Benyun ZHAO (赵犇赟)

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Wechat(微信):Claude_ZBY Date / Place of Birth: 1997.11 / Nanjing
Research Interests: Unmanned systems applications; Image processing, 3D scence understanding

EDUCATION

The Chinese University of Hong Kong (香港中文大学) 2022.09 - Present
Ph.D. Candidate（博士候选人）: *USR Group, Mechanical and Automation Engineering*
Supervisor: *Prof. Ben M. Chen*, Department Chairman, IEEE Fellow, Fellow of the Academy of Engineering Singapore, Provost's Chair Professor of the National University of Singapore
Coursework: *Linear Systems Theory & Design (A/A), Micromachining & MEMS (A-/A), Design for Additive Manufacturing (A-/A), Advanced Robotics (B+/A)*

The Chinese University of Hong Kong (香港中文大学) 2020.09 - 2021.06
Master of Science（理学硕士）: *USR Group, Mechanical and Automation Engineering*
Supervisor: *Prof. Ben M. Chen*, Department Chairman, IEEE Fellow, Fellow of the Academy of Engineering Singapore, Provost's Chair Professor of the National University of Singapore
GPA: **3.675 / 4.000**
Coursework: *Control & Industrial Automation (A/A), Machine Learning for Singal Processing (A/A), Robotics (A-/A), MEMS Technology & Applications (A-/A), Computer Vision in Practice (B+/A), MSc Project: Real-time Object Detector Implementation on UGV & UAV (A/A)*

Jiangsu Ocean Universiyt(江苏海洋大学) 2016.09 - 2020.07
Bachelor of Engineering（工学学士）: *Mechanical Design, Manufacture and Automation*
Supervisor: *Prof. Yiqiang He and Prof. Dazhi Huang*
GPA: **4.53 / 5.00** **Ranking**: **3 / 204**
Coursework: *Advanced Mathematics (94 & 92/100), Geometric Drawing and Engineering Graphics (85/100), Linear Algebra (94/100), Probability and Statistics (91/100), Principles of Mechanics (88/100), Electrotechnics and Electronics (86/100), Solidworks 3D Model Design (95/100), Engineer Training (95 & 95 /100), Electrical Control of Machinery Tools and PLC (85/100), CAD & CAM (95/100), Insturial Robot (88/100), Professional English for Mechanical Engineering (96/100)*

EXCHANGE & VISITING

Nanjing University of Science and Technology (南京理工大学) 2024.05
Visiting Student, *Control Science and Engineering, School of Computer Science and Technology*
Supervisor: *Prof. Zhenbo Song and Prof. Jianfeng Lu*

University of California, Berkeley (加州大学伯克利分校) 2023.09

Visiting Student, *HiPeR Lab*, *Mechanical Engineering*

Supervisor: *Prof. Mark M. Mueller*

Pengcheng Laboratory (鹏城国家实验室) 2023.07

International Symposium on Cooperative Autonomous Systems

Chairperson: *Prof. Ben M. Chen*, *Prof. Jie Chen* and *Prof. Hugh Liu*

Nanjing Tech University (南京工业大学) 2018.08 - 2019.07

Exchange Student

Coursework: *Thermodynamics & Heat Transfer (85/100), Design of Mechanics (86/100), Numerical Computation (92/100), Principles of Microcontrollers (91/100), Fundamentals of Control Eningeering (85/100), Hydraulic and Pneumatic Transmission (89/100), Numerical Control Technology (88/100), Finite Element Analysis (94/100), Design and Manufacture of Pressing Model (95/100)*

PUBLICATION

Journal Articles:

[1] **B. Zhao**, X. Zhou, G. Yang, J. Wen, J. Zhang, J. Dou, G. Li, X. Chen and B. M. Chen, High-resolution infrastructure defect detection dataset sourced by unmanned systems and validated with deep learning approaches, *Automation in Construction (AIC)*, 2024.

[2] **B. Zhao**, Q. Duan, G. Yang, Z. Song, J. Wen, X. Liu, X. Chen and B. M. Chen, High-Performance Real-Time Defect Detector for UAV-Based Online Large-Scale Infrastructure Detection, *IEEE Transactions on Automation Science and Engineering (T-ASE, Under Review)*, 2024.

