

## Ross Brancati, MS

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## PhD Student

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## Summary

PhD student with 4 years of experience in human movement science research. I use data science approaches including dimensionality reduction techniques, interpretable machine learning, and statistical models to understand the complex behavior of human movement from a systematic approach. As an avid fan of sports, I am interested in pursuing a career in data science/analytics in the field of sports science and research.

## Education

2020 – Present	University of Massachusetts Amherst PhD Student in Kinesiology <i>Concentration: Biomechanics</i> <i>Graduate Certificate in Statistical and Computational Data Science</i> GPA: 3.93/4.0
2018 – 2019	University of Connecticut; Storrs, CT M.S. in Biomedical Engineering <i>Concentration: Biomechanics</i> GPA: 3.9/4.0
2014 – 2018	University of Connecticut; Storrs, CT B.S. in Biomedical Engineering <i>Concentration: Biomechanics</i> GPA: 3.5/4.0

## Research Experience

### **Musculoskeletal & Orthopedic Biomechanics Laboratory**, University of Massachusetts Amherst – Amherst, MA

*Research Assistant*, August 2020 – Present

PI: Dr. Katherine Boyer

- Collect, process, and analyze large sets of biomechanics data related to musculoskeletal injuries and the aging population.
- Build interpretable machine learning models to understand the complex behavior patellofemoral pain syndrome.
- Streamline time-taxing data collection and processing procedures by developing pipelines using Python and Matlab.
- Create visualizations for presentations and publications using R/R Studio for improving data analysis and interpretation.

### **University of Massachusetts Men's Ice Hockey Team**, University of Massachusetts Amherst – Amherst, MA

*Sports Science Intern*, May 2022 – Present

Supervisor: Brandon Wickett

- Leverage Catapult's wearable technology to assess movements of players during practices, games, and skill sessions.
- Support dashboard development for seamless transition of player performance data to coaches and staff.
- Analyze athlete's data to alert team staff of potential player overexertion to prevent injuries and optimize performance.

## Research Experience (continued)

### **Orthopedic Rehabilitation and Biomechanics Laboratory**, University of Michigan - Ann Arbor, MI

*Research Associate 1*, May 2019 – August 2020

PI: Dr. Lindsey Lepley

- Examined biomechanical implications of ACL tears in animal models using deep learning-based motion tracking system.
- Overhauled laboratory space including full synchronization of motion capture, force plate, and ultrasound systems.
- Wrote custom written scripts (Matlab) to automate data processing procedures such as muscle fiber tracking.
- Developed data processing procedures for analyzing CT scans of animal model knee joints with knee osteoarthritis.

### **Sports Optimization and Rehabilitation Laboratory**, University of Connecticut - Storrs, CT

*Graduate Researcher*, December 2018 – May 2019

Co – PIs: Dr. Lindsey Lepley and Dr. Adam Lepley

- Investigated anatomical and pathological outcomes after traumatic joint injury, specifically ACL tears.
- Collected and analyzed data including kinematic, strength, muscle mechanics, neural activity, bone health, and more.
- Assisted other graduate students with ongoing projects such as tracking of muscle fibers via ultrasound recording.

## Teaching and Mentorship Experience

### **Kinesiology Department**, University of Massachusetts Amherst – Amherst, MA

*Teaching Assistant*, August 2020 – May 2021

Primary Lecturer: Thomas G. St. Laurent

- Teaching assistant for an undergraduate kinesiology course titled *Kinesiology 100: Introduction to Kinesiology*.
- Responsible for planning lessons, executing course material, and providing support for discussion section of the course.
- Topics included general kinesiology, health, nutrition, physical activity, biomechanics, and fitness testing.

### **Undergraduate Research Opportunity Program**, University of Michigan - Ann Arbor, MI

*Student Mentor*, August 2019 – August 2020

Supervisor: Dr. Lindsey Lepley

- Recruit students in the Undergraduate Research Opportunities Program to participate in lab's research.
- Trained students on project specific protocols including collecting, compiling, and analyzing 3D CT scan image data.
- Simultaneously managed a total of 5 students by delegating tasks, responsibilities, and deadlines for projects.

### **MCB Department**, University of Connecticut - Storrs, CT

*Teaching Assistant*, August 2018 – July 2019

- Lab teaching assistant for an undergraduate biology course titled *Biology 1107: Principles of Biology 1*.
- Responsible for teaching lab exercises, mentoring students, assisting students, grading, and hosting office hours.
- Learned and developed valuable skills such as lecturing, grading, and providing extra support for students.

## Industry Experience

### **Karl Storz Endovision, Inc.**, Charlton, MA

*Continuous Improvement Intern*, May 2018 - August 2018

- Implemented lean manufacturing techniques such as Kanban and Six Sigma to improve device production.
- Improved machine shop product flow by creating an efficient work environment and improving work culture.

### **Medtronic PLC**, North Branford, CT

*Research and Design Intern*, May 2017 - August 2017

- Performed feasibility and reliability testing on prototypes utilizing high tech machinery to optimize design.
- Analyzed data using Minitab to formulate statistical analysis of data sets and decide on design factors.

## Publications

1. White MS, **Brancati RJ**, Lepley LK. Joint Kinematics Dictate Subchondral Bone Remodeling in a Clinically Translational Model of Anterior Cruciate Ligament Injury. *Journal of Orthopaedic Research*. Accepted December 9, 2020. doi: 10.1002/jor.24943.
2. Davi SM, **Brancati RJ**, Lepley AS, Lepley LK. Characterizing dynamic quadriceps' morphology following anterior cruciate ligament reconstruction. *The Knee*. In review.

