

# Zachary M. C. Baum, MSc, BComp

PhD Student

Computer-Assisted Navigation, Diagnosis and Intervention Group

Wellcome / EPSRC Centre for Interventional and Surgical Sciences & Centre for Medical Image Computing

Department of Biomedical Engineering and Medical Physics, University College London

## EDUCATION

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University College London

London, United Kingdom

**Doctor of Philosophy (Medical Imaging)**

**Sep. 2019 -**

Thesis Topic: "Machine learning for ultrasound-guided interventions"

Queen's University

Kingston, Ontario, Canada

**Master of Science (Computing)**

**Sep. 2017 - May 2019**

Thesis Title: "Augmented reality training platform for placement of neurosurgical burr holes"

Notable Coursework: Bioinformatics, Pattern Recognition, Continuous Coordinate Transformations

Cumulative GPA: 4.30 / 4.30

Queen's University

Kingston, Ontario, Canada

**Bachelor of Computing – Honours (Biomedical Computing)**

**Sep. 2013 - May 2017**

Honours Thesis Title: "Mobile augmented reality display system for surgical navigation"

Notable Coursework: Computer-Assisted Surgery, Neural & Genetic Computing, Computational Biology

Dean's Honour List with Distinction Standing: 2016 – 2017

Dean's Honour List Standing: 2013 – 2016

Cumulative GPA: 3.99 / 4.30 (4<sup>th</sup> in class)

## HONOURS & AWARDS

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School of Computing, Queen's University

**Ian A. Macleod Award**

**Apr. 2019**

This award is granted to the graduate student who made the greatest contribution to the intellectual and social spirit of the School of Computing during the preceding academic year.

Queen's University

**Agnes Benidickson Tricolour Award**

**Feb. 2019**

Admissions to the Tricolour Society through the Agnes Benidickson Tricolour Award is the highest honour given to a Queen's student for non-academic, non-athletic activities. The award is named after Dr. Agnes Benidickson who was Chancellor of Queen's University from 1980 until 1996. With all recipients chosen by their fellow students, this award is bestowed in recognition of the valuable and distinguished service of outstanding individuals to the University.

Hamlyn Centre for Surgical Robotics, Imperial College London

**Hamlyn Winter School Best Project Award, Runner-Up**

**Dec. 2018**

Queen's University Athletics and Recreation

**Nixon Academic Leadership Award**

**Nov. 2018**

Awarded to the male and female varsity student-athletes who have exemplified achievement in academics, community service and fair play in their sport.

School of Computing, Queen's University

**Award for Outstanding Contribution to School Life**

**May 2017**

Recognizes outstanding contributions by a student to the Queen's School of Computing with distinguished service, while maintaining excellent academic performance and research contributions throughout their undergraduate career.

Computing Students' Association (COMPSA), Queen's University <b>Gradum Dominus Machinarium Award</b>	<b>Mar. 2017</b>
Presented to a graduating undergraduate student who has, throughout their time at Queen's has contributed to the betterment of the University experience and demonstrated spirit and enthusiasm for everything COMPSA.	
Engineering Society, Queen's University <b>Engineering Society Coding Competition, 1st Place</b>	<b>Feb. 2017</b>
Sunnybrook Research Institute <b>The Sunnybrook Research Prize, National Finalist</b>	<b>Jan. 2017</b>
Recognized as one of six national finalists for excellence in undergraduate biomedical sciences research.	

