Boyang Zhang

CONTACT INFORMATION

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LinkedIn Profile
Personal Website

RESEARCH INTERESTS

Dynamics and control; Multi-agent robotics; Motion planning; Connected and automated vehicles; Unmanned aerial vehicles; Urban air mobility; Autonomous marine vehicles; Collision avoidance; Wheeled robot; Legged robot; Soft robot; Construction robots; Human-robot interaction; Smart manufacturing; Renewable energy; System identification; Control theory; Optimization theory; Intelligent built environments; Machine Learning.

EDUCATION

Ph.D., Civil and Environmental Engineering Sept. 2023

***Duke University**, Durham, United States*

- Dissertation: Control through constraint.
- **Committee**:
  Henri Gavin (Chair), Earl Dowell, Jerome Lynch, Michael Zavlanos, Dennis Bernstein.
- **Highlights**:
  - 2022–2023 Duke Graduate/Professional Academic Exemplar of the Year
  - Preparing Future Faculty Fellow (22 fellows out of all Duke Ph.D. students/postdocs)
  - Bass Instructional TA Fellow (four fellows out of all Duke Ph.D. candidates)
  - Summer Research Fellow (two fellows out of all third year and beyond Duke Ph.D. students in seven Physical Sciences and Engineering departments)
  - Certificate in College Teaching
  - Certificate in Teaching Writing

M.S., Electrical and Computer Engineering Sept. 2023

***Duke University**, Durham, United States*

- Research project: An instantaneous nonlinear optimal control paradigm via constraints.
- **Committee**:
  Vahid Tarokh (Chair), Tyler Bletsch, Ehsan Abadi.

M.Eng., Ocean and Naval Architectural Engineering Oct. 2017

***Memorial University (MUN)**, St. John's, Canada*

- Thesis: Improving time-domain prediction of vortex-induced vibration for marine risers.
- **Committee**:
  Wei Qiu (Chair), David Molyneux, James Yang.
- **Highlights**:
  - GPA: 4.0/4.0
  - Fellow of the School of Graduate Studies (awarded to less than 10% of a degree program's final-year students.)

B.Eng., Ocean and Naval Engineering July 2013

***Tianjin University (TJU)**, Tianjin, China*

RESEARCH EXPERIENCE

Assistant Professor Aug. 2024 – Present

University of Louisiana at Lafayette, Lafayette, United States

Research Affiliate Sept. 2023 – May 2024
Duke University, Durham, United States
- Organized manuscripts and literature related to multi-agent navigation and control.
- Supported graduate student outreach activities both in person and by email.

Graduate Research Assistant June 2018 – Sept. 2023
Duke University, Durham, United States
- Developed centralized and decentralized frameworks for the navigation and control of hundreds of agents based on extensions of Gauss's principle of least constraint (GPLC).
- Resolved the deadlocks naturally among double integrators by a constraint reformulation.
- Originated computationally simple, centralized and decentralized control methods for single/multiple fully nonlinear quadrotors based on generalizations of GPLC.
- Formulated computationally simple, centralized and decentralized control methods for single/multiple nonholonomic wheeled mobile robots based on extensions of GPLC.
- Derived the input-output stability of nonlinear dynamical systems based on conic sectors.
- Led and managed the publication of **seven** first-authored papers in top venues in the field of control and optimization and won **two** best paper awards.
- Presented my doctoral research at **eight** control conferences and won **two** best presentation awards.
- Wrote proposals to win more than **$197,000** of competitive fellowships and grants to fund my doctoral work.

Graduate Research Assistant June 2014 – June 2017
Memorial University, St. John's, Canada
- Derived and compared time-domain models to predict vortex-induced vibration (VIV).
- Re-developed an in-house finite-element program in Fortran for mooring line analysis.
- Designed a model test of two cylinders under VIV interaction at high Reynolds numbers.
- Won more than **$54,000** of competitive scholarships to fund my Master's work.

Technology Intern Jan. 2015 – May 2015
American Bureau of Shipping, Houston, United States
- Researched the rules and regulations from seven classification societies: ABS, DNV-GL, LR, BV, NK, CCS, and KR.
- Upgraded the ABS notation comparison database with 371 modifications.

Undergraduate Research Assistant Mar. 2012 – June 2013
Tianjin University, Tianjin, China
- Analyzed extreme loading scenarios for an offshore jack-up platform in ANSYS.
- Assisted in coupling the hull heave-moonpool fluid motion for a SPAR platform.
- Conducted ship resistance/propulsion tests at Tianjin University Towing Tank.

