YUNSHENG MA

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EDUCATION

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

New York University — New York City, 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 Student, Electrical Engineering and Computer Sciences — Aug. 2018 – May 2019

SELECTED PUBLICATIONS

In Conference Proceedings (*denotes co-first authors)

[CVPR'24] **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*, 2024.

[CVPR'24] 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*, 2024.

[CVPR'24] 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*, 2024.

[WACV'24] **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*, 2024.

[WACVW'24] 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 Workshops*, 2024.

[ITSC'23] **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 International Conference on Intelligent Transportation Systems*, 2023.

[UAI'23] W. Ye, **Y. Ma**, X. Cao, K. Tang. "Mitigating Transformer Overconfidence via Lipschitz Regularization." In *Proceedings of the Conference on Uncertainty in Artificial Intelligence*, 2023.

[AAAI'20] 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*, 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

Embodied AI for Autonomous Driving [CVPR'24]: 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 0-shot, 3-shot, and human-in-the-loop settings.

BEV-Based 3D Detection [WACV'24]: Proposed the MACP framework to adapt a single-agent pre-trained model with cooperation capabilities. MACP achieved SOTA performance in both simulation and real-world cooperative perception benchmarks, with fewer tunable parameters and reduced communication cost.

Vision-Based Driver Monitoring [IEEE T-IV]: Proposed multi-view spatial-temporal Transformers for driver intention prediction, driver action recognition, and temporal action localization.

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

Video Emotion Recognition [AAAI'20]: Proposed a Visual-Audio Attention Network (VAANet) that integrates spatial, channel-wise, and temporal attentions into a 3D convolutional neural network. VAANet achieved SOTA performance on both the VideoEmotion-8 and Ekman-6 benchmarks.

Professional Activities

Organizing Committee

Co-Organizer, WACV 2024 Workshop on Large Language and Vision Models for Autonomous Driving — 2024
Co-Organizer, MAPLM Challenge: A Vision-Language Benchmark for Map and Traffic Scene Understanding — 2024

Reviewer | Program Committee Member

ECCV (European Conference on Computer Vision) — 2024
IJCAI (International Joint Conference on Artificial Intelligence) — 2024
CVPR (IEEE/CVF Conference on Computer Vision and Pattern Recognition) — 2024
ISBI (IEEE International Symposium on Biomedical Imaging) — 2024
IV (IEEE Intelligent Vehicles Symposium) — 2023, 2024
ITSC (IEEE International Conference on Intelligent Transportation Systems) — 2023
ICCPS (ACM/IEEE International Conference on Cyber-Physical Systems) — 2023
MOST (IEEE International Conference on Mobility: Operations, Services, and Technologies) — 2023
IEEE Internet of Things Journal
IEEE Transactions on Intelligent Vehicles

Volunteer

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

Selected Awards

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

Technical Skills

Programming: Python, C++

Libraries: PyTorch, Lightening, Hugging-Face, LangChain, Gymnasium, Open3D, OpenCV

Tools: CARLA, Chroma, Git, LaTeX, SQL