Tyler N. **Morrison**

Graduate Research Assistant | PhD Candidate

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Education

The Ohio State University
Columbus, OH, USA

Ph.D. Candidate in Mechanical Engineering
Aug. 2017 — estim. Dec. 2021

- GPA: 4.00/4.00
- Dissertation: *Computational Design Methods for Compliant Robotic Ankle Prostheses*
- Distinguished University Fellow

The University of Tulsa
Tulsa, OK, USA

B.S. Mechanical Engineering
Aug. 2013 — May 2017

- GPA: 4.00/4.00
- Chapman Presidential Scholar
- Vision Scholar

Experience

Design, Innovation and Simulation Lab (DISL)
The Ohio State University, Columbus, OH

Graduate Research Assistant
August 2017 — Present

- Developed simulation tools for powered ankle prosthesis design using trajectory optimization for human gait adaptation prediction.
- Modeled, tested, and analyzed variable stiffness robotic arm links for use in physical human-robot interaction.
- Developed software for, planned, conducted, analyzed, and interpreted experiments for interdisciplinary research on attention to preview in human drivers.
- Mentored high school, undergraduate, and MS student research projects.
- Administered and maintained lab server and rapid-prototyping equipment.
- Communicated research findings in conference sessions, workshops, and in published peer-reviewed journal articles.
- Peer-reviewed journal articles for multiple international journals and conferences.

NSF Interfaces and Surfaces REU
Clemson University, Clemson, SC

REU Research Assistant
May 2016 — August 2016

- Conducted numerical simulations of hydrogel membranes under illumination.
- Modeled and implemented code for numerical simulation of magnetically heated gels with cooling effects.
- Mentored incoming MS student on simulation software and high-performance-computing.

Biological Robotics at Tulsa Lab (BRAT Lab)
The University of Tulsa, Tulsa, OK

Undergraduate Research Assistant
May 2015 — July 2017

- Pursued independent research on grasping and manipulation with quadruped robots.
- Developed optimal foot-shuffle algorithm for quadruped stabilization under disturbances and body-position constraints.
- Developed interactive software to model quadruped kinematics and tip-over stability.

The Tulsa Children's Museum
Tulsa, OK

Mechanical Engineering Senior Project
October 2016 — May 2017

- Team designed and built a 15 foot steel auger ball-lift system for an exhibit at the children's museum.
- Elected project MVP. Our project was voted second best by our class.
- Video of the project before it was installed in the museum: https://youtu.be/jlq1ikz-zHM

The University of Tulsa Mechanical Engineering Department
Tulsa, OK, USA

Student Grader
Spring 2016 — Spring 2017

- Mechanics of Materials (ME 3023); Instrumentation and Measurement (ME 3053)

Burns and McDonnell — Aviation and Federal Division
Kansas City, MO

Mechanical Engineering Intern
Summer 2015

- Assisted in designing HVAC and plumbing systems at Tinker Air Force Base, Portland International Airport, the Sampson School at Guantanamo Bay Naval Base, and the Kansas City National Security Campus.

Journal Articles

Tyler Morrison, Richard Jagacinski, Jordan Petrov. *Drivers' Attention to Preview and Its Momentary Persistence*. 2021. «In Review».

Tyler Morrison, Emanuele Rizzi, Omer Turkkan, Richard Jagacinski, Hai-Jun Su, Junmin Wang. *Drivers' Spatio-Temporal Attentional Distributions Are Influenced by Vehicle Dynamics and Displayed Point of View*. Human Factors. 2021. «Published». DOI: 10.1177/0018720820902879

Tyler Morrison, Hai-Jun Su. *Stiffness Modeling of a Variable Stiffness Compliant Link*. Mechanism and Machine Theory. 2020. «Published». DOI: 10.1016/j.mechmachtheory.2020.104021

Richard Jagacinski, Emanuele Rizzi, Benjamin Bloom, Omer Turkkan, **Tyler Morrison**, Hai-Jun Su, Junmin Wang. *Drivers' Attentional Instability on a Winding Roadway*. IEEE Transactions on Human-Machine Systems. 2019. «Published». DOI: 10.1109/THMS.2019.2906612

Oksana Savchak, Konstantin Kornev, **Tyler Morrison**, Olga Kuksenok. *Controlling Deformations of Gel-based Composites by Electromagnetic Signals within GHz Frequency Range*. Soft Matter. 2018. «Published». DOI: 10.1039/C8SM01207E

Conference Papers

Tyler Morrison, Hai-Jun Su. *Human Walking Gait Prediction For Design Evaluation of Complex Robotic Lower-Limb Prostheses*. 2022. «Submitted».

