

ROBERT AMELARD PHD

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PERSONAL

Robert Amelard, PhD

NSERC Postdoctoral Fellow

Research Scientist, Schlegel-UW Research Institute for Aging

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Adjunct Research Professor

Western University, Department of Biophysics

Schulich School of Medicine and Dentistry

1151 Richmond St, London, Ontario, Canada, N6A 3K7

EDUCATION AND RESEARCH POSITIONS

Adjunct Research Professor

Sep 2018–Present

WESTERN UNIVERSITY London, ON

Focus: Biophotonic technologies for assessing brain health in critical care.

Research Scientist and NSERC Postdoctoral Fellow

Sep 2017–Present

SCHLEGEL-UW RESEARCH INSTITUTE FOR AGING Waterloo, ON

Focus: Integrative cardiovascular biosensors and physiological modeling for assessing cardiovascular function.

Keywords: cardiovascular biosensors, computer vision, machine learning, balance control, microgravity simulation

Visiting Researcher

Aug 2016, Feb 2017, Jul 2018

UNIVERSITY OF CALIFORNIA IRVINE Irvine, CA

Focus: Computational biophotonics, computer vision and image processing for advanced breast cancer assessment.

Visiting Researcher

Sep 2017

UNIVERSITY OF ALBERTA Edmonton, AB

Focus: Biophotonics for ischemic stroke prescreening and prevention.

Doctor of Philosophy (Ph.D.) **Alumni Gold Medal**

2013–2017

UNIVERSITY OF WATERLOO (SYSTEMS DESIGN ENGINEERING) Waterloo, ON

Thesis: Widefield computational biophotonic imaging for spatiotemporal cardiovascular hemodynamic monitoring

Keywords: computational biophotonics, statistical modeling, biomedical image/signal processing, medical device design, machine learning

Nominated for Millennium Technology Prize, Technology Academy Finland

Master of Applied Science (M.A.Sc.)

2011–2013

UNIVERSITY OF WATERLOO (SYSTEMS DESIGN ENGINEERING) Waterloo, ON

Thesis: High-level intuitive features (HLIFs) for melanoma detection

Keywords: machine learning, statistical classification, feature extraction, biomedical image processing

Bachelor of Software Engineering (B.S.E.) with distinction

2006–2011

UNIVERSITY OF WATERLOO (SOFTWARE ENGINEERING) Waterloo, ON

Keywords: multi-tiered software systems, client/server systems, distributed systems, human-computer interaction, augmented reality

RESEARCH AND SCHOLARSHIP

PRIMARY RESEARCH INTERESTS

- Physiological monitoring | Computational biophotonics | Cardiovascular biosensors
- Computer vision | Image and signal processing | Machine learning
- Cerebrovascular and cardiovascular physiology | Neuromuscular biomechanics

AWARDS/HONOURS

Alumni Gold Medal	University of Waterloo	most outstanding doctoral academic achievement	2017
NSERC Postdoctoral Fellowship	NSERC	ranked 6/94	2017-2019
Best Imaging Paper Award	Conference on Computer Vision and Imaging Systems		2017
Newport Research Excellence Award	SPIE/Newport		2017
Carl Pollock Postgraduate Fellowship	University of Waterloo		2017
Computational Biophotonics Research Fellowship	University of California Irvine		2016
Innovator's Den Runner-Up	RIA		2016
3 Minute Thesis Department Heat Runner-Up	University of Waterloo		2016
Graduate Award in Technology and Aging	AGE-WELL Network of Centres of Excellence		2015-2017
Accelerate Graduate Research Award	Mitacs		2014
Alexander Graham Bell Canadian Graduate Scholarship-Doctoral	NSERC		2013-2016
President's Graduate Scholarship	University of Waterloo		2013-2016
Faculty of Engineering Graduate Scholarship	University of Waterloo		2013
Special Graduate Scholarship	University of Waterloo		2013
Best Presentation-Graduate Research Symposium	University of Waterloo		2013
Sandford Fleming Foundation Teaching Assistantship Excellence	University of Waterloo		2012
Alexander Graham Bell Canadian Graduate Scholarship-Master's	NSERC		2011-2012
President's Graduate Scholarship	University of Waterloo		2011-2012
Best Demonstration-Capstone Design Symposium	QUALCOMM		2011

*RIA-Schlegel-UW Research Institute for Aging | SPIE-International Society for Optics and Photonics | NSERC-Natural Sciences and Engineering Research Council of Canada

Where applicable, these honours have been highlighted with the associated entry below.

PUBLICATIONS

My research straddles the fields of biomedical engineering and health sciences. I have published my biomedical engineering research primarily in top-tier biomedical optics and biomedical engineering journals: Biomedical Optics Express ($IF_5=3.5$, $h_5=50$), J. Biomedical Optics ($IF_5=2.7$, $h_5=48$), and IEEE Transactions on Biomedical Engineering ($IF_5=3.4$, $h_5=64$). I have published my cardiovascular physiology discovery papers in top-tier physiology journals or multidisciplinary journals: Journal of Applied Physiology ($IF_5=3.5$, $h_5=54$), Scientific Reports ($IF_5=4.8$, $h_5=131$).

