Peter Q. Lee, PhD

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Google Scholar | Github | LinkedIn | Website

Interests: Computer vision, robotics, control systems, remote sensing

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Education

Doctor of Philosophy (PhD) – Systems Design Engineering

University of Waterloo, Waterloo, ON ---------- September 2020 - August 2024

- $105 000 NSERC Alexander Graham Bell Canada Graduate Scholarship - Doctoral
- $120 000 Engineering Excellence Fellowship
- 95.6 Cumulative GPA
- Supervisors: Katja Mombaur; John Zelek

Human-Centered Robotics and Machine Intelligence / Vision and Image Processing Lab

- Thesis: "Autonomous Robotic System Conducting Nasopharyngeal Swabbing"
    - Designed end-effector for Frank Emika robot with force sensitivity and electromagnet to effectively wield swabs.
    - Formulated dynamic FEM beam simulation to determine optimal swab insertion paths through nasal cavity.
    - Visual servo system places and orients swab in front of nose using deep-learning computer vision models.
    - Implemented admittance control law to insert swabs from nostril to nasopharynx on phantoms.
- "Buzz-wire" task with REEM-C humanoid robot
- Undergraduate student supervision:
    - Saad Hossain: Human face and emotion recognition May 2021- August 2021
    - Kosti Vashchenko: Gesture recognition May 2022 - August 2022

Master of Applied Science – Systems Design Engineering

University of Waterloo, Waterloo, ON ---------- September 2018 – August 2020

- 93 Cumulative GPA
- $17 500 NSERC CGSM Alexander Graham Bell Canada Graduate Scholarship
- $50 000 Engineering Excellence Fellowship
- Supervisors: David Clausi; Linlin Xu

Vision and Image Processing Lab - Focus: Remote sensing

- Thesis: “Correction Methods for Non-Stationary Noise Floor in Sentinel-1 Images Using Convex Optimization “
- Fully convolutional networks for synthetic aperture radar for sea-ice segmentation
- Beluga whale detection in aerial images.
- Intramuscular and intermuscular adipose tissue segmentation in water and fat suppressed magnetic resonance images.

Bachelor of Computer Science – with Co-operative Education program, Honours, Minor in Mathematics
First Class Honours and University Medal in Computer Science

Dalhousie University, Halifax, NS ---------- September 2014 – August 2018

- Honours Thesis: “Recurrent Convolutional Networks for Prostate Cancer Segmentation in MRI: DCE time series or Ktrans?” - Supervised by Thomas Trappenberg
- 4.24 /4.30 Cumulative GPA.
- $16 000 - Dalhousie Entrance Renewable Scholarship.
- $2 500 - The Bruce and Dorothy Rossetti Scholarship Gold Award for a Third Year Student.
- University medal in Computer Science for 2018/2019 (Top graduating CS honours student).

Publications

- **Lee P. Q.,** Zelek J., Mombaur K. "Complete Autonomous Swab System with Evaluation on a Stochastically Moving Phantom Platform". Under review in IEEE Transactions on Robotics. Submitted Aug. 2024 - **`Paper`**
- **Lee P. Q.,** Zelek J., Mombaur K. "Robotic Eye-in-hand Visual Servo Axially Aligning Nasopharyngeal Swabs with the Nasal Cavity". Under review in IEEE Transactions on Medical Robotics and Bionics. Submitted Aug. 2024 - **`Paper`**

