Robbie Courter

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Education

PhD Integrative Physiology — *May 2020 – December 2023*
UNIVERSITY OF COLORADO BOULDER — Boulder, CO
- Thesis: "Movement Vigor in Multiple Sclerosis: A Neuroeconomics Perspective"

MS Integrative Physiology — *August 2018 – May 2020*
UNIVERSITY OF COLORADO BOULDER — Boulder, CO
- Thesis: "Added effort modulates the response to reward in reaching movements"

BS Biomedical Engineering — *August 2014 - May 2018*
UNIVERSITY OF VIRGINIA — Charlottesville, VA
- Degree conferred with "High Distinction"

Research & Professional Experience

NEUROMECHANICS LABORATORY — *August 2018 – Present*
Graduate Research Scientist — Boulder, CO

- Improve health outcomes for aging adults and individuals with multiple sclerosis by designing novel human subjects research and analyzing biomechanics, physiological, and decision-making data using statistical models and supervised machine learning in MATLAB, R, and Python.
- Communicate and publicize research findings by speaking at over 10 scientific conferences and publishing first-author papers in 4 peer-reviewed journals, with 2 additional papers in preparation.
- Establish and maintain a network of over 100 multiple sclerosis patients, clinicians, and knowledge experts in neurology by speaking with clinics, distributing ads, and volunteering at outreach events.

SPECIALIZED BICYCLE COMPONENTS — *May 2022 – May 2023*
Data Scientist and Scientific Advisor — Morgan Hill, CA

- Facilitate research and development operations by advising on all aspects of the scientific process and liaising between multidimensional technical, software, and executive teams, with a 1-year contract.
- Expedite product development and sales by training and deploying machine learning models with Python and R, improving accuracy by nearly 1500% while leveraging a dataset 10-times smaller, as compared to the company's pre-existing model.

UNIVERSITY OF COLORADO BOULDER — *August 2018 – May 2023*
Lead Graduate Teaching Assistant — Boulder, CO

- Curate engaging senior-level and graduate-level Biomechanics and Advanced Statistics courses by directing teams of 5-10 teaching assistants and developing course material alongside the instructor.
- Eight semesters of teaching experience in STEM courses, including Biomechanics, Exercise Physiology, and Advanced Graduate Statistics of class sizes ranging from 30-200 students.

MOTION ANALYSIS AND MOTOR PERFORMANCE LAB — *October 2015 - May 2018*
Undergraduate Research Scientist — Charlottesville, VA

- Advance orthopedic surgery outcomes by leveraging motion capture data and musculoskeletal models in MATLAB to analyze gait in pediatric patients with cerebral palsy and in animals.
- Promote scientific findings by contributing to 4 conference abstracts and a published manuscript.

CONTRALINE *July 2016 - October 2016*
Research Intern Charlottesville, VA

- Assisted with pre- and post-op animal care for FDA preclinical animal trials.
- Worked with lead veterinarian in developing tissue histology protocols.
- Improved skills of medical device R&D, FDA regulatory approval, and business development.

MOTION ANALYSIS AND MOTOR PERFORMANCE LAB *May 2016 - August 2016*
Undergraduate Research Intern Charlottesville, VA

- Designed and tested a novel setup in VICON for performing motion capture on rats.
- Built and validated a rat hindlimb musculoskeletal model in OpenSim for use in motion analysis.

SKILLS

Programming: MATLAB, R, Python, SQL (MySQL), Java

Platforms: GitHub, RMarkdown, Anaconda, Adobe Illustrator, Google MediaPipe API, OpenSim, VICON Nexus, Microsoft Office Suite

Biomechanics Laboratory: VO2/Metabolic Testing, Motion Analysis, Motion Capture, Clinical Populations, Musculoskeletal Modeling

Skills: Statistical Analysis, Neuroeconomics, Statistical Modeling, Machine Learning, Computational Modeling, Data Visualization, Scientific Writing and Communication, Public Speaking, Grant Writing, IRB/Regulatory Document Writing

Interests: Gravel cycling, trail running, Premier League soccer, fly fishing, reading fantasy, coffee

PROFESSIONAL TRAINING

Introduction to Data Science in Python *May 2022*
Coursera, University of Michigan
Credential ID 7V7NHX4EEW75

Inferential Statistical Analysis with Python Certificate *September 2021*
Coursera, University of Michigan
Credential ID 83C667LM6XWD

Understanding and Visualizing Data with Python Certificate *August 2021*
Coursera, University of Michigan
Credential ID QLDRH4C5YDPN

CITI Human Subjects Research Certification *November 2022*
CITI Program
Credential ID 47360374

Graduate Teaching Program *Fall 2018*
University of Colorado Boulder, Boulder, CO

