BIOGRAPHICAL SKETCH

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NAME: Austin McElroy

eRA COMMONS USER NAME (credential, e.g., agency login): AUSTINMCELROY

POSITION TITLE: Staff Scientist

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of Texas, Austin	B.S	05/2004	Electrical Engineering
University of Texas, Austin	M.S	5/2021	Electrical Engineering

A. Personal Statement

Austin McElroy has been a research scientist for over 15 years in nearly all aspects of Electrical Engineering: circuit design, embedded systems, high speed parallel computing, system architecture, high speed data acquisition, and machine learning. Mr. McElroy's master's work focused on machine learning classification and segmentation of Optical Coherence Tomography Images and working on an embedded system and circuit for a low cost COVID ventilator.

Since joining BridgeSource Medical, Mr. McElroy has helped complete several Phase I and II projects, primarily as an embedded systems engineer. His work in embedded systems includes projects in Rust, C, C++, and projects with and without real time operating systems. He has also expanded his embedded work to include building custom Linux operating systems for single board computers, to better navigate projects through the FDA (Food and Drug Administration) when operating systems are unavoidable. Other programming duties at BridgeSource include cross-platform Native App development in Flutter and backend server development.

Mr. McElroy is uniquely suited for this project, having extensive experience writing firmware for Bluetooth enabled microcontrollers, writing Flutter apps using device specific hardware, and integrating I2C devices. He is excited to contribute these skills to developing a posture assessment tool that can help identify ergonomic issues in a patient's day to day life and promote preventive care of the neck and back.

B. Positions, Scientific Appointments, and Honors

2020 – Current: Staff Scientist, BridgeSource Medical Corp.
Austin McElroy is a Staff Scientist for BridgeSource Medical, and his current projects include firmware and software for an Internet of Things (IoT) Medical Device Identifier, and hardware/firmware for a novel respiration-reactive nebulizer that recently won a Phase 2 after a successful Phase 1. He has also been contributing to open-source projects, releasing a communications protocol as well as an I2C support library written in Rust.

2019 – 2021: Graduate Student and Researcher
Austin McElroy is a graduate student and research assistant with Dr. Thomas Milner. His work has been focused on deep machine learning networks to perform semantic segmentation of medical images, specifically Optical Coherence Tomography images of coronary artery images. With the outbreak of COVID-19, Austin's focus shifted to the University of Texas, Austin Automated Bridge Breathing Unit (ABBU), where he architected

and implemented both the software and the electronics hardware as part of a broader partnership between the University of Texas, Austin and the University of California, Irvine.

2012 – 2019: Research Scientist
Austin McElroy's prior job was also in Dr. Milner's lab, where he was a research scientist and support staff for the lab. His work was focused on software architecture and implementation of general-purpose Optical Coherence Tomography systems, often with augmentation for data acquisition with complex timing requirements. He also implemented multiple OCT related algorithms in OpenCL to help speed up vessel imaging for the image guided laser knife project.

He also spearheaded the effort to combine OCT and Selective Laser Sintering, a type of 3D printing pioneered at the University of Texas, Austin. He built, from the ground up, the software to run the Air Force Laser Additive Manufacturing Pilot System (LAMPS) 3D printer, which included FPGA, embedded systems, and high speed DAQ, as well as OCT for monitoring the 3D print process.

2010 – Current: Engineering Consultant
Before joining the University of Texas, Austin started and still maintains an active consulting business. His work has spanned numerous projects, but most interesting were a Vaginal OCT system for pre- and post-menopausal women for determining the efficacy of vaginal rejuvenation for Cynosure. His work has also included an open-source OpenCL library for LabVIEW and a custom H-Bridge circuit for driving a high-power resistive load for water reclamation.

2006 – 2010: Research and Development Engineer – Volcano Corporation
Austin's career in biomedical engineering started as an R&D Engineer for CardioSpectra, a coronary catheter OCT imaging system founded by Dr. Thomas Milner. This company was later purchased by the Volcano Corporation, where Austin remained until Volcano moved operations to Boston, MA.

