

Scholarly Activities  
Department of Physical Medicine and Rehabilitation  
September – November 2018

**REGULAR FACULTY**

**Brenna Argall**

**Grants awarded:**

Brenna Argall (PI), Sandro Mussa-Ivaldi (Co-I) and Elliot Roth (Co-I)  
NIH R01: Human and Machine Learning for Customized Control of Assistive  
Robots  
9/1/2018 – 5/31/2022

Todd D. Murphey (PI) and Brenna Argall (co-PI)  
NSF CPS: Medium: Information-based Control of Cyber-Physical Systems  
Operating in Uncertain Environments  
9/15/2018 – 9/14/2021

**Conference publication and oral presentation:**

S. Jain and B. Argall. Recursive Bayesian Intent Inference in Shared-Control Robotics. In  
Proceedings of the IEEE International Conference on Intelligent Robots (IROS), Madrid, Spain, Oct.  
2018

**Randy Calisoff:** Abstract "Worsening of Polyarticular Pain by Trazodone: A Case Report", accepted  
for poster presentation, Psychiatry '19, the AAP Annual Meeting, February 2019

**Andrea Alberto Domenighetti**

Letter of intent to the Cerebral Palsy Alliance Research Foundation for Application Project  
Title: "Rescuing Muscle Stem Cells to Relieve Contractures in Cerebral Palsy", October 9

Submitted manuscript: "Building a Professional Identity and an Academic Career Track in  
Translational Medicine", van Dijk, Domenighetti, et al., Frontiers in Medicine, section Translational  
Medicine, October 15

Halo's Inaugural Award in recognition for translational approach to research, October 25

NIH grant application (PAR-17-465, Bench Testing Therapeutic/Indication Pairing Strategies) titled  
"Repurposing DNMT inhibitors for drug treatment of muscle contractures in cerebral palsy"

**Colin Franz**

**Invited Presentations:**

**Franz, C.K.** Therapeutic Exercise and Physical Activity Considerations for People with ALS,  
Northwestern's First Annual Updates in the Diagnosis and Management of ALS, September 28,  
2018

## **Abstracts**

Quezada, M.J., Puritz, A., Leung, A.S., **Franz, C.K.** (2018) In Vitro Neurotrauma Exacerbates Neurodegeneration and Induces TDP-43 Proteopathy in fALS iPSC-Motor Neurons. Annual International Symposium on Regenerative Rehabilitation. Seattle, WA.

Quezada, M.J., **Franz, C.K.** (2018) The Onset of Spontaneous Bursting Behavior in Human Stem Cell-Derived Motor Neurons. Midwest Motoneuron Consortium. Indianapolis, IN.

Lee, D., Daley, E.L., Leung, A.S., Puritz, A.C., Phillips, J.K., Finan, J.D., **Franz, C.K.** (2018) An In Vitro Neurotrauma System to Evaluate the Effect of a Common BDNF Genetic Polymorphism on the Survival of Human Cortical Neurons Generated from Induced Pluripotent Stem Cells. American Academy of Physical Medicine and Rehabilitation Annual Assembly (**Poster and Platform Presentation**). Orlando, FL.

## **Awards**

**Franz, C.K.** Materson ERF New Investigator Award. Foundation for Physical Medicine and Rehabilitation. Awarded for my work on “Neurotrauma in a Dish: An Induced Pluripotent Stem Cell-based Assay to Determine Patient-specific Factors Affecting Rehabilitation Outcomes”. This was presented on October 25<sup>th</sup>, 2018 at the Annual Meeting of the Academy for Physical Medicine and Rehabilitation (Orlando, FL).

## **Media**

**Dr. Franz** was featured in an article just published by “Neuronline” (Society for Neuroscience) about the upcoming SfN annual meeting in San Diego (November 3-7<sup>th</sup>, 2018):

<https://neuronline.sfn.org/Articles/Professional-Development/2018/How-to-Build-Your-Schedule-and-Connect-With-Others-at-SfNs-Annual-Meeting>

## **Deborah Gaebler**

Nonsurgical Treatment Options for Upper Limb Spasticity. *Black L, Gaebler-Spira D. Hand Clin. 2018 Nov;34(4):455-464. doi: 10.1016/j.hcl.2018.06.003. Epub 2018 Aug 18. PMID: 30286960*

### **Posters at the National AACPDM Conference:**

Scoping review of Dance Utilized in Rehabilitation for people with cerebral palsy. American Academy of Cerebral Palsy & Developmental Medicine – Cincinnati, OH October 9-13, 2018

Mirror movements in the upper extremities of individuals with unilateral and bilateral cerebral palsy. American Academy of Cerebral Palsy & Developmental Medicine – Cincinnati, OH October 9-13, 2018

I am smarter than they are-Kids with CP-Qualitative responses to Bullying. American Academy of Cerebral Palsy & Developmental Medicine – Cincinnati, OH October 9-13, 2018

The Association of Hepatoblastoma, Cerebral Palsy, and Prematurity: Case Reports. American Academy of Cerebral Palsy & Developmental Medicine – Cincinnati, OH October 9-13, 2018

## **Levi Hargrove**

### **Papers Published**

Hu B, Rouse E, **Hargrove L**, Fusion of bilateral lower-limb neuromechanical signals improves

prediction of locomotor activities *Frontiers in Robotics and AI*, 26 June 2018. doi: 10.3389/frobt.2018.00078

Lenzi T, Cempini M, **Hargrove L**, Kuiken T. Design, development, and testing of a lightweight hybrid robotic knee prosthesis. *The International Journal of Robotics Research*, July 25, 2018. DOI: 10.1177/0278364918785993

Batzianoulis I, Krausz NE, Simon AM, **Hargrove L**, Billard A. Decoding the grasping intention from electromyography during reaching motions. *Journal of Neuroengineering and Rehabilitation* 15(1):57. doi: 10.1186/s12984-018-0396-5., June 26, 2018.

**Hargrove L**, Miller L, Turner K, Kuiken T. "[Control within a virtual environment is correlated to functional outcomes when using a physical prosthesis.](#)" *Journal of Neuroengineering and Rehabilitation* 15(1):60, September 2018.

### **Conference Presentations**

Woodward RB, and **Hargrove LJ**. "Adapting Myoelectric Pattern Recognition in a Virtual Environment." International Society of Electrophysiology and Kinesiology (ISEK). June 30-July 2, Dublin, Ireland.

Azocar AF, Mooney LM, **Hargrove LJ**, Rouse EJ. [Design and Characterization of an Open-Source Robotic Leg Prosthesis](#). 2018 7th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob) 8/26/18, pp 111-118.

