Ricky Hu

Phone: 778-706-8875 | E-mail: rhu@qmed.ca | Website: http://ricky-hu.github.io

Note: No familial relation to any co-authors in publications

Education

MD Doctor of Medicine, Queen's University (Class of 2023) — Sep 2019 - May 2023

MASc Master of Applied Science, UBC — Sep 2017 - Aug 2019
Biomedical Engineering, AI and Imaging Physics (Thesis Grade: 95%)

BASc Bachelor of Applied Science, UBC — Sep 2011 - Jun 2016
Engineering Physics (Electrical & Computer Specialization)
Minor in Honours Mathematics

Research

Summary: **Total 18 published manuscripts, 2 additional under review.**

Categories	Classes	Number Published
Research Type	Foundational & Basic Sciences / Engineering Development	13
	Medical Education	2
	EDII	1
	Surveys/Commentaries	2
Publication Timing	During Medical School	12
	Before Medical School	6
Author Order	First (including co-first)	7
	Second	6
	Latter	5

Highlights of Selected (Top 5) Research Projects:

Prediction of transplant kidney function with machine learning and computational texture features
Supervisors: Dr. Timothy Murray (UBC Radiology), Dr. Robert Rohling (UBC Engineering), Dr. Christopher Nguan (UBC Urology)
Role: Programmed novel texture analysis algorithms, derived math for machine learning models, physiological interpretation of newfound image features, statistical analysis.
Status: 2 publications (1 1st author, 1 3rd author), 4 conference presentations (2 1st place awards)

Introduction to artificial intelligence workshop
Supervisors: Dr. Benjamin Kwan (Queen's Radiology), Dr. Andrew Chung (Queen's Radiology)
Role: Main instructor teaching AI to medical students and residents, developed learning objectives, created programming examples, programmed statistical analysis of feedback data.
Status: 2 publications (1 1st author, 1 2nd author)

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Prognostication of colorectal liver metastases using radiomics and machine learning
Supervisors: Dr. Marsha Reyngold (Memorial Sloan Kettering Radiation Oncology), Dr. Amber Simpson (Queen's Computer Science)
Role: Developed mathematical models to quantify textures in CT scans, developed physiological interpretation of complex predictive textures, programmed machine learning prediction algorithm
Status: 1 publication (1st author), 1 conference presentation (Top award for excellence in research)

Characterization of abnormal placental tissue with elastography and machine learning
Supervisors: Dr. Chantal Mayer (UBC Obstetrics/Gynaecology), Dr. Robert Roling (UBC Engineering)
Role: Aided in building vibration imaging device to characterize tissue elasticity, derived mathematical formulae to model properties of lesions, programmed machine learning algorithms, statistical analysis.
Status: 8 publications (2 first author, 6 2nd author), 3 conference presentations (1 people's choice award)

Invention of low-cost electrolarynx for accessible voice rehabilitation in low-resource environments
Supervisors: Dr. Donald Anderson (UBC Otolaryngology), Dr. Ameen Amanian (UBC Otolaryngology)
Role: Designed electrical circuit and 3D-printed enclosure for a voice generation device at 1/20th the cost of commercial devices. Currently in clinical trials aiming to be distributed in low-resource countries.
Status: 1 publication (1st author), 1 conference presentation (Top plenary presentation award)

All Published Manuscripts:

