Tim Allan Wheeler

Staff Software Engineer

Cupertino, CA

timwheeleronline@gmail.com

Academic History

2018 Stanford University, Ph.D., Aeronautics and Astronautics
2016 Stanford University, M.S., Aeronautics and Astronautics
2013 University of California, San Diego, B.S., Aerospace Engineering
Summa Cum Laude

Employment Record

Waymo — Mountain View, CA
2022–present *Staff Software Engineer*

Waymo is Alphabet's self-driving car company. I work on the car's reasoning, such that it can develop the appropriate costs, constraints, and tradeoffs when determining how to navigate in a complicated world. My focus is on vulnerable road users, such as pedestrians.

Volley Automation — South San Francisco, CA
2021–2022 *Senior Software Engineer*

I was responsible for the decision making system that coordinates robots in high-efficiency, fully automated garages. My work focused on the development of an extremely robust, efficient, and configurable scheduling system. I also worked on deployment, large-scale cloud simulation, analysis, and metrics. I used C++ 17, Python 3, C#, and ROS 2.

Kitty Hawk Corporation — Mountain View, CA
2019–2020 *Senior Software Engineer*
2018–2019 *Software Engineer*

I was responsible for autonomy and high-level controls for the Kitty Hawk Flyer eVTOL with contributions across the stack, principally in the high-level flight controller and the low-level thrust allocation system. I additionally conducted the hazard analyses for these systems and implemented the associated unit tests, system tests, hazard mitigations, and mitigation verification tests. In the last nine months I contributed heavily to our cloud infrastructure, having developed a general reduce step for our cloud pipeline that I then leveraged for parallel cloud-based chaos testing, motor out testing, and estimator regression analysis. I worked primarily in C++ (17 and 14) and in Python.

My final six months at Kitty Hawk were spent on a special projects team. I initiated the project repository, set up our continuous integration system, and laid out the foundation of all subsequent development. Our team worked on the rapid development and demonstration of coordinated aerospace robotics problems, to which I contributed in controls, decision making, and trajectory optimization. I was also responsible for many infrastructure tasks, including the dynamics simulator, the autopilot interface, visualization in the sim, and moving the team to the Julia programming language for rapid development.

2013–2018 **Stanford Intelligent Systems Laboratory (SISL)** — Stanford, CA
Ph.D. Candidate

Confidence in the performance and robustness of automated vehicles is required before public deployment due to the potentially fatal consequences of error in their operation. As the automotive industry moves toward autonomous driving, these systems will act with increasing autonomy and engage in increasingly complicated driving interactions. My research focused on human behavior models, decision making, and safety validation for autonomous cars. I employed decision making theory, deep learning, reinforcement learning, imitation learning, and Bayesian statistics.

Activities and Awards

Invited presentations

1. Center for Automotive Research, Stanford, *Designing to the Limits: Algorithms for Peak Performance, with Sebastian Thrun*, 2019.
2. Stanford AA222 - Algorithms for Optimization, *Guest Lecturer,*, 2019.
3. Machine Intelligence in Autonomous Vehicles Summit, REWORK, *Establishing Trust in Autonomous Vehicles*, 2017.
4. Automated Vehicles Symposium, AUVSI, *Establishing Trust in Autonomous Vehicles, an Aerospace Perspective*, 2016.

Awards

1. William F. Ballhaus Prize for Best Ph.D. Thesis, Stanford AeroAstro, 2018.
2. Burt and Deedee McMurtry Fellow, Stanford University, 2014.
3. Dep. Award for Excellence in Leadership and Service, U.C. San Diego, 2014.

Bibliographical Information

Books

1. M. J. Kochenderfer, T. A. Wheeler, and K. Wray, *Algorithms for Decision Making*. MIT Press, 2022, available at *algorithmsbook.com*, ISBN: 9780262047012.

2. M. J. Kochenderfer and T. A. Wheeler, *Algorithms for Optimization*. MIT Press, 2019, available at *algorithmsbook.com/optimization*, ISBN: 9780262039420.

Patents

1. T. A. Wheeler, "Parking systems and methods for arranging vehicles within a parking garage," Patent US 2023/0339457 A1, 2023.
2. T. A. Wheeler, "Parking systems and methods for pre-configuring bays to reduce vehicle retrieval time," Patent US 2023/0340798 A1, 2023.
3. T. A. Wheeler, "Thrust allocation using optimization in a distributed flight control system," Patent US 2021/0403171 A1, 2021.

Journal articles

1. J. Morton, T. A. Wheeler, and M. J. Kochenderfer, "Closed-loop policies for operational tests of safety-critical systems," 2018.
2. Y. Chen, T. A. Wheeler, and M. J. Kochenderfer, "Learning discrete Bayesian networks from continuous data," *Journal of Artificial Intelligence Research*, vol. 59, pp. 103–132, 2017.
3. M. Egorov, Z. Sunberg, E. Balaban, T. Wheeler, J. Gupta, and M. Kochenderfer, "POMDPs.jl: A framework for sequential decision making under uncertainty," *Journal of Machine Learning Research*, vol. 18, no. 26, pp. 1–5, 2017.
4. J. Morton, T. A. Wheeler, and M. J. Kochenderfer, "Human driver acceleration predictions using recurrent neural networks," *IEEE Transactions on Intelligent Transportation Systems*, vol. 18, pp. 1289–1298, 2017, ISSN: 1524-9050.

Conference papers

1. T. A. Wheeler and M. J. Kochenderfer, "Critical situation clusters for accelerated automotive safety validation," 2019.
2. A. Kuefler, J. Morton, T. A. Wheeler, and M. Kochenderfer, "Imitating driver behavior with generative adversarial networks," in *IEEE Intelligent Vehicles Symposium (IVS)*, 2017.
3. T. A. Wheeler, M. Holder, H. Winner, and M. Kochenderfer, "Deep stochastic radar models," in *IEEE Intelligent Vehicles Symposium (IVS)*, 2017.
4. T. A. Wheeler and M. J. Kochenderfer, "Factor graph scene distributions for automotive safety analysis," in *IEEE International Conference on Intelligent Transportation Systems (ITSC)*, 2016.
5. T. A. Wheeler, P. Robbel, and M. J. Kochenderfer, "Analysis of microscopic behavior models for probabilistic modeling of driver behavior," in *IEEE International Conference on Intelligent Transportation Systems (ITSC)*, 2016.

6. T. A. Wheeler, P. Robbel, and M. J. Kochenderfer, "Initial scene configurations for highway traffic propagation," in *IEEE International Conference on Intelligent Transportation Systems (ITSC)*, 2015.

7. T. A. Wheeler, P. Robbel, and M. J. Kochenderfer, "Traffic propagation models for estimating collision risk," in *IEEE International Conference on Intelligent Transportation Systems (ITSC)*, 2015.