## GRANTS, FELLOWSHIPS & SCHOLARSHIPS

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University College London <b>Graduate Research Scholarship &amp; Overseas Research Scholarship - £175,000</b>	<b>Sep. 2019 - Aug. 2023</b>
<i>"Machine learning for ultrasound-guided interventions"</i>	
The Graduate Research Scholarship and Overseas Research Scholarship Programs are awarded on the basis of academic excellence and research potential to attract high-quality students to University College London to undertake postgraduate research programs.	
Natural Sciences and Engineering Research Council of Canada (NSERC) <b>Postgraduate Scholarship-Doctoral - \$63,000 CAD</b>	<b>Sep. 2019 - Aug. 2022</b>
<i>"Intelligent simulated environments for augmented reality surgical training"</i>	
The Postgraduate Scholarships-Doctoral Program provides financial support to high-calibre scholars who are engaged in a doctoral program in the natural sciences or engineering.	
King's College London <b>EPSRC Doctoral Training Partnership Studentship – £190,000</b>	<b>Awarded (Sep. 2019)</b>
<i>"Intra-operative probe design and image processing optimization with deep learning for in-vivo and ex-vivo detection of cancerous tissue"</i>	
The EPSRC Doctoral Training Partnership Studentship is offered to an international applicant of King's College London's Surgical and Interventional Engineering Doctoral Program each year. The studentship is funded jointly through the EPSRC, the School of Biomedical Engineering and Imaging Sciences, as well as a project-specific industry sponsor with the intent of training and nurturing the next generation of surgical and interventional engineering scientists, researchers, innovators, and industry leaders.	
Imperial College London <b>President's PhD Scholarship – £215,000</b>	<b>Awarded (Sep. 2019)</b>
<i>"A platform for mass-spectrometry-based surgical navigation"</i>	
The President's PhD Scholarship Scheme is designed to help nurture future world-class researchers, recruiting outstanding students from around the world to Imperial College London to engage in an exciting and challenging program that complements research opportunities with professional development and networking within an elite cohort.	
School of Graduate Studies, Queen's University <b>Arthur B. McDonald Prize for Academic Excellence - \$30,000 CAD</b>	<b>Awarded (Sep. 2019)</b>
This prestigious award recognizes excellence and research potential of applicants who will begin their graduate degree programs in the School of Graduate Studies at Queen's in 2019-20. It is named in honour of Queen's University Professor Emeritus Arthur McDonald, co-winner of the 2015 Nobel Prize in Physics.	
Queen's School of Computing	

**Conference Travel Award - \$300 CAD****Mar. 2019**

To present “*Assessment of intra-operative neurosurgical planning with the Microsoft HoloLens*” at the 17th Annual Imaging Network of Ontario Symposium

Hamlyn Centre for Surgical Robotics, Imperial College London

**Hamlyn Winter School Travel Scholarship - £500****Dec. 2018**

Government of Ontario – Ministry of Advanced Education and Skills Development

**Ontario Graduate Scholarship - \$15,000 CAD****Sep. 2018 - Aug. 2019**

“*Holographic visualization for neurosurgical planning and training*”

The Ontario Graduate Scholarship program provides merit-based scholarships to Ontario’s best graduate students in all disciplines and encourages excellence in graduate studies at publicly assisted universities in Ontario.

SPIE Medical Imaging

**Chair’s Conference Travel Award - \$750 USD****Feb. 2016, 2017, 2018**

School of Graduate Studies, Queen’s University

**Tri-Agency Recipient Recognition Award - \$5,000 CAD****Sep. 2017 - Aug. 2018**

Natural Sciences and Engineering Research Council of Canada (NSERC)

**Alexander Graham Bell Canada Graduate Scholarship - \$17,500 CAD****Sep. 2017 - Aug. 2018**

“*Mobile augmented reality display system for musculoskeletal injections*”

The Canada Graduate Scholarship Program provides financial support to high-calibre scholars who are engaged in eligible master’s programs in Canada.

School of Graduate Studies, Queen’s University

**Academic Excellence Award - \$15,000 CAD****Awarded (Sep. 2017)**

Recognizes academic excellence and research potential of applicants who will begin their graduate degree programs in the School of Graduate Studies at Queen’s.

Queen’s School of Computing

**Undergraduate Research Fellowship - \$6,500 CAD****May 2017 - Aug. 2017**

“*Image overlay surgical navigation in musculoskeletal procedures*”

The Queen’s School of Computing Undergraduate Research Fellowship is an undergraduate research award that supports summer undergraduate research for Computing undergraduate students who have demonstrated academic excellence.

