Yujie HE

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EDUCATION

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

- MSc in Robotics (Track: Mobile Robotics), Minor in Data Science
- Graduate Research Assistant at Lab of Visual Intelligence for Transportation (VITA)

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
- Undergraduate Research Assistant at Vision4Robotics Group

RESEARCH INTERESTS

Robotic Perception, Visual Object Tracking, Unmanned Aerial Vehicle (UAV), 3D Vision, LiDAR Odometry. Autonomous Driving, Machine Learning

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), overall production pipeline, production 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**.
- 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, HKPolyU)

- 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 for further incorporating the **bidirectional incongruity error** into the CF learning (accepted by *ICRA 2020*).
- Proposed the adaptive **sample purification strategy** integrating with multiple convolutional features to tackle the issue of invalid samples (published in *IROS Workshop 2019*).
- 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**.

JOURNALS

[1] 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)

[2] 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)

[3] 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

[1] **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] [pre]

[2] 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]

[3] 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, 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

- **IROS** (IEEE/RSJ International Conference on Intelligent Robots and Systems) 2020.
- **ARM** (IEEE International Conference on Advanced Robotics and Mechatronics) 2019.

Teaching Assistant

- D&I-550069: Open-Source Hardware and Programming, Fall 2018 @ Tongji University.

SKILLS

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