

# Eric J. Earley

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## SUMMARY

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Postdoctoral researcher at Chalmers University of Technology, working with Max Ortiz-Catalán at the Biomechatronics and Neurorehabilitation Laboratory. I am developing lifelike sensory feedback to improve osseointegrated prosthetic limb use and control by stimulating peripheral nerves via implantable electrodes.

## EDUCATION

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Ph.D. Biomedical Engineering	2014 – 2020	Northwestern University
M.S. Biomedical Engineering	2012-2014	Northwestern University
B.S. Engineering: Mechanical Specialty	2008 – 2012	Colorado School of Mines

## RESEARCH EXPERIENCE

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### Postdoctoral Research

*2020 - present*

Chalmers University of Technology ♦ Department of Electrical Engineering  
Biomechatronics and Neurorehabilitation Laboratory

Advisor: Dr. Max Ortiz-Catalán

Developing biomimetic sensory feedback via regenerative peripheral nerve interfaces for use with osseointegrated prosthetic limbs

### Doctoral Research

*2014 – 2020*

Northwestern University ♦ Shirley Ryan AbilityLab  
Center for Bionic Medicine ♦ Neural Engineering for Prosthetics and Orthotics

Advisor: Dr. Levi Hargrove

Used 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.

## PUBLICATIONS

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### 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)*, pp. 1534-1538, 2020. doi: 10.1109/EMBC.2019.8857562.
- ◆ **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

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

## ACADEMIC & TECHNICAL SKILLS

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- ◆ Prosthetic sensory feedback, sensory integration, psychophysics
- ◆ 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
- ◆ Organization, scheduling, Kanban, scrum
- ◆ Native English; limited French, German, and Swedish

**LEADERSHIP**

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**National Communicating Science Conference***2017 – present*

Co-Treasurer, Advisory Committee

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

**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

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### 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

- ◆ “Sensory Substitution in the Presence of Vision: Providing Joint Speed Feedback to Improve Myoelectric Prosthesis Control and Adaptation,” Thesis defense, 2019.
- ◆ “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 – 2019
- ◆ Museum of Science and Industry Robotics Week, 2016 – 2019
- ◆ “ProsthEthics”, guest lecture for Robot Ethics course at University of Notre Dame, 2016 – 2018
- ◆ “How Do I Talk to my Robo-Limb?”, RSG Science Communicating Workshop, 2016.
- ◆ Engineer’s Week, 2016
- ◆ “Adler After Dark”, Adler Planetarium, 2015 – 2018
- ◆ Camp Neuro Chicago, 2015