

Brian H. Wang

SENIOR ROBOTICS RESEARCHER, PERCEPTION & AUTONOMY · DRAPER LABORATORY

🏠 brian-h-wang.github.io [in](#) [brian-h-wang](#)

Education

Cornell University

Ithaca, NY

PH.D. IN AEROSPACE ENGINEERING

August 2016 - January 2022

Advisor: Professor Mark Campbell

Thesis Title: Perception and Planning for Autonomous Navigation in Unstructured Environments

Thesis Committee: Profs. Mark Campbell, Kilian Q. Weinberger, and Silvia Ferrari

GPA: 4.09

Selected Coursework: Autonomous Mobile Robots, Human-Robot Interaction, Machine Learning for Intelligent Systems

Cornell University

Ithaca, NY

M.ENG. IN AEROSPACE ENGINEERING

August 2015 - May 2016

Advisor: Professor Mason Peck

Thesis Title: Optical Attitude Determination for Autonomous Spacecraft

GPA: 3.45

Cornell University

Ithaca, NY

B.A. IN COMPUTER SCIENCE

August 2011 - May 2015

GPA: 3.60

Professional Experience

Draper Laboratory

Cambridge, MA

SENIOR ROBOTICS RESEARCHER - PERCEPTION & AUTONOMY

February 2022 - Present

- Senior member of the technical staff in the Planning & Autonomy group.
- Develop perception and navigation capabilities for autonomous unmanned aerial vehicles (UAV's), from algorithm conception to in-field flight testing on quadrotor UAV platforms. Plan and execute tests to validate performance of autonomy algorithms.
- Implement software in Python and C++, using the Robot Operating System (ROS).

Autonomous Systems Lab

Ithaca, NY

PH.D. RESEARCHER

September 2016 - January 2022

- Research projects included vision- and lidar-based robotic perception, probabilistic tracking and estimation, and navigation in unstructured and uncertain environments.
- Developed probabilistic mapping and path planning system for autonomous robotic navigation through forest environments, using uncertain detections of tree trunk obstacles. Implemented cell decomposition obstacle mapper, path safety-aware global planner, and hybrid A* local planner in Python.
- Conducted laboratory experiments using Clearpath Jackal mobile robots, Robot Operating System (ROS) software, and a Vicon motion capture system.

Draper Laboratory

Cambridge, MA

PH.D. STUDENT INTERN

July 2019 - October 2019

- Supervisor: Dr. Gian Luca Mariottini
- Graduate student intern in the Perception & Autonomy group.
- Implemented method for autonomous vision-based navigation on resource-constrained quadrotor drones.
- Performed flight tests on a Parrot Bebop 2 drone.

NASA Langley Research Center

Hampton, VA

ENGINEERING INTERN

June 2015 - August 2015

- Supervisor: Dr. James Warner
- Worked alongside NASA Langley scientists in developing SciFEN (SCalable Implementation of Finite Elements at NASA), a free-to-use finite element analysis program optimized for massively multicore supercomputers.

Cornell University Cislunar Explorer CubeSat

Ithaca, NY

ATTITUDE DETERMINATION AND CONTROL SUBSYSTEM TEAM

June 2014 - May 2016

- Assisted with implementation of a computer-vision based attitude determination system on a Raspberry Pi computer board, enabling deep-space operations for a miniaturized, low cost lunar satellite.

Publications

JOURNAL PAPERS

- **Wang, B. H.**, Asfora, B., Zheng, R., Banfi, J., and Campbell, M. "Multiple-Hypothesis Path Planning with Uncertain Object Detections". *Arxiv preprint*.
- **Wang, B. H.**, Chao, W., Wang, Y., Hariharan, B., Weinberger, K. Q., and Campbell, M. "LDLS: 3-D Object Segmentation Through Label Diffusion From 2-D Images." *IEEE Robotics and Automation Letters*, vol. 4, no. 3, pp. 2902-2909, July 2019. *Presented at the 2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) in Macau, China.*

