

TSUN-HSUAN (JOHNSON) WANG

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RESEARCH INTERESTS

Main topics: Robotics, Machine Learning, Computer Vision.

I am particularly fascinated with building reliable learning-based models for robotic applications. The related topics I have touched upon to improve reliability include synthetic data for robust robot learning, control-theory-inspired neural networks, interpretability of policies. I worked on application of autonomous driving, drone, and soft robot.

EDUCATION

Massachusetts Institute of Technology, Cambridge, United State

Fall 2020 - Present

PhD, Electrical Engineering and Computer Science

Advised by [Prof. Daniela Rus](#).

Total GPA (to 2021 fall): 5.0/5.0

National Tsing Hua University, Hsinchu, Taiwan

Fall 2017 - Fall 2019

Master of Science, Electrical Engineering

Advised by [Prof. Min Sun](#).

Total GPA: 4.25/4.3

National Tsing Hua University, Hsinchu, Taiwan

Fall 2013 - June 2017

Bachelor of Science, Electrical Engineering

Total GPA: 3.87/4.3, Rank: 27/102

PUBLICATION

Tsun-Hsuan Wang, Alaa Maalouf, Wei Xiao, Yutong Ban, Alexander Amini, Guy Rosman, Sertac Karaman, Daniela Rus, "Drive Anywhere: Generalizable End-to-end Autonomous Driving with Multi-modal Foundation Models", NeurIPS / CoRL Workshop 2023, CoRR 2023 (under submission).

Wei Xiao, Tsun-Hsuan Wang, Chuang Gan, Ramin Hasani, Mathias Lechner, Daniela Rus, "SafeDiffuser: Safe Planning with Diffusion Probabilistic Models", CoRR 2023 (under submission).

Tsun-Hsuan Wang, Juntian Zheng, Pingchuan Ma, Yilun Du, Byungchul Kim, Andrew Spielberg, Joshua B. Tenenbaum, Chuang Gan, Daniela Rus, "DiffuseBot: Breeding Soft Robots With Physics-Augmented Generative Diffusion Models", NeurIPS 2023 (oral).

Mathias Lechner, Lianhao Yin, Tim Seyde, Tsun-Hsuan Wang, Wei Xiao, Ramin Hasani, Joshua Rountree, Daniela Rus, "Gigastep - One Billion Steps per Second Multi-agent Reinforcement Learning", NeurIPS 2023.

Tsun-Hsuan Wang, Wei Xiao, Tim Seyde, Ramin Hasani, Daniela Rus, "Measuring Interpretability of Neural Policies of Robots with Disentangled Representation", CoRL 2023 (oral).

Annan Zhang, Tsun-Hsuan Wang*, Ryan Truby, Lillian Chin, Daniela Rus, "Machine Learning Best Practices for Soft Robot Proprioception", IROS 2023.*

Lianhao Yin, Makram Chahine, Tsun-Hsuan Wang, Tim Niklas Seyde, Chao Liu, Mathias Lechner, Ramin Hasani, Daniela Rus, "Towards Cooperative Flight Control Using Visual-Attention", IROS 2023.

Wei Xiao, Tsun-Hsuan Wang, Ramin Hasani, Mathias Lechner, Daniela Rus, "On the Forward Invariance of Neural ODEs", ICML 2023.

Tsun-Hsuan Wang, Pingchuan Ma, Andrew Spielberg, Zhou Xian, Hao Zhang, Joshua Tenenbaum, Daniela Rus, Chuang Gan, "SoftZoo: A Soft Robot Co-design Benchmark For Locomotion In Diverse Environments", ICLR 2023.

Ramin Hasani, Mathias Lechner, Tsun-Hsuan Wang, Makram Chahine, Alexander Amini, Daniela Rus, "Liquid structural state-space models", ICLR 2023.

Tsun-Hsuan Wang, Wei Xiao, Makram Chahine, Ramin Hasani, Daniela Rus, "Learning Stability Attention in Vision-based End-to-end Driving Policies", LADC 2023.

Wei-Cheng Tseng, Tsun-Hsuan Wang, Yen-Chen Lin, Phillip Isola, "Offline Multi-Agent Reinforcement Learning with Knowledge Distillation", *NeurIPS 2022*.

Mathias Lechner, Ramin Hasani, Alexander Amini, Tsun-Hsuan Wang, Thomas A Henzinger, Daniela Rus, "Are All Vision Models Created Equal? A Study of the Open-Loop to Closed-Loop Causality Gap", *NeurIPS Workshop 2022*.

Wei Xiao*, Tsun-Hsuan Wang*, Makram Chahine, Alexander Amini, Ramin Hasani, Daniela Rus, "Differentiable Control Barrier Functions for Vision-based End-to-End Autonomous Driving", *T-RO 2022*.

Alexander Amini*, Tsun-Hsuan Wang*, Igor Gilitschenski, Wilko Schwarting, Zhijian Liu, Song Han, Sertac Karaman, Daniela Rus, "VISTA 2.0: An Open, Data-driven Simulator for Multimodal Sensing and Policy Learning for Autonomous Vehicles", *ICRA 2022*.

Tsun-Hsuan Wang*, Alexander Amini*, Wilko Schwarting, Igor Gilitschenski, Sertac Karaman, Daniela Rus, "Learning Interactive Driving Policies via Data-driven Simulation", *ICRA 2022*.

