Hengli Wang

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Robotics Institute,
HKUST,
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EDUCATION

The Hong Kong University of Science and Technology, Hong Kong SAR, China.
Ph.D. in Electronic & Computer Engineering 09/2018–present

- Research Interests: Computer vision, stereo matching, optical flow estimation, semantic segmentation, visual navigation, ground mobile robots, and autonomous driving.
- Supervisor: Prof. Ming Liu.

Zhejiang University, Hangzhou, China.
B.Eng. in Mechotronics Engineering 09/2014–06/2018

- Overall GPA: 3.95/4.00 (91.10/100), ranking **2nd** out of 83 students.

WORKING & RESEARCH EXPERIENCE

The Hong Kong University of Science and Technology, Hong Kong SAR, China.

- *Research in RAM-LAB* 09/2018–present
  - **Stereo Matching**
    This work developed novel network architectures that can achieve a great trade-off between accuracy and efficiency for supervised stereo matching. We also proposed effective training strategies for unsupervised stereo matching. Our CoT-Stereo ranks **1st** among all unsupervised approaches on the KITTI Stereo Benchmarks. (*Accepted by IEEE RA-L and ICIP 2021*). [Video]
  - **Optical Flow Estimation**
    We developed CoT-AMFlow, a novel unsupervised optical flow estimation approach. Our CoT-AMFlow ranks **1st** among all unsupervised approaches on the KITTI Optical Flow Benchmarks and the MPI Sintel Benchmark. (*Accepted by CoRL 2020*). [Video]
  - **Surface Normal Estimation**
    We developed an accurate and ultrafast surface normal estimator, which can generate surface normal information from dense depth images. Our approach can greatly minimize the trade-off between accuracy and efficiency for surface normal estimation. (*Accepted by IEEE RA-L*). [Video]
  - **Freespace Detection for Autonomous Driving**
    This work focused on improving freespace detection performance with the assistance of surface normal information. Our SNE-RoadSeg+ ranks **1st** on the KITTI Road Benchmark. (*Accepted by ECCV 2020, IROS 2021, and IEEE T-MECH*). [Video]
  - **Drivable Area and Road Anomaly Detection for Ground Mobile Robots**
    This work constructed a drivable area and road anomaly detection benchmark for ground mobile robots. We also adopted different types of visual features and proposed a novel data-fusion module to improve the detection performance. (*Accepted by IEEE RA-L, IROS 2020, and IEEE T-CYB*). [Page]
  - **Motion Planning for Autonomous Driving**
    This work focused on end-to-end vision-based motion planning for autonomous driving. Given a set of past surrounding-view images, we first generate perception results in bird's-eye-view (BEV) space, which are then employed to plan trajectories for self-driving vehicles. Extensive experiments demonstrated the superiority of our work over state-of-the-art approaches in BEV perception and imitating human drivers. (*Accepted by ICRA 2021, CVPRW 2021, and IEEE T-IV*). [Video]
  - **Parking Violation Detection on a Drone**
    We proposed a novel parking violation detection system embedded in a drone. The experimental results both qualitatively and quantitatively demonstrated the effectiveness and robustness of our system. (*Accepted by ECCV Workshops 2020*). [Video]
  - **Semantic Segmentation of Urban Scenes Using RGB and Thermal Data**
    This work focused on fusing RGB and thermal data for superior semantic segmentation performance under various lighting conditions. The results demonstrated the superiority of our approach over the state-of-the-arts. (*Accepted by IEEE T-ASE*). [Video]

- *Teaching Assistant*
  - ELEC 1100: Introduction to Electro-Robot Design. Fall 2019
    Instructor: Prof. Shaojie Shen, Prof. Johnny Kin On Sin, and Prof. Qiming Shao.
  - ELEC 3200: System Modeling Analysis and Control. Spring 2019
    Instructor: Prof. Wei Chen.

Unity Drive Innovation Technology Co. Ltd., Shenzhen, China.
- *Algorithm R&D Intern* 07/2018–08/2018

PUBLICATIONS

** indicates equal contribution*

Journal Papers

[1] R. Fan*, **H. Wang***, Y. Wang*, M. Liu, and I. Pitas, "Graph Attention Layer Evolves Semantic Segmentation for Road Pothole Detection: A Benchmark and Algorithms", *IEEE Transactions on Image Processing (T-IP)*, 2021.