1. **Hu R,** Chen I, Peoples J, Salameh J, Gönen M, Romesser PB, Simpson A, Reyngold M. (2022). Radiomics artificial intelligence modelling for prediction of local control for colorectal liver metastases treated with radiotherapy. Physics and Imaging in Radiation Oncology. In Press.
2. **Hu R,** Singla R, Ringstrom C, Hu Z, Lessoway V, Reid J, Murray T, Nguan C, Rohling RN. (2022). Prediction of Kidney Transplant Function with Machine Learning from Computational Ultrasound Features. Simplifying Medical Ultrasound. In Press.
3. **Hu R,** Wyss JKM, Mathur P, El-Hariri H, Danaei P, Parhar H, Amanian A, Anderson DW. (2022). A Prototype Low-Cost Pharyngeal Vibration Device for Voice Rehabilitation Following Laryngectomy. IEEE IBIOMED. In Press.
4. **Hu R,** Fan K, Pandey P, Hu Z, Yau O, Teng M, Wang P, Li A, Ashraf M, Singla R. (2022) Insights from teaching artificial intelligence to medical students in Canada. Nature Communications Medicine, 2(1), 1-5. https://doi.org/10.1038/s43856-022-00125-4
5. Deeba, F., **Hu R**, Lessoway V, Terry J, Pugash D, Mayer C, Hutcheon J, Salcudean S, Rohling R. (2022). Project SWAVE 2.0: An overview of the study design for multimodal placental image acquisition and alignment. MethodsX, 9, 101738. https://doi.org/10.1016/j.mex.2022.101738
6. Hu Z*, **Hu R***, Yau O, Teng M, Wang P, Hu G, Singla R. Tempering Expectations on the Medical Artificial Intelligence Revolution: The Medical Trainee Viewpoint. (2022). JMIR Medical Informatics, 10(8), e34304. https://doi.org/10.2196/34304
   *__Equal contribution and co-first authorship. No familial relation.__
7. Singla R, Ringstrom C, **Hu R,** Lessoway V, Reid J, Nguan C, Rohling R. Speckle and Shadows: Ultrasound-specific Physics-based Data Augmentation Applied to Kidney Segmentation. (2022). Medical Imagine with Deep Learning. ePub: https://openreview.net/forum?id=E_KsfOoVf9D .
8. Teng M, Singla R, Yau O, Lamoureux D, Gupta A, Hu Z, **Hu R**, Aissiou A, Eaton S, Hamm C, Hu S, kelly D, MacMillan KM, Malik S, Mazoli V, Teng Y, Laricheva M, Jarus T, Field TS. (2022) Health Care

Students' Perspectives on Artificial Intelligence: Countrywide Survey in Canada. JMIR medical education, 8(1), e33390. https://doi.org/10.2196/33390

9. Hu Z, **Hu R**, Yan R, Mayer C, Rohling R, Singla R. (2021). Automatic placenta abnormality detection using convolutional neural networks on ultrasound texture. Paediatric and Perinatal Imaging, 147-156. https://doi.org/10.1007/978-3-030-87735-4_14
10. Deeba F, **Hu R,** Lessoway V, Terry J, Pugash D, Hutcheon JA, Mayer C, Rohling R. (2021) A Quantitative Ultrasound Approach for Detecting Placenta-Mediated Diseases. IEEE International Ultrasonics Symposium (IUS), 1-3. https://doi.org/10.1109/IUS52206.2021.9593634
11. Deeba F, Schneider C, **Hu R,** Lessoway V, Terry J, Pugash D, Hutcheon JA, Mayer C, Rohling R. (2021) Ultrasonic Attenuation Coefficient Estimate of Placenta is correlated to MRI Proton-Density-Fat Fraction: A Preliminary Ex Vivo Study. IEEE International Ultrasonics Symposium (IUS), 1-4. https://doi.org/10.1109/IUS52206.2021.9593905
12. Deeba F, **Hu R,** Lessoway V, Terry J, Pugash D, Hutcheon JA, Mayer C, Rohling R. (2021). Project SWAVE 2.0: A multimodal placental imaging study. Placenta, 112, E17-E18. https://doi.org/10.1016/j.placenta.2021.07.059
13. Fan K, **Hu R,** Singla R. (2020). Introductory machine learning for medical students: A pilot. Medical Education, 54(11), 1042-1043. https://doi.org/10.1111/medu.14318
14. **Hu R,** Singla R, Deeba F, Rohling RN. (2019). Acoustic shadow detection: study and statistics of B-Mode and radiofrequency data. Ultrasound in Medicine & Biology, 45(8), 2248-2257. https://doi.org/10.1016/j.ultrasmedbio.2019.04.001
15. **Hu R,** Singla R, Yan R, Mayer C, & Rohling RN. (2019). Automated placenta segmentation with a convolutional neural network weighted by acoustic shadow detection. IEEE Engineering in Medicine and Biology Society (EMBC), 6718-6723. https://doi.org/10.1109/EMBC.2019.8857448
16. Deeba F, **Hu R,** Terry J, Pugash D, Hutcheon JA, Mayer C, Salcudean S, Rohling R. (2019). A spatially weighted regularization method for attenuation coefficient estimation. IEEE International Ultrasonics Symposium (IUS), 2023-2026. https://doi.org/10.1109/ULTSYM.2019.8925604
17. Jayatilleka H, Murray K, Guillén-Torres MÁ, Caverley M, **Hu R**, Jaeger NAF, Chrostowski L, Shekhar S. (2015). Wavelength tuning and stabilization of microring filters using silicon in-resonator photoconductive heaters. Optics Express, 23(19), 25084-25097. https://doi.org/10.1364/OE.23.025084
18. Ma M, Murray K, Ye M, Lin S, Wang Y, Lu Z, Yun H, **Hu R,** Jaeger NAF, Chrostowski L. (2016). Silicon photonic polarization receiver with automated stabilization for arbitrary input polarizations. CLEO: Science and Innovations, 4-8. https://doi.org/10.1364/CLEO_SI.2016.STu4G.8