Simon AM, Seyforth EA, **Hargrove LJ**. [Across-Day Lower Limb Pattern Recognition Performance of a Powered Knee-Ankle Prosthesis](#). 2018 7th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob) 8/26/18, pp 242-247.

Kaveny KJ, Simon AM, Lenzi T, Finucane SB, Seyforth EA, Finco G, Culler KL, **Hargrove LJ**. [Initial Results of a Variable Speed Knee Controller for Walking with a Powered Knee and Ankle Prosthesis](#). 2018 7th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob) 8/26/18, pp 764-769.

Hu BH, Krausz NE, **Hargrove LJ**. [A Novel Method for Bilateral Gait Segmentation Using a Single Thigh-Mounted Depth Sensor and IMU](#). 2018 7th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob) 8/26/18, pp 807-812.

Earley EJ, Johnson RE, **Hargrove LJ**, Sensinger JW. Visual Discrimination of Biomimetic Arm Speeds. Proceedings of the School and Symposium on Advanced Neurorehabilitation (SSNR2018) September 16-21, 2018 Baiona, Spain.

Piazza C., Catalano M.G., Bicchi A., **Hargrove L.J.** Preliminary Results Toward Continuous and Proportional Control of a Multi-Synergistic Soft Prosthetic Hand. In: Masia L., Micera S., Akay M., Pons J. (eds) *Converging Clinical and Engineering Research on Neurorehabilitation III*. International conference on NeuroRehabilitation (ICNR) 2018. Biosystems & Biorobotics, vol 21. Springer, Cham.

### **Book Chapter**

Lenzi T and **Hargrove L**, The Encyclopedia of Medical Robotics, Chapter 4: User-adaptive Control of Robotic Lower Limb Prostheses Ed. Sunil Agrawal. pp89-101, 2018.  
[https://doi.org/10.1142/9789813232327\\_0004](https://doi.org/10.1142/9789813232327_0004)

### **Patent**

Hargrove, LJ and Woodward, RB. [Prosthetic Virtual Reality Training Interface and Related Methods](#). US Patent App. 15/954,417, Published 10/18/2018

### **Grants submitted**

CDMRP, Joint Warfighter Medical Research Program: *An In-Clinic and In-Home Virtual Rehabilitation System for Reducing Phantom Limb Pain and Improving Functional Outcomes after Upper and Lower Extremity Amputation*. Submitted August 10, 2018.

### **Grants Awarded**

NIH-R01 (NICHD) HD079428 05 (renewal): *Intuitive Control of a Hybrid Prosthetic Leg During Ambulation*. (9/20/18 – 6/30/23)

NIH-R01 (NICHD) HD094861-01: *The Functional Importance of Powered Wrist Flexion/Extension and Simultaneous Control for Upper Limb Prostheses* (9-12-18 –5/31/23).

CDMRP Peer Reviewed Orthopaedic Research Program, Applied Research Award W81XWH-18-1-0668: *Flexible epidermal electrodes for intuitive control of powered arm and leg prostheses*. (9-15-18 –9/14/21)

NIDILRR—REGE0003 (Kuiken PI): *Technologies to Evaluate and Advance Manipulation and Mobility (TEAMM)-Rehabilitation Engineering Research Center award* (9/30/18 – 9/29/23).

## **Allen Heinemann**

### **Peer-Reviewed Publications**

Chan, Leighton et al. Response From the Editors. Archives of Physical Medicine and Rehabilitation, 99(7), 1437.

Hall, O. Trent et al. The Burden of Traumatic Spinal Cord Injury in the United States: Disability-Adjusted Life Years. Archives of Physical Medicine and Rehabilitation, in press.

Gerber, Lynn H. et al. A scoping review of burn rehabilitation publications incorporating functional outcomes, 2018

Huacong, Wen et al. Racial Differences in Weight Gain: A 5-Year Longitudinal Study of Persons With Spinal Cord Injury. Archives of Physical Medicine and Rehabilitation, 99(10), 1957-1964.

Hogaboon, Nathan. et al. Wheelchair Breakdowns Are Associated With Pain, Pressure Injuries, Rehospitalization, and Self-Perceived Health in Full-Time Wheelchair Users With Spinal Cord Injury. Archives of Physical Medicine and Rehabilitation, 99(10), 1949-1956

## **Presentations**

From Where I'm Sitting...A video series for SCI Model Systems' Hospital television networks. Presented with David Chen and Thea Flaum. Association of Spinal Cord Injury Professionals, New Orleans, LA, September 4, 2018.

Spirituality after SCI: What role does it play, and how can we better incorporate it into rehabilitation practice? International Spinal Cord Society, September 13, 2018, Sydney, Australia

Experience of Robotic Exoskeleton Use at Four Spinal Cord Injury Model Systems Centers, International Spinal Cord Society, September 15, 2018, Sydney, Australia

Pearls, Possibilities, and Pitfalls: Writing Successful Grants and Manuscript Submissions. American Congress of Rehabilitation Medicine annual meeting, Dallas, TX, September 30, 2018.

The Rehabilitation Measures Database Taskforce: Advancing Progress in Rehabilitation Research, American Congress of Rehabilitation Medicine annual meeting, Dallas, TX, September 30, 2018

How To Get Published: Authorship, Reporting Guidelines, Reviewing In Medical Rehabilitation, American Congress of Rehabilitation Medicine annual meeting, Dallas, TX, October 1, 2018.

Improving Measurement of Patient Reported Outcomes for Individuals With Traumatic Brain Injury, American Congress of Rehabilitation Medicine annual meeting, Dallas, TX, October 1, 2018.

Kisala, P.A., Shermeyer, A., Fyffe, D., Heinemann, A.W., Victorson, D., & Tulskey, D.S. Developing Clinically Relevant Scoring Standards for the Spinal Cord Injury-Quality of Life (SCI-QOL) measurement system. Poster presented at the American Congress of Rehabilitation Medicine annual meeting, Dallas, TX, October 2018. Arch Phys Med Rehabil 99(10) e65.

Kang, Eunyoung, Heinemann, AW, et al. Predictors of Loneliness in Community-Dwelling Persons after Stroke. Poster presented at the American Congress of Rehabilitation Medicine annual meeting, Dallas, TX. Archives of Physical Medicine and Rehabilitation, 99(10), e66.

Clinical Utilization of the SCI-QOL Measurement System during Inpatient Rehabilitation, International Society of Quality of Life Research, Dublin, Ireland, October 27, 2018.