Journal Manuscripts In Preparation/Submitted (2)

- [1] **R. Amelard**, K. R. Murray, E. T. Hedge, T. W. Cleworth, M. Noguchi, A. C. Laing, and R. L. Hughson, "Assessing postural instability during cerebral hypoperfusion using sub-millimeter monocular 3D sway tracking," *IEEE Transactions on Neural Systems and Rehabilitation Engineering* (2019). Submitted (TNSRE-2019-00401). arXiv:1907.05376
- [2] **R. Amelard**, J. H. Lam, B. Hill, A. Durkin, K. Cutler, and B. J. Tromberg, "Rigid body motion estimation for generating dense optical property maps from non-gridded diffuse optical spectroscopic imaging," *IEEE Transactions on Biomedical Engineering* (2019). Submitted (TBME-01472-2019)

Journal Publications Published/Accepted (10)

- [J1] K. J. Pfisterer, **R. Amelard**, A. G. Chung, and A. Wong, “A new take on measuring relative nutritional density: The feasibility of using a deep neural network to assess commercially-prepared puréed food concentrations,” *Journal of Food Engineering* **223**, 220–235 (2018). arXiv:1707.07312
- [J2] T. Beltrame, **R. Amelard**, A. Wong, and R. L. Hughson, “Extracting aerobic system dynamics during unsupervised activities of daily living using wearable sensor machine learning models,” *Journal of Applied Physiology* **124**(2), 473–481 (2018)
- [J3] T. Beltrame, **R. Amelard**, A. Wong, and R. Hughson, “Prediction of oxygen uptake dynamics by machine learning analysis of wearable sensors during activities of daily living,” *Scientific Reports* **7**, 45738 (2017)
- [J4] **R. Amelard**, R. L. Hughson, D. K. Greaves, K. J. Pfisterer, J. Leung, D. A. Clausi, and A. Wong, “Non-contact hemodynamic imaging reveals the jugular venous pulse waveform,” *Scientific Reports* **7**, 40150 (2017). arXiv:1604.05213
- [J5] **R. Amelard**, D. A. Clausi, and A. Wong, “Spatial probabilistic pulsatility model for enhancing photoplethysmographic imaging systems,” *Journal of Biomedical Optics* **21**(11), 116010 (2016). arXiv:1606.09118
- [J6] T. Beltrame, **R. Amelard**, R. Villar, M. J. Shafiee, A. Wong, and R. L. Hughson, “Estimating oxygen uptake and energy expenditure during treadmill walking by neural network analysis of easy-to-obtain inputs,” *Journal of Applied Physiology* **121**(5), 1226–1233 (2016)
- [J7] **R. Amelard**, D. A. Clausi, and A. Wong, “Spectral-spatial fusion model for robust blood pulse waveform extraction in photoplethysmographic imaging,” *Biomedical Optics Express* **7**(12), 4874–4885 (2016)
- [J8] **R. Amelard**, C. Scharfenberger, F. Kazemzadeh, K. J. Pfisterer, B. S. Lin, D. A. Clausi, and A. Wong, “Feasibility of long-distance heart rate monitoring using transmittance photoplethysmographic imaging (PPGI),” *Scientific Reports* **5**, 14637 (2015). arXiv:1503.06775 **Altmetric: 160 (top 5%)**
- [J9] **R. Amelard**, J. Glaister, A. Wong, and D. A. Clausi, “High-level intuitive features (HLIFs) for intuitive skin lesion description,” *IEEE Transactions on Biomedical Engineering* **62**(3), 820–831 (2015)
- [J10] J. Glaister, **R. Amelard**, A. Wong, and D. A. Clausi, “MSIM: Multistage illumination modeling of dermatological photographs for illumination-corrected skin lesion analysis,” *IEEE Transactions on Biomedical Engineering* **60**(7), 1873–1883 (2013)

Refereed Conference Publications (30)

- [C1] J. S. Au, **R. Amelard**, B. Y. Yiu, H. Nahas, R. L. Hughson, and A. C. H. Yu, “A femoral stealing effect: Presence of collateral retrograde blood flow redistribution in the femoral bifurcation during reactive hyperemia,” *ARTERY19 Scientific Meeting*, Hungary, Budapest (2019)
- [C2] K. J. Pfisterer, **R. Amelard**, B. Syrnyk, and A. Wong, “Towards computer vision powered color-nutrient assessment of pureed food,” in *Proc. IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Women in Computer Vision Workshop*, Long Beach, USA (2019). arXiv:1905.00310
- [C3] K. Pfisterer, **R. Amelard**, and A. Wong, “Intuitive data-driven visualization of food relatedness via t-distributed stochastic neighbor embedding,” in *Proc. Conference on Computational Vision and Imaging Systems*, **4**(1) (2018) **Best Poster Award**
- [C4] **R. Amelard**, K. J. Pfisterer, S. Jagani, D. A. Clausi, and A. Wong, “Non-contact assessment of obstructive sleep apnea cardiovascular biomarkers using photoplethysmography imaging,” in *Optical Diagnostics and Sensing XVIII: Toward Point-of-Care Diagnostics, Proc. SPIE*, San Francisco, USA (2018)
- [C5] K. J. Pfisterer, **R. Amelard**, and A. Wong, “Differential color space analysis for investigating nutrient content in a pureed food dilution-flavor matrix: a step toward objective malnutrition risk assessment,” in *Optical Diagnostics and Sensing XVIII: Toward Point-of-Care Diagnostics, Proc. SPIE*, San Francisco, USA (2018)