[3] **B. Zhao**[1], G. Yang[1], J. Zhang, J. Wen, X. Chen and B. M. Chen, Det-Recon-Reg: An Intelligent Framework Towards Automated Large-Scale Infrastructure Inspection, *IEEE Transactions on Instrumentation and Measurement (T-IM, Under Review)*, 2024. (1 denotes co-first author)

[4] **B. Zhao**[1], Q. Duan[1], Z. Song, X. Zhang, X. Liu, X. Chen and B. M. Chen, VGS: Voxel Map based Surfel Gaussian Splatting for Scene Reconstruction, *IEEE Transactions on Industrial Electronics (T-IE, Under Review)*, 2024. (1 denotes co-first author)

[5] J. Zhang, **B. Zhao***, G. Yang, X. Zhou, Y. Huang, C. Gao, X. Chen and B. M. Chen, Automated High-Precision Digital Twin Modeling of Building Façade Defects with Geobim-Assisted Registration, *Advanced Engineering Informatics (Revised and Resubmitted)*, 2024. (* denotes corresponding author)

[6] Q. Li, **B. Zhao***, X. Wang, G. Yang, Y. Chang, X. Chen and B. M. Chen, Autonomous Building Material Stock Estimation using 3D Modeling and Multilayer Perceptron: A Case of Hong

Kong, *Resources, Conservation & Recycling (Under Review)*, 2024 (* denotes corresponding author)

[7] Q. Li, G. Yang, **B. Zhao**, X. Chen and B. M. Chen, Autonomous design framework for building integrated photovoltaics: data collection, 3D modeling, and deployment strategy, *Applied Energy*, 2024.

[8] G. Yang, J. Wen, **B. Zhao**, Q. Li, X. Chen and B. M. Chen, Towards End-to-End Underwater Multi-View Stereo for Real-World Dense Scene Reconstruction, *IEEE Transactions on Industrial Informatics (T-II, Revised and Resubmitted)*, 2024.

[9] P. Zhou, S. Li, **B. Zhao**, B. Wahlberg, X. Hu, Nature-inspired dynamic control for pursuit-evasion of robots, *Automatica (Under Review)*, 2024.

[10] J. Wen, G. Yang, **B. Zhao**, D. Huang, Y. Hu, B. Zhang, X. Chen and B. M. Chen, A semi-supervised domain-adaptive real-world underwater image enhancement method, *IEEE Transactions on Circuits and Systems for Video Technology (T-CSVT, Under Review)*, 2024.

[11] G. Yang, K. Liu, J. Zhang, **B. Zhao**, Z. Zhao, X. Chen and B. M. Chen, Datasets and processing methods for boosting visual inspection of civil infrastructure: A comprehensive review and case study on crack classifications, segmentation, and detection, *Construction and Building Materials*, 2022.

[12] J. Wen, J. Cui, G. Yang, **B. Zhao**, Y. Zhai, Z. Gao, L. Dou and B. M. Chen, WaterFormer: Global-Local transformer for underwater image enhancement with environment adaptor, *IEEE Robotics and Automation Magazine (RA-M)*, 2024.

[13] G. Yang, R. Cao, J. Wen, **B. Zhao**, Q. Li, X. Chen, YH Liu and B. M. Chen, Multi-View Stereo with Geometric Encoding for Large-Scale Dense Scene Reconstruction, *IEEE Transactions on Automation Science and Engineering (T-ASE, Under Review)*, 2024.

[14] J. Wen, J. Cui, G. Yang, **B. Zhao**, Z. Gao, B. M. Chen, Progressive Domain-Adaptive Underwater Object Detection Assisted with Underwater Image Enhancement, *Engineering Applications of Artificial Intelligence (EAAI, Under Review)*, 2024.

[15] L. Long, Z. Gan, Z. Liu, **B. Zhao**, Q. Li, MSD-Det: Masonry Structures Damage Detection Dataset for Preventive Conservation of Heritage, *Journal of Cultural Heritage (Under Review), 2024*

[16] Q. Li, L. Long, X. Li, G. Yang, C. Bian, **B. Zhao**, X. Chen and Ben M. Chen, Life cycle cost analysis of circular photovoltaic façade in dense urban environment using 3D modeling, *Renewable Energy*, 2024.

[17] Q. Li, G. Yang, C. Gao, Y. Huang, J. Zhang, D. Huang, **B. Zhao**, X. Chen and B. M. Chen, Single drone-based 3D reconstruction approach to improve public engagement in conservation of heritage buildings: A case of Hakka Tulou, *Journal of Building Engineering*, 2024.

[18] Y. He, H. Xu, C. Ren, X. Liu, W. Feng, L. Zuo, Z. Huang and **B. Zhao**, Research status of preparation methods of multi-component high entropy alloy (多组元高熵合金制备方法的研究现状), *Nonferrous Metals Engineering (有色金属工程)*, 2020

Conference Articles:

[1] **B. Zhao**, X. Zhou, G. Yang, J. Wen, J. Zhang, X. Chen and B. M. Chen, CUBIT-Det: A high-definition infrastructure defect dataset fully evaluated with deep learning processes, *IEEE 18th International Conference on Control & Automation (ICCA)*, Reykjavík, Iceland, 2024.