Babbitt, E., Semik, P., Heinemann, A.W., Cherney, L. Sensitivity of the Communication Confidence Rating Scale for Aphasia (CCRSA), poster presented at the American Speech-Language-Hearing Association annual meeting, Boston, MA, November 16, 2018.

## **Invited Talk**

Keynote Speaker, Fujian University of Traditional Chinese Medicine, Fuzhou, China, November 9, 2018.

### **Proposals under Review**

NIDCD: Defining Trajectories of Linguistic, Cognitive-Communicative and Quality of Life Outcomes in Aphasia with Leora Cherney  
CDC: Injury Control Research Center

### **Service Activities**

Member, Committee on Functional Assessment for Adults with Disabilities, National Academies of Sciences, Engineering, and Medicine's, 2017 – present.

Member, Advisory Board, National Center for Medical Rehabilitation Research, 2016-2019.

Member, NINDS Stroke CDE v2.0 Working Group, 2018-.

Advisory Board, Craig H. Neilsen Award, Larry Vogel, PI. Shriner's Hospital, Chicago, IL, 2018-2021

### **Prakash Jayabalan**

#### **Publications:**

Physical Activity and Worsening of Radiographic Findings in Persons with or at Risk for Knee Osteoarthritis. *Arthritis Care Res (Hoboken)*. 2018. Sept 20. [Epub ahead of print]. P Jayabalan, G Rouleau, M Kosherginsky, Dunlop D, L Sharma.

A Stimulus-Response Framework to Investigate the Influence of Continuous Versus Interval Walking Exercise on Select Serum Biomarkers in Subjects with Knee Osteoarthritis. *AM J Phys Med Rehabil*. 2018 Oct 8 [Epub ahead of print]. P Jayabalan, J Gustafson, SR Piva, GA Sowa, SS Farrokhi.

Non-interventional Therapies for the Management of Knee Osteoarthritis. Accepted to *J Knee Surg*. October 2018. J Dadabo, J Fram, P Jayabalan.

#### **Conference Presentations:**

AAPM&R (Oct 2018), Orlando, FL

- Session Director/Speaker: Working Out and Working Together as a Team: Creating an Innovative Community and Academic Partnership to Optimize Physical Activity in Lung Cancer Survivors

- Speaker: Top Musculoskeletal Papers

- Poster: The Effect of Psychosocial and Socioeconomic Factors on Pain Experience in Patients Receiving Corticosteroid Injection in Knee Osteoarthritis. K Huang, K McClary, N Sardonovic, P Jayabalan

1st World Congress of Golf and Health, London UK (Oct. 2018)

- Podium presentation 'Golf and Knee Osteoarthritis'

#### **Committees:**

- AMA House of Delegates Representative, AAP (term started Oct 2018)

- Academic Chair, Steering Committee, Alliance for Research in Chicago (term started Oct 2018)

- Healthcare Policy and Legislative Committee, AAPM&R

## Arun Jayaraman

### **Papers Published**

Liu Y, Tian L, Raj MS, Cotton M, Ma Y, Ma S, McGrane B, Pendharkar AV, Dahaleh N, Olson L, Luan H, Block O, Suleski B, Zhou Y, Jayaraman C, Koski T, Aranyosi AJ, Wright JA, **Jayaraman A**, Huang Y, Ghaffari R, Liot M, Rogers JA. Intraoperative monitoring of neuromuscular function with soft, skin-mounted wireless devices. *npj Digital Medicine* 1:19, May 23, 2018. doi:10.1038/s41746-018-0023-7.

Radhakrishnan S, Kohler F, Gutenbrunner C, **Jayaraman A**, Pieber K, Li J, Schiappacasses C. Mobility in persons with lower extremity amputations and influencing factors: Using the International Classification of Functioning, Disability and Health to quantify expert views. *Prosthetics and Orthotics International*. August 10. P1-7. DOI: 10.1177/0309364618792714

Sok P, Xiao T, Azeze Y, **Jayaraman A**, Albert MV. Activity Recognition for Incomplete Spinal Cord Injury Subjects Using Hidden Markov Models. *IEEE Sensors Journal* 18(15) 6369 – 6374. Epub. 8/6/18. DOI: 10.1109/JSEN.2018.2845749

**Jayaraman C**, Mummidisetty CK, Loesch A, Kaur S, Hoppe-Ludwig S, Staat M, **Jayaraman A**. “[Postural and metabolic benefits of using a forearm support walker in older adults with impairments.](https://doi.org/10.1016/j.apmr.2018.10.001)” *Archives of Physical Medicine and Rehabilitation* <https://doi.org/10.1016/j.apmr.2018.10.001>

Maneyapanda MB, Stork R, Ingraham B, Lonini L, **Jayaraman A.**, Shawen N, Ripley D. “Association of Sleep with Neurobehavioral Impairments during Inpatient Rehabilitation after Traumatic Brain Injury.” *NeuroRehabilitation* DOI: 10.3233/NRE-182533. October 15, 2018.

Heinemann AW, Jayaraman A., Mummidisetty CK, Spraggins J, Pinto D, et al. “Experience of Robotic Exoskeleton Use at Four Spinal Cord Injury Model Systems Centers.” *Journal of Neurologic Physical Therapy* 42(4):256-267. October 1, 2018.

### **Conference Presentation**

“How does the type of KAFO affect gait efficiency and community mobility: a randomized clinical trial comparing the micro-processor controlled KAFO (MPO) vs SCO vs KAFO.” OT World, Leipzig, Germany May 15-18, 2018

### **Conference Proceedings**

Xiao Bo, Poellabauer C, O’Brien MK, Mummidisetty CK, **Jayaraman A**. Detecting Label Errors in Crowd-Sourced Smartphone Sensor Data. 2018 International Workshop on Social Sensing (SocialSens) 17 April 2018. DOI: 10.1109/SocialSens.2018.00017

### **Grants Submitted**

Falk Medical Foundation Catalyst Award: *Wearable sensors to detect cerebral palsy in infants.* Submitted July 24, 2018.

CDMPR Spinal Cord Injury Research Program Clinical Trial Award: *Combinational Therapy to Enhance Neural Recovery After Incomplete Spinal Cord Injury.* Submitted October 15, 2018.

CDMRP Spinal Cord Injury Research Program Translational Research Award (Gordon PI). *Clinical Implementation of Movement Amplification to Improve Gait Stability After Spinal Cord Injury.* Submitted October 15, 2018.

Michael J. Fox Foundation – Invited submission to Digital Data RFP: *Clinical Assessment and Monitoring of Neuromotor Function in PD Patients through Advanced Dynamic Pose Estimation*. Submitted October 29, 2018.

