This year we recruited Dr. Philip Stahl, who is the Optical Components Lead Engineer for the James Webb Space Telescope (JWST), based out of Huntsville, Alabama. Dr. Stahl gave an engaging and informative talk on the big picture of the project, while also noting some technical challenges met along the way. He offered insight on the more general topic of problem solving in a real-life setting, and advice to the prospective scientists and engineers in the audience. This event hosted ~150 people. Before the lecture, we took Dr. Stahl on several lab tours of the various Electrical Engineering labs and the NanoFab.

NASA Speaker Event: Part 2 PODCAST

This year, we had the privilege of hosting a podcast with Dr. Stahl, geared toward high school students thinking about careers in science. Two University of Alberta students, and SPIE members, Kyle McKee and Ryan Boehnke engaged in an interesting discussion with Dr. Stahl addressing a variety of questions they wish were answered before they had come to University. We hope that the outcome is informative and entertaining to the high school students who choose to watch! The podcast will be available shortly on the University of Alberta’s new podcast series, hosted by Raymond Matthias.
Projects

Goals of Projects
We set out this year with the goal of once again improving the application skills of our student members, and we hoped that this year we could further develop the projects created last year to create more impressive versions of them to showcase what our club could create, while also providing a slightly larger challenge for the students. These projects were often discussed at Monthly meetings, and with these projects we set out to attract new members who are interested in creating or assisting in such projects.
Modifying the LED Message Fan
The LED message fan was a simple projects utilizing just 5 LEDs, a Digispark microcontroller, a hall sensor and neodymium magnet, and an ordinary household fan. The project was great for learning the basics of coding in the Arduino IDE, and how POV displays work. The project was a great mix of design, calculation, and hands-on skill development. The project layout was designed from scratch with some influence from similar projects available online. From here, all code and calculations were done from scratch; this meant determining how fast the fan spun, and then how long to leave the LED’s on. These times were on the order of microseconds; it was interesting to discover that the Digispark was indeed able to support this small time-scale switching with ease. After some hard work and a few hours of debugging, the project was a success. We even created a library of the alphabet and the digits 0-9 so that the message can be easily changed in just a couple lines at the bottom of the code. The next step in this project is eliminating that last step. It is somewhat tedious to have to connect the display via usb to a laptop every time you want to change the message. From here, we will create a mobile application such that we can reprogram the fan display from our phones. This will be implemented with an ESP-32 module, which was less than $5 on eBay! This will be an interesting build as it will familiarize the builder with app design, and integration of these apps with electronics projects. Once one understands how to integrate the ESP-32 with bluetooth, it opens up the door for endless bluetooth/app-controlled projects in the future.

Modifying the Laser Communicator
Last year, a laser communicator was created as a wireless communication device. This consisted of designing and building both a transmitter and a receiver. In the transmitter component of this communication device an Arduino was programmed by the SPIE members to decompose a string of text (input by a computer) into its binary form. The Arduino is then used to pulse a laser diode where the on/off pattern imitates the binary data. A photoresistor is integrated into the receiver component of the laser communicator, which is used to determine the on/off binary representation of the laser diode. The received binary data is sent to an Arduino in the receiver, where this information is converted back into readable text by the programmed Arduino code. This readable text is then displayed on a LCD screen that has been integrated into the receiver. However, after playing with this device, a number of weaknesses were observed, namely aligning the beam was very temperamental, and there was a significant amount of noise in the received signal that, when large data files were communicated, resulted in discrepancies between the sender and receiver. To try and
minimize these error, we set out to create a new mount for the received, that also incorporated a wide view lense in front of the receiver to allow the detection of the beam accurately and from a variety of angles. We also set out to modify the receiver and sender code to provide more checks on the send code, and prevent the loss of data. These modifications are still ongoing, and are anticipated to be completed in the summer.

**SPIE Student Travel Grant**

This year, we were lucky to receive the SPIE Officer Travel Grant for 2018-2019 for the San Diego Optics+Photonics Conference. Two Students attended this event, Liam McRae and Ryan Boenhke, who both had a fantastic time meeting other student leaders and networking at the Annual Leadership conference. Liam was also lucky enough to have two posters accepted for presentation at the conference, and had a great time presenting his research. Ultimately, the grant was a great way to meet fellow student leaders, researchers, and people from the industry.

**Future Projects**

This year, we were lucky to have a past president, David Asgar-Deen, donate a robot his current lab was using as an inpatient monitoring device, with a motor, ultrasonic sensors, and a camera. With these high end materials, we intend to pursue new projects that utilize computer vision on a mobile platform, where we can demonstrate and teach new skill pertaining to robotics, and using camera technology to view and respond to a environment.

This year, we were also lucky to have an influx in associate members who have had experience using commercial laser imaging technology for mapping different areas and objects. Accordingly, we have identified an opportunity to create a low cost laser sensing system, where we intend to showcase how this technology is used to map an object on a very small and low cost system. These are ambitious projects, however we believe that they are achievable with the experience we have and the materials we have available.

**Looking Forward**

This year will have an emphasis on the attracting new members to the club. We have attracted a number of associate members to the club, however we will be looking to advertise projects and the events we have hosted to attract new members to the club. We will also continue to do our best to supplement the education students receive with real world examples, and will do our best to showcase the field of optics and photonics to the student body with current students work, and guest lecturers.
Financials

This year the chapter was fortunate enough to receive a one-time $1500 CAD grant from the Faculty of Engineering to allow our members to have further mentoring with Dr. Stahl in the Canadian Rockies, as well as receive the activity grant funding. As a result the money available to the club has grown from the 2017-2018 year. The club’s faculty advisor also requires that there be at least a $3,250.00 at year end, which has been maintained.

<table>
<thead>
<tr>
<th>Year End Capital</th>
<th>Amount (CAD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-2018</td>
<td>$3920.14</td>
</tr>
<tr>
<td>2018-2019</td>
<td>$5186.16</td>
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</tbody>
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Below is a detailed breakdown of revenue and expenses.

<table>
<thead>
<tr>
<th>Revenue Source</th>
<th>Amount (CAD)</th>
<th>Expenses (CAD)</th>
<th>Description</th>
<th>Expense Amount</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPIE Activity Fund</td>
<td>700 USD</td>
<td>Annual General Meeting</td>
<td>Pizza was bought for members who attended</td>
<td>$118.61</td>
<td>September 20, 2018</td>
</tr>
<tr>
<td>Faculty of Engineering Grant</td>
<td>$1500</td>
<td>Guest Lecture Visit</td>
<td>Pizza and beverages for the event were covered by the department of electrical and computer engineering</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hotel Cost was fronted by the Faculty of Engineering, and reimbursed by SPIE</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dinner for the speaker was covered by the Department of Electrical and Computer Engineering</td>
<td>$0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 SPIE students attended a visit to Jasper, AB, with Dr. Philip Stahl. This idea was proposed to the Faculty of Engineering, and</td>
<td>$963.59</td>
<td>March 22, 2019</td>
</tr>
</tbody>
</table>
they provided the grant money.

<table>
<thead>
<tr>
<th>Outreach Expenses</th>
<th>The fee to attend clubs fair was provided for, and the Science FUNDay required no fee</th>
<th>$0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Expenses</td>
<td>The parts for the projects this year were already in place or provided for. Our activity grant also arrived a little later than anticipated, so the money has not been used yet</td>
<td>$0</td>
</tr>
<tr>
<td>Bank Maintenance</td>
<td>Monthly fee required by Bank</td>
<td>$15.00</td>
</tr>
</tbody>
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