

# Boyang Zhang

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CONTACT 133 Hudson Hall  
INFORMATION Durham, NC 27708  
+1 919-660-5201

[boyang.zhang@duke.edu](mailto:boyang.zhang@duke.edu)  
[LinkedIn Profile](#)  
[Personal Website](#)

RESEARCH INTERESTS Dynamics and control; Multi-agent robotics; Robot motion planning; Connected and automated vehicles; Unmanned aerial vehicles; Autonomous surface/underwater vehicles; Collision avoidance; Wheeled robot; Legged robot; Soft robot; Human-robot interaction; Smart manufacturing; Renewable energy; Smart power grids; System identification; Control theory; Optimization theory; Intelligent civil infrastructures; Operations research.

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 **Graduate Research Assistant**  
*Duke University, Durham, United States*

June 2018 – Sept. 2023

- 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.
- Wrote applications to win 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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/10.23919/ACC50511.2021.9483358).

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| CONFERENCE<br>PRESENTATIONS | <ul style="list-style-type: none"> <li>• 2023 American Control Conference, San Diego, CA. <span style="float: right;">May 2023</span></li> <li>• 2023 Southeast Control Conference, Gainesville, FL. <span style="float: right;">Feb. 2023</span></li> <li style="padding-left: 20px;"><b>Best Presentation Award</b></li> <li>• 61st IEEE Conference on Decision and Control, Cancún, Mexico. <span style="float: right;">Dec. 2022</span></li> <li>• 2022 American Control Conference, Atlanta, GA. <span style="float: right;">June 2022</span></li> <li>• IEEE/CAA JAS Symposium Series 1 (virtual). <span style="float: right;">Feb. 2022</span></li> <li>• 60th IEEE Conference on Decision and Control, Austin, TX. <span style="float: right;">Dec. 2021</span></li> <li>• 2021 Southeast Control Conference, Blacksburg, VA. <span style="float: right;">Oct. 2021</span></li> <li>• 2021 American Control Conference, New Orleans, LA. <span style="float: right;">May 2021</span></li> </ul> |
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TEACHING EXPERIENCE	<p><b>Co-instructor of <a href="#">Uncertainty, Design, and Optimization (CEE 201)</a></b> <span style="float: right;">Spring 2023</span>  <i>Duke University, Durham, United States</i></p> <ul style="list-style-type: none"> <li>• Gave four guest lectures and weekly 75-minute recitations to 20 undergraduate students.</li> <li>• Assisted in preparing lecture materials and homework questions/solutions.</li> <li>• Held weekly office hours.</li> </ul>
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TEACHING EXPERIENCE	<p><b>Instructor of <a href="#">Robust Control (ME 592)</a></b> <span style="float: right;">Spring 2018</span>  <i>Duke University, Durham, United States</i></p> <ul style="list-style-type: none"> <li>• Developed lecture notes.</li> <li>• Gave lectures to seven people, including five undergraduate/graduate students and two professors.</li> </ul>
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TEACHING EXPERIENCE	<p><b>Graduate Teaching Assistant</b> <span style="float: right;">Fall 2021/Spring 2022</span>  <i>Duke University, Durham, United States</i></p> <ul style="list-style-type: none"> <li>• Gave three tutorial labs to 51 students in EGR 201.</li> <li>• Gave two guest lectures to 15 students in CEE 690.06.</li> <li>• Held weekly office hours.</li> <li>• Graded the assignments and lab reports.</li> </ul>
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TEACHING EXPERIENCE	<p><b><a href="#">Mechanics of Solids (EGR 201)</a></b> <span style="float: right;">Fall 2021</span>          Undergraduate course, 54 students.</p>
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TEACHING EXPERIENCE	<p><b><a href="#">Risk and Resilience in Engineering (CEE 690.06)</a></b> <span style="float: right;">Spring 2022</span></p>
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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

**International/National Level:**

- **Outstanding Self-financed Students Abroad Award** (\$6,000) June 2023  
*China Scholarship Council*
- **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)*
- **Triple-A Student** Mar. 2009  
*Department of Education, Hebei Province, China*

**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 IEEE/CAA Journal of Automatica Sinica
- REVIEWERSHIP IEEE Open Journal of Control Systems
- IEEE Control Systems Letters
- IEEE Conference on Decision and Control
- IEEE Access
- Information Sciences
- American Control Conference

- PROFESSIONAL Member of IEEE
- SOCIETIES Member of IEEE Control Systems Society

- LANGUAGES & **Language:**
- SKILLS
- Fluent in English; native in Chinese (Simplified and Traditional).

- Computer:**
- L<sup>A</sup>T<sub>E</sub>X, Matlab, Fortran, C, Linux, SolidWorks, Gnuplot, AutoCAD, ANSYS.

- REFERENCES Available upon request.