

# Yujie HE

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Institute of Microengineering (IMT), School of Engineering (STI)

École polytechnique fédérale de Lausanne (EPFL), 1015, Lausanne, Switzerland

## EDUCATION

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### École polytechnique fédérale de Lausanne (EPFL), Switzerland

*Sep. 2020 - Present*

- Major in Robotics (Track: Mobile Robotics); Minor in Data Science
- Semester Research Student at [Laboratory of Intelligent Systems \(LIS\)](#)
- Enroll as special student (Fachstudierende) at ETH Zürich

### Tongji University, Shanghai, China

*Sep. 2015 - Jul. 2020*

- BEng in Mechanical Engineering; GPA: 4.57/5; Ranking: 4/114
- Awarded Excellent Graduates of Shanghai and Tongji University Outstanding Scholarship

## RESEARCH INTERESTS

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

## PROJECT EXPERIENCES

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### Development of vision based algorithms to a window/balcony drone delivery 📄

*Feb. 2021 - Present*

Semester Research Student at [Laboratory of Intelligent Systems \(LIS\)](#), EPFL

Supervisor: [Valentin Wüest](#), [Dr. Przemyslaw Mariusz Kornatowski](#), and [Prof. Dario Floreano](#)

- Conducted literature survey on marker-based autonomous drone navigation applications, and investigated the suitable **fiducial visual marker for last-cm delivery** with in-depth evaluation.
- Based on the [PackDrone](#) developed at LIS, distance sensor (TFMINI Plus) and camera (MYNTEYE S1030) is utilized for **collision prevention** and **marker-based navigation**.
- Indoor tests with OptiTrack system as reference are currently underway to verify the accuracy and robustness of overall pipeline in complex **window/balcony drone delivery scenarios**

### Real2CAD: Shape Matching of Real 3D Object Data to Synthetic 3D CADs

*Feb. 2021 - Present*

Semester Research Student in [3D Vision](#) provided by [Computer Vision and Geometry Group](#), ETH Zürich

Supervisor: [Dr. Iro Armeni](#) and [Shengyu Huang](#) (PhD student)

- Based on [joint embedding](#), a novel end-to-end scan to CAD retrieval neural network is proposed. Noisy 3D object scan is separated from the background cluttering and further completed into a CAD-like representation through the network.
- A mixed strategy of offline triplet sampling is applied to learn a **rotation-aware joint embedding** of scan and CAD to enable the fine-grained CAD retrieval with the approximate rotation.
- Evaluation on the **scan and CAD similarity** and **Scan2CAD** benchmark demonstrate the state-of-art algorithms performance compared to the baseline in both retrieval accuracy and alignment accuracy.

### LiDAR-Based High-Definition Map Development for V2X Applications

*Jun. 2020 - Aug. 2020*

Perception Algorithm Development Intern at Hesai

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 work has been accepted by *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 **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 as well as the advanced lecture on RGBD sensors for the course 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 at Hesai

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<sup>2</sup> 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**.

## CONFERENCE PAPERS

- [c3] Yue Pan, Pengchuan Xiao, **Yujie He**, Zhenlei Shao\*, and Zesong Li. "MULLS: Versatile LiDAR SLAM via Multi-metric Linear Least Square" accepted by *IEEE International Conference on Robotics and Automation (ICRA)*, Xi'an, China, 2021. [[paper](#)] [[code](#)] [[demo](#)]
- [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/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Las Vegas, USA, 2020. [[paper](#)] [[code](#)] [[talk](#)] [[demo](#)]
- [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](#)]

## 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)

## SELECTED HONORS

- **Excellent Graduates of Shanghai** (top 3% 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**
  - \* IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2021.
  - \* IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020.
  - \* IEEE International Conference on Advanced Robotics and Mechatronics (ARM), 2019.
- **Teaching Assistant**
  - \* D&I-550069 Open-Source Hardware and Programming (Fall 2018) @ Tongji Univ.

## SKILLS

<b>Programming</b>	MATLAB, Python, C/C++, L <sup>A</sup> T <sub>E</sub> X
<b>Design</b>	AutoCAD, SolidWorks
<b>Hardware</b>	Arduino, Raspberry Pi, Pixhawk
<b>Libraries</b>	PX4, ROS, OpenCV, PCL
<b>Language</b>	Chinese (Native), English (C1), Deutsch (B1), Français (A1)