Natural Sciences and Engineering Research Council of Canada (NSERC)

**Undergraduate Student Research Award - \$6,000 CAD****May 2016 - Aug. 2016**

“*Image overlay guidance for medical interventions*”

Queen’s School of Computing

**Workshop Travel Award - \$1,000 CAD****May 2016**

To present the workshop “*3D Slicer: Hands on introduction to medical image visualization*” at the IEEE EMBS International Student Conference 2016

## RESEARCH EXPERIENCE

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Laboratory for Percutaneous Surgery, School of Computing, Queen’s University  
**Research Assistant**

**May 2015 - May 2019**

Develops open-source medical engineering solutions for image-guided therapy and surgical navigation. Contributes to the open-source platforms 3DSlicer and SlicerIGT through implementation and development of software for ultrasound-based scoliosis monitoring and augmented reality display devices. Conducts clinical trials and feasibility studies for augmented reality and holographic technologies in neurosurgical planning and emergency medicine. Provides mentorship and supervision to high-school and undergraduate students; recent supervised projects

include assessment of tracked ultrasound calibration reproducibility and development of low-cost needle guides for spine interventions, among others.

## ACADEMIC & TEACHING EXPERIENCE

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### Teaching Assistance

School of Computing, Queen's University

**CISC 472 - Medical Informatics (Head TA)**

**Winter 2018, Winter 2019**

**CISC 121 - Introduction to Computing Science I (Head TA)**

**Winter 2019**

**CISC 432 - Advanced Data Management Systems (Head TA)**

**Fall 2018**

**CISC P81 - Computers: Applications and Implications**

**Fall 2015, Winter 2017**

**CISC 365 – Algorithms (Head TA)**

**Fall 2016**

Faculty of Engineering and Applied Science, Queen's University

**CMPE 365 – Algorithms (Head TA)**

**Fall 2017**

### Invited Course Lectures

School of Computing, Queen's University

**CISC 472 - Medical Informatics**

**Winter 2019**

Lecture: Augmented Reality Neurosurgical Planning

**CISC 432 - Advanced Data Management Systems**

**Fall 2018**

Lecture: Introduction to and Development with CouchDB

**CISC 330 - Computer-Assisted Surgery**

**Fall 2018**

Lecture: Spatially Tracked Ultrasound and Ultrasound-Guided Interventions

**CISC 330 - Computer-Assisted Surgery**

**Fall 2018**

Lecture: Augmented Reality Neurosurgical Planning

**CISC 472 - Medical Informatics**

**Winter 2018**

Lecture: Computer-Assisted Interventions

**CISC 330 - Computer-Assisted Surgery**

**Fall 2017**

Lecture: Mobile Augmented Reality Surgical Navigation Systems

**CISC 330 - Computer-Assisted Surgery**

**Fall 2016**

Lecture: Mobile Augmented Reality Surgical Navigation Systems

### Supervision & Mentorship Experience

#### *Students Mentored in Research Project*

Laboratory for Percutaneous Surgery, School of Computing, Queen's University

**Julia Wiercigoch, Undergraduate Student**

**Spring 2018**

Design of low-cost, adjustable handheld needle guide for spine interventions

**Sydney Perrin, High School Student**

**Spring 2018**

Assessment of freehand ultrasound calibration reproducibility for ultrasound-guided navigation

**Hillary Lia, Undergraduate Student**

**Spring 2018**

Development of electromagnetically tracked partial nephrectomy navigation training system

**Eden Bibic, High School Student**

**Spring 2016**

Design of redundant sensor array for intraoperative electromagnetic tracking error monitoring

**Aidan Baksh, High School Student**

**Spring 2015**

Design of optically and electromagnetically tracked navigation tools for computer-navigated surgery

## PROFESSIONAL EXPERIENCE

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Verdure Imaging Inc.

### **Senior Medical Engineering & Software Consultant**

**Jul. 2016 -**

Develops ultrasound-based diagnostic software for monitoring and assessing scoliosis. Works to implement well-designed and user-friendly software and develop documentation which is compliant with FDA and other regulatory bodies.

Smith School of Business, Queen's University

### **Project Assistant**

**May 2019 – Aug. 2019**

Advised students in the Master of Management in Artificial Intelligence program on implementation strategies and technology solutions for their Capstone projects. Guided student model development and validation efforts, while aiding students in selecting and reviewing appropriate reporting and visualization tools.