Tyler Morrison, Dylan Trainor, Hai-Jun Su. *Optimization of the Compliant Drive Mechanism for a Prosthetic Ankle*. ASME IDETC-CIE. *St. Louis, MO, USA*. August 2020. «Published». DOI: 10.1115/DETC2020-22442

Tyler Morrison, Chunhui Li, Xu Pei, Hai-Jun Su. *A Novel Rotating Beam Link for Variable Stiffness Robotics Arms*. IEEE International Conference on Robotics and Automation. *Montreal, CA*. May 2019. «Published». DOI: 10.1109/ICRA.2019.8793833

Research Presentations

Tyler Morrison, Richard Jagacinski, Jordan Petrov. *Attention and Visual Sensory Memory in Simulated Driving*. Psychonomic Society Annual Meeting. *Virtual*. November 2021. «Oral».

Tyler Morrison, Richard Jagacinski, Jordan Petrov. *Measuring the Range of Attention to Preview and Its Momentary Persistence in Simulated Driving*. International Symposium on Aviation Psychology. *Oregon State University*. May 2021. «Oral».

Richard Jagacinski, Emanuele Rizzi, Benjamin Bloom, O. Anil Turkkan, **Tyler Morrison**, Hai-Jun Su, Junmin Wang. *The shape of attention when tracking a winding roadway*. Midwest Cognitive Science Conference. *Columbus, OH*. May 2019. «Oral».

Xianpai Xeng, **Tyler Morrison**, Hai-Jun Su. *Mechanical Solutions to Variable Stiffness Robotic Arms*. IEEE ICRA Workshop on Physical Human-Robot Interaction. *Montreal, CA*. May 2019. «Poster + Oral».

Tyler Morrison, Joshua Schultz. *Optimal shuffles to prevent quadruped tipover during cooperation*. Robotics: Science and Systems Workshop on Design and Control of Small Legged Robots. *Pittsburgh, PA, USA*. June 2018. «Poster + Oral».

Oksana Sachak, Yao Xiong, **Tyler Morrison**, Konstantin Kornev, Olga Kuksenok. *Magnonics in hydrogels: modeling and magnetomechanical effects in GHz frequency range*. MRS Spring Meeting: Computer-Based Modeling and Experiment for the Design of Soft Materials Symposium. *Phoenix, AZ, USA*. April 2017. «Oral».

Honors & Awards

Graduate

2017 **Distinguished University Fellow**, The Ohio State University *Columbus, OH, USA*
2017 **Department Supplementary Fellowship Award**, The Ohio State University *Columbus, OH, USA*

Undergraduate

2017 **College of Engineering and Natural Sciences Steven J. Bellovich Medal**, The University of Tulsa *Tulsa, OK, USA*
2017 **Sidney Born Award in Mechanical Engineering**, The University of Tulsa *Tulsa, OK, USA*
2017 **Senior Project – Most Valuable Team Member**, The University of Tulsa, Mech. Eng. Dept. *Tulsa, OK, USA*
2016 **Putnam Competition Team Member**, The University of Tulsa, Math Dept. *Tulsa, OK, USA*
2017 **Best Senior Project Team: Runner-Up**, The University of Tulsa Mechanical Engineering Senior Projects *Tulsa, OK, USA*
2016 **Nominee, National Barry Goldwater Scholarship**, The University of Tulsa *Tulsa, OK, USA*
2013 — 2017 **President's Honor Roll**, The University of Tulsa *Tulsa, OK, USA*
2013 **National Merit Finalist**, National Merit Scholarship Corporation
2013 **Presidential Scholar**, The University of Tulsa *Tulsa, OK, USA*

