Craig A. Macsemchuk

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EDUCATION

Master of Applied Science *Expected graduation 2023*
Medical Imaging Specialization, 4.0 GPA
Institute of Biomedical Engineering
University of Toronto

Thesis: *"A Magnetic Resonance Imaging Guided High Intensity Focused Ultrasound Robotics Platform for Fetal Surgical Interventions"*

Bachelor of Engineering *2021*
Physics Minor, First Class Standing
Department of Electrical Engineering
Lakehead University

Thesis: *"Increased Imaging Performance of Solid-State Positron Emission Tomography Devices via Dynamic Biasing of Silicon Photomultipliers"*

Diploma of Engineering Technology *2019*
Department of Electrical Engineering
Lakehead University

PROFESSIONAL EXPERIENCE

Electrical and Software Designer Sept 2019 - Present
Radialis Medical *Thunder Bay, ON*

- Ground up electronics and embedded system design, mixed-signal PCB design, mechanical control system design
- Embedded C development for mechanical control and patient safety systems
- Linux systems security, administration, infrastructure, high-speed networking, and Python script development
- Unit testing, code safety analysis, product lifecycle development, and documentation
- Code, electrical designs, and documentation cleared FDA certification

Conservation Intern June 2016 - May 2017
Conservation and Energy Services, Thunder Bay Hydro *Thunder Bay, ON*

- Ground-up creation and implementation of a technical data collection program for commercial clients with a focus on commercial electrical equipment and building systems (HVAC, refrigeration, lighting, and process control)
- Organization and classification of large amounts of customer technical data into a database
- Development of a technical survey and utilization of commercial survey platforms

Head Solar Power and Communications Technician August 2013 - June 2017
Maki Bay Solar *Thunder Bay, ON*

- Design, repair, and installation of solar power generation sites and related electrical and mechanical systems
- Field diagnosis and repair specializing in the control of sun-tracking arrays, monitoring systems, and device communication

Petroleum Mechanic January 2012 - August 2013
Northwest Petroleum Equipment Ltd. *Thunder Bay, ON*

- Troubleshooting, repair, and installation of petroleum systems and related equipment
- Ensured the compliance of work to the Liquid Fuel Handling Code (TSSA LFHC-07) along with internal quality and safety standards
- Utilization of heavy equipment and machinery such as bucket loaders, forklifts, aerial work platforms, and dump trucks
- Work in remote northern communities

RESEARCH EXPERIENCE

Research Assistant May 2019 - Sept 2019
Radialis Medical, Thunder Bay Regional Health Research Institute *Thunder Bay, ON*

- Electronics, embedded firmware, and imaging pipeline software development regarding a planar clinical positron emission tomography imaging device for mammography applications
- Developed a near real-time imaging data validation and error correction algorithm which recovered up to 70% more data for image reconstruction
- Consolidated multiple microcontrollers into single a platform based on the TI Hercules Safety MCU to receive sensor inputs, control safety systems, and facilitate machine motion.
- Participated in the 2019 session of the Lakehead University Summer School On Medical Imaging.

Research Assistant May 2018 - August 2018
Hotchkiss Brain Institute, University of Calgary *Calgary, AB*

- Integration of GE Healthcare human clinical magnetic resonance imaging products into an experimental high-intensity focused ultrasound (HIFU) therapy software platform (Proteus) for MRI thermometry
- Python software development in the areas of networking, Linux systems, and MRI image processing
- Data collection, analysis, and signal processing related to the intra-operative measurement of essential tremor with an accelerometer

Research Assistant 2017 - 2021
Department of Civil Engineering, Lakehead University *Thunder Bay, ON*

- Developed electrical control systems related to the automation of dynamic envelope building designs for energy-efficient and healthful housing for northern climates
- Experiment design, data collection, and analysis

AWARDS & HONORS

Cultivate the Next Generation Scholarship, Focused Ultrasound Foundation ($14,600)	*2021*
Summer School on Medical Imaging, Thunder Bay Regional Health Research Institute	*2019*
Global Internship Program Awardee, Focused Ultrasound Foundation ($1,800)	*2018*
Student Research Scholarship, University of Calgary ($6,400)	*2018*
Competitor, Ontario Engineering Competition, Carleton University	*2017*
First Place, Junior design, Lakehead Engineering Competition, Lakehead University	2017

ABSTRACTS

"High Intensity Focused Ultrasound (HIFU) Ablation of Fetal Rabbit Umbilicus", A. Danialy, K. Piorhowska, R. Raghuram, A. Headrick, C.A. Macsemchuk, N. Fakhari, J. Baranger, O. Villemain, T Van Miegham, A. Waspe, J. Drake (2022). *21st Annual International Symposium of Therapeutic Ultrasound*, 2022,

"Gadgetron-based open-source thermometry pipeline for Siemens MRI platforms", C.A. Macsemchuk, W. Foltz, C. Macgowan, S. Pichardo, A. Waspe, J. Drake (2022). *21st Annual International Symposium of Therapeutic Ultrasound*, 2022,

"Online data processing with GE human clinical MRI scanners", C.A. Macsemchuk, R.M. Lebel, A. Beserra, J. Loree-Spacek, L. Curiel, S. Pichardo (2018). *6th International Symposium on Focused Ultrasound*, 2018, P-BR-19.

