Ross Brancati, MS

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 *Concentration: Biomechanics* *Graduate Certificate in Statistical and Computational Data Science* GPA: 3.93/4.0
2018 – 2019	University of Connecticut; Storrs, CT M.S. in Biomedical Engineering *Concentration: Biomechanics* GPA: 3.9/4.0
2014 – 2018	University of Connecticut; Storrs, CT B.S. in Biomedical Engineering *Concentration: Biomechanics* 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. 9th 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. 43rd 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 Unicompartmental 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

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

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

Skills

- Python (pandas, numpy, matplotlib, statistics)
- Matlab
- R / RStudio (ggplot, tidyverse, tidyr, gt)
- Machine Learning (scikit-learn)
- Deep Learning (pytorch, tensorflow)
- Relational databases (pandas, some SQL)
- Labview
- Statistics
- CAD (Solidworks)
- Dynamic Programming
- Human Subjects Research
- Process Automation
- Finite Element Analysis (Ansys)
- Image Processing (Dragonfly ORS, 3D Slicer, CT, MRI)
- Motion Capture (Qualysis, Vicon, Visual 3D)
- Wearable Tech (IMUs)
- Electromyography (Delsys, BioPac, Neuraxon)
- Force Plates (AMTI)
- Ultrasound Imaging
- Project Management (Agile, Kanban, Six Sigma)

References

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