JONATHAN M. BOSNICH

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EDUCATION

Washington University in St. Louis — St. Louis, MO
Ph.D. in Systems Science and Mathematics — 2025 - Present

Northwestern University — Evanston, IL
M.S. in Mechanical Engineering, *control and robotics emphasis* — 2021 - 2024
Thesis: *Increasing Robustness in Koopman-Based Feedback Stabilization*

University of Colorado, Boulder — Boulder, CO
B.S. in Mechanical Engineering, *Summa Cum Laude* — 2016 - 2020
B.A. in Mathematics, *With Distinction* — 2016 - 2020

Coursework
Topology, Real Analysis, Abstract Algebra, Applied Dynamical Systems, Data-Driven Dynamical Systems, Nonlinear Optimization, Distributed Optimization, Linear Systems, Stochastic Processes, Active Robot Learning

Programming
Python, MATLAB, Julia, ROS

RESEARCH EXPERIENCE

Interactive & Emergent Autonomy Lab (Northwestern University) — Evanston, IL
Graduate Research Assistant — 2021 - 2024
Advisor: Todd Murphey

- Applied Koopman operator theory to compute data-driven stabilizing control that accounts for model error
- Extended the Koopman-based modeling algorithm ResDMD to nonlinear systems with affine control input
- Derived error bounds on model eigenvalue's distance to a true eigenvalue of the system using this algorithm
- Formulated and algorithmically solved finding min-norm stabilizing control gains for discrete linear systems

Bio-Inspired Perception and Robotics Lab (University of Colorado) — Boulder, CO
Undergraduate Research Assistant — 2019 - 2020
Advisor: J. Sean Humbert

- Extracted state information from a system of distributed sensors by projecting data onto basis functions
- Developed a data-driven method for choosing optimal basis functions by solving integral operator equations
- Used a Galerkin approximation of the singular value expansion to solve integral operator equations
- Investigated analytic and data-driven methods for modeling and controlling an array of soft actuators

Mathematics Department (University of Colorado) — Boulder, CO
Independent Research in Lie Theory — Spring 2020
Advisor: Keith Kearnes

- Worked on the unsolved classification of 10-dimensional simple Lie algebras over the two-element field
- Used the adjoint representation and spectral graph theory to study the only known Lie algebra of this type
- Formulated and programmed criteria for admissible Lie algebras, reducing 2048 possibilities to at most 85

Collective Dynamics and Control Lab (University of Maryland) — College Park, MD
Research Intern, Bio-Inspired Robotics REU — Summer 2019
Advisor: Derek Paley

- Created a soft-robotic gripper that adapts the force it applies to an object via sensory feedback control
- Implemented PID control law in MATLAB, fabricated the soft gripper, and integrated the system
- Delivered final presentation to the REU cohort, lab members, and PIs, and was awarded best presentation

Mathematics Department (University of Colorado) Boulder, CO
Research Intern, Mathematics REU Summer 2018
Advisor: Nathaniel Thiem

- Sought an algebraic relationship relating the partitions of an integer n and of a set with n elements
- Employed techniques from algebraic combinatorics and graph theory to search for this relationship

TEACHING EXPERIENCE

Loyola University Chicago Chicago, IL
Mathematics Instructor Fall 2024 - Spring 2025

- Taught four sections of Precalculus II, covering exponential, logarithmic, and trigonometric functions

Mechanical Engineering 314 - Machine Dynamics (Northwestern University) Evanston, IL
Teaching Assistant Spring 2023 & 2024

- Taught total of 26 lectures, and received high praise from the students and instructor (Todd Murphey)
- Topics I covered: Euler-Lagrange equations, constraints, external forces, Noether's theorem, impacts

Math Academic Resource Center (University of Colorado) Boulder, CO
Tutor for Precalculus through Calculus III 2018 - 2020

Applied Mathematics Department (University of Colorado) Boulder, CO
Learning Assistant for Calculus I & II 2017 - 2018

TEAMS Elementary School Engineering Program Longmont, CO
Group Leader 2016 - 2017

PROFESSIONAL EXPERIENCE

Spectra Logic Corporation Boulder, CO
Systems Engineer Intern 2020 - 2021

- Wrote Python program that queried and analyzed CAN communication metrics stored in an SQL database
- Identified performance degradation by visualizing data from different sources in a single multi-plot chart
- Conducted tests, collected data, and performed statistical analysis to investigate robot positioning issues

Mechanical Engineering Capstone Project Boulder, CO
Systems Engineer 2019 - 2020
Client: National Oceanic and Atmospheric Administration (NOAA)

- Designed hardware and software for aircraft-mounted atmospheric LiDAR scanner to track wildfires
- Implemented feedback controller in LabVIEW that ensured a steady scan in the presence of aircraft motion

HONORS

Northwestern University

- NSF GRFP Honorable Mention 2021
- Ted Belytschko Fellowship (one of two recipients) 2021
- Walter P. Murphy Fellowship 2021

University of Colorado, Boulder

- Outstanding Undergraduate of the College of Engineering 2020
- Outstanding Undergraduate of the Mechanical Engineering Department 2020
- College of Engineering Dean's list (every semester) 2016 - 2020
- Engineering Honors Program 2016 - 2020
- Esteemed Scholars Program 2016 - 2020
- Phi Beta Kappa (academic fraternity) 2018 - 2020
- Pi Mu Epsilon (math honor society) 2018 - 2020