"Navigational analysis and sensory responses of MR-guided focused ultrasound thalamotomy: Early results", C.A. Weiner, C.A. Macsemchuk, E.L. Mazerolle, G.B. Pike, Z.H. Kiss, S. Pichardo (2018). *6th International Symposium on Focused Ultrasound*, 2018, P-BR-26.

INVITED TALKS AND PRESENTATIONS

"High Intensity Focused Ultrasound - Online Data Processing With MRI Scanners" Lakehead Georgian Partnership, Georgian College, Barrie ON (2019)

"Surgical Sound Waves", Neuroscience Research Interest Group of Lakehead University, Thunder Bay ON (2018)

"Online Data Processing for GE Human Clinical MRI Scanners", 8th Annual Alberta Imaging Symposium, Calgary AB (2018)

"MRI Thermometry in the MRgHIFU Essential Tremor Treatment Cycle", Alberta Undergraduate Neuroscience Conference, Edmonton AB (2018)

POSTERS

"'A Dynamic Phantom Positioner for Magetic Resonance Guided High Intensity Focused Ultrasound Research" University of Toronto Dept. of Surgery Gallie Day, University of Toronto (2022)

"Online Error Correction for Pre-Clinical Positron Emission Mammography Devices", Lakehead University Summer School On Medical Imaging, Thunder Bay (2019)

"Multisite software platform of MRI-guided focused ultrasound hyperthermia applications", M. Siddiqui, S. Engler, M. MacDonald, C. A. Macsemchuk et al. Society for Thermal Medicine 2019 Annual Meeting, St. Pete Beach, Fl (2019)

"Online Data Processing for GE Human Clinical MRI Scanners", 6th International Symposium on Focused Ultrasound, Reston VA (2018)

GRANTS

Co-investigator 2020

Ontario COVID-19 Rapid Research Fund (Reached second-round approval, unawarded)

- "Development and Evaluation of a Reusable Prototype of an N95-Like Mask to Address Shortages and the Reported Side Effects of Present N95 Mask During Pandemic Situations"
- Budgetary projection and supporting expertise for the design, testing, and production of a 3d printed N95-like mask
- Multidisciplinary team including faculty members from nursing, anthropology, and engineering with international collaborators

TEACHING EXPERIENCE

Teaching Assistant (ESC-204 PRAXIS III) Full Year 2021/2022

Division of Engineering Science, University of Toronto *Toronto, ON*

- Instructed classes of up to 50 students in theory and hands-on engieering design projects
- Guided students in creating comprehensive designs and prototypes for stakeholders in Thailand and The Republic of Congo
- Graded written personal reflections, design proposals, presentations, and final reports

Laboratory Instructor (EL-306 Telecommunications) Fall Semester 2019/2020

School of Engineering Technology, Confederation College *Thunder Bay, ON*

- Instructed three laboratory sections of Telecommunications for electrical engineering technology and instrumentation technician students
- Course content included the basic theory and practice of transmission and reception of AM and FM signals with a focus on troubleshooting complex analog circuits

Course Instructor (EL-307 Industrial Data Networks) Winter Semester 2018/2019

School of Engineering Technology, Confederation College *Thunder Bay, ON*

- Instructed two lecture and laboratory sections of Industrial Data Communication Networks for electrical engineering technology, instrumentation technician, and embedded systems students
- Handled class sizes of up to 20 students and guided them through comprehensive, hands-on laboratory investigations and the assembly of electrical cables
- Course content included data transmission protocols (RS232, RS422, RS485, Modbus RTU) and the architecture of industrial local area networks

TECHNICAL STRENGTHS

Programming Languages	Python, C, MATLAB, OpenCL, Verilog, PIC18 Assembly
Software	EAGLE, AutoCAD, GNU/Linux, MacOS, Microsoft Windows
Tools	SPICE, Simulink, Git, Bash, Make, GDB, Jira, LaTeX
Hard Skills	Hand tools, Prototype design, 3D printing, laser CNC, and PCB fab
Soft Skills	System troubleshooting, team and self–directed work, project organization and documentation, interdisciplinary learning

VOLUNTEER EXPERIENCE

Director 2018-2019
Lakehead University Engineering Makerspace

- Oversaw daily operations of a makerspace employing 3d printers, laser CNC, and hand tools
- Successfully applied for a grant of $4,000 for two new 3d CAD workstations

Chair 2017-2018
Lakehead University IEEE Student Branch

- Oversaw branch activity including the organization of four academic speakers
- Invited and organized the visit of then IEEE President and CEO Karen Bartleson

Treasurer 2016-2017
Lakehead University IEEE Student Branch

- Wrote for grant funding to establish Canada's 40th IEEE McNaughton Learning center
- IEEE Canada foundation awarded $1,421 for student lab equipment