Johnson Zhong

Robotics PhD Candidate

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Education

2018-09 to now

University of Michigan

- PhD Candidate in Robotics under Dmitry Berenson
- Cumulative GPA: 3.96/4.0

2013-09 to 2018-06

University of Toronto

- B.ASc in Engineering Science Robotics with high honours - johnsonzhong.me/res/grad/degree.pdf
- Cumulative GPA: 3.91/4.0
- Major GPA: 4.0/4.0
- **Rank** 2/161 in semester 5 | 5/158 in semester 6

Journal Publications

2022-01

S. Zhong, N. Fazeli, and D. Berenson, "Soft Tracking Using Contacts for Cluttered Objects to Perform Blind Object Retrieval," *RA-L*, 2022. - link

2021-02

S. Zhong, Z. Zhang, N. Fazeli, and D. Berenson, "TAMPC: An Online Controller for Escaping Traps in Novel Environments," *RA-L*, 2021. - link

2018-01

K. E. Murray, O. Petelin, **S. Zhong**, J. M. Wang, M. Eldafrawy, J.-P. Legault, E. Sha,A. G. Graham, J. Wu, M. J. P. Walker et al., "Vtr 8: High-performance CAD and Customizable FPGA Architecture Modelling," *TRETS*, 2019. **Best Paper Award.** - link

Academic Funding

2018-09 to 2019-09

Robotics Institute Fellowship ($75000)

2013-09 to 2018-05

Shaw Admission Scholarship ($20000)

2015-05

Undergraduate Student Research Awards (USRA) grant from Natural Sciences and Engineering Research Council of Canada (NSERC) ($6000)

2013-09

Walter Scott Guest Memorial Scholarship ($5000)

Awards

2018-04

Engineering Science Award of Excellence - johnsonzhong.me/res/grad/award_of_excellence.pdf

2018-01

3rd in Ontario Engineering Competition 2018 Programming category ($500)

2016-03

1st in Ontario Engineering 2016 Competition Programming category ($2000) - johnsonzhong.me/projects/snowfun

2015-10

1st in Canada in IEEEXtreme 9.0 (28/6800 globally) - johnsonzhong.me/res/ieee9.pdf

2015-01

Context.io API prize in PennApps Winter 2015 ($500) - devpost.com/software/snowball

2014-10

8th in Canada in IEEEXtreme 8.0 (52/6500 globally) - johnsonzhong.me/res/ieee8.pdf

2014-09

Google Cloud Platform prize in Hack the North 2015 ($1000) - devpost.com/software/forenships

2013-10

6th in Canada in IEEEXtreme 7.0 (43/7500 globally) - johnsonzhong.me/res/ieee.jpg

Research Projects

2017-09 to 2018-05

Magnetic Microbead Control for Intracellular Manipulation with Prof. Yu Sun

Undergraduate Thesis at the Advanced Micro and Nanosystems Laboratory MATLAB QT

The lab develops a cutting edge magnetic tweezer to manipulate nano-sized beads

- Created simulation of the magnetic system
- Explored how practical constraints impacted controllable region
- Designed a learned gain scheduling controller to optimize controllable region

2016-05 to 2017-09

Verity Studios R&D Engineering Intern with Prof. Raffaello D'Andrea

16 months Professional Experience Year, Zurich - veritystudios.com C++ QT boost

Verity Studios is an ETH spinoff specializing in indoor drone show systems.

- Modelled novel indoors localization system using physics first principles
- Enabled optimization of flight performance
- Achieved **correlation of 0.86** (95% confidence >0.80) against experimental performance

2015-05 to 2015-09

FPGA CAD Routing Optimization with Prof. Vaughn Betz

Summer research with USRA NSERC 5k grant, University of Toronto - johnsonzhong.me/projects/vpr C++

Verilog-to-Routing (VTR) is a CAD flow mapping Verilog to FPGAs. Its runtime performance was bottlenecked by the routing phase for large circuits.

- Developed route tree pruning algorithm to allow incremental reroutes, speeding up routing by up to **3x** on difficult benchmarks
- Designed targeted rerouting algorithm for critical yet suboptimal connections, producing up to **30% faster** resulting circuits (maximum frequency)
- Benchmarked over realistic circuits, with speedups scaling with circuit size

Teaching Experience

2022-07 to 2023-01

Graduate Student Instructor for ROB 502 Programming for Robotics (new course) - link

- Designed assignments, labs, and quizzes
- Set up automated grading for assignments and quizzes
- Led weekly 2 hour interactive labs

Projects

2021-01 to 2022-06

PyTorch Differentiable Robot Kinematics

Open source library - github.com/UM-ARM-Lab/pytorch_kinematics python PyTorch

Parallel and differentiable robot forward kinematics and Jacobian calculation

- >100 stars
- Differentiable robot kinematics and Jacobian computation
- Load robot description from URDF, SDF, and MJCF formats

2020-01 to 2022-03

PyTorch Model Predictive Path Integral Controller

Open source library - github.com/UM-ARM-Lab/pytorch_mppi python PyTorch

Batched and GPU friendly implementation of Model Predictive Path Integral (MPPI) controller.

- >150 stars
- Used by many university labs
- Handle stochastic dynamic models

2015-09 to 2015-11

Autonomous Cooperating Robots

AER201 Design Project in a team of 3 - johnsonzhong.me/projects/robot/ C++ Arduino

The task was to design and build a mobile robot to play connect-4 on a semi-randomized game board. We decided to pursue a two robots approach, one for retrieving the ball and one for playing the ball.

- Targeted randomly placed high-reward ball dispensers to obtain **fastest ball retrieval time** (3 ball/min vs average 0.5 ball/min)

2014-11 to 2015-09

Simple Algorithms and Data Structures Library

Open source personal project - johnsonzhong.me/sal/ C++

Header only C++ template library with an interactive tester focused on implementation readability.

- Implemented sets and maps with treaps to get **4x insertion and 2x read** time improvements over standard library

Languages

	Experience [> thousands of lines of code]
Python	100
C++	60
Javascript	15
C	5

Software Skills

Specialities	Asynchronous programming, Parallelization
Build tools	CMake, Makefile, Catkin
Version control	Git, SVN
Environments	ROS, Linux, Web, Arduino
Libraries	PyTorch, numpy, cvxpy, Boost, QT, D3
Simulators	PyBullet, MuJoCo
Code review	Gerrit
Integration	Buildbot, Jenkins
Database	PostgreSQL, MySQL