LEI TAI, Advance Driving Solutions, Huawei

CONTACT INFORMATION	Email: onlytailei@hotmail.com Tel: +8613269235096
	Web: https://onlytailei.github.io GitHub: https://github.com/onlytailei
	Google Scholar: 2500+ citations

EDUCATION

Hong Kong University of Science and Technology, Hong Kong SAR, China P.R.

Ph.D. in Electronic & Computer Engineering.   Sept. 2014 - Sept. 2019
- Advisor: Prof. Ming Liu

University of Freiburg, Germany

Visiting Scholar in Autonomous Intelligent Systems Lab   Mar. 2017 - Jan. 2018
- Advisor: Prof. Dr. Wolfram Burgard

Harbin Institute of Technology , Harbin, China P.R.

M.S. in Engineering.   Sep. 2012 - Jun. 2014

B.S. in Engineering.   Sep. 2008 - Jun. 2012

WORKING AND RESEARCH EXPERIENCE

Tech Lead, PNC AI, ADS, Car BU, Huawei   May. 2023 - present
- Led the system design for combining prediction and decision in a individual network. Reduced the resource and time consuming of the embedded system with 5% lower.
- Led the prediction plan in the low-end solution with 80% resource reduction and only 5% prediction accuracy loss.
- Contributed to the Pre-research plans including FSD planning, end-to-end APA with reinforcement learning, and heatmap-based prediction and planning network.

Line Manager, Prediciton, ADS, Car BU, Huawei   Dec. 2022 - May. 2023
- Led the deploying of the data-driven prediction strategy in anywhere and anytime, including Mapless, Freeway, Urban, AVP and ADAS. Improved the prediction miss rate in all scenarios by 5% based on temproal consistency optimization and multitask training strategy.
- Conducted the comprehensive prediction system with traffic flow, uncertainty field, model-based kinematics learning, collision avoidance with MCTS, etc. Achieved targeted lifting of the prediction system with data augmentation, knowledge distillation, self-supervising, and adversarial attack of the deep learning model.
- Conducted several times of the code refactoring for the embedded prediction node for better readability and maintainability.

Top Minds/Principal Engineer, ADS, Car BU, Huawei   Feb. 2020 - Dec. 2022
- Rebuilt the main prediction model from the feature-based encoding to the Bird's-eye-view encoding. Upgraded the vehicle prediction precision with 50% higher than before. Improved the original data processing and training pipelines 6 times faster. Contributed both cpp and python code more than 6000 lines respectively. Constructed the python interface for HD map api individually.
- Led the full system upgrading from the rule-based prediction system to the data-driven prediction system covering various scenarios including highway, urban and unstructured environments. Accomplished the training and deploying of various prediction backbone networks including BEV, vector-based GNN and transformer. Considered knowledge distillation and transfer learning in sub-tasks like the intent prediction in the intersection and the non-vehicle trajectory prediction. Improved efficiency through code refactoring and pipeline optimization. Reduced the time cost of the prediction node with 15% lower for both the peak time and the average time.

- Conducted the temporal and spatial par of the BEV perception network. Improved the detection accuracy by two percent.
- Realized both the prediction and the decision task in a shared backbone structure and the decision task labeling method. Charged the building of a simulation environment for the interactive and reactive navigation simulation of multiple agents. Deployed reinforcement learning methods in the simulator for the decision task training of multiple agents (still in progress).

Algorithm Engineer II, A.I. Lab, Alibaba   Sep. 2019 - Feb. 2020
- Accomplished the planning framework for a logistics mobile robot platform.
- Achieved the State-of-the-art result in monocular 3D object detection task based on uncertainty learning and graph optimization for paired objects.

Research in sensorimotor learning, RAM Lab   Sep. 2015 - Sep. 2019
- Sensorimotor learning for both indoor and outdoor robot navigation.
- Improved autonomous driving through human gaze learning.
- 3D point cloud perception including detection and segmentation.

Research in deep RL for robotics, AIS Lab   Mar. 2017 - Jan. 2018
- Generalized deep reinforcement learning with external memory and prediction ability.
- Socially compliant navigation in a crowded environment.
- Visual domain adaptation for learning-based visual control policies.

SELECTED
PUBLICATIONS
(FULL LIST)

1. Yongjian Chen, **Lei Tai**, Kai Sun, Mingyang Li, "MonoPair: Monocular 3D Object Detection Using Pairwise Spatial Relationships. ", *CVPR*, 2020. (**Once State-of-the-art in KITTI Monocular 3D object detection**)

2. Jingwei Zhang*, **Lei Tai***, Peng Yun, Yufeng Xiong, Ming Liu, Joschka Boedecker, Wolfram Burgard, "VR Goggles for Robots: Real-to-sim Domain Adaptation for Visual Control", (*equal contribution), *IEEE Robotics and Automation Letters (RA-L)*, 2019. (**Unsupervised video style transfer beyond optical-flow-based baseline**)

3. **Lei Tai**, Jingwei Zhang, Ming Liu, Wolfram Burgard, "Socially-compliant Navigation through Raw Depth Inputs with Generative Adversarial Imitation Learning", *International Conference on Robotics and Automation (ICRA)*, 2018.

4. Jingwei Zhang, **Lei Tai**, Joschka Boedecker, Wolfram Burgard, Ming Liu, "Neural SLAM: Learning to Explore with External Memory". (**Implict mapping for navigation, referenced by Deepmind**).

5. **Lei Tai**, Giuseppe Paolo, and Ming Liu, "Virtual-to-real Deep Reinforcement Learning Continuous Control of Mobile Robots for Mapless Navigation, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2017. (**Second most cited paper among IROS 2017 proceedings**)

AWARDS   Paper Awards
- ICAR Best Student Paper Award, Hong Kong   July 2017
Contest Awards
- AIMiner the most influenced 2000 research scholars,
  Top100 in Robotics Globally   Oct 2021
- Runner-up of 2013 ABU Robocon, Zoucheng, China   June 2013
- Best Technology of 2012 ABU Robocon, Harbin, China   June 2012
- Honorable Mention of Mathematical Contest in Modeling   Mar 2011

ACADEMIC ACTIVITIES	Referee Services • *International Journal of Robotics Research (IJRR)* • *Autonomous Robots (AURO).* • *IEEE Transactions on Neural Networks and Learning Systems (NNLS).* • *IEEE Robotics and Automation Letters (RA-L).* • *International Journal of Advanced Robotic Systems, (IJARS).* • *Conference on Robot Learning (CoRL)*, 2019-2020. • *International Conference on Robotics and Automation (ICRA)*, 2017-2021. • *International Conference on Intelligent Robots and Systems (IROS)*, 2016-2021.
PROFESSIONAL SKILLS	Programming • Proficient in Python/C++ and their compiling and debugging. • Experienced in building interfaces across python/c++ through pyind11. • Familiar with bash, html, matlab, lua, *etc.* Deep Learning Frameworks • Proficient in PyTorch and related techniques like quantization, AMP and jit.script. Familiar with TensorFlow and weights transformation among different frameworks. • Familiar with deep reinforcement learning frameworks like Ray, Tianshou *etc.* • Co-Developed one of the earliest pytorch-based reinforcement learning algorithm library **jingweiz/pytorch-rl**, **700+ stars**. Robotics • Proficient in robot simulation platforms like ROS, Gazebo and Rviz. Familiar with optimization libraries for planning and SLAM like g2o, ipopt and nlopt. • Developed robotics algorithm library **onlytailei/CppRobotics**, **1400+ stars**.