Depu Meng, Ph. D.

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Education

University of Science and Technology of China - Microsoft Research Asia — Beijing, China
Ph. D. in Control Science and Engineering — *Sept. '18 – Jun. '23*
Advisors: Dr. Baining Guo (Microsoft), Prof. Houqiang Li (USTC)

University of Science and Technology of China — Hefei, Anhui, China
B.E. in Electrical Engineering (School of Gifted Young) — *Sept. '14 – Jun. '18*

Work Experience

University of Michigan — Michigan, United States
Research Fellow, Department of Civil and Environmental Engineering — *Aug. '23 –*
Mentor: Prof. Henry X. Liu

University of Michigan — Michigan, United States
Research Assistant, Department of Civil and Environmental Engineering — *Apr. '22 – Aug. '23*
Mentor: Prof. Henry X. Liu

Meituan — Beijing, China
Intern, Autonomous Delivery Group — *Aug. '21 – Apr. '22*
Mentor: Dr. Changqian Yu

Microsoft Research Asia — Beijing, China
Intern, Visual Computing Group — *Jul. '19 – Jul. '21*
Mentor: Dr. Jingdong Wang

Microsoft Research Asia — Beijing, China
Intern, Visual Computing Group — *Jul. '17 – Jul. '18*
Mentor: Dr. Jingdong Wang

Research Interests

Applied Computer Vision Perception Problems: 2D/3D object detection, tracking, segmentation, pose estimation, motion prediction. My research interests are deeply rooted in the field of Computer Vision and Machine Learning, with a particular focus on computer vision algorithms such as object detection, pose estimation, generative models, and tracking. I love to develop practical computer vision algorithms as well as deploy them into real-world applications.

Publications

Rusheng Zhang*, **Depu Meng***, Shengyin Shen, Zhengxia Zou, Houqiang Li, Henry X. Liu.
MSight: An Edge-cloud Infrastructure-based Perception System for Connected Automated Vehicles
Submitted to IEEE Transactions on Intelligent Transportation Systems.

Rusheng Zhang, **Depu Meng**, Lance Bassett, Shengyin Shen, Zhengxia Zou, Henry X. Liu.
Robust Roadside Perception for Autonomous Driving: An Annotation-free Straegy with Synthesized Data.
IEEE Transactions on Intelligent Vehicles.

Rusheng Zhang, **Depu Meng**, Tinghan Wang, Tai Karir, Shengyin Shen, Michael Maile, Michael Shulman, Henry X. Liu.

Systematic Assessment of Roadside Perception Systems for Automated Vehicles: Insights from Field Testing
Transportation Research Board Annual Meeting, 2024.
Submitted to IEEE Transactions on Intelligent Transportation Systems.

Depu Meng, Owen Sayer, Rusheng Zhang, Shengyin Shen, Houqiang Li, Henry X. Liu
ROCO: A Roundabout Traffic Conflict Dataset
Transportation Research Board Annual Meeting, 2023.

Depu Meng, Changqian Yu, Deheng Qian, Houqiang Li, Dongchun Ren.
HyMo: Hybrid Motion Representation Learning for Prediction from Raw Sensor Data.
IEEE Transaction on Multimedia, 2023.
Yunsheng Ni, **Depu Meng**, Changqian Yu, Chengbin Quan, Dongchun Ren, Youjian Zhao.
CORE: Consistent Representation Learning for Face Forgery Detection.
CVPR 2022 Workshop on Media Forensics.

Depu Meng*, Xiaokang Chen*, Zejia Fan, Yuhui Yuan, Gang Zeng, Houqiang Li, Lei Sun, Jingdong Wang.
Conditional DETR for Fast Training Convergence.
International Conference on Computer Vision, 2021.

Depu Meng, Zigang Geng, Zhirong Wu, Bin Xiao, Houqiang Li, Jingdong Wang.
Consistent Instance Classification for Unsupervised Representation Learning.
ICCV 2021 Workshop on Self-supervised Learning for Next-Generation Industry-level Autonomous Driving.

Ke Sun, Zigang Geng, **Depu Meng**, Bin Xiao, Dong Liu, Zhaoxiang Zhang, Jingdong Wang.
Bottom-Up Human Pose Estimation by Ranking Heatmap-Guided Adaptive Keypoint Estimates.
Tech Report.