Michael J. Fox Foundation – Invited submission to Digital Data RFP: *Using Smartwatch data from the CIS-PD Study to Estimate MDS-UPDRS Scores at Home*. Submitted October 29, 2018.

**Grants Awarded**

CDMRP—W81XWH-18-2-0057: Orthotics and Prosthetics Outcomes Research Program, Orthotics and Prosthetics Outcomes Research Award. *Personalized Mobility Interventions using Smart Sensor Resources for Lower-limb Prostheses Users* (9/30/18 – 9/29/22)

NIDILRR—REGE0003 (Kuiken PI): *Technologies to Evaluate and Advance Manipulation and Mobility* (TEAMM)-Rehabilitation Engineering Research Center award (9/30/18 – 9/29/23).

NIDILRR—REGE0005 (Patton, PI): Collaborative Machines Enhancing Therapies (COMET) (9/30/18 – 9/29/23)

**Allison Kessler** was awarded a teaching pin from Feinberg for her Phase 1 Medical Student lectures.

**Todd Kuiken**

**Keynote Speaker:**

**Kuiken T.** ‘*Building Bionics*’ International Society of Electrophysiology and Kinesiology (ISEK). June 30-July 2, Dublin, Ireland.

**Papers Published**

Reissman T, Halsne E, Lipschutz R, Miller L, **Kuiken T.** A novel gel liner system with embedded electrodes for use with upper limb myoelectric prostheses. *PLoS ONE* 13(6): e0198934. June 18, 2018. <https://doi.org/10.1371/journal.pone.0198934>

Swartz AQ, Turner K, Miller L, **Kuiken T.** Custom, rapid prototype thumb prosthesis for partial-hand amputation: A case report. *Prosthetics and Orthotics International* 42 (2), 187-190, April 2018.

Lenzi T, Cempini M, Hargrove L, **Kuiken T.** Design, development, and testing of a lightweight hybrid robotic knee prosthesis. *The International Journal of Robotics Research*, July 25, 2018. DOI: 10.1177/0278364918785993

Hargrove L, Miller L, Turner K, **Kuiken T.** “[Control within a virtual environment is correlated to functional outcomes when using a physical prosthesis.](#)” *Journal of Neuroengineering and Rehabilitation* 15(1):60, September 2018.

Dumanian GA, Potter BK,..**Kuiken TA,** et al. “Targeted Muscle Reinnervation Treats Neuroma and Phantom Pain in Major Limb Amputees: A Randomized Clinical Trial” *Annals of Surgery*, October 2018. *Epub Ahead of Print*. doi: 10.1097/SLA.0000000000003088



### **Grants Submitted**

Application to TREAT (Center for Translation of Rehabilitation Engineering Advances and Technology) Commercialization Assistance Program: Manual Standing Wheelchair Submitted September 25, 2018.

Application to TREAT (Center for Translation of Rehabilitation Engineering Advances and Technology) Commercialization Assistance Program: Low-Cost Prosthetic Hand/Arm System Submitted September 25, 2018.

Pre-application to Cerebral Palsy Alliance: Design of a Manual Standing Wheelchair for Children with Cerebral Palsy. Submitted October 14, 2018.

Shirley Ryan AbilityLab—Craig H. Neilsen Foundation Infrastructure Center Project Award— Spinal Cord Injury Research: *Novel Design of an Upper Limb Orthosis for Individuals with C5-C7 Spinal Cord Injury*. Submitted November 2, 2018.

### **Grants Awarded**

NIDILRR—REGE0003: *Technologies to Evaluate and Advance Manipulation and Mobility (TEAMM)*-Rehabilitation Engineering Research Center award (9/30/18 – 9/29/23).

### **Other:**

Invited talk "Building Bionics" at Northwestern University, 50th Anniversary of Continuing Education, "Robotics, Artificial Intelligence, and You."

October 4, 2018 Invited to present and demonstrate the manual standing wheelchair at NIDILRR 40th anniversary celebration, Washington DC. October 18, 2018. This was the only NIDILRR-funded product demonstrated at the event.

Presented two posters at NIDILRR 40th anniversary celebration, Washington DC. October 18, 2018:

Development and Evaluation of a Manual Standing Wheelchair ( Todd Kuiken

Pattern Recognition for Improved Control of Upper Limb Myoelectric Prostheses (Levi Hargrove, Ann Simon)

### **Mitra Lavasani**

#### Grant Submitted

NIH-R01: Stem Cell Mediated Restoration of Aging Neuromuscular Tissues

Role: PI

#### Professional Activities/Services

Invited Participant at the Chicago Women in Philanthropy

Invited Search Committee, Clinical Chairs Recruitment, Shirley Ryan AbilityLab

Invited speaker for Keystone Board Education & Volunteering Committee, Shirley Ryan AbilityLab

Invited speaker for The American Congress of Healthcare Executive Group, Shirley Ryan AbilityLab

Invited speaker for The National Grantmakers in Health (GIH) Conference, Shirley Ryan AbilityLab

Invited speaker The Northwestern Alumni Relations and Development Team, Shirley Ryan AbilityLab

Invited Speaker for Inside Look: Science of Ability, Shirley Ryan AbilityLab

Northwestern University Interdepartmental Neuroscience Graduate Program (NUIN) Student Recruitment Participant and Interviewer

### **Bryan Malas**

Port E, Hebal F, Hunter C, **Malas B**, Reynolds M. Measuring the Impact of Brace Intervention on Pediatric Pectus Carinatum Using White Light Scanning. *J Pediatr Surg* (2018), <https://doi.org/10.1016/j.pedsurg.2018.08.016>

Hebal F, Port E, Hunter C, **Malas B**, Green J, Reynolds M. A Novel Technique to Measure Severity of Pediatric Pectus Excavatum Using White Light Scanning., *J. Pediatr Surg* (2018), <https://doi.org/10.1016/j.jpedsurg.2018.04.017>

### **Laura Miller**

#### **Papers Published**

Reissman T, Halsne E, Lipschutx R, **Miller L**, Kuiken T. A novel gel liner system with embedded electrodes for use with upper limb myoelectric prostheses. *PLoS ONE* 13(6):e0198934. June 18, 2018. <https://doi.org/10.1371/journal.pone.0198934>

Swartz AQ, Turner K, **Miller L**, Kuiken T. Custom, rapid prototype thumb prosthesis for partial-hand amputation: A case report. *Prosthetics and Orthotics International* 42 (2):187-190, April 2018.

Hargrove L, **Miller L**, Turner K, Kuiken T. "[Control within a virtual environment is correlated to functional outcomes when using a physical prosthesis.](#)" *Journal of Neuroengineering and Rehabilitation* 15(1):60, September 2018.