Submitted Manuscripts Under Review:

1. **Hu, R.** Rizwan A, Hu Z, Li A, Chung A, Kwan B. An Artificial Intelligence Training Workshop for Diagnostic Radiology Residents: A Canadian Perspective. Submitted to Radiology: Artificial Intelligence.
2. Singla R, **Hu R,** Ringstrom C, Lessoway V, Reid J, Nguan C, Rohling R. The Kidneys Are Not All Normal: Investigating the Speckle Distributions of Transplanted Kidneys. Submitted to Ultrasound in Medicine and Biology.

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Peer-Reviewed Conference Oral and Poster Presentations

1. (Oral) **Hu R**, Singla R, Ringstrom C, Hu Z, Lessoway V, Reid J, Murray T, Nguan C, Rohling RN. (2022). Prediction of Kidney Transplant Function with Machine Learning from Computational Ultrasound Features. Workshop of Advances in Simplifying Medical Ultrasound at the 2022 International Conference on Medical Image Computer and Computer Assisted Intervention. Singapore.
2. (Oral) **Hu R**, Wyss JKM, Mathur P, El-Hariri H, Danaei P, Parhar H, Amanian A, Anderson DW. (2022). A Prototype Low-Cost Pharyngeal Vibration Device for Voice Rehabilitation Following Laryngectomy. 2022 International Conference on Biomedical Engineering.. Yogyakarta, Indonesia.
3. (Oral and Poster) **Hu R,** Hu Z, Singla R, Ringstrom C, Hu G, Lessoway V, Reid J, Rohlinh R, Nguan C, Murray T. (2022). Predicting transplant kidney function decline from ultrasound only using an interpretable artificial intelligence model. Canadian Association of Radiologists Annual Scientific Meeting. Virtual. Also presented at UBC Radiology Research day in Vancouver, BC.

    1st place winner of Radiologist-In-Training Competition (CAR ASM 2022)
    1st place winner of Canada Diagnostic Poster Contest (UBC Radiology Research Day)

4. (Poster) Singla R, Ringstrom C, **Hu R,** Lessoway V, Reid J, Nguan C, Rohling R. Speckle and Shadows: Ultrasound-specific Physics-based Data Augmentation Applied to Kidney Segmentation. (2022). Medical Imaging and Deep Learning 2022. Zurich, Switzerland.
5. (Oral) Singla R, Ringstrom C, **Hu R,** Lessoway V, Reid J, Rohling R, Nguan C. Ultrasound Speckle Distributions of Transplanted Kidneys. (2022) UBC Urology 16th Annual Lorne D. Sullivan Research Day. 2022. Vancouver, Canada.
6. (Oral) Singla R, Ringstrom C, Hu Z, **Hu R**, Lessoway V, Reid J, Nguan C, Rohling R. (2022) AutoKV-Net: Calculating Single Kidney Volume in Two-Dimensional Ultrasound Automatically by Mimicking Sonographers. Annual Integrative Ultrasound Meeting Journal of Ultrasound in Medicine Supplement.
7. (Poster + Oral) Hu Z**, Hu R,** Yan R, Mayer C, Rohling R, Singla R. Automated Placental Disease Prediction in Ultrasound with Neural Networks. (2021). The 3rd Annual Tri-Cluster Research Day. Vancouver, Canada.

    1st Place Winner of People's Choice Top Poster Award
8. (Poster + Oral) Hu Z, **Hu R,** Singla R, Yan R, Rohling RN, Mayer C. (2021) Automated AI-based risk stratification of placental disease from ultrasound imaging with a convolutional neural network system. UBC Radiology Research Day. Virtual.