Liming Zhao, Mingjie Li, **Depu Meng**, Xi Li, Zhuowen Tu, Zhaoxiang Zhang, Yueting Zhuang, J. Wang.
Deep Convolutional Neural Networks with Merge-and-Run Mappings.
International Joint Conference on Artificial Intelligence, 2018.

Research and Engineering Projects

Full-stack Road-side Perception Development, Deployment, Evaluation *Apr. '22 – present*

- I am working on developing the full-stack road-side object detection and tracking algorithm for autonomous driving. We are trying to build a robust and scalable roadside perception system. Our research includes detection on adverse conditions, detection for Vulnerable Road Users, detection of safety-critical events. (Submitted to IEEE T-IV, IEEE T-ITS)
- The perception system has been deployed with an Edge-Cloud (AWS) architecture at 8 sites in City of Ann Arbor, Michigan, and we are working with other partners for deployment in Oakland County, Michigan.
- We are studying on how to detect car crash accidents and traffic conflict events from videos recorded by road-side cameras. (Accepted by TRBAM 2023)
- We developed a roadside perception evaluation approach, and evaluated three roadside perception systems in the Mcity Test Facility. (Accepted by TRBAM 2024, submitted to IEEE T-IV)

LiDAR-based Perception and Motion Prediction for Autonomous Driving *Aug. '21 – Apr. '22*

- We propose a framework that jointly performs instance-wise motion (global motion) prediction and point-wise motion (local motion) prediction. We find out that global motion prediction and local motion prediction can mutually benefit from each other. (Accepted by IEEE T-MM)

Transformer based Object Detection *Dec. '20 – Jul. '21*

- Identify and solve the slow training convergence problem in DETR. Introduce conditional spatial embedding to dynamically shrink the search space of cross-attention to object extremities and region inside objects. $10\times$ training speed-up is achieved. (Accepted by ICCV 2021)

Unsupervised Representation Learning *Apr. '20 – Oct. '20*

- Study the instance classification method in unsupervised representation learning. Propose a consistent instance classification method to ease the optimization difficulty in instance classification. Verify the quality of learned representations on varies down-stream tasks: object detection, instance segmentation, semantic segmentation, pose estimation. (Accepted by ICCV Workshop 2021)

Real-time Semantic Segmentation *Dec. '19 – Mar. '20*

- Build a high-efficiency semantic segmentation network based on HRNet. (Shipped to Microsoft Form Recognizer for Table Segmentation)

Open-sourced Projects

Roundabout Traffic Conflict Dataset and Intersection Trajectory Dataset University of Michigan

Developer and Maintainer *Jan. '23 – present*

- We collected and annotated a roundabout traffic conflict dataset through the conflict detection algorithm and roadside perception system: Dataset link.
- We also open-sourced an intersection vehicle trajectory dataset collected by our roadside perception system. The dataset contains two weeks of trajectory data at two intersections in City of Ann Arbor: Dataset link.

Integration of Conditional DETR to HuggingFace Microsoft Research Asia

Developer *Jun. '22 – Dec. '22*

- I integrated the Conditional DETR model into the HuggingFace object detection community. Project is open-source: HuggingFace link

Deep Learning GUI Development Microsoft Research Asia

Front-end developer *Oct. '17 – Dec. '17*

- UWP based front-end, Python based back-end software. Use Keras as deep learning platform.
- Support remote connection, GUI-based model building, editing, saving, loading for plain CNN architectures. Support loss curve display.
- Project is open-source: Github link

Awards

Shenzhen Stock Exchange Scholarship, USTC *Dec. '22*

Star of Tomorrow Internship Award, Microsoft Research Asia *Jul. '18*

First Prize in Intelligent Robot Competition, Harbin Institute of Technology *Jul. '16*

The AEGON-INDUSTRIAL Fund Scholarship, USTC *Oct. '15*

Services

Conference Reviewer: CVPR 2022, CVPR 2023, CVPR 2024, ECCV 2022, ECCV 2024, ICCV 2023, CICAI 2022, TRBAM 2023, TRBAM 2024

Journal Reviewer: IEEE T-IV, IEEE T-MM, IEEE T-CSVT, Neurocomputing