PUBLICATIONS

Manuscripts

[Under Review]
Bruening, G. W., **Courter, R. J.,** Sukumar, S., O'Brien, M. K., & Ahmed, A. A. (2024). Disentangling the effects of metabolic cost and accuracy on movement speed. *PLoS Computational Biology.*

Summerside, E. M.*, **Courter, R. J.***, Shadmehr, R., & Ahmed, A. A. (2024). Slowing of Movements in Healthy Aging as a Rational Economic Response to an Elevated Effort Landscape. *Journal of Neuroscience*, *44*(15). https://doi.org/10.1523/JNEUROSCI.1596-23.2024
(*equal contribution)

Courter, R. J., Alvarez, E., Enoka, R. M., & Ahmed, A. A. (2023). Metabolic costs of walking and arm reaching in persons with mild multiple sclerosis. *Journal of Neurophysiology*, *129*(4), 819–832. https://doi.org/10.1152/jn.00373.2022

[In preparation]
Courter, R. J., Enoka, R. M., & Ahmed, A. A. (2023). Reward-mediated movement vigor is altered in multiple sclerosis.

Preprints

Bruening, G. W., **Courter, R. J.,** Sukumar, S., O'Brien, M. K., & Ahmed, A. A. (2023). Disentangling the effects of metabolic cost and accuracy on movement vigor (p. 2023.02.08.527734). *bioRxiv.* https://doi.org/10.1101/2023.02.08.527734

Summerside, E. M.*, **Courter, R. J.***, Shadmehr, R., & Ahmed, A. A. (2023). Effort cost of reaching prompts vigor reduction in older adults. *bioRxiv.* https://doi.org/10.1101/2023.08.28.555022
(***** equal contribution)

Courter, R., Alvarez, E., Enoka, R., & Ahmed, A. (2022). Metabolic costs of walking and arm reaching in persons with mild multiple sclerosis (p. 2022.08.31.506034). *bioRxiv.* https://doi.org/10.1101/2022.08.31.506034

Articles and Science Communication

Courter, R. (2022, August 5). Faster, higher, stronger – together. *Science Buffs.* https://sciencebuffs.org/2022/08/05/faster-higher-stronger-together/

Courter, R. J., & Ahmed, A. A. (2019). To break a habit, timing's everything. *Nature Human Behaviour*, 1–2. https://doi.org/10.1038/s41562-019-0744-x

Conference Proceedings

Courter, R., Alvarez, E., Enoka, R., & Ahmed, A. (2023). Movement-specific changes in energy expenditure for persons with mild multiple sclerosis. *Multiple Sclerosis and Related Disorders*, *73*, 104653. https://doi.org/10.1016/j.msard.2023.104653

Courter, R., Enoka, R., Ahmed, A., *Energetic costs of walking, but not arm reaching, are elevated for persons with mild multiple sclerosis.* San Diego, CA: Society for Neuroscience, 2022.

Courter, R.J., Summerside, E.M., Shadmehr, R., Ahmed, A. A. *Increased effort of moving in aging leads to differential slowing of movement time and reaction time.* Rocky Mountain American Society of Biomechanics Annual Conference. Estes Park, CO. 2022.

Courter, R.J., Summerside, E.M., Ahmed, A. A. *Effort cost of reaching biases reward responsiveness towards reacting faster over moving faster*. Chicago, IL: Society for Neuroscience, 2021.

Courter, R.J., Ahmed, A. A. *Effort modulates the response to reward in reaching movements*. Exhibitor 1-D-34. Society for the Neural Control of Movement, 2021.

Courter, R.J., Ahmed, A. A. *On the consistency of preferred movement speeds*. Program No. 311.27. 2019 Neuroscience Meeting Planner. Chicago, IL: Society for Neuroscience, 2019.

Courter, R., Ahmed, A. *Robust Approach for Eliciting Preferred Reaching Speed.* Rocky Mountain American Society of Biomechanics 9th Annual Conference. Estes Park, CO. 2019.

Dienes, J., Slater, C., Miller, P., Janson, K., **Courter, R.,** Franklin I., Christ, G.J., Russell, S.D. *Novel Kinetic Analysis of Rodent Gait After Volumetric Muscle Loss Injury*. Gait and Clinical Movement Analysis Society Annual Conference. Indianapolis, IN. 2018.

Dienes, J., Hu, X., Janson, K., Slater, C., **Courter, R.**, McCormack, K., Christ, G.J., Russell, S.D. *Modeling and Analysis of Gait Biomechanics after Volumetric Muscle Loss Injury*. Tissue Engineering and Regenerative Medicine Annual Conference and Exhibition. Charlotte, NC. 2017.

Dienes, J., Slater, C., Miller, P., **Courter, R.,** Tumperi, M., Janson, K., Christ, G.J., Russell, S.D. *Comprehensive Characterization of Rodent Gait Kinetics and Kinematics as a Standard of Comparison for Regenerative Therapies*. 6th Annual AR3T Symposium on Regenerative Rehabilitation. Pittsburgh, PA. 2017.