- [C6] M. Y. Tran, **R. Amelard**, and A. Wong, “Integrating multispectral hemodynamic imaging for bulk tissue oxygenation analysis,” in *Proc. Conference on Computational Vision and Imaging Systems*, **3**(1) (2017) **Best Imaging Paper Award**
- [C7] A. MacLean, K. Pfisterer, **R. Amelard**, A. G. Chung, D. Kumar, and A. Wong, “Goldilocks and the three parameters: empirically finding the “just right” for segmenting food images for the AFINI-T system,” *Proc. Conference on Computational Vision and Imaging Systems* **3**(1) (2017)
- [C8] **R. Amelard**, R. L. Hughson, D. A. Clausi, and A. Wong, “Non-contact arrhythmia assessment in natural settings: a step toward preventive cardiac care,” in *Diagnostic and Therapeutic Applications of Light in Cardiology*, *Proc. SPIE* **10042**, 1004205, San Francisco, USA (2017)
- [C9] **R. Amelard**, R. L. Hughson, D. K. Greaves, D. A. Clausi, and A. Wong, “Assessing photoplethysmographic imaging performance beyond facial perfusion analysis,” in *Optical Diagnostics and Sensing XVII*, *Proc. SPIE*, 100720Q, San Francisco, USA (2017) **Student Paper Award**
- [C10] M. Wilson, **R. Amelard**, D. Clausi, and A. Wong, “Co-integrating thermal and hemodynamic imaging for physiological monitoring,” *Proc. Conference on Computational Vision and Imaging Systems* **2**(1), Waterloo, Canada (2016)
- [C11] B. Chwyl, **R. Amelard**, D. Clausi, and A. Wong, “A Bayesian multi-scale framework for photoplethysmogram imaging waveform processing,” in *Proc. Conference on Computational Vision and Imaging Systems*, **2**(1), Waterloo, Canada (2016)
- [C12] B. Chwyl, A. G. Chung, **R. Amelard**, J. Deglint, D. A. Clausi, and A. Wong, “SAPPHIRE: Stochastically acquired photoplethysmogram for heart rate inference in realistic environments,” in *Proc. IEEE International Conference on Image Processing*, 1230–1234 (2016)
- [C13] B. Chwyl, A. G. Chung, **R. Amelard**, J. Deglint, D. A. Clausi, and A. Wong, “Time-frequency domain analysis via pulselets for non-contact heart rate estimation from remotely acquired photoplethysmograms,” in *Proc. Conference on Computer and Robot Vision*, 201–207, Victoria, Canada (2016)
- [C14] **R. Amelard**, D. A. Clausi, and A. Wong, “Coded hemodynamic imaging for non-contact detection of abnormal blood pulse waveforms,” in *Proc. Imaging Network Ontario*, Toronto, Canada (2016)
- [C15] **R. Amelard**, D. A. Clausi, and A. Wong, “Spectral photoplethysmographic imaging sensor fusion for enhanced heart rate detection,” in *Proc. SPIE*, **9701**, 970113, San Francisco, USA (2016)
- [C16] **R. Amelard**, K. J. Pfisterer, D. A. Clausi, and A. Wong, “Non-contact hematoma damage and healing assessment using reflectance photoplethysmographic imaging,” in *Multimodal Biomedical Imaging XI*, *Proc. SPIE* **9701**, 970112, San Francisco, USA (2016)
- [C17] J. Deglint, A. G. Chung, B. Chwyl, **R. Amelard**, F. Kazemzadeh, X. Y. Wang, D. A. Clausi, and A. Wong, “Photoplethysmographic imaging via spectrally demultiplexed erythema fluctuation analysis for remote heart rate monitoring,” in *Multimodal Biomedical Imaging XI*, *Proc. SPIE* **9701**, 970111, San Francisco, USA (2016)
- [C18] **R. Amelard**, J. Leung, D. A. Clausi, and A. Wong, “A portable plug-and-play imaging system for physiological monitoring,” in *Proc. Conference on Computational Vision and Imaging Systems*, **1**, Waterloo, Canada (2015)
- [C19] F. Kazemzadeh, C. Jin, M. Yu, **R. Amelard**, S. Haider, S. Saini, M. Emelko, D. A. Clausi, and A. Wong, “Multispectral digital holographic microscopy with applications in water quality assessment,” in *Novel Optical Systems Design and Optimization XVIII*, *Proc. SPIE* **9579**, 957906, San Diego, USA (2015)
- [C20] D. S. Cho, S. Haider, **R. Amelard**, A. Wong, and D. A. Clausi, “Quantitative features for computer-aided melanoma classification using spatial heterogeneity of eumelanin and pheomelanin concentrations,” in *Proc. IEEE International Symposium on Biomedical Imaging*, 59–62, New York, USA (2015)
- [C21] **R. Amelard**, C. Scharfenberger, A. Wong, and D. A. Clausi, “Illumination-compensated non-contact imaging photoplethysmography via dual-mode temporally-coded illumination,” in *Multimodal Biomedical Imaging X*, *Proc. SPIE* **9316**, 931607, San Francisco, USA (2015)