[2] P. Cai, **H. Wang**, H. Huang, Y. Liu, and M. Liu, "Vision-Based Autonomous Car Racing Using Deep Imitative Reinforcement Learning", *IEEE Robotics and Automation Letters (RA-L)*, 2021.

[3] **H. Wang***, R. Fan*, P. Cai, and M. Liu, "PVStereo: Pyramid Voting Module for End-to-End Self-Supervised Stereo Matching", *IEEE Robotics and Automation Letters (RA-L)*, 2021.

[4] R. Fan*, **H. Wang***, B. Xue*, H. Huang, Y. Wang, M. Liu, and I. Pitas, "Three-Filters-to-Normal: An Accurate and Ultrafast Surface Normal Estimator", *IEEE Robotics and Automation Letters (RA-L)*, 2021.

[5] **H. Wang***, R. Fan*, Y. Sun, and M. Liu, "Dynamic Fusion Module Evolves Drivable Area and Road Anomaly Detection: A Benchmark and Algorithms", *IEEE Transactions on Cybernetics (T-CYB)*, 2021.

[6] R. Fan*, **H. Wang***, P. Cai, J. Wu, M. J. Bocus, L. Qiao, and M. Liu, "Learning Collision-Free Space Detection from Stereo Images: Homography Matrix Brings Better Data Augmentation", *IEEE/ASME Transactions on Mechatronics (T-MECH)*, 2021.

[7] T. Liu, Q. Liao, L. Gan, F. Ma, J. Cheng, X. Xie, Z. Wang, Y. Chen, Y. Zhu, S. Zhang, Z. Chen, Y. Liu, M. Xie, Y. Yu, Z. Guo, G. Li, P. Yuan, D. Han, Y. Chen, H. Ye, J. Jiao, P. Yun, Z. Xu, **H. Wang**, H. Huang, S. Wang, P. Cai, Y. Sun, Y. Liu, L. Wang, and M. Liu, "The Role of the Hercules Autonomous Vehicle During the COVID-19 Pandemic: An Autonomous Logistic Vehicle for Contactless Goods Transportation", *IEEE Robotics and Automation Magazine (RAM)*, 2021.

[8] P. Cai, Y. Sun, **H. Wang**, and M. Liu, "VTGNet: A Vision-Based Trajectory Generation Network for Autonomous Vehicles in Urban Environments", *IEEE Transactions on Intelligent Vehicles (T-IV)*, 2020.

[9] Y. Sun, W. Zuo, P. Yun, **H. Wang**, and M. Liu, "FuseSeg: Semantic Segmentation of Urban Scenes Based on RGB and Thermal Data Fusion", *IEEE Transactions on Automation Science and Engineering (T-ASE)*, 2020.

[10] **H. Wang**, Y. Sun, and M. Liu, "Self-Supervised Drivable Area and Road Anomaly Segmentation Using RGB-D Data for Robotic Wheelchairs", *IEEE Robotics and Automation Letters (RA-L)*, 2019.

Conference and Workshop Papers

[11] **H. Wang***, R. Fan*, P. Cai, and M. Liu, "SNE-RoadSeg+: Rethinking Depth-Normal Translation and Deep Supervision for Freespace Detection", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2021.

[12] P. Cai, **H. Wang**, Y. Sun, and M. Liu, "DiGNet: Learning Scalable Self-Driving Policies for Generic Traffic Scenarios with Graph Neural Networks", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2021.

[13] **H. Wang**, R. Fan, and M. Liu, "Co-Teaching: An Ark to Unsupervised Stereo Matching", *IEEE International Conference on Image Processing (ICIP)*, 2021.

[14] **H. Wang**, R. Fan, and M. Liu, "SCV-Stereo: Learning Stereo Matching from a Sparse Cost Volume", *IEEE International Conference on Image Processing (ICIP)*, 2021.

[15] **H. Wang**, P. Cai, R. Fan, Y. Sun, and M. Liu, "End-to-End Interactive Prediction and Planning with Optical Flow Distillation for Autonomous Driving", *IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops (CVPRW)*, 2021.