Paul Tylkin, Tsun-Hsuan Wang, Kyle Palko, Ross Allen, Ho Chit Siu, Daniel Wrafter, Tim Niklas Seyde, Alexander Amini, Daniela Rus, "Interpretable Autonomous Flight via Compact Visualizable Neural Circuit Policies", *RAL 2022*.

Paul Tylkin, Tsun-Hsuan Wang, Tim Seyde, Kyle Palko, Ross Allen, Alexander Amini, Daniela Rus, "Autonomous Flight Arcade Challenge: Single- and Multi-Agent Learning Environments for Aerial Vehicles", *AAMAS 2022 Extended Abstract*.

Tsun-Hsuan Wang*, James Tu*, Jingkang Wang, Sivabalan Manivasagam, Mengye Ren, Raquel Urtasun, "Adversarial Attacks On Multi-Agent Communication", *ICCV 2021*.

Tsun-Hsuan Wang, Siva Manivasagam, Ming Liang, Bin Yang, Wenyuan Zeng, Raquel Urtasun, "V2VNet: Vehicle-to-Vehicle Communication for Joint Perception and Prediction", *ECCV 2020 (oral)*.

Tsun-Hsuan Wang*, Yen-Chi Cheng*, Chieh Hubert Lin, Hwann-Tzong Chen, Min Sun, "Point-to-Point Video Generation", *ICCV 2019*. [[link](#)]

Tsun-Hsuan Wang, Hou-Ning Hu, Chieh Hubert Lin, Yi-Hsuan Tsai, Wei-Chen Chiu, Min Sun, "3D LiDAR and Stereo Fusion using Stereo Matching Network with Conditional Cost Volume Normalization", *IROS 2019*. [[link](#)]

Tsun-Hsuan Wang, Fu-En Wang, Juan-Ting Lin, Yi-Hsuan Tsai, Wei-Chen Chiu, Min Sun, "Plug-and-Play: Improve Depth Estimation via Sparse Data Propagation", *ICRA 2019*. [[link](#)]

Tz-Ying Wu*, Juan-Ting Lin*, Tsun-Hsuan Wang, Chan-Wei Hu, Juan Carlos Niebles, Min Sun, "Liquid Pouring Monitoring via Rich Sensor Inputs", *ECCV 2018*. [[link](#)]

Tsun-Hsuan Wang*, Hung-Jui Huang*, Juan-Ting Lin, Chan-Wei Hu, Kuo-Hao Zeng, Min Sun, "Omnidirectional CNN for Visual Place Recognition and Navigation", *ICRA 2018*. [[link](#)]

RESEARCH EXPERIENCES

MIT-IBM Watson AI Lab, Cambridge, MA, United State.

Summer 2022

Research Intern

Advised by [Prof. Chuang Gan](#).

We work on **soft robot co-design** for locomotion in diverse environment. Specifically, we demonstrate the fascinating the interplay between **environment, morphology, and behavior**, and investigate how **differentiable physics** can help or fail along with extensive empirical studies and comparison with other state-of-the-art baselines.

Uber Advanced Technologies Group, Toronto, Canada.

Summer 2019

Research Intern

Advised by [Prof. Raquel Urtasun](#).

We majorly focused on leveraging **vehicle-to-vehicle communication** to improve perception and prediction system in self-driving vehicles and studied security of vehicle-to-vehicle communication from the perspective of adversarial attack.

Vision Science Lab (NTHU), Hsinchu, Taiwan

Fall 2017 - Spring 2019

Graduate Student

Advised by Prof. Min Sun.

I mainly worked on **depth estimation**, co-advised by [Prof. Wei-Chen Chiu](#) and [Dr. Yi-Hsuan Tsai](#). We proposed to apply adversarial attack to depth completion (ICRA 2019). Extending my previous project, we presented a conditional

normalization to incorporate LiDAR measurement in stereo matching networks (IROS 2019). I also worked on **video generation**, co-advised by [Prof. Hwann-Tzong Chen](#). We investigated how to generate videos given start and end frames without sacrificing generation quality and diversity (ICCV 2019).

Institute of Information Science, Academia Sinica, Taipei, Taiwan

Summer 2017

Research Assistant

Advised by Prof. Min Sun.

Based on my undergraduate work, we used metric learning to learn an embedding that is aware of spatial distance in physical world and applied it to **indoor place recognition**, which was then integrated with a gradient-based heuristic policy for **robot navigation**. This work was accepted by ICRA 2018.

Vision Science Lab (NTHU), Hsinchu, Taiwan

Spring 2017

Undergraduate Student

Advised by Prof. Min Sun.

We built a **mobile robot system** with a ground robot (Turtlebot), embedded system (NVIDIA TX1), and a 360° camera. We also ran *ORB-SLAM* and navigation stack on the robot.

HONOR & AWARD

Fall 2022, **MathWorks Fellowship**

Summer 2022, **Finalist of Qualcomm Innovation Fellowship**

Fall 2020, **David S. Y. and Harold Wong Fellowship**

Fall 2018, **Appier Scholarship**: for outstanding students in their research with top conference papers.

Fall 2017, **Matriculation Scholarship (MS)**: award to 10 people every year (< 10%).

Fall 2016, **Academic Achievement Award**: top 3 students in a semester.

Summer 2014, **Oversea Exchange Scholarship**: around 10 people granted every year (< 10%).

Fall 2013, **Matriculation Scholarship (BS)**: award to 10 people every year (< 10%).