CURRICULUM VITAE


# Chang Liu, PhD

Department of Kinesiology and Nutrition
University of Illinois at Chicago
cliu67@uic.edu


## ACADEMIC POSITION

**Assistant Professor (Tenure Track)** 8/15/2024 – Present
Department of Kinesiology and Nutrition
University of Illinois at Chicago

**Courtesy Assistant Professor** 7/1/2024 – Present
Department of Biomedical Engineering
University of Florida

## EDUCATION

**Doctor of Philosophy,** Biomedical Engineering 2016 – 2021
University of Southern California, Los Angeles, CA
Dissertation: *"Understanding Reactive Balance Control Strategies in Non-Disabled and Post-Stroke Gait"*
Advisor: James M. Finley

**Master of Science**, Biomedical Engineering 2016 – 2017
University of Southern California

**Bachelor of Science** (*Summa Cum Laude*), Biomedical Engineering 2012 – 2016
University of Southern California

## RESEARCH TRAINING

**Postdoctoral Research Associate** 7/1/2021 – 6/30/2024
Human Neuromechanics Lab, University of Florida
Advisor: Daniel P. Ferris

**Graduate Research Assistant** 2016 – 2021
Locomotion Control Lab, University of Southern California
Advisor: James M. Finley

**Lab Rotation Research Assistant** Spring 2017
Computational Neuro-Rehabilitation Lab, University of Southern California
Advisor: Nicolas Schweighofer

**Undergraduate Research Assistant** 2013 – 2016
JVL Orthopaedic Research Center, Orthopaedic Institute for Children, UCLA
Advisor: Edward Ebramzadeh

## RESEARCH FUNDING

### *Completed Research Support*

**American Heart Association Postdoctoral Fellowship** 1/1/2023 –6/30/2024
Cortical processes during post-stroke gait
Role: Principal Investigator (Sponsor: Daniel Ferris; Co-Sponsor: Dorian Rose)
Amount: $140,558.00 (100% PI effort)
Resigned in Jul.2024 due to acceptance of a faculty position

**USC Undergraduate Research Fellowship** 2014 – 2016
Amount: $5000/year

## AWARDS

Training in Grantsmanship for Rehabilitation Research (TIGRR) 2025
*TIGRR Workshop is funded by NIH/NICHD grant number 2R25HD074546.*
1st Place International Mobile Brain/Body Imaging Paper Award 2024
USC WISE Student Travel Award Summer 2019
USC WISE Student Travel Award Summer 2018
De Luca Foundation Student Travel Award Summer 2018
Runner up ASME-BED PhD Student Paper Competition
in World Congress of Biomechanics Summer 2018
Grodins Service Award in BME Department Spring 2018
USC Graduate Student Travel Grant Summer 2017
USC Viterbi Fredricka Gordon Scholarship 2015
Searchlighter Scholarship 2014
USC Viterbi Langston Scholarship 2013
USC Undergraduate Academic Achievement Award 2012 – 2016
USC Dean's List 2012 – 2016
USC Provost's Undergrad Research Fellowship 2013 – 2016

## PUBLICATIONS

Underline indicates mentees

### *Manuscript In Preparation*

16. **C. Liu**, E. Pliner, J. Salminen, R. Downey, J. Huang, R. Swearinger, N. Richer, C. J. Hass, D. J. Clark, T. M. Manini, R. D. Seidler, and D. P. Ferris, Age-related differences in electrocortical dynamics during uneven terrain walking.

15. J. Salminen, **C. Liu**, E. M Pliner, M. Tenerowicz, A. Roy, N. Richer, J. Hwang, C. J Hass, D. J Clark, R. D Seidler, T. M Manini, Y. Cruz-Almeida, D. P Ferris, Gait Speed Related Changes in Electrocortical Activity in Younger and Older Adults. *Journal of Neurophysiology*.

***Published Peer-Reviewed Manuscripts***

14. J. Hwang, **C. Liu**, S. P. Winesett, S. A. Chatterjee, A. D. Gruber II, C. Swanson, T. M. Manini, C. J. Hass, R. D. Seidler, D. P. Ferris, D. J. Clark. Prefrontal cortical activity during uneven terrain walking in younger and older adults. *Front. Aging Neurosci. 16:1389488*.