Office of Undergraduate Admission and Recruitment, Queen's University

### **Automation Developer**

**Jan. 2019 - May 2019**

Developed software and macros to automate the reporting and collection of various test scores and other application-specific information for Admission Coordinators to simplify daily workflows and remove the need for manual searches through internal datastores by any staff members.

## COMMUNITY INVOLVEMENT

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Students' Union UCL, University College London

### **Student Member, Board of Trustees Finance Sub-Committee**

**Nov 2019 -**

One of four students appointed by the Student Union executive to aid in and be responsible for considering the strategy and general management of the Student Union's finances. This includes setting annual budgets, key performance objectives, and monitoring the financial performance of the organization.

Sail Canada / Voile Canada

### **Director at Large, Board of Directors**

**Oct 2018 -**

Provides the governance and strategic direction for the Association. Brings an array of skills, expertise, and sailing experience to fulfill my responsibilities and duties on the board with respect to setting the vision and mission of the Association. Provides input and monitors performance of all branches of the Association by overseeing core financial information and updating policies to reflect international best practices in sailing. Additionally serves as a member of the Governance, Finance and Fundraising Committees.

Faculty of Arts and Science, Queen's University

### **Graduate Studies Mentor & Recruitment Advisor**

**Aug. 2018 - May 2019**

Took part in discussions with current undergraduate students through online and in-person events to address concerns and questions of prospective students on programs, supervisors, funding applications and graduate student life.

Graduate Computing Society (GCS), Queen's University

### **MSc SGPS Liaison Officer**

**May 2018 - May 2019**

Attended meetings of the Society of Graduate and Professional Students (SGPS) and their Council to act as a liaison for the concerns of School of Computing graduate students with the SGPS.

Graduate Computing Society (GCS), Queen's University

### **President**

**May 2018 - May 2019**

Was responsible for the day-to-day operations of the society. Planned monthly social events for students and sits on various committees as the voice and representative for computing graduate

students. Revamped the Society's orientation activities to better engage with students and provide them with a grasp of the resources and supports available in the department and at Queen's. Created a 'Computing Graduate Student Handbook' for students to provide information on the department, resources, courses, and life in Kingston.

Office of Undergraduate Admission and Recruitment, Queen's University  
**Senior Campus Tour Guide**

**Mar. 2018 - May 2019**

Led prospective students and families throughout campus, giving a first impression and information on Queen's University. Provides day-to-day oversight of the program and additional logistical support during large recruitment events.

School of Computing, Queen's University  
**Computing Student Research Conference, Founder & Conference Chair**

**Jan. 2018 - Oct. 2018**

Was responsible for the planning and execution of the inaugural Computing Student Research Conference. Oversaw the management of six additional chairs and their respective committees to create and facilitate a conference which promotes and encourages Canadian students to engage in undergraduate and graduate research.

Graduate Computing Society (GCS), Queen's University  
**COMPSA Liaison Officer**

**Sep. 2017 - May 2019**

Attended meetings of the Computing Students' Association (COMPSA) and their Council to act as a liaison for the School of Computing's graduate students with COMPSA. Provided assistance with interpretation of policy and external perspectives as an ex-officio member of the association.

Graduate Computing Society (GCS), Queen's University  
**MSc Graduate Committee Officer**

**Sep. 2017 - May 2019**

Attended the School of Computing Graduate Committee's meetings to represent the opinions and interests of master's students in the School of Computing, and to actively strive to improve the MSc program for students.

School of Computing, Queen's University  
**School of Computing Council, Graduate Student Member**

**Sep. 2017 - May 2019**

Voiced graduate student concerns and discusses changes to programs, courses and other aspects of the School of Computing with members of Administration, Faculty and Staff.

Graduate Computing Society (GCS), Queen's University  
**Vice President Operations**

**Sep. 2017 - May 2018**

Primarily responsible for the day-to-day operations of the Society. Was responsible for the Society's finances, event budgeting and acted as a coordinator for all officers of the Society.

Student Experience Office, Queen's University  
**Summer Orientation to Academic Resources (SOAR) Peer Ambassador**

**Jul. 2017**

Created a welcoming environment for incoming students, their families and guests by assisting with program implementation and event coordination. Coordinated registration and check-in for over 2000 attendees and acted as a Master of Ceremonies throughout the event. Participated in panel discussions to share personal experiences on resources, campus life, and academics.