CONFERENCE PAPERS

- **Wang, B. H.**, Diaz-Ruiz, C., Banfi, J., and Campbell, M. "Detecting and Mapping Trees in Unstructured Environments with a Stereo Camera and Pseudo-Lidar." *International Conference on Robotics and Automation (ICRA), 2021.*
- Wang, Y., Lai, Z., Huang, G., **Wang, B. H.**, van der Maaten, L., Campbell, M., and Weinberger, K. Q. "Anytime Stereo Image Depth Estimation on Mobile Devices". *International Conference on Robotics and Automation (ICRA), 2019.*
- **Wang, B. H.**, Wang, Y., Weinberger, K. Q., and Campbell, M. "Deep Person Re-identification for Probabilistic Data Association in Multiple Pedestrian Tracking". *Arxiv preprint.*
- Gemerek, J. R., Ferrari, S., **Wang, B. H.**, and Campbell, M. "Video-guided Camera Control for Target Tracking and Following". *IFAC Conference on Cyber-Physical and Human Systems, 2018.*

Leadership, Service, and Other Experience

Asian Pacific American Employee Resource Group at Draper

Cambridge, MA

PROFESSIONAL DEVELOPMENT CO-LEAD

October 2022 - Present

Reviewer

REVIEWED CONFERENCE PAPER SUBMISSIONS FOR:

- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS): 2019
- IEEE International Conference on Robotics and Automation (ICRA): 2021, 2022, 2024

Debates on the Future of Robotics Research: Conference Workshop

Online Event

ORGANIZING COMMITTEE (2019-2021), TECHNICAL CHAIR (2021)

September 2019 - June 2021

- Organized series of debates on the impacts and direction of robotics research, held as online workshops at ICRA 2020 and 2021.

Team SmartScene, NSF Innovation Corps (I-Corps)

Ithaca, NY and Washington, D.C.

TECHNICAL LEAD

June 2019 - September 2019

- Participated in NSF I-Corps entrepreneurship program to explore commercialization of vision-based tracking and prediction research. Interviewed potential customers across the country to learn about needs and possible application areas in traffic safety, mobility, and smart buildings sectors.

SiGMA: Sibley Graduates in Mechanical and Aerospace

Ithaca, NY

TREASURER

August 2018 - May 2021

Cornell AI Driving Olympics Team

Ithaca, NY

CO-FOUNDER, PROJECT SUPERVISOR

September 2018 - May 2020

Sport Taekwondo at Cornell

Ithaca, NY

PRESIDENT (2014-2015), TREASURER (2013-2014)

August 2011 - May 2017

Teaching and Mentorship

Draper Laboratory

Cambridge, MA

DRAPER SCHOLAR MENTOR

December 2022 - Present

- Supervise master's student research on reinforcement learning for robot collision avoidance, as a Draper Scholar mentor.
- Advise research direction and machine learning software implementation.

Autonomous Systems Lab

Ithaca, NY

STUDENT MENTOR

August 2017 - May 2021

- Mentor for undergraduate and master's student projects in the Autonomous Systems Lab, including:
 - 3D object detection-based SLAM on Clearpath Jackal robot.
 - Object detection and particle filter localization for autonomous driving on miniature robotic cars.
 - Embedded system design for stereo camera data collection device.

eCornell: Autonomous Mobile Robots

Ithaca, NY

COURSE CONTENT DEVELOPER

June 2020 - March 2021

- Course instructor: Prof. Hadas Kress-Gazit
- Developed slides, animations, and coursework on robotics algorithms, for an online version of Cornell's Autonomous Mobile Robots course to be offered through the eCornell certificate program.

MAE 5180: Autonomous Mobile Robots

Ithaca, NY

TEACHING ASSISTANT

January 2020 - May 2020

- Course instructor: Prof. Hadas Kress-Gazit
- Graduate-level course on algorithms for autonomous robots.
- Taught students fundamental robotics algorithms for localization, mapping, SLAM, and path planning.

CS 3410: Systems Programming

Ithaca, NY

TEACHING ASSISTANT

January 2015 - May 2016

- Core computer science class on computer architecture and the hardware-software interface.

Skills

TECHNICAL SKILLS: SOFTWARE

- **Programming languages:** Experienced with Python. Proficient with C++, MATLAB.
- **Software tools and libraries:** ROS, NumPy, Numba, OpenCV, StereoLabs ZED SDK, GTSAM, Git version control, Linux.

TECHNICAL SKILLS: HARDWARE

- **Robot platforms:** Clearpath Robotics Jackal, Rethink Robotics Baxter, iRobot Create, Parrot Bebop 2.
- **Embedded systems:** Raspberry Pi, Arduino, Nvidia Jetson.
- **Sensors:** Stereolabs ZED camera, Velodyne VLP-16 lidar, Intel RealSense RGBD camera.

LANGUAGES

- **English** (native speaker)
- **Korean** (conversant)
- **Mandarin Chinese** (basic knowledge)