Yujie HE

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EDUCATION

École polytechnique fédérale de Lausanne (EPFL), Switzerland *Sep. 2020 - Present*

- MSc in Robotics (Track: Mobile Robotics)

Tongji University, Shanghai, China *Sep. 2015 - Jul. 2020*

- BEng in Mechanical Engineering; GPA: 4.57/5 ; Ranking: 4/113
- Awarded Excellent Graduates of Shanghai and Tongji University Outstanding Scholarship

RESEARCH INTERESTS

Robotic Perception, Visual Object Tracking, Mobile Robotics, Unmanned Aerial Vehicle (UAV), 3D Vision, LiDAR Odometry, Pedestrian Intention Prediction, Autonomous Driving

PROJECTS AND EXPERIENCE

LiDAR-Based High-Definition Map Development for V2X Applications *Jun. 2020 - Aug. 2020*
Perception Algorithm Development Intern
Referee: Dr. Kai Sun (Chairman & Chief Scientist of Hesai Technology)

- Conducted a survey on high-definition maps and V2X applications from scratch, including mainstream data formats (such as OpenDRIVE, lanelet, NDS), production pipeline & tools, major global suppliers, and related datasets & simulators.
- Participated in the **road test for Hesai's latest 128-line LiDAR Pandar128**, and applied image processing and point cloud registration & matching algorithms to build a **semi-automated workflow from point clouds to high-definition maps** (related works has been submitted to *ICRA 2021*).
- Developed the **HDMap SDK** (alpha version) based on OpenDRIVE1.6 for V2X scenarios, including **data I/O, coordinate projection, retrieval, visualization**, which provided support for downstream perception algorithms (3D object detection & tracking).

Online Visual Object Tracking for UAV in Dynamic Environments *Sep. 2018 - Aug. 2020*
Undergraduate Research Assistant at Vision4Robotics Group, Tongji University
Supervisor: Prof. Changhong Fu; *Co-advisor*: Prof. Peng Lu (Director of ArcLab, HKU)

- Investigated correlation filter (CF)-based **visual object tracking** for UAV and improved overall tracking performance in challenging scenarios with real-time operational capability. Related work has been published in top conferences and journals.
- Proposed a lightweight and generalizable **triple attention strategy** on CF-based framework by exploiting mutual independence of the appearance model and feature responses to implement real-time tracking for UAV (accepted by *IROS 2020* as **first author**).
- Employed the adaptive **GMSD-based context analysis** and **dynamic weighted filters** for utilizing both contextual and historical information, and leveraged **lightweight convolution features** to efficiently raise the tracking robustness (accepted by *Neural Computing and Applications* as **first student author**).

- Exploited the inter-frame information between prediction and backtracking phases, and further incorporated the **bidirectional incongruity error** into the CF learning (accepted by *ICRA 2020* and extended version in TCSVT).
- Realized **nonsingleton fuzzy logic controllers** for unmanned aerial manipulators, reducing error rate by 20% compared to PID controllers in six types of trajectories.

Tongji University Design & Innovation College *Sep. 2018 - Jan. 2019*
Teaching Assistant in Open Source Hardware and Programming
Supervisor: Prof. Xiaohua Sun (Director of Center for Digital Innovation)

- Designed three sets of **serial electromechanical modules** for Industrial Design first-year students
- Delivered lectures on basic mechanical theory cooperating with Arduino hardware and programming and advanced RGBD sensors for the semester project [video]

Tongji University DIAN Racing Formula Student Electric Team *Sep. 2016 - Dec. 2018*
Powertrain Group Leader
Referee: Prof. Dr.-Ing. Tong Zhang (Director of the Clean Energy Automotive Engineering Center)

- Designed and optimized the overall powertrain system for **China's first leading four-wheel-drive Formula Student Racecar**, achieving 8% higher efficiency and 10% more lightweight.
- Participated FSEC 2017 - 2018 and SFJ 2018 as **Chief Powertrain Engineer** and reported at open-house Design Final Event, contributing to DIAN Racing's win in First Place in Engineering Design and Efficiency Prize, and Best Powertrain Award. [video]

SLAM and Autonomous Navigation for Skid Steer Wheel Robot *Jul. 2018 - Aug. 2018*
Robotics Algorithm Development Intern
Referee: Dr. Kai Sun (Chairman & Chief Scientist of Hesai Technology)

- Implemented sensor fusion between **40-channel LiDAR (Pandar40)** and **gyroscope**, achieving a 5% accuracy improvements on advanced SLAM framework and 3D point cloud **mapping of Tongji University Jiading Campus**.
- Deployed control, decision, and communication ROS nodes for the self-developed **skid steer wheel robot**, realizing autonomous navigation and obstacle avoidance in a $300m^2$ workspace.