- [C22] **R. Amelard**, C. Scharfenberger, A. Wong, and D. A. Clausi, “Non-contact assessment of melanin distribution via multispectral temporal illumination coding,” in *Multimodal Biomedical Imaging X, Proc. SPIE* **9316**, 93160N, San Francisco, USA (2015)
- [C23] A. Chung, X. Y. Wang, **R. Amelard**, C. Scharfenberger, J. Leong, J. Kulinski, A. Wong, and D. A. Clausi, “High-resolution motion-compensated photoplethysmographic imaging for remote heart rate monitoring,” in *Multimodal Biomedical Imaging X, Proc. SPIE* **9316**, 93160A, San Francisco, USA (2015)
- [C24] D. S. Cho, S. Haider, **R. Amelard**, A. Wong, and D. Clausi, “Physiological characterization of skin lesion using non-linear random forest regression model,” in *Proc. Conference of the IEEE Engineering in Medicine and Biology Society*, 3349–3352, Chicago, USA (2014)
- [C25] S. Haider, D. Cho, **R. Amelard**, A. Wong, and D. A. Clausi, “Enhanced classification of malignant melanoma lesions via the integration of physiological features from dermatological photographs,” in *Proc. Conference of the IEEE Engineering in Medicine and Biology Society*, 6455–6458, Chicago, USA (2014)
- [C26] A. Wong, K. A. Scott, E. Li, and **R. Amelard**, “Continuous sea ice thickness estimation using a joint modis and amsr-e guided variational model,” in *Proc. IEEE International Geoscience and Remote Sensing Symposium*, 4106–4109, Melbourne, Australia (2013)
- [C27] **R. Amelard**, A. Wong, F. Li, and D. A. Clausi, “Unsupervised classification of sea-ice and water using synthetic aperture radar via an adaptive texture sparsification transform,” in *Proc. IEEE International Geoscience and Remote Sensing Symposium*, 3958–3961, Melbourne, Australia (2013)
- [C28] **R. Amelard**, A. Wong, and D. A. Clausi, “Unsupervised classification of agricultural land cover using polarimetric synthetic aperture radar via a sparse texture dictionary model,” in *Proc. IEEE International Geoscience and Remote Sensing Symposium*, 4383–4386, Melbourne, Australia (2013)
- [C29] **R. Amelard**, A. Wong, and D. A. Clausi, “Extracting morphological high-level intuitive features (HLIF) for enhancing skin lesion classification,” in *Proc. Conference of IEEE Engineering in Medicine and Biology Society*, 4458–4461, San Diego, USA (2012)
- [C30] **R. Amelard**, A. Wong, and D. A. Clausi, “Extracting high-level intuitive features (HLIF) for classifying skin lesions using standard camera images,” in *Proc. Conference on Computer and Robot Vision*, 396–403, Toronto, Canada (2012)

Patents (2)

- [P1] **R. A. Amelard** and A. S. L. Wong, “System and method for spatial cardiovascular monitoring,” *U.S. Patent 62/270409 Patent Pending* (Dec 21 2016)
Also filed as: Canada Patent 2,952,485
- [P2] G. Valsan, S. Z. Mahmoodabadi, R. B. Wagner, D. Priest, and **R. Amelard**, “Multispectral medical imaging devices and methods thereof,” *US Patent 14/341103 Issued* (Jul 25 2014)
Also issued as: Europe Patent EP2977003, Japan Patent JP2016030214, China Patent CN105286785, Hong Kong Patent HK1215142

Books (1)

- [B1] A. Wong, J. R. Wallace, E. A. Lee, X. Wang, V. Cheung, A. Kumar, **R. Amelard**, and I. Ivkovic, *Data Structures and Algorithms in a Nutshell*, University of Waterloo (2015)

Book Chapters (2)

- [BC1] **R. Amelard** and A. Wong, “Hemodynamic imaging,” in *Encyclopedia of Biomedical Engineering*, R. Narayan, Ed., 545–550, Elsevier, 1st ed. (2018)
- [BC2] **R. Amelard**, J. Glaister, A. Wong, and D. A. Clausi, “Melanoma decision support using lighting-corrected intuitive feature models,” in *Computer Vision Techniques for the Diagnosis of Skin Cancer*, J. Scharcanski and M. E. Celebi, Eds., *Series in BioEngineering*, 192–219, Springer, Heidelberg (2013)

Theses (2)