#### **Grants Submitted**

CDMRP, Orthotics and Prosthetics Outcomes Research Program - Clinical Trial Award. *The Functional Importance of Powered Wrist Flexion for Transradial Prosthetic Users*. Pre-application submitted August 6, 2018.

CDMRP, Orthotics and Prosthetics Outcomes Research Program - Clinical Research Award. *A Pilot Investigation to Determine the Presence of Pathogens on Gel Liners Worn by Amputees*. Pre-application submitted August 3, 2018

Invited submission to CDMRP Orthotics and Prosthetics Outcomes Research Program Clinical Trial Award: *The Functional Importance of Powered Wrist Flexion for Transradial Prosthetic Users*. Submitted October 25, 2018.

#### **Grants Awarded**

NIDILRR—REGE0003 (Kuiken PI): *Technologies to Evaluate and Advance Manipulation and Mobility (TEAMM)*-Rehabilitation Engineering Research Center award (9/30/18 – 9/29/23).

**Jacqueline Neal** was recognized for completing the Feinberg Academy of Medical Educators (FAME) certificate program; was inducted into FAME

**Matthew Oswald** was awarded a teaching pin from Feinberg for his Phase 1 Medical Student lectures.

**Leslie Rydberg** was awarded the John X. Thomas, Jr. Best Teachers of Feinberg Award

**W. Zev Rymer**

Keynote presentation: "An Evaluation of the Emerging use of Advanced Technologies in Major U.S. Academic Rehabilitation Hospitals" at 2018 International Symposium on Rehabilitation Engineering (ISRE) in Qinhangdao, China, September 7

Plenary talk: "Novel strategies to enhance neural plasticity after damage to the central nervous system: Applications of acute intermittent hypoxia (AIH)" at SSNR 2018 in Baiona, Spain, September 19

Published "Shear Waves Reveal Viscoelastic Changes in Skeletal Muscles After Hemispheric Stroke" by Rasool G, Wang AB, **Rymer WZ**, Lee SSM, *IEEE Trans Neural Syst Rehabil Eng.* 2018 Oct. PMID: 30334740

Invited presentation: "Rehabilitation Technologies: Global Experience with Rehabilitation Robotics" at The 14th Rehabilitation Symposium cum the 6th Sir Harry Fang Oration, The Hong Kong College of Orthopaedic Surgeons in Hong Kong, October 13

Invited presentation: "Novel Techniques to Augment Neural Plasticity After Spinal Cord Injury: Applications of Acute Intermittent Hypoxia (AIH)" at The 14th Rehabilitation Symposium cum the 6th Sir Harry Fang Oration, The Hong Kong College of Orthopaedic Surgeons in Hong Kong, October 13

Invited presentation: "How Does Botulinum Toxin Reduce Spasticity?" at The 14th Rehabilitation Symposium cum the 6th Sir Harry Fang Oration, The Hong Kong College of Orthopaedic Surgeons in Hong Kong, October 14

Invited presentation: "Mechanisms of Spasticity after Injury to the Neuraxis - Implications for Novel Therapeutics" at The 14th Rehabilitation Symposium cum the 6th Sir Harry Fang Oration, The Hong Kong College of Orthopaedic Surgeons in Hong Kong, October 14

Invited presentation: "US Clinical Experience with Wearable Exoskeletons as Therapeutic Rehabilitation Devices Following Injury to the CNS: An Evolving Story" during Worldwide Consensus of NeuroRehabilitation at ICNR 2018 in Pisa, Italy, October 16

Invited presentation: "Translational Neural Engineering: Bringing Neurotechnology into the Clinics" at IEEE BRAIN Initiative Symposium on Technology for NeuroRehabilitation, ICNR 2018 in Pisa, Italy, October 16

Invited presentation (Symposium #1): "Translational Neural Engineering: Bringing Neurotechnology into the Clinics" at IEEE Brain Initiative Workshop on Advanced NeuroTechnologies in San Diego, CA, November 1

Invited presentation (Session 1: Contracture & More ): "Changes in muscle architecture after hemispheric stroke can adversely affect efficiency of muscle contraction in pennate muscles" at First International Motor Impairment Conference in Coogee, Sydney Australia, November 27

### **Diane Dudas Sheehan**

Received Outstanding Teacher recognition, NU, September 19, 2018

#### **Teaching**

Fall 2018 Small group Leader for Ethics in Action (EIA) Class – M2 medical students, NU

Continue to teach (repeating lecture) PM&R residents / students during Pediatric rotation at Shirley Ryan AbilityLab:

"Neuromuscular Scoliosis Evaluation and Management" on 9/11/18

"Comprehensive Evaluation and Practical Treatment of Children with Wounds" on 8/14/18 & 9/18/18

8/21/18 "SMA & Arthrogyrosis" presented to PM&R 3<sup>rd</sup> year Residents at the Shirley Ryan AbilityLab

10/23/18 "Systems of Care & Chronic Illness in Pediatrics" presented to PM&R 3<sup>rd</sup> year Residents at the Shirley Ryan Ability Lab (SRAL)

Presented "Spinal Muscular Atrophy" presented to Ortho APNs and Nurses, LC, August 28

## **RESEARCH FACULTY**

### **Anne Deutsch**

#### **Peer-reviewed publications**

Krishnan S, Stroke survivors' perspectives on the selection of a post-acute care setting, rehabilitation goal-setting, and satisfaction with post-acute care rehabilitation, and transition to home" Journal of Neurologic Physical Therapy. In Press.

Deutsch A Heinemann AW, Cook KF, Foster L, Miskovic A, Goldsmith A. Cella D. Inpatient Rehabilitation Quality of Care from the patient's Perspective: Impact of Data Collection Timing and patient Characteristics. Archives of Phys Medicine and Rehabilitation. In Press.

Pardasaney P, Pope G, Amico P, Deutsch A, Kline T, Silver B, Scheffler S, Meadow A, West P. Medicare outpatient Physical Therapy Expenditures Vary by Diagnosis and Functional Mobility. Physical Therapy. in Press.

### **Presentations Educational Sessions**

Deutsch A, Functional Abilities and Goals and Active Diagnoses. Webinar presentation for the Centers for Medicare and Medicaid Services' Skilled Nursing Facility Quality Reporting Program Training; Sept 12, 2018.

Deutsch A. Functional Abilities and Goals. Presentation at the Centers for Medicare and Medicaid Services' Home Health Quality Reporting Program Training, Baltimore, MD; November 6, 2018.

