Yujie HE

(+41) 78-338-95-35 he-yujie@outlook.com yujie-he.github.io
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
- 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

PROJECT EXPERIENCES

Correspondence Matching Learning for Visual Object Segmentation *Feb. 2022 - Present*
Semester Research Student at Computer Vision Lab (CVL), ETH Zürich
Supervisor: Dr. Martin Danelljan, Prune Truong (PhD), and Prof. Luc Van Gool

- Exploited Dense Correspondence Network with self-supervised techniques and probabilistic confidence estimation for robust long-term visual object segmentation task.

Multi-Modal Pedestrian Behavior Analysis for Qolo Navigation in Crowd *Oct. 2021 - Present*
Research Assistant at Learning algorithms and systems Laboratory (LASA), ETH
Supervisor: Dr. Diego Paez-Granados and Prof. Aude Billard

- Under EU Crowdbot project – safe navigation of robot in crowd, established the benchmark for pedestrian behavior and reactive control performance analysis based on data recorded from experiments in which the robot navigates through crowds in the center of Lausanne.
- Develop open-source toolkit for sensor data extraction and processing, pedestrian detection and tracking based on deep learning-based method, pedestrian behavior characterization and robot performance evaluation, and data visualization. Related work has submitted in IROS 2022 [1].

Autonmous Navigation and Artifact Detection 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 - Aug. 2021*
Semester Research Student at Laboratory of Intelligent Systems (LIS), EPFL
Supervisor: Valentin Wüest (PhD), 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 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)

- 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 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* [2]).
- 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** [4]).
- 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** [3]).
- 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 [5, 6]).

FEATURED PUBLICATION

† indicates corresponding author(s)

[1] D. Paez-Granados†, **Y. He**, D. Jia, B. Leibe, K. Suzuki, and A. Billard, "Pedestrian-Robot Interaction on Crowd Navigation: Reactive Control Methods and Evaluation," in *In submission to IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2022, pp. 1–8. [code] [dataset].

[2] 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].

[3] 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. 12 591–12 607, Aug. 2020. [paper] [code] [demo].

[4] **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].

[5] 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].

[6] ——, "Learning Temporary Block-Based Bidirectional Incongruity-Aware Correlation Filters for Efficient UAV Object Tracking," *IEEE Transactions on Circuits and Systems for Video Technology*, pp. 1–1, 2020. [paper] [code].

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): 2020, 2021
  - IEEE International Conference on Advanced Robotics and Mechatronics (ARM): 2019
- **Teaching Assistant**
  - D&I-550069 Open-Source Hardware and Programming (Fall 2018) @ Tongji Univ.
  - 151-9062-00L Robotics Summer School (2022) @ ETH Zurich

SKILLS

Programming	MATLAB, Python, C/C++, LaTeX
Robotics	PX4, ROS, OpenCV, PCL
Hardware	Arduino, Raspberry Pi, Pixhawk
Design	AutoCAD, SolidWorks
Language	Chinese (Native), English (C1), Deutsch (B1), Français (A1)