## Conference Abstracts

1. **Brancati RJ**, Boyer KA. Data Mining Approach to Determining Gait Abnormalities in Runners with Patellofemoral Pain Syndrome. North American Congress on Biomechanics. *Oral Presentation*. Ottawa, Canada. August 21-25, 2022.
2. **Brancati RJ**, Kent JA, Hayes KL, Alvarado F, Boyer KA. Assessment of Aging Related Changes in Postural Control Using Time to Contact. North American Congress on Biomechanics. *Oral Presentation*. Ottawa, Canada. August 21-25, 2022.
3. **Brancati RJ**, Boyer KA. Biomechanical Characteristics of Runners Recently Recovered from Patellofemoral Pain Syndrome. 9<sup>th</sup> World Congress of Biomechanics. *Oral Presentation*. Taipei, Taiwan. July 10-14, 2022.
4. **Brancati RJ**, Kent JA, Boyer KA. Time to Contact Captures Declines in Postural Control Following Fatiguing Activity. 43<sup>rd</sup> Annual Meeting of the American Society of Biomechanics. *Oral Presentation*. Virtual Meeting. August 11, 2021.
5. **Brancati RJ**, Boyer, KA. Time to Contact Captures Declines in Postural Control Following Fatiguing Activity. UMass Amherst School of Public Health & Health Sciences Research Day 2021. *Oral Presentation*. Virtual Meeting. April 16, 2021.
6. Davi SM, **Brancati RJ**, Lepley AS, DiStefano LJ, Lepley LK. Examining the Dynamic Complexity of the Quadriceps Following Anterior Cruciate Ligament Reconstruction. National Association of Athletic Trainers Convention. *Oral Presentation*. Orlando, Florida. June 29, 2021.
7. White MS, Davi SM, **Brancati RJ**, Lepley LK. Alterations in Gait and Knee Joint Alignment Substantiate New PTOA Rodent Model of ACL Injury. Orthopaedic Research Society Annual Meeting. *Oral Presentation*. Phoenix, Arizona. February 10, 2020.
8. Lepley LK, White MS, Davi SM, Lepley AS, **Brancati RJ**. Novel Pre-clinical Model of Post-traumatic Osteoarthritis Demonstrates Unicompartamental Declines in Trabecular Bone Volume. Orthopaedic Research Society Annual Meeting. *Poster Presentation*. Phoenix, Arizona. February 10, 2020.
9. Davi SM, **Brancati RJ**, Lepley LK. Characterizing Abnormalities in Dynamic Quadriceps' Function Following Anterior Cruciate Ligament Reconstruction. Orthopaedic Research Society Annual Meeting. *Poster Presentation*. Phoenix, Arizona. February 8, 2020.

## Grant Applications

1. National Biomechanics Day Loadsol Grant (2021) – Not Funded
2. National Biomechanics Day Loadsol Grant (2022) – Not Funded
3. DeLuca Foundation Training Initiative (2022) – Not Funded

## Awards and Honors

2021	UMass Amherst School of Public Health and Health Sciences Research Day Travel Award Winner - \$1500
2020 – 2021	UMass Amherst Kinesiology Department Graduate Student Annual Travel Award - \$150
2018 – 2019	Outstanding Teaching Assistant Recognition in MCB Department
2017 – 2019	American Collegiate Hockey Association Academic All-American
2017 – 2018	University of Connecticut School of Engineering Dean's List

## Memberships, Affiliations and Leadership

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2020 – present	American Society of Biomechanics UMass Amherst Student Chapter – Vice President
2020 – present	American Society of Biomechanics Member
2020 – present	National Center for Neuromodulation for Rehabilitation Member
2019 – 2020	University of Michigan Undergraduate Student Research Program Mentor

## Service

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2021	National Biomechanics Day 2021 Virtual Outreach Event
2022	National Biomechanics Day 2022 Outreach Event

## Skills

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| <ul style="list-style-type: none"><li>• Python (pandas, numpy, matplotlib, statistics)</li><li>• Matlab</li><li>• R / RStudio (ggplot, tidyverse, tidyr, gt)</li><li>• Machine Learning (scikit-learn)</li><li>• Deep Learning (pytorch, tensorflow)</li><li>• Relational databases (pandas, some SQL)</li><li>• Labview</li><li>• Statistics</li><li>• CAD (Solidworks)</li><li>• Dynamic Programming</li></ul> | <ul style="list-style-type: none"><li>• Human Subjects Research</li><li>• Process Automation</li><li>• Finite Element Analysis (Ansys)</li><li>• Image Processing (Dragonfly ORS, 3D Slicer, CT, MRI)</li><li>• Motion Capture (Qualysis, Vicon, Visual 3D)</li><li>• Wearable Tech (IMUs)</li><li>• Electromyography (Delsys, BioPac, Neuraxon)</li><li>• Force Plates (AMTI)</li><li>• Ultrasound Imaging</li><li>• Project Management (Agile, Kanban, Six Sigma)</li></ul> |
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## References

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### **Katherine Boyer, PhD**

Associate Professor  
Principal Investigator, Musculoskeletal Orthopedic Biomechanics Laboratory  
Department of Kinesiology  
Department of Orthopedics and Physical Rehabilitation, UMass Medical School  
University of Massachusetts – Amherst  
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### **Lindsey K. Lepley PhD, ATC**

Associate Professor, Athletic Training  
Principal Investigator, Orthopedic Rehabilitation and Biomechanics Laboratory  
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