Deutsch A. Healthcare Research. Presentation to high school students about careers in health care research. Course: Introduction to Health Occupations, Naperville Central High School, Naperville, IL; November 16, 2018.

### **Presentations: Conference**

Deutsch A, Pardasaney P. Healthcare Quality Measurement: Overview of the Current landscape and Applications to Research and Practice. American Congress of Rehabilitation Medicine: Progress in Rehabilitation Research Conference. Dallas, TX. October 1, 2018.

Deutsch A. Award Winning Idea: Doctorate-Prepared Researcher Role Award REACH Session 707). Association of Rehabilitation Nurses REACH Conference. West Palm Beach, FL; October 20, 2018.

Deutsch A. Improving Quality in Rehabilitation Care. University of Lucerne, Fall 2018 Lecture Series: Rehabilitation in Health Systems: A Global Perspective. Lucerne, Switzerland. October 10, 2018.

### **Service Activities**

Chair, Research Committee, Association of Rehabilitation Nurses

### **Award**

2018 Doctorate-Prepared Researcher Role Award, Association of Rehabilitation Nurses. West Palm Beach, October 17, 2018.

## **Linda Ehrlich-Jones**

### **Peer-Reviewed Publications**

Pellegrini CA, Powell SM, Mook N, DeVivo K, & Ehrlich-Jones L. Use of physical activity monitors in rheumatic populations. (2018). *Curr Rheumatol Rep*; 20(12): 73.

### **Presentations**

PI Seminar Presentation 10/08/18 on Health Services and Health Outcomes Research at the Shirley Ryan AbilityLab.

Kulhawy-Wibe S, Zell JA, Michaud K, Yazdany J, Ehrlich-Jones L, Thorne C, Everix D, & Barber C. Cross-cultural validity of functional status assessment measures in rheumatoid arthritis, poster presentation, American College of Rheumatology Annual Scientific Meeting, 10/21/18, Chicago.

Song J, Lee J, Lee YC, Chang AH., Semanik PA, Ehrlich-Jones L, Chang RW, & Dunlop, D. Restless sleep trajectories over 8 years: Data from the Osteoarthritis Initiative, poster presentation, American College of Rheumatology Annual Scientific Meeting, 10/22/18, Chicago.

The Rehabilitation Measures Database Taskforce: Advancing Progress in Rehabilitation Research, American Congress of Rehabilitation Medicine annual meeting, Dallas, TX, September 30, 2018

Beginning Motivational Interviewing Class for Physical Therapy Students 9/18-9/21/18

CRRN Review Course lecture on Test-Taking Strategies 10/4/18

### **New Awards**

Lupus Intervention Fatigue Trial (LIFT) R01, NIAMS, 8/1/2018-7/31/2023

### **Proposals in Development**

PCORI resubmission on EnhanceFitness vs. Walk with Ease: Finding the Best Fit for Older Adults with Chronic Knee Symptoms with Rowland Chang, MD, MPH.

### **Service Activities**

US Bone & Joint Initiative Scientific Committee 10/22/18

## **Jessica Pedersen**

### **Presentations**

Worobey L, Boninger M, Kirby DL, Dyson-Hudson T, Cowan R, Shea M, Pedersen J. Optimizing Outcomes in Wheelchair Skills and Maintenance Training Through Group and Remote Training, Instructional Course ACRM, September 30, 2018 Dallas, TX

Presperin Pedersen J, Smith C. Clinical evidence in supporting spinal curves in seating. Poster ACRM , October 3, 2018, Dallas, TX.

### **Accepted**

Participation in TIGRR grant writing session. January 8-12, 2019

## **Anne Simon**

Batzianoulis I, Krausz NE, **Simon AM**, Hargrove L, Billard A. Decoding the grasping intention from electromyography during reaching motions. *Journal of Neuroengineering and Rehabilitation* 15(1):57. doi: 10.1186/s12984-018-0396-5., June 26, 2018

### **Conference Proceedings**

**Simon AM**, Seyforth EA, Hargrove LJ. [Across-Day Lower Limb Pattern Recognition Performance of a Powered Knee-Ankle Prosthesis](#). 2018 7th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob) 8/26/18, pp 242-247.

Kaveny KJ, **Simon AM**, Lenzi T, Finucance SB, Seyforth EA, Finco G, Culler KL, Hargrove LJ. [Initial Results of a Variable Speed Knee Controller for Walking with a Powered Knee and Ankle Prosthesis](#) 2018 7th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob) 8/26/18, pp 764-769.

### **Mary Ellen Stoykov**

#### **Published Abstracts**

Ghassemi M, Barry A, Triandafilou K, **Stoykov M**, Kamper DG & Roth E. Use of a EMG-controlled game as a therapeutic tool to retain hand muscle activation patterns following stroke. Society for Neuroscience, November 2018, San Diego, CA [ABSTRACT – 693.15].

#### **Manuscript**

Ghassemi M, Triandafilou K, Barry A, **Stoykov ME**, Roth E, Mussa-Ivaldi, FA, Kamper DG & Rajiv, Ranganathan. Development of an EMG-controlled Serious Game for Rehabilitation. Submitted to Transactions on Neural Systems and Rehabilitation Engineering.

#### **Grants Submitted:**

Mary Ellen Stoykov, was co-investigator on an R01 submission entitled “Bimanual coordination training for finger individuation to improve fine motor control in both hands after stroke” submitted in October to NCMRR . PIs: Kamper DG & Roth E

#### **Professional Activities**

Invited Guest: American Occupational Therapy Foundation in Chicago, November 9, 2018. The James House, 1560 N. Sandburg Terrace, PH (Penthouse), Chicago, Illinois

## **NU PROSTHETICS AND ORTHOTICS CENTER**

### **Publications:**

Perry, D.C., Schiro-Geist, C., Marme', M., **Duncan, J.C.**, Robertson, R., & Willmering, P (accepted). Undergraduate rehabilitation education and accreditation: Importance of being persistent. Journal of Applied Rehabilitation Counseling.

Oswald, G., Huck, G., & **Duncan, J.** (accepted). The state of undergraduate rehabilitation education: current program coordinator perspectives. Rehabilitation Research, Policy, and Education.

**Caldwell R, Fatone S** (2018) Technique modifications for a suction suspension version of the Northwestern University Flexible Sub-Ischial Vacuum socket: The Northwestern University

Flexible Sub-Ischial Suction socket. Prosthetics and Orthotics International, doi.org/10.1177/0309364618798869; Epub ahead of print).

