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

Dissertation Summary

For my dissertation, I developed software tools to predict changes in the gait of wearers of lower limb robotic prostheses. I formulated new objectives and dynamic models for prosthetic gait prediction trajectory optimization. I also demonstrated methods for using these tools to conduct parametric design studies, and showed that doing so provides novel design insight.

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*

- Developed optimal foot-shuffle algorithm for quadruped stabilization under disturbances and body-position constraints.

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

Selected 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

Selected 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

Selected Research Presentations

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

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

Selected 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	**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*
2016	**Nominee, National Barry Goldwater Scholarship**, The University of Tulsa	*Tulsa, OK, USA*
2013	**Presidential Scholar**, The University of Tulsa	*Tulsa, OK, USA*

Other

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