Queen's Varsity Sailing Team, Queen's University  
**President & Captain**

**Jan. 2017 - Dec. 2019**

Acted as chairperson of the executive committee and as the team's spokesperson and representative to Queen's University and other external stakeholders. Managed finances and operations for the team of over 60 athletes and its coaching staff. Created the 'Try Varsity Sailing' program to bring high school sailors to Queen's to experience life as a student-athlete. Established partnerships with Able Sail Kingston to aid with their fundraising and promotional efforts.

Canadian Intercollegiate Sailing Association (CICSA)

**Team Development Officer****Jan. 2017 - Dec. 2017**

Created and promoted opportunities for new post-secondary institutions to develop competitive sailing programs through outreach and mentorship. Organized sailing clinics and implemented a team ranking system across the league to reinforce existing best practices in college sailing. Represented the Association to external sports associations such as Sail Canada.

**Queen's Native Student Association (QNSA)****Director of Web Development****Sep. 2016 - Aug. 2017**

Oversaw the design, development, and maintenance of the QNSA webpage, and worked to rebrand the organization's national online presence.

**Arts and Sciences Undergraduate Society (ASUS), Queen's University****The Data Journal, Founder & Editor-in-Chief****May 2016 - Apr. 2017**

Coordinated with the Editorial Board and Panel of Referees, tracks submissions to the Journal, hires management, and provides general supervision and oversight of the Journal's inaugural volume.

**Office of Undergraduate Admission and Recruitment, Queen's University****Campus Tour Guide****Mar. 2016 - Mar. 2018**

Led prospective students and families throughout campus, giving a first impression and information on Queen's University.

**Information Technology Services (ITS), Queen's University****Information Services and Technology Student Advisory Committee Member** **May 2015 - Apr. 2016**

Provided concerns and commented on student priorities about information technology at Queen's University. Discussed current and future information technology initiatives while developing reports for ITS management.

**School of Computing, Queen's University****School of Computing Council, Undergraduate Student Member****May 2015 - Apr. 2016**

Voiced undergraduate student concerns and discussed changes to programs, courses and other aspects of the School of Computing with members of Administration, Faculty and Staff.

**Arts and Sciences Undergraduate Society (ASUS), Queen's University****Computing Representative****May 2015 - Apr. 2016**

Represented Computing students at ASUS Assembly. Presented the views, perspectives and needs of Computing Students to the ASUS Executive and other Assembly members.

**Computing Students' Association (COMPSA), Queen's University****Vice President Operations****May 2015 - Apr. 2016**

Oversaw day-to-day operations and finances of the Association, worked with commissioners to assist with execution of their events and initiatives throughout the year. Renewed relations with the Arts and Science Undergraduate Society and worked collaboratively with them to found new programs such as The Data Journal - Queen's first undergraduate computer science research journal.

**School of Computing, Queen's University****Orientation Chair****Oct. 2014 - Sep. 2015**

Planned, coordinated and successfully delivered the 2015 Computing Orientation Week. Recruited and trained Orientation Leaders and Executives. Reinforced positive relations with external bodies and stakeholders, including students, staff, faculty and administrators ranging from the School of Computing, to the Office of the Principal. Developed new events with other faculties to promote interfaculty relations and restructured several core events of the week. As a result, saw higher turn-out and retention rates than any previous computing orientation weeks.

**School of Computing, Queen's University****Open House Volunteer****Oct. 2013 - May 2019**

Engages with students at various recruitment events, such as Fall Preview, March Break Open House, Majors Night, the Ontario University Fair and Summer Orientation to Academic Resources (SOAR). Helps to promote the Queen's School of Computing, the Faculty of Arts and Science, and the School of Graduate Studies to prospective students and parents through discussion of the programs offered at Queen's, and by demoing various graduate and undergraduate research projects at these events.