    1st place winner of Canadian Diagnostic Poster Contest

9. (Poster) Hu Z**, Hu R**, Yan R, Mayer C, Rohling R, Singla R. Automatic Placenta Abnormality Detection using Convolutional Neural Networks on Ultrasound Texture. (2021) Perinatal, Preterm and Paediatric Image Analysis at the 2021 International Conference on Medical Image Computer and Computer Assisted Intervention. Virtual.
10. (Poster) Crête S, Campbell N, **Hu R,** Peoples J, Yan M, Olding T, Tyryshkin K, Simpson A, and Ynoe de Moraes F. (2021). Time-dependent machine learning prediction model to estimate survival time of brain metastases with MRI radiomics. European Society for Radiotherapy and Oncology Congress.

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11. (Oral) **Hu R,** Chen I, Beaulieu K, Zhang Y, Reyngold M, Simpson A. (2020) An artificial intelligence model to predict survival of liver metastases patients. Queen's Medical Student Research Showcase, Oral Presentation.

Winner of Dr. Albert Clark Award (Top Submission for Excellence in Research)

12. (Oral) **Hu R,** Mathur P, El-Hariri H, Wyss J, Danaei P, Parhar H, Prisman E, Anderson DW (2018) A low-cost variable frequency vibration device to assist speech generation for laryngectomy patients. UBC Department of Surgery Research Day, Oral Presentation.

Winner of Top Plenary Award

Extracurricular Leadership and Volunteering Activities

Co-Founder and Lead Instructor - AI for Medical Students Workshop Jan 2019 – Present

- Founded, and taught AI workshop (running 4 times, is ongoing) having 300+ medical students registered and 60+ live attendees, designed lectures on AI concepts and custom AI programming examples.
- Approved for Academic Enrichment Program credits at Queen's School of Medicine

Senior Scout Leader - 3rd Richmond Scout Troop Sep 2010 - Present

- Develop programs to train 300+ scouts aged 5-20 in outdoor survival, leadership, and communication from leading 150+ workshops, 30+ camping trips
- Organized and participated in 17+ fundraisers, raising $40,000+ for youth programs.
- Earned 7 national awards for service with our scout group earning the most awards of any in BC!

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Water Rescue Leader - Scouts Canada Jun 2010 - Present

- Led team of 6 rescuers (senior rescuer since 2018) to pilot watercraft and aid sailors in distress each summer (hiatus in clerkship). Responsible for 200+ sailors over the years without major incident.

Sailing Instructor - Scouts Canada Jun 2010 - Present

- Led volunteer-run nonprofit sailing program accessible to all youth backgrounds. Taught theory and coached in-water to 200+ students. Repaired boats with custom 3D-printed parts to reduce costs.

Computer Science and Statistics Consultant / Tutor - Independent Sep 2015 - Present

- Programmed tutorials for custom statistics analysis for medical students to conduct their research projects. Taught mathematics and programming to junior engineering students.

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Senior Executive - Queen's Innovation in Medicine Interest Group Aug 2020 - Aug 2021

- Organized seminars, networking events, and workshops for medical students to learn about novel medical technologies and engage with physician-innovators.

Startup Co-Venturer - Entrepreneurship @ UBC Sep 2018 - Oct 2019

- Volunteered in team of 2 to develop business models for a startup developing flexible ultrasound devices. Presented to physicians and investors to highlight medical, engineering, and economic value.

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Activities Discontinued Prior to Medical School

Executive, UBC Biomedical Engineering Graduate Association	Sep 2017 - May 2019
Project Advisor, UBC Biomedical Engineering Student Team	Sep 2017 - Sep 2018
Webmaster, UBC Engineering Undergraduate Society	Sep 2013 - May 2015

Extracurricular Interests and Hobbies

Collegiate Trivia Sep 2016 - Present

- I compete on the Queen's Quizbowl team (and previously at UBC) and organize local tournaments for medical students. I hope in the future to organize local trivia leagues and audition for Jeopardy!

Hackathon Competitor Oct 2015 - Present

- Participated in 6 hackathons collaborating with engineers and medical students to build prototypes such as an implant detector or self-driving robots. Won the 2015 Google Games programming competition.

Robotics - Rapid Circuit Fabrication and 3D Printing Sep 2015 - Present

- I build low-cost devices using electromechanical circuits and 3D-printing. Currently I am making custom trivia buzzers and printing counterfeit boat repair parts to aid our non-profit sailing program.

Recreational Dodgeball Sep 2017 - Present

- I compete at Queen's intramural and Vancouver dodgeball leagues (video of valiant loss on YouTube!)

Recreational Table Tennis Sep 2010 - Present

- I play table tennis in local leagues, previously played competitively at the provincial level.