- [T1] **R. Amelard**, “Widefield Computational Biophotonic Imaging for Spatiotemporal Cardiovascular Hemodynamic Monitoring,” *PhD Thesis, University of Waterloo* (2017). <http://hdl.handle.net/10012/12066>
- [T2] **R. Amelard**, “High-Level Intuitive Features (HLIFs) for Melanoma Detection,” *Master’s Thesis, University of Waterloo* (2013). <http://hdl.handle.net/10012/7761>

Industry R&D Publications (3)

- [I1] **R. Amelard**, “Feasibility assessment of non-invasive heart rate monitoring system for clinical use.” for Hill-Rom Inc. (2016)
- [I2] **R. Amelard**, “A real-time multispectral melanin compensation algorithm for tissue oxygen imaging.” for Christie Medical Holdings (2013)
- [I3] **R. Amelard**, C. Scharfenberger, A. Wong, and D. A. Clausi, “An image processing system for determining parcel dimensions.” for Rogue Specialty Transportation (2013)

PRESENTATIONS

I have delivered 34 presentations in 3 countries (Canada, USA, Australia), including 4 invited seminar talks, and have received 3 honours.

Invited Seminar Talks

- [P1] “Detecting atrial fibrillation in blood pulse signals using generated datasets.” Machine Learning Research Group Seminar (University of Guelph, Guelph, Aug 2018)
- [P2] “Co-integrating biophotonics, wearable sensors, signal processing and artificial intelligence for assessing age-related biomarkers.” Laser Microbeam and Medical Program Seminar (University of California Irvine, Irvine, Jul 2018)
- [P3] “Assessing widefield hemodynamic pulsatility using computational biophotonic imaging: a co-integration of biomedical optics, electronic control, image processing and machine learning.” Alberta Machine Intelligence Institute Seminar (University of Alberta, Edmonton, Sep 2017)
- [P4] “Non-contact hemodynamic monitoring.” Laser Microbeam and Medical Program Seminar (University of California Irvine, Irvine, Aug 2016)

Academic Presentations

- [P5] “Non-contact biophotonic assessment of changes in central venous pressure using photoplethysmographic imaging.” Optical Diagnostics and Sensing XIX (SPIE Photonics West, San Francisco, Jan 2019)
- [P6] “Coded Hemodynamic Imaging: an infrared eye into the body.” Cerebral Hypoperfusion Summit (Schlegel-UW Research Institute for Aging, Waterloo, Apr 2018)
- [P7] “Engineering meets cardiovascular physiology: Non-contact blood pulse imaging for new ways of monitoring cardiovascular health.” Research Seminar (Schlegel-UW Research Institute for Aging, Waterloo, Feb 2018)
- [P8] “Non-contact assessment of obstructive sleep apnea cardiovascular biomarkers using photoplethysmography imaging.” Optical Diagnostics and Sensing XVIII (SPIE Photonics West, San Francisco, Jan 2018)
- [P9] “Non-contact arrhythmia assessment in natural settings: a step toward preventive cardiac care.” Diagnostic and Therapeutic Applications of Light in Cardiology (SPIE Photonics West, San Francisco, Jan 2017)
- [P10] “Assessing photoplethysmographic imaging performance beyond facial perfusion analysis.” Optical Diagnostics and Sensing XVII (SPIE Photonics West, San Francisco, Jan 2017)

- [P11] “Photoplethysmographic imaging for non-contact blood pulse detection.” Systems Design Engineering Seminar (University of Waterloo, Waterloo, Sep 2015)
- [P12] “Intelligent clinical decision support system for melanoma cancer management.” Agfa Healthcare (Waterloo, Jul 2015)
- [P13] “Illumination-compensated non-contact imaging photoplethysmography via dual-mode temporally-coded illumination.” Multimodal Biomedical Imaging X (SPIE Photonics West, San Francisco, Feb 2015)
- [P14] “Skin lesion classification system: image processing summary.” Agfa Healthcare (Waterloo, Apr 2014)
- [P15] “Unsupervised classification of agricultural land cover using SAR via a sparse texture dictionary model.” IEEE International Geoscience and Remote Sensing Symposium (Melbourne, Australia, Jul 2013)
- [P16] “Unsupervised classification of sea-ice using SAR via an adaptive texture sparsifying transform.” IEEE International Geoscience and Remote Sensing Symposium (Melbourne, Australia, Jul 2013)
- [P17] “Continuous sea ice thickness estimation using a joint MODIS/AMSR-E guided variational model.” IEEE International Geoscience and Remote Sensing Symposium (Melbourne, Australia, Jul 2013)
- [P18] “Importance of intuitive features in clinical decision support systems.” University of Waterloo Research Symposium (Waterloo, Mar 2013) **Best Oral Presentation**
- [P19] “Progress on a clinical decision support system for detecting melanoma.” Agfa Healthcare (Waterloo, Sep 2012)
- [P20] “Perceptual structure distortion ratio: an image quality metric based on robust measures of complex phase order.” Conference on Computer and Robot Vision (Toronto, May 2012)
- [P21] “Extracting high-level intuitive features (hlf) for classifying skin lesions using standard camera images.” Conference on Computer and Robot Vision (Toronto, May 2012)
- [P22] “Extracting high-level intuitive features to enhance skin cancer detection.” Graduate Student Research Conference (Waterloo, Apr 2012)
- [P23] “A computational framework for recognizing handwritten matrices.” Symbolic Computation Research Seminar (Waterloo, Apr 2010)
- [P24] “A system for tracking and managing a managed assets program.” TD Asset Management (Toronto, Aug 2009)

