YUNSHENG MA

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EDUCATION

Purdue University — West Lafayette, IN
Ph.D., Research Field: Autonomous Driving, Transportation Engineering — Jan. 2023 – Present

New York University — New York, NY
Master of Science, Computer Science — Sep. 2020 – May 2022

Harbin Institute of Technology — Weihai, China
Bachelor of Engineering, Computer Software Engineering — Sep. 2016 – May 2020

University of California, Berkeley — Berkeley, CA
Visiting Students, Electrical Engineering and Computer Sciences — Aug. 2018 – May 2019

SELECTED PUBLICATIONS

In Conference Proceedings (*denotes co-first authors)

Y. Ma*, C. Cui*, X. Cao*, W. Ye, P. Liu, J. Lu, A. Abdelraouf, R. Gupta, K. Han, A. Bera, J. M. Rehg, Z. Wang. "LaMPilot: An Open Benchmark Dataset for Autonomous Driving with Language Model Programs." In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition* (**CVPR**), 2024.

X. Cao*, T. Zhou*, **Y. Ma***, W. Ye, C. Cui, K. Tang, Z. Cao, K. Liang, Z. Wang, J. M. Rehg, and C. Zheng. "MAPLM: A Real-World Large-Scale Vision-Language Dataset for Map and Traffic Scene Understanding." In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition* (**CVPR**), 2024.

J. Lu*, C. Cui*, **Y. Ma**, A. Bera, and Z. Wang. "Quantifying Uncertainty in Motion Prediction with Variational Bayesian Mixture." In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition* (**CVPR**), 2024.

Y. Ma*, J. Lu*, C. Cui, S. Zhao, X. Cao, W. Ye, Z. Wang. "MACP: Efficient Model Adaptation for Cooperative Perception." In *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision* (**WACV**), 2024.

C. Cui*, **Y. Ma***, X. Cao*, W. Ye*, Y. Zhou, K. Liang, J. Chen, J. Lu, Z. Yang, K. Liao, T. Gao, E. Li, K. Tang, Z. Cao, T. Zhou, A. Liu, X. Yan, S. Mei, J. Cao, Z. Wang, C. Zheng. "A Survey on Multimodal Large Language Models for Autonomous Driving." In *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) Workshops*, 2024.

C. Cui, **Y. Ma**, X. Cao, W. Ye, Z. Wang. "Drive As You Speak: Enabling Human-Like Interaction With Large Language Models in Autonomous Vehicles." In *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) Workshops*, 2024.

Y. Ma, W. Ye, X. Cao, A. Abdelraouf, K. Han, R. Gupta, Z. Wang. "CEMFormer: Learning to Predict Driver Intentions from In-Cabin and External Cameras via Spatial-Temporal Transformers." *IEEE 26th International Conference on Intelligent Transportation Systems* (**ITSC**), 2023.

W. Ye, **Y. Ma**, X. Cao, K. Tang. "Mitigating Transformer Overconfidence via Lipschitz Regularization." In *Proceedings of the Thirty-Ninth Conference on Uncertainty in Artificial Intelligence* (**UAI**), 2023.

S. Zhao*, **Y. Ma***, Y. Gu, J. Yang, T. Xing, P. Xu, R. Hu, H. Chai, and K. Keutzer. "An End-to-End Visual-Audio Attention Network for Emotion Recognition in User-Generated Videos." In *Proceedings of the AAAI Conference on Artificial Intelligence* (**AAAI**), 2020, **Oral Presentation**.

Journal Articles

Y. Ma, R. Du, A. Abdelraouf, K. Han, R. Gupta, Z. Wang. "Driver Digital Twin for Online Recognition of Distracted Driving Behaviors." *IEEE Transactions on Intelligent Vehicles*, 2024.

C. Cui, **Y. Ma**, J. Lu, Z. Wang. "REDFormer: Radar Enlightens the Darkness of Camera Perception with Transformers." *IEEE Transactions on Intelligent Vehicles*, 2023.

Work Experience

Digital Twin Lab, Purdue University Aug. 2022 – Present
Graduate Research Assistant Advised by Dr. Ziran Wang

Foundation Models for Autonomous Driving: Proposed *LaMPilot*, a new benchmark for language-guided autonomous driving, which uses LLMs to translate natural language instructions into executable codes that act as driving policies. *LaMPilot* combines functional primitives with heuristics, enabling the LLM to interact safely with the driving environment through code generation. The benchmark was used to compare a variety of SOTA LLMs in zero-shot, few-shot, and human-in-the-loop settings. Works have been published in **CVPR**.

BEV Perception: Proposed a novel MACP framework to adapt a single-agent pre-trained model with cooperation capabilities. It achieves SOTA performance in both simulation and real-world cooperative perception benchmarks, with fewer tunable parameters and reduced communication cost. Works have been published in **WACV**.

In-Cabin Monitoring: Proposed novel multi-view spatial-temporal Transformers for driver intention prediction, driver action recognition, and temporal action localization. Works have been published in **T-IV** and **ITSC**.

Didi Chuxing June 2019 – Sep. 2019
Research Engineer Intern Advised by Dr. Pengfei Xu

Video Emotion Recognition: Proposed a Visual-Audio Attention Network (VAANet) that integrates spatial, channel-wise, and temporal attentions into a 3D convolutional neural network. It achieved SOTA performance on both the VideoEmotion-8 and Ekman-6 datasets. Work published at **AAAI**.

Professional Activities

As a Workshop/Challenge Organizer

Co-Chair of *WACV 2024 Workshop on Large Language and Vision Models for Autonomous Driving*, Waikoloa, Hawaii.

Co-Organizer of the MAPLM Challenge: *A Vision-Language Benchmark for Map and Traffic Scene Understanding*.

As a Reviewer

Reviewer of *International Joint Conference on Artificial Intelligence* (**IJCAI**) 2024
Reviewer of *IEEE/CVF Conference on Computer Vision and Pattern Recognition* (**CVPR**) 2024
Reviewer of *IEEE International Symposium on Biomedical Imaging* (**ISBI**) 2024
Reviewer of *IEEE International Conference on Intelligent Transportation Systems* (**ITSC**) 2023
Reviewer of *ACM/IEEE International Conference on Cyber-Physical Systems* (**ICCPS**) 2023
Reviewer of *IEEE International Conference on Mobility: Operations, Services, and Technologies* (**MOST**) 2023

Reviewer of *IEEE Internet of Things Journal* (**IoT-J**)
Reviewer of *IEEE Transactions on Intelligent Vehicles* (**T-IV**)

As a Volunteer

Volunteer of *Conference on Uncertainty in Artificial Intelligence* (**UAI**) 2023
Volunteer of *AAAI Conference on Artificial Intelligence* (**AAAI**) 2023
Assistant Moderator of *TRB Conference on Innovations in Travel Analysis and Planning* 2023
Webmaster of *IEEE Technical Committee on Internet of Things in Intelligent Transportation System* 2022 – Present

Fellowships & Awards

Annual Conference on Next-Generation Transportation Systems, *Outstanding Speaker Award* 2023
AAAI Student Scholarship Grant 2023
NeurIPS ML4AD Grant by Waymo 2022

Technical Skills

Programming: Python, C/C++

Packages: PyTorch, Lightening, Hugging-Face, LangChain, Carla, OpenAI-Gym, OpenCV

Tools: Git, LaTeX, SQL