[16] **H. Wang**, P. Cai, Y. Sun, L. Wang, and M. Liu, "Learning Interpretable End-to-End Vision-Based Motion Planning for Autonomous Driving with Optical Flow Distillation", *International Conference on Robotics and Automation (ICRA)*, 2021.

[17] **H. Wang**, Y. Sun, R. Fan, and M. Liu, "S2P2: Self-Supervised Goal-Directed Path Planning Using RGB-D Data for Robotic Wheelchairs", *International Conference on Robotics and Automation (ICRA)*, 2021.

[18] **H. Wang**, R. Fan, and M. Liu, "CoT-AMFlow: Adaptive Modulation Network with Co-Teaching Strategy for Unsupervised Optical Flow Estimation", *Conference on Robot Learning (CoRL)*, 2020. (34% acceptance rate).

[19] **H. Wang***, Y. Liu*, H. Huang*, Y. Pan*, W. Yu, J. Jiang, D. Lyu, M. J. Bocus, M. Liu, I. Pitas, and R. Fan, "ATG-PVD: Ticketing Parking Violations on a Drone", *European Conference on Computer Vision (ECCV) Workshops*, 2020.

[20] R. Fan*, **H. Wang***, M. J. Bocus, and M. Liu, "We Learn Better Road Pothole Detection: From Attention Aggregation to Adversarial Domain Adaptation", *European Conference on Computer Vision (ECCV) Workshops*, 2020.

[21] R. Fan*, **H. Wang***, P. Cai, and M. Liu, "SNE-RoadSeg: Incorporating Surface Normal Information into Semantic Segmentation for Accurate Freespace Detection", *European Conference on Computer Vision (ECCV)*, 2020.

[22] **H. Wang***, R. Fan*, Y. Sun, and M. Liu, "Applying Surface Normal Information in Drivable Area and Road Anomaly Detection for Ground Mobile Robots", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2020.

ACADEMIC ACTIVITIES

Technical Program Committees

- 1st Autonomous Vehicle Vision (AVVision) Workshop in conjunction with WACV 2021.
- 2nd Autonomous Vehicle Vision (AVVision) Workshop in conjunction with ICCV 2021.
- Special sessions in ICIP 2021, ICAS 2021, and IROS 2021.

Conference Presentations

- IROS 2021, Prague, Czech Republic.
- ICIP 2021, Anchorage, USA.
- CVPR 2021, Virtual.
- ICRA 2021, Xi'an, China.
- CoRL 2020, Cambridge MA, USA.
- IROS 2020, Las Vegas, USA.
- ECCV 2020, Glasgow, UK.

Reviewer Services

- IEEE/CVF International Conference on Computer Vision (ICCV), 2021.
- IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2021.
- IEEE International Conference on Image Processing (ICIP), 2021.
- IEEE International Conference on Autonomous Systems (ICAS), 2021.
- IEEE Winter Conference on Applications of Computer Vision (WACV) Workshops, 2021.
- The British Machine Vision Conference (BMVC), 2020-2021.
- IEEE International Conference on Robotics and Automation (ICRA), 2019–2022.
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2019–2021.
- IEEE Transactions on Image Processing (T-IP).
- IEEE Transactions on Neural Networks and Learning Systems (T-NNLS).

- IEEE Transactions on Intelligent Transportation Systems (T-ITS).
- IEEE Robotics and Automation Letters (RA-L).

AWARDS

- Postgraduate Scholarship in the HKUST, 2018-present.
- Outstanding Graduates in Zhejiang Province, 2018.
- Second-Class Scholarship in Zhejiang University (Top 10%), 2017.
- Tang Lixin Scholarship (**Lifetime**, around **0.16%** every year), 2016–present.
- First-Class Scholarship in Zhejiang University (Top 5%), 2016.
- Meritorious Winner in the Interdisciplinary Contest In Modeling (Top 13%), 2016.
- First Prize for the 7th National College Student Mathematics Competition, 2015.
- National Scholarship in Zhejiang University (Top 2%), 2015.

PROFESSIONAL SKILLS

- Programming: Python, MATLAB, C/C++.
- Frameworks: PyTorch, ROS.
- Language: Passing CET-4 and CET-6; TOEFL-IBT, 100/120.
- National Computer Rank Examination C Language Certificate of Level 2.
- C1 Motor Vehicle Driving License.