## PUBLICATIONS & PRESENTATIONS

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### Journal Articles

1. T Ungi, H Greer, K Sunderland, V Wu, **Z Baum**, C Schlenger, M Oetgen, K Cleary, S Aylward, G Fichtinger. "Automatic spine ultrasound segmentation for scoliosis visualization and measurement," IEEE Transactions on Biomedical Engineering. (2020) [\[DOI\]](#)
2. **Z Baum**, A Lasso, S Ryan, T Ungi, E Rae, B Zevin, R Levy, G Fichtinger. "Augmented reality training platform for neurosurgical burr hole localization," Journal of Medical Robotics Research – Special Issue: Technology-enabled Tools for Clinical Skills Assessment. (2020) [\[DOI\]](#)

### Conference Presentations

1. **Z Baum**, S Ryan, E Rae, A Lasso, T Ungi, R Levy, G Fichtinger. "Assessment of intraoperative neurosurgical planning with the Microsoft HoloLens," 17th Annual Imaging Network of Ontario Symposium (2019). (Oral)
2. H Lia, **Z Baum**, T Vaughan, T Ungi, T McGregor, G Fichtinger. "Usability and accuracy of an electromagnetically tracked partial nephrectomy navigation system," 17th Annual Imaging Network of Ontario Symposium (2019). (Poster)
3. **Z Baum**, B Church, A Lasso, T Ungi, C Schlenger, D Borschneck, P Mousavi, G Fichtinger. "Step-wise identification of ultrasound-visible anatomical landmarks for 3D visualization of scoliotic spine," SPIE Medical Imaging - Image-Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 10951, p. 1095129 (2019). (Poster) [\[DOI\]](#)
4. H Lia, **Z Baum**, T Vaughan, T Ungi, T McGregor, G Fichtinger. "Electromagnetically tracked partial nephrectomy navigation: demonstration of concept," SPIE Medical Imaging - Image-Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 10951, p. 109512W (2019). (Poster) [\[DOI\]](#)
5. S Perrin, **Z Baum**, M Asselin, G Underwood, S Choueib, H Lia, T Ungi, A Lasso, G Fichtinger. "Reproducibility of freehand calibrations for ultrasound-guided needle navigation," SPIE Medical Imaging - Image-Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 10951, p. 109512B (2019). (Poster) [\[DOI\]](#)
6. J Wiercigoch, **Z Baum**, T Ungi, J Fritz, G Fichtinger. "Validation of a low-cost adjustable handheld needle guide for spine interventions," SPIE Medical Imaging - Image-Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 10951, p. 109510L (2019). (Oral) [\[DOI\]](#)
7. **Z Baum**, T Ungi, A Lasso, B Church, C Schlenger, G Fichtinger. "Ultrasound-based vertebral landmark localization using deformable spine models," 16th Annual Imaging Network of Ontario Symposium (2018). (Poster)
8. R Hisey, T Ungi, M Holden, **Z Baum**, Z Keri, C McCallum, D Howes, G Fichtinger. "Assessment of the use of webcam-based workflow detection for providing real-time feedback in central venous catheterization training," 16th Annual Imaging Network of Ontario Symposium (2018). (Poster)
9. C Pinter, B Travers, **Z Baum**, T Ungi, A Lasso, B Church, G Fichtinger. "Real-time transverse process delineation in tracked ultrasound for scoliosis measurement," 16th Annual Imaging Network of Ontario Symposium (2018). (Poster)
10. **Z Baum**, T Ungi, A Lasso, B Church, C Schlenger, G Fichtinger. "Visual aid for identifying vertebral landmarks in ultrasound," SPIE Medical Imaging - Image-Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 10576, p. 105760Z (2018). (Oral) [\[DOI\]](#)
11. R Hisey, T Ungi, M Holden, **Z Baum**, Z Keri, G Fichtinger. "Real-time workflow detection using webcam video for providing real-time feedback in central venous catheterization training," SPIE Medical Imaging - Image-Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 10576, p. 1057620 (2018). (Poster – Honourable Mention Award) [\[DOI\]](#)