Non-Academic Presentations

- [P25] “New technologies for health monitoring.” Lunch With Residents Research Seminar (Schlegel-UW Research Institute for Aging, Waterloo, Oct 2018)
- [P26] “How can a computer see your blood?.” Curiosity Fair (Schlegel-UW Research Institute for Aging, Waterloo, May 2018)
- [P27] “Blood flow imaging and demystifying academic research.” Biomedical Engineering Undergraduate Seminar (Waterloo, May 2017)
- [P28] “Improving quality of care through touchless vitals monitoring.” Innovator’s Den (Schlegel Villages Innovation Summit, Toronto, Jun 2016) **Runner-Up**
- [P29] “Revolutionizing baby monitoring with cutting-edge imaging research.” Velocity Fund Finals (Waterloo, Mar 2016)
- [P30] “Touchless vitals monitoring: pushing toward preventive healthcare.” 3 Minute Thesis Competition (Waterloo, Mar 2016) **Runner-Up, Department Heat**
- [P31] “Inventing an imaging system and how to get people excited about your research.” Vision and Image Processing Research Seminar (Waterloo, Feb 2016)

- [P32] “Graduate School—What I wish I knew in 3rd year.” Software Engineering Undergraduate Symposium (Waterloo, Oct 2015)
- [P33] “The cardiovascular system: a primer for biomedical engineering applications.” Vision and Image Processing Research Seminar (Waterloo, Jan 2014)
- [P34] “Making an academic poster.” Rockway Mennonite Collegiate (Kitchener, Jan 2013)

RESEARCH FUNDING

- Bed rest in older adults accelerates aging-like changes** 2019
Co-Applicant | Canadian Institutes of Health Research
\$200,000 CAD
- Coded hemodynamic imaging to advance astronaut health** 2018–2020
Co-Applicant | Canada Space Agency Flights and Fieldwork for the Advancement of Science and Technology
\$400,000 CAD
- MAchine Learning and Computer Vision to Enhance the Detection of STROke (MAE-STRO): Pilot and Feasibility Study** 2017–2019
Co-Applicant | Quality Improvement & Clinical Research Alberta Stroke Program
\$24,900 CAD
- Smart heart rate and breath rate monitoring framework using cameras** 2017
Co-Applicant | Hill-Rom Inc.
\$30,000 USD
- Advanced aging ResearCH (ARCH) to transform health and well-being of older adults** 2015
Collaborator | Canadian Foundation for Innovation
\$1,387,023 CAD
- A mixing model for inferring oxygen status from multispectral imaging** 2013
Collaborator | Mitacs
\$15,000 CAD

PUBLIC MEDIA ATTENTION

*My research received international public media attention following my 2015 Scientific Reports paper, including being featured on Discovery Channel’s **Daily Planet**, **OmniTV**, and various newspaper, radio, and online media outlets. Consequently, my article received 160 Altmetric social impact score, top 5% of all ranked journal publications.*

- Researcher Profile: Robert Amelard** Biotechnology and Bioengineering Conference Aug 2019
- Canadian scientists investigate effects of space travel on human body** The National Jul 2019
- The Americas’ most innovative universities for AI and robotics** Current Jan 2019
- Curiosity of the Ages on Display at RIA** RIA Research Highlights Jun 2018
- Smart clothing aims to predict failing health** Waterloo Stories May 2018
- Curiosity Fair unites inquisitive minds of all ages** The Record May 2018
- UW unveils new artificial intelligence lab [VIDEO]** CTV News Apr 2018
- Waterloo Launches AI Institute [VIDEO]** University of Waterloo Apr 2018
- Waterloo Artificial Intelligence Institute—A Message from the Co-Directors [VIDEO]** Apr 2018
- UWaterloo
- Impact of emerging technologies on healthcare** Cyber Psychology Aug 2016
- Cultivating and spreading innovation** Research Matters Jul 2016
- It takes a village: Lab Profile** LAB Business Magazine Feb 2016

- Preventing medical emergencies through vascular imaging** University of Waterloo's Feb 2016
Student Success Office Blog
- Getting under your skin: A video camera that tracks blood flow** Waterloo Stories Jan 2016
- New touchless device makes earlier detection of heart problems possible** Waterloo Jan 2016
News
- Featured on:* Discovery Channel's [The Daily Planet](#) and [OmniTV News](#).
- Selected appearances:* Yahoo! News, The Engineer, Science Daily, Phys.org, Gizmag, Sina, Exchange Magazine, Design Engineering, United Press International, International Business Times, Big News Network, NDTV, Seattle Bulletin, 570 news, Imprint Newspaper
- Translated to:* French, German, Russian, Chinese, Spanish, Arabic, Indonesian
- Building collaborative internships with a win-win mentality** AGE-WELL Blog Nov 2015

