

Eric J. Earley

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SUMMARY

Postdoctoral researcher at the Chalmers University of Technology, working with Max Ortiz-Catalán at the Center for Bionics and Pain Research. I oversee and direct our research on sensory feedback to improve osseointegrated prosthetic limb use and control by stimulating peripheral nerves via implantable electrodes.

EDUCATION

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

Postdoctoral Research

2020 - present

Chalmers University of Technology ♦ Department of Electrical Engineering
Center for Bionics and Pain Research
Advisor: Dr. Max Ortiz-Catalán

Developing sensory feedback via RPNI stimulation for use with osseointegrated prosthetic limbs. Investigating longitudinal behavioral and functional impacts of sensory feedback on prosthesis use at home, and quantifying perceptions and psychophysical metrics of varying stimulation parameters.

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

Peer-Reviewed Publications

- ◆ **E.J. Earley**, R.E. Johnson, J.W. Sensinger, L.J. Hargrove, “Joint Speed Feedback Improves Myoelectric Prosthesis Adaptation after Perturbed Reaches in Non Amputees,” *Scientific Reports*, vol. 11, no. 1, 2021. doi: 10.1038/s41598-021-84795-5
- ◆ **E.J. Earley**, R.E. Johnson, L.J. Hargrove, 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

- ◆ B.M. Musolf, **E.J. Earley**, M. Muñoz-Novoa, M. Ortiz-Catalán, “Analysis and Design of a Bypass Socket for Transradial Amputations,” *43rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, 2021.
- ◆ **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, 2019. 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 Robotics and Automation Letters |
| ◆ Annals of Physical and Rehabilitation Medicine | ◆ IEEE Transactions on Biomedical Engineering |
| ◆ Assistive Technology | ◆ IEEE Transactions on Human-Machine Systems |
| ◆ Biomedical Signal Processing and Control | ◆ IEEE Transactions on Mechatronics |
| ◆ Computer Methods in Biomechanics and Biomedical Engineering | ◆ IEEE Transactions on Medical Robotics and Bionics |
| ◆ IEEE EMBS Conference on Neural Engineering | ◆ IEEE Transactions on Neural Systems & Rehabilitation Engineering |
| ◆ IEEE Engineering in Medicine and Biology Conference | ◆ Journal of NeuroEngineering and Rehabilitation |
| ◆ IEEE International Conference on Biomedical Robotics and Biomechanics | ◆ Myoelectric Control Conference |
| ◆ IEEE International Conference on Intelligent Robots and Systems | ◆ PLOS ONE |
| ◆ IEEE International Conference on Rehabilitation Robotics | ◆ Scientific Reports |
| | ◆ Wearable Technologies |

ACADEMIC & TECHNICAL SKILLS

- ◆ Prosthetic sensory feedback, sensory integration, psychophysics
- ◆ Pattern recognition, classification, and machine learning algorithms
- ◆ Human motor control, motor learning and adaptation, musculoskeletal anatomy
- ◆ MATLAB, C, Simulink, LabVIEW
- ◆ SolidWorks, FEA
- ◆ HTML5, CSS
- ◆ Adobe Illustrator, Photoshop, Premiere, After Effects. Affinity Designer, Photo
- ◆ Organization, scheduling, Kanban, scrum
- ◆ Native English; limited working proficiency Swedish; elementary proficiency German, and French

LEADERSHIP

National Communicating Science Conference

2017 – present

Leadership Team, 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

SciShow YouTube Channel

2018 – 2020

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?](#)
- ◆ [Why Do Fetuses Kick So Much?](#)

Sci-Inspiration YouTube Channel

2017 – 2018

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

Other Science Videos

2016 – 2017

- ◆ “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

- ◆ [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