12. C Pinter, B Travers, **Z Baum**, S Kamali, T Ungi, A Lasso, B Church, G Fichtinger. "Real-time transverse process detection in ultrasound" SPIE Medical Imaging - Image-Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 10576, p. 105760Y (2018). (Oral) [[DOI](#)]
13. **Z Baum**, T Ungi, A Lasso, G Fichtinger. "Real-time, tracked, mobile augmented reality display for surgical navigation: usability study on simulated patients," 9th National Image-Guided Therapy Workshop (2017). (Poster)
14. **Z Baum**, T Ungi, A Lasso, G Fichtinger. "Evaluation of a mobile, real-time, tracked augmented reality display for surgical navigation," 15th Annual Imaging Network of Ontario Symposium (2017). (Oral)
15. A Ilina, A Lasso, M Jolley, B Wohler, A Nguyen, A Scanlan, **Z Baum**, F McGowan, G Fichtinger. "Creating patient-specific anatomical models from highly elastic materials using 3D-printed molds," 15th Annual Imaging Network of Ontario Symposium (2017). (Poster)
16. E Bibic, **Z Baum**, V Harish, T Ungi, A Lasso, G Fichtinger. "PLUS Model Catalog: A library of 3D-printed medical tools," 15th Annual Imaging Network of Ontario Symposium (2017). (Poster)
17. G Underwood, T Ungi, **Z Baum**, A Lasso, G Kronreif, G Fichtinger. "Registration of preoperative images for navigated brain surgery using ultrasound-accessible skull regions," 15th Annual Imaging Network of Ontario Symposium (2017). (Oral)
18. V Harish, E Bibic, A Lasso, M Holden, T Vaughan, **Z Baum**, T Ungi, G Fichtinger. "An application of redundant sensors for intraoperative electromagnetic tracking error monitoring," 15th Annual Imaging Network of Ontario Symposium (2017). (Oral)
19. **Z Baum**, T Ungi, A Lasso, G Fichtinger. "Usability of a real-time tracked augmented reality display system in musculoskeletal injections," SPIE Medical Imaging - Image-Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 10135, p. 101352T (2017). (Poster) [[DOI](#)]
20. A Ilina, A Lasso, M Jolley, B Wohler, A Nguyen, A Scanlan, **Z Baum**, F McGowan, G Fichtinger. "Patient-specific pediatric silicone heart valve models based on ultrasound," SPIE Medical Imaging - Image-Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 10135, p. 1013516 (2017). (Oral) [[DOI](#)]
21. G Underwood, T Ungi, **Z Baum**, A Lasso, G Kronreif, G Fichtinger. "Skull registration for prone patient position using tracked ultrasound," SPIE Medical Imaging - Image-Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 10135, p. 1013522 (2017). (Poster) [[DOI](#)]
22. R House, V Harish, A Lasso, **Z Baum**, G Fichtinger. "Evaluation of the Intel RealSense SR300 camera for image-guided interventions and application in vertebral level localization," SPIE Medical Imaging - Image-Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 10135, p. 101352Z (2017). (Poster) [[DOI](#)]
23. V Harish, E Bibic, A Lasso, M S Holden, T Vaughan, **Z Baum**, T Ungi, G Fichtinger. "Monitoring electromagnetic tracking error using redundant sensors," SPIE Medical Imaging - Image-Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 10135, p. 101352R (2017). (Poster) [[DOI](#)]
24. **Z Baum**, A Lasso, T Ungi, G Fichtinger. "Usability of augmented reality displays for musculoskeletal surgical navigation," Canadian Undergraduate Conference on Healthcare (2016). (Poster)
25. **Z Baum**, A Lasso, T Ungi, G Fichtinger. "Real-time self-calibration of a handheld augmented reality overlay system," 14th Annual Imaging Network Ontario Symposium (2016). (Poster)
26. V Harish, A Baksh, T Ungi, A Lasso, **Z Baum**, G Gauvin, C Engel, J Rudan, G Fichtinger. "Monitoring electromagnetic tracking error in computer-navigated breast cancer surgery," 14th Annual Imaging Network Ontario Symposium (2016). (Oral)
27. **Z Baum**, A Lasso, T Ungi, G Fichtinger. "Augmented reality overlay system for computer-guided needle insertion procedures," 10th Annual Inquiry @ Queen's Undergraduate Research Conference. Queen's University (2016). (Oral)
28. **Z Baum**, A Lasso, T Ungi, G Fichtinger. "Real-time self-calibration of a tracked augmented reality display," SPIE Medical Imaging - Image-Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 9786, p. 97860F (2016). (Oral) [[DOI](#)]
29. V Harish, A Baksh, T Ungi, A Lasso, **Z Baum**, G Gauvin, C Engel, J Rudan, G Fichtinger. "Measurement of electromagnetic tracking error in a navigated breast surgery setup," SPIE Medical Imaging - Image Guided Procedures, Robotic Interventions, and Modeling. International Society for Optics and Photonics, Vol. 9786, p. 97862K (2016). (Poster) [[DOI](#)]