[2] **B. Zhao**, Q. Duan, G. Yang, Z. Song, J. Wen, X. Liu, H. Tang, Q. Li, X. Chen and B. M. Chen, Lightweight yet High-Performance Defect Detector for UAV-Based Large-Scale Infrastructure Real-Time Inspection, submitted to *IEEE International Conference on Robotics and Automation (ICRA*),

Atlanta, USA, 2025.

[3] G. Yang[1], **B. Zhao[1]**, J. Zhang, C. Gao, Y. Huang, J. Wen, Q. Li, X. Chen and B. M. Chen, Det-Recon-Reg: An intelligent framework towards automated large-Scale infrastructure inspection, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Abu Dhabi, UAE, 2024. (1 denotes co-first author)

[4] X. Zhou, **B. Zhao***, G. Yang, J. Zhang, L. Li and B. M. Chen, SANet: Small but accurate detector for aerial flying object, *IEEE International Conference on Robotics and Automation (ICRA)*, Yokohama, Japan, 2024. (* denotes corresponding author)

[5] J. Wen, J. Cui, **B. Zhao**, B. Han, X. Liu, Z. Gao and B. M. Chen, EnYOLO: A Real-Time Framework for Domain-Adaptive Underwater Object Detection with Image Enhancement, *IEEE International Conference on Robotics and Automation (ICRA)*, Yokohama, Japan, 2024.

[6] J. Wen, G. Yang, **B. Zhao**, D. Huang, Y. Hu, B. Zhang, X. Chen and B. M. Chen, I2D-UIE: Alleviating Inter- and Intra-Domain Shifts for Real-world Underwater Image Enhancement, submitted to *IEEE International Conference on Robotics and Automation (ICRA)*, Atlanta, USA, 2025.

[7] G. Yang, J. Wen, **B. Zhao**, Q. Li, Y. Huang, X. Chen, A. Lam, and B. M. Chen, End-to-End Underwater Multi-View Stereo for Dense Scene Reconstruction, submitted to *IEEE International Conference on Robotics and Automation (ICRA)*, Atlanta, USA, 2025.

[8] G. Yang, R. Cao, J. Wen, **B. Zhao**, Q. Li, Y. Huang, X. Chen, A. Lam, YH Liu and B. M. Chen, Multi-View Stereo with Geometric Encoding for Dense Scene Reconstruction, submitted to *IEEE International Conference on Robotics and Automation (ICRA)*, Atlanta, USA, 2025.

[9] J. Wen, J. Cui, G. Yang, **B. Zhao**, Y. Zhai, Z. Gao, L. Dou and B. M. Chen, WaterFormer: Global-Local transformer for underwater image enhancement with environment adaptor, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Abu Dhabi, UAE, 2024.*

[10] J. Wen, J. Cui, G. Yang, **B. Zhao**, Z. Gao and B. M. Chen, Underwater object detection integrated with image enhancement, *IEEE International Conference on Real-time Computing and Robotics (RCAR)*, Alesund, Norway, 2024

[11] G. Yang, X. Zhou, C. Gao, **B. Zhao**, J. Zhang, Y. Chen, X. Chen and B. M. Chen, Multi-view stereo with learnable cost metric, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Detroit, Michigan, USA, 2023.

[12] X. Zhou, G. Yang, Y. Chen, C. Gao, **B. Zhao**, L. Li and B. M. Chen, ADMNet: Anti-drone real-time detection and monitoring, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Detroit, Michigan, USA, 2023.

TEACHING ASSISTANT

- CUHK MAEG4998 -- Final Year Project 2024-2025 by *Prof. Ben M. Chen*
  Project Title: Deep Learning-Based Detection and Segmentation of Building Façade Defects and Components: From Dataset Establishment to Drone Experiments
- CUHK MAEG4040 -- Mechatronic System 2024-2025 by *Prof. Xin Ma*
- CUHK ESTR1006 -- Multivariable Calculus 2023-2024 by *Prof. Dongkun Han*
- CUHK MAEG4040 -- Mechatronic System 2023-2024 by *Prof. Xin Ma*
- CUHK MAEG5910 -- Master of Science Project 2023-2024 by *Prof. Ben M. Chen*
  Project Title: Learning-Based Large-Scale 3D Reconstruction: A Comparison between Multi-View Stereo and Neural Radiance Field