C. Contributions to Science

1. M work as a graduate student has been focused on helping provide a low-cost ventilator for early efforts to help treat COVID-19 symptoms that progressed to the need for ventilators. This work included architecting all software running on the ventilator microcontroller as well as laying out and fabricating the printed circuit board that. All software and hardware were designed with an eye on manufacturing and FDA approval, which includes documenting software processes and testing the hardware and software to show safety and efficacy.
    a. GRUSLOVA, A., Cabe, A., Katta, N., Jenny, S., Valvano, J., Phillips, T., McElroy, A., LaSalle, R., Truskett, V., Viswanathan, N. and Rathnasingham, R., 2021. 295: Automated Bag Breathing Unit for COVID-19 Ventilator Shortages. Critical Care Medicine, 49(1), p.134.

2. My work as a research scientist was in software and hardware support for an optics lab. I was responsible for architecting and implementing Optical Coherence Tomography (OCT) acquisition and control software to meet the demanding needs of timing and large data acquisition set by the graduate students. My role was one of both mentorship and support so the graduate students could focus on science and not get bogged down in implementation. Well architected software was needed for precise timing and triggering on the microsecond level for projects such as real-time OCT guided tumor ablation and photothermal excitation and detection of lipids in arteries.
    a. N. Katta, A. D. Estrada, A. B. McElroy and T. E. Milner, "Dual-Wavelength Laser Brain Surgery Guided by Optical Coherence Tomography," in Clinical and Translational Biophotonics, 2020.
    b. N. Katta, A. D. Estrada, A. B. McElroy, A. Gruslova, M. Oglesby, A. G. Cabe, M. D. Feldman, R. Y. D. Fleming, A. J. Brenner and T. E. Milner, "Laser brain cancer surgery in a xenograft model guided by optical coherence tomography," Theranostics, vol. 9, no. 12, p. 3555, 2019.
    c. N. Katta, A. B. McElroy, A. D. Estrada and T. E. Milner, "Optical coherence tomography image-guided smart laser knife for surgery," Lasers in surgery and medicine, vol. 50, no. 3, pp. 202-212, 2018.

    d. N. Katta, A. McElroy and T. E. Milner, "Monitoring Nanosecond Pulsed Laser Thermal Dynamics In Tissue Using Optical Coherence Tomography," in Lasers In Surgery And Medicine, 2018.

3. My other goal as a research scientist was to expand the use of Optical Coherence Tomography technology to other applications. My efforts led to the successful integration of OCT in real time with Selective Laser Sintering (SLS) 3D printers to monitor and correct for defects during the printing process. Defects that were detected using OCT could be corrected or the build stopped to save time and money. The same demanding timing requirements for real time tissue ablation also apply to laser sintering and lead to new intellectual property in the field.
    a. M. R. Gardner, A. Lewis, J. Park, A. B. McElroy, A. D. Estrada, S. Fish, J. J. Beaman Jr and T. E. Milner, "In situ process monitoring in selective laser sintering using optical coherence tomography," Optical Engineering, vol. 57, no. 4, p. 041407, 2018.
    b. A. D. Lewis, N. Katta, A. B. McElroy, T. E. Milner, S. Fish and J. J. Beaman Jr, "Understanding and improving optical coherence tomography imaging depth in selective laser sintering nylon 12 parts and powder," Optical Engineering, vol. 57, no. 4, p. 041414, 2018.
    c. A. Lewis, N. Katta, A. McElroy, T. Milner, S. Fish and J. Beaman, "Investigation of optical coherence tomography imaging in nylon 12 powder," in 28th Annual Int. Solid Freeform Fabrication Symp, 2017.
    d. W. W. Wroe, J. Gladstone, T. Phillips, S. Fish, J. Beaman and A. McElroy, "In-situ thermal image correlation with mechanical properties of nylon-12 in SLS," Rapid Prototyping Journal, 2016.