

Yujie HE

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Institute of Electrical and Micro Engineering (IEM), School of Engineering (STI)

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

EDUCATION

École polytechnique fédérale de Lausanne (EPFL), Switzerland

Sep. 2020 - Present

- Major in Robotics (Track: Mobile Robotics)
- 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

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

PROJECT EXPERIENCES

Autonomous Navigation and Artifact Detection & Mapping in Cluttered Environment

Jul. 2021

Participant of [ETH Robotics Summer School](#)

- Highly competitive program with less than 7% acceptance ratio for students outside ETHz.
- Integrated the existing ROS software stack with MissionPlanner to enable autonomous navigation and localization of the SuperMegaBot in the training facility at Wangen an der Aare, designed to simulate complex search/rescue scenarios.
- Developed post-processing toolkit to analyze the detected artifacts from the recorded rosbag, and utilize DBSCAN to cluster duplicate instances generated by YOLO3.

Development of Vision Based Algorithms to a Window/Balcony Drone Delivery

Feb. 2021 - Jul. 2021

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 **window/balcony drone delivery scenarios** with obstacles.

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

Feb. 2021 - Jul. 2021

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

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

- Proposed a novel end-to-end scan to CAD retrieval neural network based on **joint embedding**, where noisy 3D object scan can be separated from the background cluttering and further completed into a CAD-like representation.
- Applied the mixed strategy of offline triplet sampling to learn a **rotation-aware joint embedding** of scan and CAD to enable the fine-grained CAD retrieval with the approximate rotation.

- Evaluated on the **scan and CAD similarity** and **Scan2CAD** benchmark, which demonstrates the state-of-art 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 main-stream 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* [0]).
- Developed the **HMap 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** [0]).
- 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** [0]).
- 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* [[lin2020TCSVT](#), 0]).
- 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 $300m^2$ 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**.

FEATURED PUBLICATION

† indicates corresponding author(s)

- [0] Y. Pan, P. Xiao, **Y. He**, Z. Shao[†], and Z. Li, "MULLS: Versatile LiDAR SLAM via Multi-metric Linear Least Square," in *IEEE International Conference on Robotics and Automation (ICRA)*, May 2021. [[paper](#)] [[code](#)] [[demo](#)].
- [0] C. Fu[†], **Y. He**, F. Lin, and W. Xiong, "Robust multi-kernelized correlators for UAV tracking with adaptive context analysis and dynamic weighted filters," *Neural Computing and Applications*, vol. 32, no. 16, pp. 12591–12607, Aug. 2020. [[paper](#)] [[code](#)] [[demo](#)].
- [0] **Y. He**, C. Fu[†], F. Lin, Y. Li, and P. Lu, "Towards Robust Visual Tracking for Unmanned Aerial Vehicle with Tri-Attentional Correlation Filters," in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Oct. 2020, pp. 1575–1582. [[paper](#)] [[code](#)] [[talk](#)] [[demo](#)].
- [0] F. Lin, C. Fu[†], **Y. He**, F. Guo, and Q. Tang, "BiCF: Learning Bidirectional Incongruity-Aware Correlation Filter for Efficient UAV Object Tracking," in *IEEE International Conference on Robotics and Automation (ICRA)*, May 2020, pp. 2365–2371. [[paper](#)] [[code](#)] [[demo](#)].

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

Programming	MATLAB, Python, C/C++, L ^A T _E X
Libraries	ROS, PX4, OpenCV
Hardware	JestonNano, Pixhawk, Arduino, Raspberry Pi
Design	AutoCAD, SolidWorks
Language	Chinese (Native), English (C1), Deutsch (B1), Français (A1)