Christopher X. Miller

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Experience

Research Assistant – Robotics: Assistive and Rehabilitation (argallab), *Northwestern Univ; Chicago, IL* **7/17 – Present**

Intelligent Wheelchair:

- Designed, managed, and executed a 16-person, IRB-approved study to classify human control inputs
- Modeled when to autonomously shift between assistance modes by classifying human control commands using RNNs, anomaly detection, and classical methods (KERAS/TensorFlow/scikit-learn); to be submitted to IROS 2020
- Developed software to measure the quality of human control commands (ROS/Python/C++)

Robotic Arm (Kinova MICO):

- Co-designed and -managed a 20-person, IRB-approved study to classify robotic arm control difficulty and developed software for control-sharing modes (ROS/Python) using an in-house potential fields library

Electrical Engineer II – National Robotics Engineering Center (NREC), *Carnegie Mellon Univ; Pittsburgh, PA* **6/16 – 7/17**

Wheel-to-Track Transformer Robot (DARPA Ground Vehicle X Program):

- Designed rugged, noise-immune electronic control and monitoring system through mixed-signal circuit design and PCB fabrication (Altium Designer); assembled and tested benchtop electrical prototype; assisted with full system integration

Mining Pipeline Profiler Robot (Anglo American Copper Chile):

- Designed high-level electrical system, robot's motherboard, motor controller interfaces, power supplies and cable harnesses (Altium Designer); assisted with systems integration and testing

Project Management:

- Served as electrical system project manager and lead electrical engineer on US DoD/DARPA- and industry-sponsored robotics projects through high-level system design (Visio), personnel task allocation, and milestone tracking
- Communicated updates with executive sponsor leadership via monthly presentations and quarterly reports

Summer Undergraduate Research Fellow – NASA's Jet Propulsion Laboratory/Caltech; *Pasadena, CA* **5/14 – 8/14**

JPL BioSleeve V3 (Surface EMG-based gesture recognition system):

- Miniaturized BioSleeve's DAQ from the size of a small desktop computer to that of an index card by developing C++ and MATLAB drivers for existing computer systems
- Implemented BioSleeve's wireless abilities via Bluetooth hardware integration and custom EMG electrode fabrication

Education

Master of Science in Mechanical Engineering Sep. 2017 – Jun. 2020
Northwestern University, Evanston, IL.
Advisor: Brenna Argall

Bachelor of Science in Electrical Engineering Aug. 2012 – May 2016
The Pennsylvania State University, University Park, PA.
Advisor: Sean Brennan; Schreyer Honors College

Major Awards

National Defense Science and Engr. Grad. Fellowship - U.S. Dept. of Defense ($124K + tuition)	Apr. 2019
Graduate Research Fellowship – The National Science Foundation ($138k, declined)	Apr. 2019
Walter P. Murphy Fellowship – Northwestern University ($80k)	Sep. 2017
Penn State College of Engineering Research Scholarship ($16k)	May 2011

Technical Skills

Languages	ROS, Python, MATLAB, C++, HTML5, CSS, Java
Tools	Visio, Altium Designer, TensorFlow, KERAS, scikit-learn, pandas, SolidWorks
Hardware	PCB design, soldering (PTH & SMD to 0402), Arduino, SPI, I2C, UART, CAN, motion controllers, LIDAR, encoders, microcontrollers (e.g. TI, STM, and Microchip), bio-sensing systems (EMG/EEG)
Other	Technical writing, IRB review, human trial design, battery characterization/modeling, cable harness design /assembly, Kalman filters, particle filters, rugged system design, robotic potential fields, robot arm control

Publications

"An Intelligent Framework for Shifting between Different Levels-of-Autonomy," **(1st Author),** *To Be Submitted to IROS 2020.*
"An On-Line ICR EKF Approach to Estimating Wheelchair Tire Slip," **(3rd Author),** Journal Article, See: DS-16-1564. 2019.
"Formalized Task Characterization for Human-Robot Autonomy Allocation," **(2nd Author)**, ICRA 2019.
"State of Charge Estimation for an Electric Wheelchair using a Fuel Gauge Model," **(1st Author)**, DSCC 2016.