- CUHK MAEG5910 -- Master of Science Project 2022-2023 by *Prof. Ben M. Chen*
  Project Title: Building Defects Detection based on YOLOv8
- CUHK MAEG4040 -- Final Year Project 2022-2023 by *Prof. Ben M. Chen*
  Project Title: Building Defect Dataset Establishment and Real-time Defect Detection
- CUHK MAEG5910 -- Master of Science Project 2021-2022 by *Prof. Ben M. Chen*
  Project Title 1: Defect Images Generation based on Generative Adversarial Network
  Project Title 2: Concrete Cracks Detection based on Semantic Segmentation

Note: MAEG (Mechanical and Automation Engineering)机械与自动化工程系课程; ESTR (ELITE Stream)工程学院精英班课程

INTERNSHIP & WORK

Hong Kong Centre for Logistics Robotics(香港物流机器人研究中心) &

The Chinese University of Hong Kong (香港中文大学) 2021.07 - 2022.08

Position: Research Assistant **(科研助理)** for unmanned system based computer vision tasks

Luoyang YTO Group Corporation (洛阳中国第一拖拉机厂) 2019.10 - 2019.11

Position: Mechanical Engineer **(机械工程师)**

Jinling Branch of Sinopec (南京金陵石化) 2016.06 - 2016.08

Position: Mechanical Engineer **(机械工程师)** 2017.06 - 2017.08

HONORS & AWARDS

- **Gold Award** – Chun Wo Innovation Student Awards 2022 (香港俊和学生创新奖), Hong Kong, 2023.11
- **Best Business Potential Award (最佳商业潜力奖)** -- Chun Wo Innovation Student Awards 2022 (香港俊和学生创新奖), Hong Kong, 2023.11
- **Best Business Idea Award (最佳商业创意奖)** -- Young Entrepreneurs Development Council (香港青年企业家发展局), Hong Kong, 2023.07
- **Champion** -- Professor Charles K. Ko Student Creativity Award (高琨教授学生创新奖), CUHK, Hong Kong, 2023.06
- **Bronze Medal** -- 48th Geneva International Exhibition of Inventions (日内瓦国际发明展), Geneva, Switzerland, 2023.04
- **Postgraduate Scholarship (研究生全额奖学金)** -- CUHK, Hong Kong, 2022-2026
- **Outstanding Undergraduate of the 2020 Class (2020 届优秀本科毕业生)** -- Jiangsu Ocean University, Lianyungang, China, 2020
- **First Class Annual Scholarship (年度一等奖学金)** -- Jiangsu Ocean University, Lianyungang, China, 2019-2020

- **Competition-based Individual Scholarship** (**单项竞赛奖学金**) -- Jiangsu Ocean University, Lianyungang, China, 2019.10
- **Second Prize** -- China RoboWork 2019 (中国工程机器人大赛) Small Quadrotor Project Shaoguan, China, 2019.04
- **Merit Student** (**三好学生**) -- Jiangsu Ocean University, Lianyungang, China, 2018-2019
- **First Class Annual Scholarship** (**年度一等奖学金**) -- Nanjing Tech University, Nanjing, China, 2018-2019
- **Champion** -- 'Engineer Training Cup' Mechanical Manufacturing and Innovative Design Competition Solar Power Car Project (**"工程训练杯"机械制造创新设计大赛太阳能车组**), Jiangsu Ocean University, Lianyungang, China, 2018.07
- **First Class Annual Scholarship** (**年度一等奖学金**) -- Jiangsu Ocean University, Lianyungang, China, 2017-2018
- **Outstanding Student Union Cadre** (**优秀学生会干部**) -- Jiangsu Ocean University, Lianyungang, China, 2017-2018
- **First Class Annual Scholarship** (**年度一等奖学金**) -- Jiangsu Ocean University, Lianyungang, China, 2016-2017
- **Outstanding Student Union Member** (**优秀学生会成员**) -- Jiangsu Ocean University, Lianyungang, China, 2016-2017

TECHNICAL SKILLS

- ✧ Robotics & Deep Learning: C++, Python, Linux, ROS, Gazebo, Pytorch, Keras, PCL, CloudCompare, MeshLab, OpenCV, Open3D, etc.
- ✧ 3D & 2D Modeling: Creo, Solidworks, AutoCAD, ANSYS, etc.
- ✧ Numerical Analysis and Statistics: Numpy, Scipy, Scikit-Learn, Pandas, Matlab, etc.
- ✧ Control System: Labview, Matlab & Simulink, PLC, Python, etc.