## Theses

1. **Z Baum**. “Augmented reality training platform for placement of neurosurgical burr holes,” Master’s thesis, Queen’s University (2019). [[URI](#)]

### Academic Workshops

1. **Z Baum\***, V Harish\*. “3D Slicer: Hands on Introduction to Medical Image Visualization,” IEEE EMBS International Student Conference (2016).

### STEM Outreach Workshops

1. **Z Baum\***, H Lia\*, E Rae\*, G Underwood\*. “Translational Clinical Engineering at the Laboratory for Percutaneous Surgery,” Youth Outreach Event Workshop – The Canadian Medical Hall of Fame Discovery Day in Health Sciences at Queen’s University (2018).
2. **Z Baum\***, H Lia\*, G Underwood\*. “Translational Clinical Engineering at the Laboratory for Percutaneous Surgery,” Youth Outreach Event Workshop – The Canadian Medical Hall of Fame Discovery Day in Health Sciences at Queen’s University (2017).
3. **Z Baum\***, V Harish\*. “Translational Clinical Engineering at the Laboratory for Percutaneous Surgery,” Youth Outreach Event Workshop – The Canadian Medical Hall of Fame Discovery Day in Health Sciences at Queen’s University (2016).

### Other Presentations

1. **Z Baum**. “Mobile image overlay system for surgical navigation,” 5th Annual Bruce Visiting Scholar in Surgical Innovation Lectureship – Trainee Seminar, Queen’s University (2017).
2. **Z Baum**. “Design, development, and evaluation of a real-time tracked augmented reality display system for surgical navigation,” Sunnybrook Research Prize, Sunnybrook Research Institute (2016).

## MEMBERSHIPS

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IEEE EMBS – The IEEE Engineering in Medicine and Biology Society <b>Student Member</b>	<b>2016 -</b>
IEEE – The Institute of Electrical and Electronics Engineers <b>Student Member</b>	<b>2016 -</b>
SPIE – The International Society for Optics and Photonics <b>Student Member</b>	<b>2015 –</b>

## SELECT ATHLETIC HONOURS & AWARDS

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Sail Canada / Voile Canada

**Helly Hansen Sailor of the Month**

**Nov. 2017, Mar. 2018**

Queen's University Athletics and Recreation

**Jack Jarvis Trophy**

**Mar. 2018**

Awarded annually to a Varsity Club male student-athlete in his 4th or 5th year who best displays qualities of scholastic achievement, competitiveness, leadership, sportsmanship, dedication and exceptional contributions to his team.

Queen's University Athletics and Recreation

**Queen's Sailing Team Most Valuable Player**

**Mar. 2018**

Canadian Intercollegiate Sailing Association (CICSA)

**Landon Gardner Volunteer of the Year Award**

**Nov. 2017**

Canadian Intercollegiate Sailing Association (CICSA)

**Male Skipper of the Year Award**

**Nov. 2017**

Queen's Sailing Team

**Nathan Cohen Memorial Trophy**

**Nov. 2017**

Canadian Intercollegiate Sailing Association (CICSA)

**1st Place - Team Racing National Championship**

**2013, 2014, 2016, 2017**

North American Intercollegiate Sailing Association (ICSA)

**1st Place – Canadian American Cup**

**2014, 2015, 2016, 2017**

Queen's University Athletics and Recreation

**Varsity Clubs Male Athlete of the Week**

**24/10/2016, 11/9/2017**

CORK / Sail Kingston

**1st Place - Olsen 30 North American Championship**

**Jul. 2017**