TEACHING

COURSE INSTRUCTOR

Teaching evaluation summary:



MTE 140 Data Structures and Algorithms University of Waterloo (117 students)	Jan–Apr 2019
MTE 140 Data Structures and Algorithms University of Waterloo (117 students)	Jan–Apr 2018

TEACHING ASSISTANTSHIPS

TA evaluation (mean,std)=(9.75,0.38) (out of 10, n=4 submitted)

BME 122 Data Structures and Algorithms 54 students (no evaluation submitted)	Jan–Apr 2017
BME 122 Data Structures and Algorithms 54 students (no evaluation submitted)	Jan–Apr 2016
BME 122 Data Structures and Algorithms 41 students, 10/10 evaluation	Jan–Apr 2015
SYDE 575 Image Processing 50 students, 9.2 evaluation	Sep–Dec 2014
MTE 140 Data Structures and Algorithms 142 students, 9.8/10 evaluation	May–Aug 2014
MTE 140 Data Structures and Algorithms 121 students (no evaluation submitted)	May–Aug 2012
SYDE 121 Digital Computation 97 students, 10/10 evaluation	Sep–Dec 2011

Sandford Fleming Foundation Teaching Assistantship Excellence Award

COURSE DEVELOPMENT

Data Structures and Algorithms in a Nutshell: MTE140/BME122 Course Textbook, A Wong, JR Wallace, EA Lee, X Wang, V Cheung, A Kumar, **R Amelard**, I Ivkovic, University of Waterloo, 2016.

GUEST LECTURES

Trees and Heaps MTE 140 Data Structures and Algorithms	Mar 2015
C++ Memory and Classes BME 122 Data Structures and Algorithms	Feb 2015
Colour Image Processing SYDE 575 Image Processing	Nov 2014
Scaling Software Systems using Data Structures and Algorithms MTE 140 Data Structures and Algorithms	Jul 2014
Pattern Recognition in Biomedical Applications SYDE 372 Pattern Recognition	Apr 2014
Insertions/Deletions in Linked and Array Lists MTE 140 Data Structures and Algorithms	Mar 2013

TEACHING CERTIFICATIONS

Certificate in Fundamentals of University Teaching Centre of Teaching Excellence May 2014
Course for developing teaching strategies, knowledge and skills. Consisted of 6 workshops, 3 microteaching session evaluations, and 2 full guest lectures evaluation.

SUPERVISORY ACTIVITIES

UNDERGRADUATE SUPERVISION

Hetal Dawda Mechatronics Engineering May 2019–Present
“3D stereoscopic imaging for jugular venous pulse assessment.”

Hannah Heigold Biomedical Engineering (NSERC USRA) May 2019–Present
“Biophotonic imaging for assessing intracranial pressure effects on brain blood flow.”

Braeden Syrnyk Mechatronics Engineering (NSERC USRA) May 2018–Apr 2019
“(1) Recurrent neural networks and dataset generation for arrhythmia detection.”
“(2) Deep semantic segmentation for food segmentation and nutrient estimation.”

Monica Hanna Biomedical Sciences Sep 2018–Dec 2018
“Design and development of tunable optical tissue phantom models for biophotonic calibration”

Lucille Huang Mechatronics Engineering Sep 2018–Dec 2018
“Integrating physiological data repositories for cardiovascular artificial intelligence modeling”

Alex Tobias Mechatronics Engineering Jan–Apr 2018
“Arrhythmia dataset generation and cleaning”

Francois Barnard Mechatronics Engineering Jan–Apr 2018
“Biomedical imaging calibration and tracking for cerebrovascular monitoring”

Milind Paliath Systems Design Engineering Jan–Apr 2018
“Medical device data extraction and integration with clinical patient monitors”

Yanyan Tran Biomedical Engineering May–Dec 2017
“Multispectral biophotonic imaging system design and development”

Alexander Maclean Biomedical Engineering May–Aug 2017
“RGB-D imaging analysis for widefield nutrient quantification at the plate level”

Mujtaba Tirmizi Mechatronics Engineering Jan–Apr 2017
“Multimodal physiological monitoring system development”

Jordan Guerten Biomedical Engineering Jan–Apr 2017
“Multispectral optical system development”

Shubh Jagani Systems Design Engineering Sep 2016–Apr 2017
“Non-intrusive sleep apnea detection using wavelet-based machine learning”

Mikaela MacMahon Biomedical Engineering Sep–Dec 2016
“Embedded thermal imaging calibration and integration”

Mackenzie Wilson Biomedical Engineering “Opto-electronic biomedical imaging system development”	Apr–Dec 2016
Jason Leung Biomedical Engineering “Development and manufacturing (3D print, machining) hardware for portable biomedical imaging”	May–Aug 2015, Sep–Dec 2017
Bill S. Lin Mechatronics Engineering (NSERC USRA) “Biomedical hemodynamic image analysis”	Sep 2014–Apr 2017
Audrey Chung Systems Design Engineering “Extracting heart rate from ambient smartphone cameras”	Jan–Apr 2014
Eura Cho, Sara Greenberg, Sharon Leung, Michelle Pugne, Emily Sim Systems Design Eng. “Real-time parking lot computer vision analytics platform”	Jan–Apr 2013