Piano and Guitar Sep 2005 - Present

- Achieved RCM Grade 8 Piano certification and Grade 3 in Harmony. Self-taught guitar from interest and to teach songs to scouts (currently teaching sea shanties).

Academic Awards

Canada Diagnostic Centre Best Poster Award	2022
Canadian Association of Radiologists Radiologist-In-Training Top Oral Award	2022
Image Guided Therapeutics and Diagnostics Symposium Top Abstract Award	2021
Canada Diagnostic Centre Best Poster Award	2021
Queen's University Basmajian Research Scholar	2021
Queen's School of Medicine Dr. Albert Clark Award for Excellence in Medical Student Research	2020
UBC Chung Surgery Research Day Top Plenary Talk Award	2018
UBC Biomedical Engineering Symposium Best Poster Award	2018
UBC Faculty of Applied Science Graduate Student Award	2018
UBC School of Biomedical Engineering Graduate Student Initiative Award	2018
Sun Rise Rotary Club Scholarship	2012
UBC President's Entrance Scholarship	2011

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Funding and Grants

Queen's Radiology Research Grant - $7000 2022
(Role: First author, lead instructor for Artificial Intelligence in Medicine training Workshop)
Resident Doctors of British Columbia Innovation Fund - $5000 2022
(Role: First author, lead engineer for low-cost electrolarynx invention)

Non-Academic Awards

Queen's Medicine Golden Stethoscope Award (Peer-nominated for "best memes") 2020
Scouts Canada Certificate of Commendation 2017, 2018, 2019
Duke of Edinburgh's Award – Gold Level 2017
Scouts Canada Bar to Good Service 2017
Scouts Canada Medal of Good Service 2013
Scouts Canada Medal of the Maple 2013
Queen's Venturer Award 2010

EDII Training Courses

Embedding EDI in Knowledge Mobilization, Translation, and Data 2022
Unconscious Bias 2022
Developing Inclusive Research Teams 2022
Human Rights 101 2021
Introduction to Equity, Diversity, and Inclusion 2021

Work Experience

Medical Imaging Physics Teaching Assistant - UBC Sep 2018 – Dec 2018

- Instructed medical imaging tutorials and graded assignments/exams in topics of X-ray, CT, MRI, and ultrasound imaging physics for electrical engineering undergraduate students.

Graduate Research Assistant - UBC Robotics and Control Laboratory Aug 2017 – Aug 2019

- Programmed AI algorithms and aided in building elastography devices to characterize abnormal tissue in placenta. Designed and led 2 clinical studies, published 8 manuscripts.

Software Engineer - MDA Systems Ltd. Aug 2016 – April 2017

- Developed algorithms and software for image processing, geodetic mapping, and earth ellipsoid modelling from satellite imagery data for applications such as weather prediction and Google Earth.

Data Science Engineer - Pacific Institute of Mathematical Sciences May 2016 – Aug 2016

- Programmed 15 prototypes of data analytics software using a fully remote python kernel on a web browser, such as an image recognition interface from a user-input image.

Research Assistant - UBC Photonics Research Group May 2015 – Sep 2015

- Designed and implemented a microcontroller photocurrent stabilization system to maximize signal power output of a photonic chip, co-authored in two publications for contributions.

Software Development Intern - Spot Solutions Ltd May 2014 – Dec 2014

- Programmed C# applications in an Agile environment to monitor real time sensors by processing data to a database through SQL procedures and a C# (.NET) framework.

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Research Engineering Intern - NORAM Engineering and Constructors Jan 2013 – Apr 2013

- Planned, executed, and analyzed chemical yield experiments, utilizing MATLAB signal processing algorithms to filter chemical reactor thermoconductivity data.

Non-Clinical Technical Skills

Programming and Software:

C, C++, MATLAB, Python, Jupyter, Bash, SolidWorks, Lumerical, Git

Electrical and Mechanical:

Digital logic, signal processing, Fourier spectral analysis, circuit simulation, information theory, CNC and manual machining, rapid prototyping (3D printing, laser cutting, waterjet)

Mathematics & Physics:

Machine learning, computer vision, statistical modelling, differential error analysis, linear programming, partial differential analysis, statistical mechanics, optics, electrodynamics

Memberships

Canadian Association of Radiologists Student Member
American Roentgen Ray Society Student Member
Radiological Society of North America Student Member
Canadian Association of Internal Medicine Student Member
American Heart Association Member
Institute of Electrical and Electronics Engineers Student Member
Engineering in Medicine and Biology Society Student Member