13. **C. Liu**, F. J. Valero-Cuevas, J. M. Finley, Generalizability of foot-placement control strategies during unperturbed and perturbed gait. *Royal Society Open Science*. **11:** 231210.

12. **C. Liu,** R.J. Downey, J. S. Salminen, S. Arvelo Rojas, N. Richer, E. M. Pliner, J. Hwang, Y. Cruz-Almeida, T. M. Manini, C. J. Hass, R.D. Seidler, D. J. Clark, D.P. Ferris. Electrical Brain Activity during Human Walking with Parametric Variations in Terrain Unevenness and Walking Speed. *Imaging Neuroscience*. 2024.

11. **C. Liu,** R.J. Downey, Y Mu, N. Richer, J. Hwang, V. Shah, S. Sato, C. Hass, T. Manini, D. Clark, R. Seidler, D.P. Ferris. Comparison of EEG source localization estimations using simplified and anatomically accurate head models in young and older adults. *IEEE Transactions in Neural System and Rehabilitation Engineering*. 2023. vol. 31, pp. 2591-2602.

10. R. J. Downey, N. Richer, R. Gupta, **C. Liu**, E.M. Pliner, A. Roy, J. Hwang, D.J. Clark, C.J. Hass, T. M. Manini, R. D. Seidler, D. P. Ferris (2022). Uneven terrain treadmill walking in younger and older adults. bioRxiv 2022.03.01.482507. *PLOS ONE*. 17(12): e0278646.

9. **C. Liu**, J. L. McNitt-Gray, J.M. Finley, Impairments in the mechanical effectiveness of reactive balance control strategies during walking in people post-stroke. *Frontiers in Neurology*. 2022 Oct 31;13:1032417.

8. **C. Liu**, S. Park, J.M. Finley, The Choice of Reference Point for Computing Sagittal Plane Angular Momentum Affects Inferences about Dynamic Balance. *PeerJ.* 10 2022: e13371.

7. K. Reuter, **C. Liu,** N. Le, P. Angyan, J. M. Finley, Comparative analysis of general practice and digital methods to recruit stroke survivors to a clinical mobility study. *Journal of Medical Internet Research*. 2021 Oct 13;23(10):e28923.

6. N. Nibras*, **C.Liu***, D. Mottet, C. Wang, D. Reinkensmeyer, O. Remy-Neris, I.Laffont, N.Schweighofer, Dissociating Sensorimotor Recovery and Compensation during

Exoskeleton Training Following Stroke. *Frontiers in Human Neuroscience*. 2021 Apr 30;15:645021.
(* Equal Contribution).

5. S. Park, **C. Liu**, S. J. Mulroy, J. K. Tilson, J.M. Finley, Using Biofeedback to Reduce Spatiotemporal Asymmetry Impairs Dynamic Balance in People Post-stroke. *Neurorehabilitation and Neural Repair*. 2021 Aug;35(8):738-749.

4. **C. Liu,** J. M. Finley, Asymmetric Gait Patterns Alter the Reactive Control of Intersegmental Coordination Patterns during Walking in the Sagittal Plane. 2020. *PLOS ONE. 15 (5),* e0224187

3. T.J.W. Buurke, **C. Liu,** S. Park, R.d.Otter, J.M. Finley, Maintaining Sagittal Plane Balance Compromises Frontal Plane Balance during Reactive Stepping in People Post-stroke (2020). *Clinical Biomechanics*. 80:105135

2. **C. Liu**, L. Macedo, J.M. Finley, Conservation of Reactive Stabilization Strategies in the Presence of Step Length Asymmetries during Walking, *Frontiers in Human Neuroscience*, (2018) 12, 251.

1. A.R. Knutsen, S. N. Sangiorgio, **C. Liu**, S. Zhou, T.Warganich, J. Fleming, T.G. Harris, E. Ebramzadeh. (2016). Distal fibula fracture fixation: Biomechanical evaluation of three different fixation implants. *Foot Ankle Surg.* 22, 278–285.