**Fatone S, Hafner B** (2018) OPERF turns 10! The O&P Edge, September, <https://opedge.com/Articles/ViewArticle/2018-09-01/operf-turns-ten>

Dr Fatone's DOD-funded project developing the NU-FlexSIV Socket was highlighted in the DoD Blast Injury Research Program 2017 Science & Technology Efforts & Programs Prevention, Mitigation, and Treatment of Blast Injuries Annual Report to the Executive Agent. Full report: [https://blastinjuryresearch.amedd.army.mil/index.cfm/annual\\_reports](https://blastinjuryresearch.amedd.army.mil/index.cfm/annual_reports) Project Summary: [https://blastinjuryresearch.amedd.army.mil/assets/docs/reset/fy17/orthotics\\_and\\_prosthetics/Prosthetic\\_Socket\\_Technology.pdf](https://blastinjuryresearch.amedd.army.mil/assets/docs/reset/fy17/orthotics_and_prosthetics/Prosthetic_Socket_Technology.pdf)

Shepherd MK, Azocar AF, **Major MJ**, Rouse EJ. Amputee perception of prosthetic ankle stiffness during locomotion. Journal of NeuroEngineering and Rehabilitation, 2018 (in press).

**Major MJ**. Fall prevalence and contributors to the likelihood of falling in persons with upper limb loss. Physical Therapy, 2018 (in press).

Kim J, **Major MJ**, Hafner B, Sawers A. Frequency and circumstances of falls reported by ambulatory unilateral lower limb prosthesis users: a secondary analysis. Physical Medicine & Rehabilitation, 2018 Sep 6 [ePub].

Prost V, Olesnavage KM, Johnson WB, **Major MJ**, Winter V AG. Design and testing of a prosthetic foot with interchangeable custom springs for evaluating lower leg trajectory error, an optimization metric for prosthetic feet. J. Mechanisms Robotics, 2018; 10(2): 021010.

#### **Presentations:**

**Stefania Fatone, PhD, BPO (Hons)**, was invited to present two lectures at the Nordiske Bandagist Kongres held in Copenhagen, Denmark, on September 6-8, 2018. Dr. Fatone gave presentations on "The NU-FlexSIV Socket: Development, Research and Dissemination," as well as "Informing Decisions about Dysvascular Partial Foot Amputation Using a Shared Decision-Making Approach."

**Brinkmann, J.** (2018) Teaching Professionalism and Ethics during Residency; and Adherence among Users of Orthoses. Midwest Chapter of the American Academy of Orthotists and Prosthetists, September 13 - 15, Lake Geneva, WI.

**Duncan, J. and Hoggatt, M.** (2018) Patient Satisfaction, So What? Midwest Chapter of the American Academy of Orthotists and Prosthetists, September 13 - 15, Lake Geneva, WI.

**Major, M.** (2018) Sensorimotor and Biomechanical Factors of Older Adults with and without Lower Limb Loss: Implications to Gait and Balance. Midwest Chapter of the American Academy of Orthotists and Prosthetists, September 13 - 15, Lake Geneva, WI.



**Quinlan, J. Baer G, Subramanian V, Yohay J, Poziembo B, Richardson R, Fatone S** (2018) Tensile and Coefficient of Friction Testing of Textured Prosthetic Socket Specimens. Midwest Chapter of the American Academy of Orthotists and Prosthetists, September 13 - 15, Lake Geneva, WI.

**Robinson, C.** (2018) NCOPE Update. Midwest Chapter of the American Academy of Orthotists and Prosthetists, September 13 - 15, Lake Geneva, WI.

**Steven A. Gard, PhD**, was invited to speak to researchers at the Orthopaedic & Rehabilitation Engineering Center (OREC), Marquette University, on September 17, 2018, where he presented "Do Persons with Transtibial Amputations Require Prosthetic Shock Absorbing Components during Gait?"

**Megan Hodgson and Tiffany Ryan (2018).** Comparison of Direct Control vs Morph for Myoelectric Multi-Articulated Hands with Abstract Object Manipulation: A Pilot Study. Poster Presentation, American Orthotic Prosthetic Association (AOPA) National Assembly, September 26-29 in Vancouver, BC, Canada.

**Hannah Howington and John Brinkmann (2018).** Characteristics of Effective Motivational Interviewing Training in Healthcare. Poster Presentation, American Orthotic Prosthetic Association (AOPA) National Assembly, September 26-29 in Vancouver, BC, Canada.

Senczyszyn, A., & **Duncan, J.C.** (2018). *Healthcare accessibility in the United States: Barriers and risk factors impacting care.* 2018 American Orthotic Prosthetic Association (AOPA) National Assembly. September 26-29, Vancouver, BC, Canada

**Stefania Fatone, PhD, BPO (Hons)**, was the keynote speaker at the Australian Orthotic and Prosthetic Association (AOPA) 2018 Congress held in The Gold Coast, Australia from October 4-6. Dr. Fatone gave a presentation on "What We Know, What We Don't Know, and What We Want to Know." Dr. Fatone also presented a free paper, "Evaluation of the NU-FlexSIV Socket for Persons with Transfemoral Amputation," which received the Guild Best Presentation Award. Dr. Fatone also spoke about her career at a Student Event for Future Leaders held the evening of October 4.

**Steven A. Gard, PhD**, was invited to speak at the NU IRB Members Retreat on October 19, 2018, where he presented " Medical Device Studies: Significant Risk, Nonsignificant Risk, or Exempt?"

Willmering, P., Schiro-Geist, C, **Duncan, J.C.**, & Robertson, R. (2018). *Stakeholders Forum on Undergraduate Accreditation.* NCRE Fall Conference. October 25-27, 2018 in Arlington, VA.

#### Awards:

**Stefania Fatone, PhD, BPO (Hons)** received the Guild Best Presentation Award at the Australian Orthotic and Prosthetic Association (AOPA) 2018 Congress for the free paper presentation titled "Evaluation of the NU-FlexSIV Socket for Persons with Transfemoral Amputation" which was co-authored by **Ryan Caldwell, Rebecca Stine, Vasanth Subramanian** and John Angelico.

**Diana Pressney, CO, MPO**, a graduate of the NUPOC MPO class of 2016, received the 2018 Orthotic and Prosthetic Education and Research Foundation (OPERF)/American Board for Certification in Orthotics, Prosthetics and Pedorthics (ABC) Resident Travel Award. OPERF's clinical and scientific reviewers selected her residency project, Effect of Virtual Reality Immersion on Phantom Limb Pain and Phantom Limb Sensation. The award is a \$2,500 cash prize that enables her to present her research at the Annual Meeting and Scientific Symposium of the American Academy of Orthotists and Prosthetists in Orlando, FL, in March 2019.