PROFESSIONAL ACTIVITIES

PROFESSIONAL AFFILIATIONS

Member, SPIE	Jan 2015–Present
Member, IEEE	Mar 2012–Present
Member, IEEE Engineering Medicine and Biology Society	Jan 2012–Present

EDITORIAL ACTIVITIES

Guest Editor Sensors (Special Issue on Biomedical Imaging and Sensing)	2019
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CONFERENCE COMMITTEE ACTIVITIES

Program Committee Member 2nd International Workshop on Computer Vision for Physiological Measurement (part of IEEE International Conference on Computer Vision)	2019
Conference Organization Committee Cerebral Hypoperfusion Summit	2018
Program Committee Member 1st International Workshop on Computer Vision for Physiological Measurement (part of IEEE Conference on Computer Vision and Pattern Recognition)	2018
Conference Organization Committee 3rd Annual Conference on Vision and Imaging Systems	2017
Conference Coordinator 2nd Annual Conference on Vision and Imaging Systems	2016
Conference Coordinator 1st Annual Conference on Vision and Imaging Systems	2015
Conference Organization Committee International Society for Gravitational Physiology Aging in Space Symposium	2014

SERVICE ACTIVITIES

Regional Science Fair Judge Waterloo-Wellington Science and Engineering Fair	2018, 2019
Event Volunteer Soapbox Science – Promoting Women in STEM Research	Jun 2019
Volunteer Ontario Blind Sports Association	2017, 2018
Science Fair Judge Centennial Public School	Mar 2018
Engineering Design Project Judge UWaterloo Software Engineering Capstone Design Symposium	Mar 2017
Computer Vision Elementary School Outreach Coordinator KW Bilingual School	Dec 2015
Engineering Design Project Judge UWaterloo Engineering Design Project Symposium	Nov 2014
Sectional Lead Engineering Jazz Band	Jan–Apr 2010

PROFESSIONAL DEVELOPMENT

Innovators of Tomorrow Certificate AGE-WELL Network of Centres of Excellence Nov 2016
Teaching and Learning Conference University of Waterloo May 2014
Mitacs Team Building Excellence Workshop Mitacs Aug 2013

EMPLOYMENT HISTORY

Medical Device Research Intern Jan–Apr 2014
CHRISTIE MEDICAL HOLDINGS Kitchener, ON
Developed novel biophotonic models for a real-time multispectral biophotonic tissue assessment for use in a commercial medical device. Patent published.

Software Engineer Intern May–Aug 2011
GOOGLE INC Kitchener, ON
Developed massively distributed ads software server serving millions of hits per hour globally. Improved load efficiency by over 10%.

NSERC Undergraduate Research Assistant–Symbolic Computation Sep–Dec, Jan–Apr 2010
SCHOOL OF COMPUTER SCIENCE, UNIVERSITY OF WATERLOO Waterloo, ON
Developed computational method for interpreting and parsing hand-written mathematics for engineering applications.

Quantitative Finance Developer May–Aug 2009
TD ASSET MANAGEMENT Toronto, ON
Developed data mining techniques to deliver rich financial model analysis for fund managers.

Medical Imaging Software Developer Sep–Dec 2008
AGFA HEALTHCARE Waterloo, ON
Developed software framework for handling mammography medical images in radiology hospital imaging systems (PACS).

R&D Software Developer Jan–Apr 2008, May–Aug 2007
UNCHARTERED SOFTWARE Toronto, ON
Integrated real-time online geographical map retrieval and rendering from open-source map servers.

REFEREE ACTIVITIES

JOURNAL REFEREEING

Biomedical Optics Express
Journal of Biomedical Optics
OSA Continuum
Applied Optics
IEEE Transactions on Biomedical Engineering
IEEE Transactions on Medical Imaging
IEEE Transactions on Emerging Topics in Computational Intelligence
IEEE Journal of Biomedical and Health Informatics
IEEE Transactions on Systems, Man and Cybernetics
IEEE Access
npj Digital Medicine
Biomedical Signal Processing and Control
Computer Methods and Programs in Biomedicine
Current Medical Imaging Reviews
Artificial Intelligence in Medicine

Applied Sciences

Sensors

Electronics

International Journal of Environmental Research and Public Health

American Journal of Physiology – Heart and Circulatory Physiology

Journal of Sports Engineering and Technology

Scientific Reports (Nature Publishing Group)

CONFERENCE REFEREEING

Conference on Computer Vision and Pattern Recognition (CVPR) 2018

Conference on Biological Information and Biomedical Engineering (BIBE) 2018

IEEE International Symposium on Biomedical Engineering (ISBI) 2015–2017

GRANT REVIEW

Centre for Bioengineering and Biotechnology Seed Funding 2018

Ontario Research Fund, Ministry of Research Innovation and Science 2017

ADDITIONAL INTERESTS

Hockey goaltending

Road cycling [[Strava profile](#)]

Coppersmithing [[Photos](#)]

Alto saxophone and electric guitar

Reading