Refereed Journal Publications

1. **Zhang, B.** and Gavin, H.P. Gauss's Principle with Inequality Constraints for Multi-agent Navigation and Control. *IEEE Transactions on Automatic Control*, vol. 67, no. 2, pp. 810-823, 2022, doi: 10.1109/TAC.2021.3059677.
(impact factor: **6.8**; Google Scholar Metrics ranking in **Automation & Control Theory: 3/20**)

2. **Zhang, B.** and Gavin, H.P. Decentralized Control of Multiagent Navigation Systems. *IEEE/CAA Journal of Automatica Sinica (JAS)*, vol. 9, no. 5, pp. 922-925, 2022, doi: 10.1109/JAS.2022.105569.
(impact factor: **11.8**; Scopus ranking in **Control and Optimization: 1/121**)

3. **Zhang, B.** and Qiu, W. Improving Time-Domain Prediction of Vortex-Induced Vibration for Marine Risers. *Marine Systems & Ocean Technology*, vol. 13, no. 1, pp. 13-25, 2018, doi: 10.1007/s40868-017-0041-3.

Peer-Reviewed Conference Publications

1. **Zhang, B.** and Gavin, H.P. Computationally Efficient Tracking Control of Differential Drive Wheeled Mobile Robots. *Proceedings of the 2023 American Control Conference (ACC)*, pp. 891-896, 2023, doi: 10.23919/ACC55779.2023.10156242.
2. **Zhang, B.** and Gavin, H.P. Decentralized Unified Position-Attitude Control of Nonlinear UAVs. *Proceedings of the 61st IEEE Conference on Decision and Control (CDC)*, pp. 5214-5219, 2022, doi: 10.1109/CDC51059.2022.9992624.
3. **Zhang, B.** and Gavin, H.P. Unified Position-Attitude Control of A Nonlinear Quadrotor Swarm. *Proceedings of the 2022 American Control Conference (ACC)*, pp. 4030-4035, 2022, doi: 10.23919/ACC53348.2022.9867205.
4. **Zhang, B.** and Gavin, H.P. Natural Deadlock Resolution for Multi-agent Multi-swarm Navigation. *Proceedings of the 60th IEEE Conference on Decision and Control (CDC)*, pp. 5958-5963, 2021, doi: 10.1109/CDC45484.2021.9683102.
5. **Zhang, B.** and Gavin, H.P. Unified Position and Attitude Control of a Fully Nonlinear Quadrotor. *Proceedings of the 2021 American Control Conference (ACC)*, pp. 1064-1069, 2021, doi: 10.23919/ACC50511.2021.9483358.

Conference Presentations

- 7th TX-LA Undergrad Math Conference, College Station, TX. Mar. 2024
  Plenary Speaker
- 2023 American Control Conference, San Diego, CA. May 2023
- 2023 Southeast Control Conference, Gainesville, FL. Feb. 2023
  Best Presentation Award
- 61st IEEE Conference on Decision and Control, Cancún, Mexico. Dec. 2022
- 2022 American Control Conference, Atlanta, GA. June 2022
- IEEE/CAA JAS Symposium Series 1 (virtual). Feb. 2022
- 60th IEEE Conference on Decision and Control, Austin, TX. Dec. 2021
- 2021 Southeast Control Conference, Blacksburg, VA. Oct. 2021
- 2021 American Control Conference, New Orleans, LA. May 2021

Teaching Experience

Instructor of **System Dynamics Modeling and Analysis** (MCHE 374) Fall 2024
University of Louisiana at Lafayette, Lafayette, United States

Co-instructor of **Uncertainty, Design, and Optimization** (CEE 201) Spring 2023
Duke University, Durham, United States

- Gave four guest lectures and weekly 75-minute recitations to 20 undergraduate students.
- Assisted in preparing lecture materials and homework questions/solutions.
- Held weekly office hours.

Instructor of **Robust Control** (ME 592) Spring 2018
Duke University, Durham, United States

- Developed lecture notes.
- Gave lectures to seven people, including five undergraduate/graduate students and two professors.

Graduate Teaching Assistant Fall 2021/Spring 2022

Duke University, Durham, United States

- Gave three tutorial labs to 51 students in EGR 201.
- Gave two guest lectures to 15 students in CEE 690.06.
- Held weekly office hours.
- Graded the assignments and lab reports.

Mechanics of Solids (EGR 201) Fall 2021
Undergraduate course, 54 students.

Risk and Resilience in Engineering (CEE 690.06) Spring 2022
Graduate/Undergraduate course, 15 students.