#### **Meetings:**

**Stefania Fatone, PhD, BPO (Hons)**, visited Jonkoping University in Sweden from September 8-12, 2018. She visited with her colleague Nerrolyn Ramstrand, PhD, BPO (Hons), working on a symposium application for submission to the 2019 International Society for Prosthetics and Orthotics World Congress as well as acting as an external referee evaluating applicants for an Assistant Professor position at Jonkoping University.

**Stefania Fatone, PhD, Ryan Caldwell, CP and John Brinkmann, CP**, hosted a visit to NUPOC on November 13 by Keith Kral, a prosthetist from Sweden who was awarded a travel fellowship from the Swedish Orthotic and Prosthetic Association to visit facilities in the US to learn about P&O education and new clinical techniques.

#### **Laboratory Visits/Events:**

**Stefania Fatone, PhD, BPO (Hons)**, and **Ryan Caldwell, CP**, taught the 2 day hands-on NU-FlexSIV Socket Course to:

- 12 prosthetists at Heckert and van Lierop in Eindhoven, The Netherlands, on September 19-20, 2018.
- 12 prosthetists at Scheck and Sires, Inc., in Chicago, Illinois on November 2-3, 2018.
- 18 prosthetists at Ossur Americas in Orlando, Florida on November 9-10, 2018.

#### **Recent Appointments:**

**Matthew Major, PhD**, accepted an invitation to serve on the Technical Programme Committee for the joint Trent International Prosthetics Symposium and UK ISPO National Member Society Conference, Salford, United Kingdom, March 20-23, 2019.

**Matthew Major, PhD**, accepted an invitation to serve on the American Academy of Orthotists & Prosthetists Outcomes Research Committee.

#### **Grant Submissions:**

**Stefania Fatone, PhD**, was Co-Investigator on an application submitted to the DOD Orthotics and Prosthetics Outcomes Research Program titled "Consequences of socket design for hip muscle function among unilateral transfemoral amputees" submitted on October 25, 2018 (PI: Andrew Sawers, PhD, University of Illinois at Chicago).

**Stefania Fatone, PhD**, was PI on an application submitted to the DOD Orthotics and Prosthetics Outcomes Research Program titled “Comparative Effectiveness of Socket Casting Methods: Improving Form and Fit” submitted on October 25, 2018.

**Steven Gard, PhD**, was PI on an application to the DOD Orthotics and Prosthetics Outcomes Research Program for the project entitled, “Optimal Selection of Prosthetic Knees and Feet Combinations for Improving Walking and Standing Performance in Transfemoral Prosthesis Users” submitted on October 25, 2018.

**Matthew Major, PhD**, was PI and **Stefania Fatone, PhD**, was a Co-Investigator on a VA Merit Review Application titled “Hybrid Electrical-Mechanical Pump for Vacuum Suspension of Prosthetic Sockets” re-submitted November 15, 2018.

**Grant LOI Submissions:**

**Gard, S.** “Optimal Selection of Prosthetic Knee and Foot Combination for Improving Walking and Standing Performance in Transfemoral Prosthesis Users.” Submitted to the Department of Veterans Affairs, Rehabilitation Research & Development Service, on November 1, 2018.

**Gard, S.** “Evaluation of a hydraulic prosthetic foot/ankle component to increase swing phase toe clearance in persons with transfemoral amputation.” Submitted to the Department of Veterans Affairs, Rehabilitation Research & Development Service, on November 1, 2018.

**Matthew Major, PhD.** “Hybrid Electrical-Mechanical Pump for Vacuum Suspension of Prosthetic Sockets.” Submitted to the Department of Veterans Affairs, Rehabilitation Research & Development Service, on November 15, 2018.

**OTHER FACULTY**

**Lee Miller**

**New Grants:**

IS-1835345 (Pandarinath) 10/1/2018 - 9/30/2021

National Science Foundation

"Discovering dynamics in massive-scale neural datasets using machine learning"

In the fifty years of recorded from neurons in M1, great effort has been devoted to understanding the relation between these individual signals, and movement-related signals collected during highly constrained motor behaviors performed by over-trained monkeys. In parallel, theoreticians posited that the computations performed in the brain depend critically on network-level phenomena: lawful “dynamics” within brain circuits that constrain the activity, and dictate how evolves over time. Our primary goal is to develop a powerful new suite of analysis tools based on cutting-edge machine learning techniques that can reveal these dynamics at unprecedented temporal and spatial scales.

Role: Co-I

"Scalable Electrode Technology for High Resolution Chronic Recording of Brain"

There is a need in neuroscience research for arrays of very small electrodes that are implanted in the brain to provide stable long-term recording and stimulation of neural electrical activity. The neural recordings are used to understand normal brain functions such as learning, adaption, and behavior, as well as to investigate neural dysfunction. We are proposing to develop an electrode technology that meets these needs and uses scalable fabrication processes that will promote dissemination of the technology to the neuroscience community and eventually for clinical applications in brain-computer interfaces for individuals with spinal cord injury, amputation, stroke, and other major neurological deficits.

Role: Co-PI

**Publications:**

Glaser JI, Perich MG, Ramkumar P, **Miller LE**, Kording KP (2018) Population coding of conditional probability distributions in dorsal premotor cortex. *Nature Communications*:137026

Benjamin, A. S., H. L. Fernandes, T. Tomlinson, P. Ramkumar, C. VerSteeg, R. H. Chowdhury, **L. E. Miller** and K. P. Kording (2018). "Modern Machine Learning as a Benchmark for Fitting Neural Responses." *Frontiers in Computational Neuroscience* 12(56).

Dekleva, B. M., K. Kording and **L. E. Miller** (in press). "Single reach plans in dorsal premotor cortex." *Nat Commun*.

Gallego, J. A., M. G. Perich, S. N. Naufel, C. Ethier, S. A. Solla and **L. E. Miller** (in press). "Multiple tasks viewed from the neural manifold: Stable control of varied behavior." *Nat Commun*.

Perich, M. G., J. A. Gallego and L. Miller (in press). "A Neural Population Mechanism For Rapid Learning." *Neuron*.

Lawlor, P. N., M. G. Perich, **L. E. Miller** and K. P. Kording (in press). "Linear-Nonlinear-Time-Warp-Poisson models of neural activity." *Journal of Computational Neuroscience*: 194498.

Pandarinath, C., K. C. Ames, A. A. Russo, A. Farshchian, **L. E. Miller**, E. L. Dyer and J. C. Kao (in press). "Latent factors and dynamics in motor cortex and their application to brain-machine interfaces." *Journal of Neuroscience*.