

# Eric J. Earley

ericearley@u.northwestern.edu

312-238-2079

## SUMMARY

---

PhD candidate in Biomedical Engineering at Northwestern University. My research merges two traditionally separate fields: control of robotic prosthetic limbs, and motor learning and adaptation. My work aims to better understand visual uncertainty as it relates to limb proprioception, and to develop sensory substitution feedback to improve prosthesis proprioception even in the presence of vision.

## EDUCATION

---

Ph.D. Biomedical Engineering	2014 – 2019 (expected)	Northwestern University
M.S. Biomedical Engineering	2012-2014	Northwestern University
B.S. Engineering: Mechanical Specialty	2008 – 2012	Colorado School of Mines

## RESEARCH EXPERIENCE

---

### Doctoral Research

2014 – 2019 (expected)

Northwestern University ♦ Shirley Ryan AbilityLab

Center for Bionic Medicine ♦ Neural Engineering for Prosthetics and Orthotics

Advisor: Dr. Levi Hargrove

Using sensory feedback to improve motor adaptation by providing information not accurately available via vision, as determined by psychophysical analysis.

### Master's Research

2012 – 2014

Northwestern University ♦ Rehabilitation Institute of Chicago

Center for Bionic Medicine ♦ Neural Engineering for Prosthetics and Orthotics

Advisor: Dr. Levi Hargrove

Improved control of partial-hand prostheses through optimization of EMG pattern-recognition parameters while preserving wrist mobility.

### Volunteer Internship

2012

University of Colorado ♦ Anschutz Medical Campus

BioMechatronics Development Laboratory

Advisor: Dr. Richard F. Weir

Designed thumb actuation mechanism and housing and created SolidWorks models of prototype 3-DOF prosthetic hand.

### Undergraduate Senior Design

2011 – 2012

Colorado School of Mines

Advisor: Dr. Cynthia Norrgran

Outfitted powered standing wheelchair with EEG intent recognition control.

### Summer Internship

2011

ADA Technologies, Inc.

Supervisor: Dr. Thierry Carriere

Developed and tested robotic fire detection and targeted fire suppression system for use in an aircraft dry bay.

## PUBLICATIONS

---

### Peer-Reviewed Publications

- ◆ **E.J. Earley**, R.E. Johnson, L.J. Hargrove and J.W. Sensinger, "Joint Speed Discrimination and Augmentation for Prosthesis Feedback," *Scientific Reports*, vol. 8, no. 1, 2018. doi: 10.1038/s41598-018-36126-4
- ◆ **E.J. Earley**, L.J. Hargrove, T.A. Kuiken, "Dual Window Pattern Recognition Classifier for Improved Partial-Hand Prosthesis Control," *Frontiers in Neuroscience*, vol. 10, no. 58, 2016. doi:10.3389/fnins.2016.00058.

### Conference Papers and Posters

- ◆ **E.J. Earley**, L.J. Hargrove, "Modeling Expected Reaching Error and Behaviors for Motor Adaptation," *41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*. Accepted.
- ◆ **E.J. Earley**, R.E. Johnson, L.J. Hargrove and J.W. Sensinger, "Visual Discrimination of Biomimetic Arm Speeds," *2018 School and Symposium on Advanced Neurorehabilitation (SSNR)*, pp. 52, 2018.
- ◆ **E.J. Earley**, K.J. Kaveny, R.E. Johnson, L.J. Hargrove and J.W. Sensinger, "Joint-based velocity feedback improves myoelectric prosthesis performance," *2017 Myoelectric Controls and Upper Limb Prosthetics Symposium*, pp. 116, 2017.
- ◆ **E.J. Earley**, K.J. Kaveny, R.E. Johnson, L.J. Hargrove and J.W. Sensinger, "Joint-based velocity feedback to virtual limb dynamic perturbations," *2017 International Conference on Rehabilitation Robotics (ICORR)*, pp. 1313-1318, 2017. doi: 10.1109/ICORR.2017.8009430.
- ◆ **E.J. Earley** and L.J. Hargrove, "The Effect of Wrist Position and Hand-Grasp Pattern on Virtual Prosthesis Task Performance," *6th IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechanics (BioRob)*, pp. 542-547, 2016. doi: 10.1109/BIOROB.2016.7523682.
- ◆ **E.J. Earley**, A.A. Adewuyi, and L.J. Hargrove, "Optimizing Pattern Recognition-Based Control for Partial-Hand Prosthesis Application," *36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, pp. 3574-3577, 2014. doi: 10.1109/EMBC.2014.6944395.