- **Lee P. Q.,** Zelek J., Mombaur K. "Collaborative robot arm inserting Nasopharyngeal swabs with Admittance Control". Under review in Scientific Reports. Submitted Nov. 2023 - **`Paper`**
- **Lee P. Q.,** Zelek J., Mombaur K. "Simulating and Optimizing Nasopharyngeal Swab Insertion Paths for use in Robotics". 9th IEEE RAS/EMBS International Conference for Biomedical Robotics and Biomechatronics (BioRob). Aug. 2022 - **`Oral presentation`**
- **Lee P. Q.,** Rajendran V., Mombaur K. "Optimization-Based Motion Generation for Buzzwire Tasks With the REEM-C Humanoid Robot". Frontiers In Robotics and AI. June 2022 - **`Paper`**
- **Lee P. Q.,** Xu L., Clausi D. A. "Estimating Noise Floor in Sentinel-1 Images with Linear Programming and Least Squares". IEEE Transactions in Geoscience and Remote Sensing. 2022. - **`Paper`**
- **Lee P. Q.**, Radhakrishnan K., Clausi D. A., Scott K. A., Xu L., Marcoux M. "Beluga Whale Detection in the Cumberland Sound Bay using Convolutional Neural Networks". Canadian Journal of Remote Sensing. Mar. 2021. - **`Paper`**
- **Lee P. Q.,** Xu L., Clausi D. A. "Recalibrating Sentinel-1 Additive Noise-Gain with Linear Programming". IEEE International Geoscience and Remote Sensing Symposium. Sept. 2020. – **`Oral presentation`**
- **Lee P. Q.**, Xu L., Clausi D. A. "Sentinel-1 Additive Noise Removal from Cross-Polarization Extra-Wide TOPSAR with Dynamic Least Squares". Remote Sensing of Environment. Oct. 2020 - **`Paper`**
- **Lee P. Q.**, Xu L., Clausi D.A. "Methodologies for Sea-ice Segmentation using Fully Convolutional Network". 40th Canadian Symposium on Remote Sensing & Geomatics Atlantic. Fredericton, New Brunswick. June 2019. - **`Oral presentation`**
- Radhakrishnan K., **Lee P. Q.**, Sankar V., Scott K.A., Clausi D.A., Xu L. "Automated Whale Detection from Airborne Optical Imagery along Eastern Canadian Arctic". 40th Canadian Symposium on Remote Sensing & Geomatics Atlantic. Fredericton, New Brunswick. June 2019. - **`Poster presentation`**
    - Won best student poster award
- **Lee P. Q.**, Guida A., Patterson S., Trappenberg T., Bowen C. V., Beyea S. D., Merrimen J., Wang C., Clarke S. E. "Model-free prostate cancer segmentation from dynamic contrast-enhanced MRI with recurrent convolutional networks: A feasibility study". Computerized Medical Imaging and Graphics. May 2019. - **`Paper`**
- Hoar D., Lee P.Q., Guida A., Patterson S., Bowen C. V., Merrimen J., Wang C. "Combined transfer learning and test-time augmentation improves convolutional neural network-based semantic segmentation of prostate cancer from multi-parametric MR images" Computer Methods and Programs in Biomedicine. Oct 2021. - **`Paper`**
- Guida A., Hoar D., **Lee P. Q.**, Patterson S., Clarke, S., Bowen C. V. "Systems and Methods for Generating Cancer Predictions Maps from Multiparametric Magnetic Resonance Images using Deep Learning". U.S. Patent Application No. 62/783,734, filed December 21, 2018. Patent Pending. - **`Patent`**

- **Lee P. Q.**, Patterson S., Bowen C. V., Beyea S. D., Rioux J., Merrimen J., Wang C., Clarke S. E. "Identifying Prostate Cancer with MRI and Machine Learning" at Dalhousie Radiology Research Day. Halifax, Nova Scotia. May 2017. - **`Oral presentation`**

Employment

Teaching Assistant for SYDE 575 (Image processing, Waterloo) - 2019, 2020, 2021, 2022, 2023

- Marking of labs & exams
- Prepared tutorials & supervised labs
    - Communicated concepts and assisted in answering questions from students
    - Deep learning end of term lecture

Research Assistant at BIOTIC. ---------- January 2017 – August 2018

- Applying machine learning methods with libraries in Python to segment prostate cancer in MR biomedical images.
- Constructing and tuning recurrent and convolutional deep-learning models.
- Manipulating and interpolating biomedical digital images in DICOM and binary formats.
- Experience setting up and conducting hypothesis driven experiments.

Marker for CSCI 2132 (Software development, Dalhousie) ----------January – April 2018

- Marked assignments based on Unix, C programs, and software development practices.
- Coordinated with other TAs to mark assignments, midterms, and exams.
- Handled mark appeals from students.

Learning Center Teaching Assistant ---------- September - December 2016

- Communicated with students to solve issues with computer science related homework and studying.

Research Assistant at Social Navigator Inc.----------May – August 2016

- Recipient of $4 500 NSERC IUSRA grant.
- Used Python and C along with SQL based databases to parse and collect datasets from Twitter.
- Experimented with machine learning techniques, including Neural Networks and Support Vector Machines.

Other

Volunteering

- CanAge non-profit organization (https://www.canage.ca)--------- May 2020 - Dec 2020
    - Webmaster, system admin, technical support
- Conference on Vision and Intelligent Systems (CVIS) ---------- 2020
    - Organizing committee

Participated in a number of ACM/ICPC programming team competitions.

- Atlantic Canadian Preliminary Contest: Acadia University, 2015; University of Cape Breton, 2016; University of New Brunswick, 2017 (First place).
- Northeast North America Regional Contest, 2017 (Sixth place).