Dienes, J., Hu, X., Janson, K., Slater, C., **Courter, R.,** McCormack, K., Christ, G.J., Russell, S.D. *Analysis and Modeling of Rodent Gait Biomechanics in Response to Volumetric Muscle Loss Injury.* American Society of Biomechanics 41st Annual Conference. Boulder, CO. 2017.

Theses

Courter, R. J. (2023). *Movement Vigor in Multiple Sclerosis: A Neuroeconomics Perspective* [Ph.D. Dissertation, University of Colorado at Boulder]. https://www.proquest.com/pqdtglobal/docview/2901755856/abstract/173C9F42B90F40EDPQ/1

Courter, R.J., Ahmed, A. A. (2020). *Added effort modulates the response to reward in reaching movements* [Masters Research Project, University of Colorado Boulder].

Courter, R., Berne. (2018). *Doping and Cycling* [Undergraduate Sociotechnical Thesis, supported by the School of Engineering and Applied Science. University of Virginia].

Courter, R., Russell, S. (2018). *Design of an Instrumented Rig for Modeling and Analysis of Cycling Biomechanics on a Triathlon/TT Bicycle* [Undergraduate Capstone Report, supported by the School of Engineering and Applied Science. University of Virginia].

Acknowledged Contributions

Brill, J. W., & Kram, R. (2021). Does the preferred walk–run transition speed on steep inclines minimize energetic cost, heart rate or neither? *Journal of Experimental Biology*, *224*(3), jeb233056. https://doi.org/10.1242/jeb.233056

Dienes, J. A., Hu, X., Janson, K. D., Slater, C., Dooley, E. A., Christ, G. J., & Russell, S. D. (2019). Analysis and Modeling of Rat Gait Biomechanical Deficits in Response to Volumetric Muscle Loss Injury. *Frontiers in Bioengineering and Biotechnology*, *7*. https://doi.org/10.3389/fbioe.2019.00146

INVITED PRESENTATIONS AND LECTURES

Guest Speaker, "What causes movement slowness in multiple sclerosis?" Rocky Mountain MS Center's MS Young Professionals Network meeting. Denver, CO. July 2023.

Rapid Podium, "Metabolic costs of walking and reaching in persons with mild multiple sclerosis." Rocky Mountain American Society of Biomechanics Annual Conference. Estes Park, CO. April 2022.

Guest Lecture, "Multiple Regression." IPHY 5800 Advanced Statistics and Research Methods in Integrative Physiology. University of Colorado Boulder, Boulder CO. April 2021.

Guest Speaker, International Baccalaureate Graduation and Recognition Ceremony, Lee-Davis High School, Mechanicsville VA, January 2019.

Guest Speaker, "A Thesis Portfolio: Doping and Cycling," 31st Annual Undergraduate Research and Design Symposium at UVA, April 2018.

HONORS AND AWARDS

Dissertation Completion Fellowship *Fall 2023*
University of Colorado Boulder
Award: $14,000

Graduate School Domestic Travel Grant *September 2022*
University of Colorado Boulder
Award: $300

Summer Graduate School Fellowship *Summer 2022*
University of Colorado Boulder
Award: $6,000

Graduate and Professional Student Government Travel Award *September 2019*
University of Colorado Boulder
Award: $300

Graduate Student Travel Award *March 2019*
Department of Integrative Physiology, University of Colorado Boulder
Award: $300

Degree conferred with "High Distinction" *May 2018*
University of Virginia

Cumulative GPA of at least 3.60

Undergraduate Research and Design Symposium Finalist *May 2018*
University of Virginia

Class of 2018 Student Spotlight *April 2017*
University of Virginia

PROFESSIONAL SERVICE

Reviewer *June 2021 - Present*
Experimental Brain Research

COMMUNITY SERVICE

Bike MS *Summer 2019 - Present*
Volunteer/Participant, Colorado

Davis Phinney Foundation for Parkinson's *Fall 2018 – Fall 2019*
Volunteer, Boulder, CO

CU Boulder Triathlon Team *Fall 2018 – Present*
Race Volunteer, Boulder, CO

Madison House at UVA *Fall 2016 - Fall 2017*
Volunteer Soccer Coach, Charlottesville, VA

Charlottesville Multisport *Fall 2016 - Spring 2018*
Race Volunteer, Charlottesville, VA

PROFESSIONAL AFFILIATIONS

Society for the Neural Control of Movement *2021 - Present*

Society for Neuroscience *2019 - Present*

Biomedical Engineering Society *2015 – 2018*

OTHER

CU Boulder Triathlon Team *Fall 2018 - Present*

UVA Triathlon Team *Fall 2014 - Spring 2018*
Treasurer, Spring 2017 – Fall 2017

REFERENCES

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