Graduate Teaching Assistant Jan. 2014 – Dec. 2015

Memorial University, St. John's, Canada

- Gave tutorial lectures and labs to 344 students.
- Generated the solutions to assignments and exams.
- Graded the assignments and lab reports.

Mechanical Vibrations (EN 6933) Fall 2014/2015
Undergraduate course, 106/105 students.

Fluid Mechanics (EN 4961) Spring 2015
Undergraduate course, 91 students.

Dynamics and Maneuvering of Ocean Vehicles (EN 7035) Spring 2014
Undergraduate course, 20 students.

Marine Propulsion (EN 5020) Winter 2014
Undergraduate course, 22 students.

Grants, Awards, & Honors

National/International Level:

- Best Presentation Award Feb. 2023
  2023 Southeast Control Conference
- 2022 Society for Risk Analysis Annual Meeting Student Award ($75) Nov. 2022
  Society for Risk Analysis
- 2022 CDC Student Travel Award and Workshop Support ($825) Sept. 2022
  61st IEEE Conference on Decision and Control (CDC)
- 2022 ACC Student Travel Grant ($445) Apr. 2022
  2022 American Control Conference (ACC)
- 2022 ACC Best Student Paper Award Nominee Nov. 2021
- Selected oral presenter Jan. 2023/Oct. 2021
  Southeast Control Conference
- 60th IEEE CDC Student Travel Support ($125) Sept. 2021
  60th IEEE Conference on Decision and Control (CDC)
- 60th IEEE CDC Best Student Paper Award Nominee Sept. 2021
- 2021 ACC Student Registration Grant ($100) Apr. 2021
  2021 American Control Conference (ACC)
- Short-Term Innovative Research Grant ($60,000) Sept. 2019
  U.S. Army Research Office
- Mitacs Accelerate Award ($10,000) Jan. 2015
  Mitacs Canada
- Offshore Technology Research Fellowship ($42,000) Sept. 2013/2014
  Natural Sciences and Engineering Research Council of Canada
- Excellent Volunteer Sept. 2012
  World Economic Forum (Tianjin Summer Davos)

University Level:

- Duke DEFINE Academy Research Talk Competition – **1st place** — Oct. 2023
- Duke DEFINE Academy Fellow (26 out of 82 applicants nationwide) — Sept. 2023
- Senol Utku Annual Award with High Distinction — May 2023
- Duke In the Spotlight Award — May 2023
- **Duke Graduate/Professional Academic Exemplar of the Year** — Mar. 2023
- Duke Graduate School Conference Travel Award ($700) — Nov. 2022
- Preparing Future Faculty Fellowship ($500) — July 2022
- Duke Graduate School Conference Travel Award ($525) — May 2022
- Summer Research Fellowship ($12,561) — Jan. 2022
- Bass Instructional Teaching Assistant Fellowship ($29,770) — Dec. 2021
- Auburn Preparing Future Faculty Fellow (200 out of 800+) — Sept. 2021
- Senol Utku Annual Award with Highest Distinction ($350) — Apr. 2021
- The only student participant/speaker at Duke Libraries fundraising event — Apr. 2019
- Fellow of the MUN School of Graduate Studies — Nov. 2017
- Duke Graduate School Fellowship ($85,479) — Aug. 2017
- McGill Engineering Doctoral Award ($96,000) (declined) — Mar. 2017
- MUN Outstanding Teaching Assistant Award Nominee — May 2016
- MUN School of Graduate Studies Scholarship ($2,000) — Sept. 2013/2014
- TJU Excellent Student Leadership Scholarship — Dec. 2011
- TJU Advanced Student in Volunteer Service — Dec. 2011

Certifications

- Science Communication — Mar. 2023
  Duke University, Durham, United States
- Offshore Systems for Oil & Gas Production and Renewable Energy — Mar. 2016
  University of Maine, Orono, United States
- Arctic/Subarctic Offshore Engineering — May 2015
  American Society of Mechanical Engineers (ASME)
- Fundamentals of Riser & Flexible Pipe Engineering — May 2015
  American Society of Mechanical Engineers (ASME)
- The Fundamentals of Project Management — May 2015
  Memorial University, St. John's, Canada
- Design and Analysis of Floating Platforms — Oct. 2014
  John Halkyard Associates, Houston, United States

Invited Reviewership

AAAI Symposia
IEEE Access
IEEE/CAA Journal of Automatica Sinica
IEEE Open Journal of Control Systems
IEEE Control Systems Letters
IEEE Conference on Decision and Control
Information Sciences
American Control Conference

Professional Societies

Member of IEEE
Member of IEEE Control Systems Society

References

Available upon request.