### Journal Referee

- ◆ IEEE Transactions on Neural Systems & Rehabilitation Engineering
- ◆ Biomedical Signal Processing and Control
- ◆ IEEE Engineering in Medicine and Biology Conference
- ◆ PLOS ONE
- ◆ Computer Methods in Biomechanics and Biomedical Engineering
- ◆ Assistive Technology
- ◆ Allied Academies Biomedical Research
- ◆ IEEE International Conference on Rehabilitation Robotics
- ◆ Myoelectric Control Conference
- ◆ Transactions on Mechatronics
- ◆ Transactions on Human-Machine Systems
- ◆ IEEE International Conference on Biomedical Robotics and Biomechanics

## ACADEMIC & TECHNICAL SKILLS

---

- ◆ Pattern recognition, classification, and machine learning algorithms
- ◆ Human motor control, motor learning and adaptation, musculoskeletal anatomy
- ◆ MATLAB, Simulink, LabVIEW
- ◆ SolidWorks, FEA
- ◆ HTML5, CSS
- ◆ Adobe Illustrator, Photoshop, Premiere, After Effects

## LEADERSHIP

---

### National Communicating Science Conference

2017 – present

Co-Treasurer, Advisory Committee

Program organizer for sixth annual national conference held summer 2018, responsible for selecting panelists and organizing non-panel workshops. Treasurer and advisory committee member, responsible for developing fiscal procedures and managing \$100,000 budget for flagship and local conferences

### Chicago Communicating Science Conference

2015 – 2017

Treasurer, Lead Organizer

Organizer and treasurer for second conference held summer 2016. Lead organizer for third conference held summer 2017. Tracked budget and donated funds, secured conference location, and oversaw the conference.

### Northwestern University McCormick Graduate Leadership Council

2013 – present

Workshop Coordinator and Instructor

Coordinated workshops to teach introductory through advanced MATLAB and SolidWorks skills, and coordinated additional workshops on other transferable skills, for over 600 graduate students.

### Northwestern University Biomedical Engineering Graduate Students Group

2013 – 2017

Co-President

Oversaw periodic academic and social events, maintained communication with other officers, proposed and facilitated changes to annual BME research day including pop talks (short 3-minute overviews of research using jargon-free language), and rebuilt website.

### Colorado School of Mines Robotics Club

2008 – 2011

Treasurer, Mentor

Developed and managed \$26,000 annual budget. Co-initiated project to design, build and program self-balancing wheelchair. Mentored high school students for FIRST Robotics Competition

## PUBLIC OUTREACH & EDUCATION

---

### Sci-Inspiration YouTube Channel

2018 – present

Channel explores scientific topics through popular media including movies, television, and video games.

- ◆ [Why can't we travel Faster than Light?](#): Explores the laws of physics that prevent traveling faster than the speed of light
- ◆ [How can we travel Faster than Light?](#): Walks through various sci-fi and theoretical technology that could allow faster than light travel

### SciShow YouTube Channel

2018 – present

Freelance script writer for SciShow, a YouTube channel which make easy-to-understand science videos

- ◆ [Why Do Prosthetic Limbs Feel Way Heavier Than Biological Ones?](#)
- ◆ [Why Scientists are Giving Robots Human Muscles](#)
- ◆ [Why Do Batteries Taste Sour?](#)
- ◆ [Why Does Body-Temperature Air Feel Hot?](#)
- ◆ [Is Sitting up Straight Actually Good Posture?](#)
- ◆ [Does Medicine Actually Expire?](#)

### Other Science Videos

2016 – present

- ◆ “STEM Connect Careers: Eric Earley.” *Discovery Education*, 2017.

- ◆ [Prosthetic Limbs and Motor Adaptation](#): A short 3-minute video explaining the purpose of my research using clear and concise language

**Science Writing***2017 – present*

- ◆ [The Cybathlon: The Olympics of Restoring Daily Tasks](#), HELIX Magazine.

**Public Talks & Demos***2014 – present*

- ◆ “Wunderbar Together Science Slam,” Daley Plaza, Chicago, IL, 2019.
- ◆ “Neural Engineering: Designing Bionic Limbs Controlled by the Brain,” College of DuPage STEMinar Series, 2018.
- ◆ “Get-A-Grip” Program, Nettelhorst Elementary, 2017 – 2018
- ◆ Chicago Science Festival, Illinois Science Council, 2016 – present
- ◆ Museum of Science and Industry Robotics Week, 2016 – present
- ◆ “ProsthEthics”, guest lecture for Robot Ethics course at University of Notre Dame, 2016 – present
- ◆ “How Do I Talk to my Robo-Limb?”, RSG Science Communicating Workshop, 2016.
- ◆ Engineer’s Week, 2016
- ◆ “Adler After Dark”, Adler Planetarium, 2015 – present
- ◆ Camp Neuro Chicago, 2015