**PEER-REVIEWED CONFERENCE ABSTRACTS**

15. E. Pliner*, **C. Liu*** et al. Compensation Related Utilization of Neural Circuits (CRUNCH) of Electrocortical Activity during Walking on Terrain Unevenness. *Mobile Brain/Body Imaging (MoBI)*. Slovenia. July, 2024 (*Equal contribution)

14. J. Salminen, **C. Liu** et al. Older Adults' Brain Activations Vary with Treadmill Walking Speed and Surface Unevenness. *Mobile Brain/Body Imaging (MoBI)*. Slovenia. July, 2024

13. **C. Liu**, T. J. Peng, D. K. Rose, D. P. Ferris. Electrocortical dynamics during post-stroke gait: a preliminary analysis. *American Society of NeuroRehabilitation* (ASNR). San Antonio. Apr, 2024

12. **C. Liu,** R.J. Downey, J. Salminen, D.P. Ferris. Neural oscillation across gait cycle during uneven terrain walking. *IEEE Neural Engineering*. Baltimore, USA, Apr. 2023.

11. **C. Liu,** R. Downey, A. Studnicki, N. Jacobsen, D. Ferris, Comparison of EEG source localization estimations using simplified and anatomically accurate head models in young and older adults. *Mobile Brain/Body Imaging (MoBI)*. San Diego, USA, June 2022

10. R. Novotny, **C. Liu**, James Finley, Motor module generalizability between unperturbed and perturbed walking after stroke. *Neural Control of Movement.* April. 2021

9. N. Nibras, **C. Liu**, D. Mottet, C. Wang, D. Reinkensmeyer, O. Remy-Neris, I. Laffont, N. Schweighofer, Dissociating sensorimotor recovery and compensation during exoskeleton training following stroke. *Neural Control of Movement.* April. 2021

8. **C. Liu**, S. Park, J. M. Finley. Does the Reference Axis for Computing Angular Momentum Affect Inferences about Dynamic Balance? *American Society of Biomechanics* [Podium]. August 2020.

7. **C. Liu**, S. Park, N. Sánchez, J.K. Tilson, S.J. Mulroy, and J. M. Finley. Asymmetries in the Reactive Control of Angular Momentum during Post-stroke Gait. *XXVII Congress of International Society of Biomechanics*. Calgary, Canada [Podium]. August 2019.

6. S. Park, **C. Liu**, N. Sánchez, J.K. Tilson, S.J. Mulroy, and J. M. Finley. Impact of Modifying Spatiotemporal Asymmetry on Dynamic Balance during Walking Post-Stroke. *XXVII Congress of International Society of Biomechanics*. Calgary, Canada [Podium]. August 2019.

5. **C. Liu**, S. Park, N. Sánchez, J.K. Tilson, S.J. Mulroy, and J. M. Finley. Altering Spatiotemporal Asymmetry Influences the Reactive Control of Balance During Walking in People Post-stroke. *Society for Neuroscience*. Chicago, USA. October 2019.

4. S. Park, **C. Liu**, N. Sánchez, J.K. Tilson, S.J. Mulroy, and J. M. Finley. Impact of Modifying Spatiotemporal Asymmetry on Frontal Plane Whole-body Angular Momentum during Walking Post-stroke. *Society for Neuroscience*. Chicago, USA. October 2019.

3. **C. Liu** and J.M. Finley. Assessing the effects of spatiotemporal asymmetry on intersegmental coordination elicited by slip-like perturbations during walking. *World Congress of Biomechanics*. Dublin, Ireland [Podium]. July 2018.

2. **C. Liu** and J.M. Finley. Modulation of step length asymmetry affects reactive control of balance. *American Society of Biomechanics* in Boulder, USA. August 2017.

1. J.M. Finley, **C. Liu**, and N. Sanchez. Mapping the Influence of Spatiotemporal Asymmetries on Energetic Cost and Reactive Balance during Walking. *Dynamic Walking Conference* in Mariehamm, Sweden. May 2017.

**OTHER ABSTRACTS**

3. **C. Liu**, A. Kim, G. Petzinger, J.M.Finley. Associations between Cognition and Reactive Balance in People with Parkinson's Disease. *Neuroplasticity and Brain Repair Retreat*, Lake Arrowhead, USA. December 2019.

2. **C. Liu**, J.M.Finley. Asymmetries in the Reactive Control of Angular Momentum during Post-stroke Gait. *Biomedical Engineering Grodins Symposium*, University of Southern California, USA. April 2019.

