Bohao Zhang

PhD Candidate · Robotics

University of Michigan, 2505 Hayward St, Ann Arbor, MI 48109

jimzhang@umich.edu | cfather.github.io/jimzhang.github.io/ | linkedin.com/in/bohao-zhang-8815101ba/

Education

University of Michigan — *Ann Arbor*
PhD Candidate in Robotics — *Aug 2020 - April 2025 (anticipated)*
- Advisor: Prof. Ram Vasudevan

University of Michigan — *Ann Arbor*
BS in Computer Engineering — *Aug 2018 - May 2020*
- Minor in Mathematics

Shanghai Jiaotong University — *Shanghai*
BS in Electrical & Computer Engineering — *Aug 2016 - Aug 2020*
- Dual degree with University of Michigan

Skills

Languages	**C++, MATLAB, CUDA, Python**
Softwares	**Eigen, Pinocchio, fmincon, IPOPT, MuJoCo, PyBullet, PyTorch, docker**
Soft skills	**Professional academic communication, Project leadership, Independent research ability**

Research Projects

Provably-Safe, Real-time Planning & Control For Bipedal Robots Using Reachability-Based Trajectory Design — *2021 - present*
Worked on Agility Robotics' Digit-v3 humanoid robot
- Generated a library of multiple-step gaits offline using nonlinear optimization toolbox Ipopt
- Applied a passivity-based robust controller to achieve bounded tracking error given model uncertainty
- Generated whole-body reachable sets for collision checking in real-time during online planning
- Leader of the project

Autonomous Robust Manipulation via Optimization with Uncertainty-aware Reachability — *2021 - 2023*
Worked on Kinova Gen3 robotic arm
- Applied a passivity-based robust controller to achieve bounded tracking error given model uncertainty
- Performed reachability-based planning to achieve guaranteed-safe performance
- Designed and implemented algorithms in CUDA for generating reachable sets and online real-time planning

Real-Time, Safe Motion Planning and Control for Manipulation of Unsecured Objects — *2022 - present*
Worked on Kinova Gen3 robotic arm
- Generated reachable sets of contact constraints to guarantee safety of manipulating unsecured objects
- Designed and implemented algorithms in CUDA for generating reachable sets and online real-time planning

Real-Time, Certified, Chance-Constrained Motion Planning using the Parallel Bernstein Algorithm — *2020 - 2021*
Worked on a two-wheeled Segway
- Applied parallel Bernstein algorithm to find the global optimum of the online optimization problem in real-time
- Implemented algorithms in CUDA for online real-time planning

Safe, Optimal, Real-time Trajectory Planning with a Parallel Constrained Bernstein Algorithm *2019 - 2020*

Worked on a two-wheeled Segway

- Applied parallel Bernstein algorithm to find the global optimum of the online optimization problem in real-time
- Designed and implemented algorithms in CUDA for online real-time planning

Publications

Published

Jonathan Michaux, Adam Li, Qingyi Chen, Che Chen, **Bohao Zhang**, Ram Vasudevan. 2024. Safe Planning for Articulated Robots Using Reachability-based Obstacle Avoidance With Spheres. Robotics: Science and Systems.

Zachary Brei, Jonathan Michaux, **Bohao Zhang**, Patrick Holmes, Ram Vasudevan. 2024. Serving Time: Real-Time, Safe Motion Planning and Control for Manipulation of Unsecured Objects. IEEE RA-L

Patrick Holmes, Shreyas Kousik, **Bohao Zhang**, Daphna Raz, Corina Barbalata, Matthew Johnson-Roberson, Ram Vasudevan. 2020. Reachable Sets for Safe, Real-Time Manipulator Trajectory Design. Robotics: Science and Systems.

Bohao Zhang*, Shreyas Kousik*, Pengcheng Zhao*, Ram Vasudevan. 2021. Safe, Optimal, Real-time Trajectory Planning with a Parallel Constrained Bernstein Algorithm. IEEE Transactions on Robotics, vol. 37, no. 3, pp. 815-830.

In Review

Xun Fu, **Bohao Zhang**, Ceri J Weber, Kimberly L Cooper, Ram Vasudevan, Talia Y Moore. 2024. Jointed Tails Enhance Control of Three-dimensional Body Rotation. arxiv.org/abs/2406.09700 (Under review in Royal Society Interface)

Jonathan Michaux, Patrick Holmes, **Bohao Zhang**, Che Chen, Baiyue Wang, Shrey Sahgal, Tiancheng Zhang, Sidhartha Dey, Shreyas Kousik, Ram Vasudevan. 2024. Can't Touch This: Real-Time, Safe Motion Planning and Control for Manipulators Under Uncertainty. arxiv.org/abs/2301.13308 (Under review in IEEE T-RO)

Awards & Fellowships

2018 & 2019 **Dean's list**, University of Michigan

2017 **Honorable Mention**, COMAP Mathematical Contest in Modeling

2016 **John Wu & Jane Sun Outstanding Scholarship**, Shanghai Jiaotong University

Outreach & Professional Development

Service and Outreach

2022 **Girls in Science and Engineering (WISE GISE) Summer Day Camp**, Mentor

Peer Review

Reviewed one publication for IEEE Transactions on Robotics (T-RO)

Reviewed one publication for IEEE Transactions on Machine Learning in Communications and Networking (TMLCN)

Reviewed one publication for IEEE International Conference on Robotics and Automation (ICRA)