Tongji University Super Power Robot Team *Oct. 2016 - Jun. 2018*
Project Manager & Mechanical Development Leader
Supervisor: Dr. Jiong Zhao (Senior Engineer Staff Member at Tongji University)

- Led main robots design for national mobile robot competition, RoboMaster, achieving lightweight and stability of the **chassis** and **3DOF pan-tilt mechanism** for **multi-robot interaction**.

JOURNAL PAPERS

[j3] Changhong Fu*, Junjie Ye, Juntao Xu, **Yujie He**, and Fuling Lin. "Disruptor-Aware Interval-Based Response Inconsistency for Correlation Filters in Real-Time Aerial Tracking" accepted by *IEEE Transactions on Geoscience and Remote Sensing* [code] [demo] (JCR Q1, IF = 5.855)

[j2] Fuling Lin, Changhong Fu*, **Yujie He**, Fuyu Guo, and Qian Tang. "Learning Temporary Block-Based Bidirectional Incongruity-Aware Correlation Filters for Efficient UAV Object Tracking" accepted by *IEEE Transactions on Circuits and Systems for Video Technology.* [paper] [code] (JCR Q1, IF=4.133)

[j1] Changhong Fu*, **Yujie He**, Fuling Lin, and Weijiang Xiong. "Robust Multi-Kernelized Correlators for UAV Tracking with Adaptive Context Analysis and Dynamic Weighted Filters" accepted by *Neural Computing and Applications.* [paper] [code] [demo] (JCR Q1, IF=4.664)

CONFERENCE PAPERS

[c2] **Yujie He**, Changhong Fu*, Fuling Lin, Yiming Li, and Peng Lu. "Towards Robust Visual Tracking for Unmanned Aerial Vehicle with Tri-Attentional Correlation Filters" accepted by *IEEE International Conference on Intelligent Robots and Systems (IROS), Las Vegas, USA, 2020.* [paper] [code] [demo] [talk]

[c1] Fuling Lin, Changhong Fu*, **Yujie He**, Fuyu Guo, and Qian Tang. "Learning Bidirectional Incongruity-Aware Correlation Filter for Efficient UAV Object Tracking" accepted by *IEEE International Conference on Robotics and Automation (ICRA), Paris, France, 2020.* [paper] [code] [demo]

WORKING PAPERS

[i2] Yue Pan, Pengchuan Xiao, **Yujie He**, Zhenlei Shao*, and Zesong Li. "MULLS: Versatile LiDAR SLAM via Multi-metric Linear Least Square" submitted to *IEEE International Conference on Robotics and Automation (ICRA), Xi'an, China, 2021.* [code] [demo]

[i1] Changhong Fu*, Fuling Lin, Fan Li, and **Yujie He**. "Sample Purification-Aware Correlation Filters for UAV Tracking with Cooperative Deep Features" accepted by *IROS Workshop on Fast Neural Perception and Learning for Intelligent Vehicles and Robotics, Macau, China, 2019.* [code] [poster] (*Best Poster Award*)

SELECTED HONORS

Excellent Graduates of Shanghai (top 2% students from all majors, provincial)	*Jun. 2020*
Best Poster Award of IROS Workshop (top 3 papers)	*Nov. 2019*
Tongji Scholarship of Excellence (top 5%, departmental)	*Dec. 2016 - Dec. 2018*
Best Powertrain Award & First Prize in Formula Student China (top 5%)	*Nov. 2017 - Nov. 2018*
Overall Runner-up of EV class in Student Formula Japan (highest level in Asia)	*Sep. 2018*
Second Prize in RoboMaster National College Student Robot Contest (top 10%)	*Jun. 2018*

SERVICE

Reviewer for IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2020.

Reviewer for IEEE International Conference on Advanced Robotics and Mechatronics (ARM) 2019.

Teaching Assistant for D&I-550069 Open-Source Hardware and Programming (Fall 2018) @ Tongji Univ.

SKILLS

Programming	MATLAB, Python, C/C++, LaTeX
Design	AutoCAD, SolidWorks
Hardware	Arduino, Raspberry Pi
Libraries	PCL, Open3D, OpenCV
Simulation	ROS, Simulink
Language	Chinese (Native), English (C1), Deutsch (B1), Français (A1)