1. **C. Liu**, J.M.Finley. Assessing Changes in the Reactive Control of Balance Due to Modifications of Step Length Asymmetry, *Biomedical Engineering Grodins Symposium*, University of Southern California, USA. April 2017.

## INVITED TALKS

10. **C. Liu,** Electrical Brain Activity during Human Walking with Parametric Variations in Terrain Unevenness and Walking Speed, Mobile Brain/Body Imaging International Conference, Slovenia, June. 2024 (Award Talk)

9. **C. Liu**, Leveraging brain-body dynamics to improve mobility. Northwestern University Prothesis & Orthosis Center, Chicago, Canada

8. **C. Liu**, Leveraging brain-body dynamics to improve mobility. Simon Fraser University, Vancouver, Canada

7. **C. Liu,** Quantify cortical processes during walking post-stroke. Brooks Rehabilitation Hospital. August 2022, Jacksonville, USA.

6. **C. Liu**, E. Pliner, A.Studnicki, Demonstration of Phantom Head and Dual Layer Electrodes. International Mobile Brain/Body Interaction Workshop. June 2022, San Diego, USA.

5. **C.Liu,** R. Downey. Comparison of EEG source localization estimations using simplified and anatomically accurate head models in young and older adults. *Mind in Motion Retreat*. March 2022, Gainesville, USA.

4. **C.Liu,** Understanding the Contributors to Impaired Reactive Control during Walking for People Post-stroke. *CPSR NTA Trainees4Trainees Webinar Series,* March 2021

3. **C. Liu**, Understanding the Contributors to Impaired Reactive Control during Walking for People Post-stroke. *BKN NeuroRehabiliation Seminar*, University of Southern California, USA. June 2020.

2. N. Nibras and **C. Liu.** Investigating True Recovery versus Compensation Post-stroke with Longitudinal Arm Kinematic Data from the ARMEO Device. *BKN NeuroRehabiliation Seminar,* University of Southern California, USA. April 2020.

1. **C. Liu**, Investigating how step length asymmetry affects reactive control of stability. *BKN NeuroRehabiliation Seminar*, University of Southern California, USA. March 2019.

## TEACHING EXPERIENCE

**Course Director**
KN 362: Tissue Engineering, UIC (3 hours per week) Fall 2024

**Guest Lecturer** Fall 2023
BME 2202: Engineering Statics and Dynamics in Biological Systems, UF
- Prepared course material and delivered lectures on human biomechanics

**Teaching Assistant**
BME 302: Medical Electronics, USC Spring 2020
- Led weekly laboratory sessions (~6-8hrs/wk) on circuit design using Multisim and hands-on projects for senior BME students.
- Prepared lectures and class activities (~3hrs/wk) focusing on analog circuits to ensure students understood materials

BME 101: Introduction to Biomedical Engineering, USC Fall 2019
- Led weekly laboratory sessions on Matlab coding and Arduino circuit design.

**Grader**
Dynamics System, USC Fall 2015 – Spring 2016
Introduction to Biomedical Engineering, USC Fall 2015

## STUDENT MENTORSHIP

***Graduate Student***
Jingjing Sun (2024 – Present; Mentor; UIC Kinesiology)
Joy Itodo (2024 – Present; PhD Committee Member; UIC Kinesiology)
Udaya Nadendla (2023-2024; UF Biomedical Engineering)
- Subsequent position: PhD student at the University of Florida

Madison Tenerowicz (2023; UF Neuroscience)

***Undergraduate Student***
Siena Villancio-Wolter (2023 – 2024; Biomedical Engineering)
- Subsequent position: PhD student at the University of Washington Seattle
- Recipient of NSF GRFP, mentored during the application process
- Honor's Thesis: Compare IMU-derived joint angle and marker-based joint angle at various walking speeds

Sai Shrestha (2023 – 2024; Biomedical Engineering)
- Subsequent: Roche Diagnostic
- Honor's Thesis: Gait Parameters During Body-Weight Support Conditions for Post-Stroke Population
- Recipient of BME Undergraduate Research Award 2024

Sofia Arvelo Rojas (2021 – 2024; Biomedical Engineering)