Other

2011 **Eagle Scout**, Boy Scouts of America *Kansas, USA*

Selected Graduate Coursework

Robotics/AI Machine Learning for Engineers – Mechanical Control of Robots – Design of Smart Products
Design Advanced Kinematics and Mechanisms – Optimal Design of Structures – Form Synthesis and Analysis
Control Lumped Parameter Systems – Digital Control Engineering – Design and Control of Mechatronic Systems

Skills and Previous Experience

Programming MATLAB, Python, Java, C/C++, Mathematica, Powershell, LaTeX, Git, GitHub, CasADi, Ipopt, Visual Studio, Cmake, make
Modeling & Design Software Solidworks, AutoCAD, Adobe Illustrator, Revit
Simulation OpenSim, ANSYS, ABAQUS, Solidworks Simulation, SPSS
Hardware Arduino, Raspberry Pi, DC Motors, Lidar, Basic Circuit Design, Compliant Mechanisms
Rapid Prototyping 3D-Printing, Laser Cutting, Plasma Cutting
Algorithms Fourier Analysis, Wavelet Analysis, Regression, Machine Learning, Trajectory Optimization, Nonlinear Programming
Misc. Experiment Design, Debugging, Code Optimization, Parallel Computing, Research Ethics

Other Presentations

Abdulhamid Aljaber, Sultan Al-Nabhani, Nick Criser, Brian Hall, Joel Kapp, **Tyler Morrison**, Drake Norman, Alex Price, Tommy Weissert. *The Tulsa Children's Museum Petroleum Exhibit Ball Lift*. The University of Tulsa Senior Projects. *Tulsa, OK, USA*. April 2017. «Oral».

Brian Hall, **Tyler Morrison**, Alex Price. *The Tulsa Children's Museum Auger Ball Lift*. The University of Tulsa Department of Mechanical Engineering Advisory Board Meeting. *Tulsa, OK, USA*. March 2017. «Oral».

Tyler Morrison, Joshua Schultz. *Algorithms for Shuffling Foot Placements to Maintain Stability of a Quadruped Robot Engaged in a Cooperative Task*. The University of Tulsa Student Research Colloquium Mechanical: Engineering Session. *Tulsa, OK, USA*. March 2017. «Oral».

Tyler Morrison, Olga Kuksenok. *Numerical Simulations of NIPA Gel Membranes Exposed to Heat and Light*. Clemson Undergraduate Research Symposium. *Clemson, SC, USA*. July 2016. «Poster».

Tyler Morrison, Joshua Schultz. *Investigation into Coordinated Gaits of Quadruped Robots Engaged in Grasping and Manipulation with Applications in Search and Rescue*. The University of Tulsa Student Research Colloquium: Mechanical Engineering Session. *Tulsa, OK, USA*. March 2016. «Oral».

Extracurricular Activity

Tau Beta Pi *Tulsa, OK, USA*

Involved Member of Oklahoma Beta Chapter *2015 — 2017*

- Helped lead initiation of new members and organize induction ceremonies and fellowship activities.

Mathematical Association of America Putnam Competition *Tulsa, OK, USA*

University of Tulsa Team Member and Individual Competitor *2014, 2015*

- Personal best score of 11, ranks in top 21% of mathematicians in North America. (World-wide median score is zero points).

Boy Scouts of America *Kansas City, KS, USA*

Eagle Scout *2001 — 2013*

- Eagle Scout service project: leading and organizing a team to build bookshelves for a library system for a local children's home.
- Member of U.S. BSA delegation to the 2011 World Scout Jamboree in Sweden.

Attended Conferences

- International Symposium on Aviation Psychology; May 18-21, 2021; Online
- ASME IDETC-CIE; August 17-19, 2020; Online
- IEEE International Conference on Robotics and Automation; May 20-24, 2019; Montreal, QC, CA
- Robotics: Science and Systems; June 26-30, 2018; Pittsburgh, PA, USA

Peer-Review Assistance

- IROS 2018, Mechanism and Machine Theory, RoboSoft 2020

Passions

- Running and Biking, Dog Fostering and Training, Medical Spouse