- Subsequent position: PhD student at Georgia Tech
- Honor's Thesis: Optimize IMU sensor placement for gait event detection at various walking speeds

Tyler Irby (2023 – present; Biology)

Yiru Mu (2021 – 2023; Biomedical Engineering, Honors Thesis; Subsequent: Graduate student at Georgia Tech)

- Honor's Thesis: Effects of skull and cerebrospinal fluid conductivity on EEG source localization

Emily Campfield (2021 – 2023; Biomedical Engineering)

Edward Beck (2021 – 2022; Mechanical Engineering; Recipient of NSF REU)

Alex Briones (2021 – 2022; Biomedical Engineering; Subsequent: Edward Lifesciences)

## WORK EXPERIENCE

**Summer R&D Quality Engineer Intern** Summer 2016
Abbott Vascular, Temecula

**Mechanical Engineering Intern** Spring 2016
General Stim, Los Angeles

**Marketing & Project Management Intern** Summer 2014 &2015
Shanghai Potevio Co., Ltd, Shanghai

## COMMUNITIY AND VOLUNTEER SERVICE

**Poster judge Neuromuscular Plasticity Training Program** Spring 2024
University of Florida

**Outreach Volunteer** 2022
Girls with Nerve, University of Florida

**Outreach Volunteer** 2022, 2023
National Biomechanics Day, University of Florida

**Teaching Assistant**
ASB GitHub Workshop 2020

**Instructor and Organizer** 2019
Kinesiology: Moving Minds and Bodies through Sports, Medicine, and Health (CORE-195), USC Summer Program
Course Director: Christina Dieli-Conwright, PhD, MPH, FACSM, CSCS

- Planned the biomechanics activities and led the wireless IMU experience

**Outreach Volunteer** 2019
National Biomechanics Day, University of Southern California

**Webpage designer and organizer** 2018
USC VR Symposium for Health

**Instructor** 2018
Kinesiology: Moving Minds and Bodies through Sports, Medicine, and Health (CORE-195), USC Summer Program
Course Director: Christina Dieli-Conwright, PhD, MPH, FACSM, CSCS
- Led the motion capture experience

**Organizing Committee** 2018
Biomedical Engineering Grodins Symposium, USC
- Organized and acquired funding for ~100 attendants annual symposium.

**Volunteer** 2015-2018
Visions & Voices, USC

**Delegate** 2014
Chinese Student & Scholar Association, USC

## SCIENTIFIC REVIEW

***Grant Review***
AHA Reviewer-in-Training program (2024)
AHA Reviewer for Predoctoral Fellowships (2024)
North Carolina Biotechnology Center (2024)

***Journal Review***

| Year | Scientific Journal (number of reviewed papers) |
|---|---|
| 2024 | IEEE Transactions on Neural Systems and Rehabilitation (1)<br>Frontiers in Aging Neuroscience (1)<br>Frontiers in Sports and Active Living (1)<br>Royal Society Open Science (1) |
| 2023 | IEEE Transactions on Neural Systems and Rehabilitation (3)<br>Frontiers in Human Neuroscience (1)<br>Frontiers in Neurology (1)<br>Journal of Biomechanics (1)<br>Journal of Motor Behavior (1)<br>PLOS One (1) |

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|---|---|
| 2022 | IEEE Transactions on Neural Systems and Rehabilitation (1)<br>iScience (1)<br>Journal of Applied Biomechanics (1)<br>Journal of Biomechanics (1)<br>Scientific Reports (1) |

***Conference Review***

American Society of Biomechanics 2024
Abstract Reviewer annual conference

## PROFESSIONAL MEMBERSHIPS

American Society of Biomechanics. 2017 – Present.
American Heart Association. 2018 – Present.
Society for Neuroscience. 2019 – Present.
American Society for Neurorehabilitation. 2019 – Present.
CPSR National Trainee Association. 2020
IEEE Member. 2023 – Present.

## TECHNICAL SKILLS

**Programming languages:** Matlab, R, Python
**Motion Capture System and Physiological Testing:** Qualisys Oqus 5 Cameras, Delsys EMG System, Visual 3D, Inertia Measurement Unit**,** EEG
**Other:** LabVIEW, Solidworks, MultiSim

## CERTIFICATE

**Statistical Learning** 2018
Stanford Online