Sanbao Su

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QUALIFICATIONS

- Several publications at conferences and journals, including ICRA, CVPR, ECCV, DAC, RAL, TMLR.
- Strong research experience in Robotics, Autonomous Vehicles, Augmented Reality, Computer Vision, Machine Learning, Deep Learning, and Vision Language Model (VLM).
- Strong programming experience on C++, Python, PyTorch, Tensorflow and data structures.
- More than 2 years of full-time work experience as a software engineer in the world's top 500 companies, including the Autonomous Vehicle Dep, focusing on C++ coding, software design, and software systems.
- Collaboration skills, project development with 50+ people and managed a team of 15 programmers.

EDUCATION

Ph.D., Machine Learning, Department of Computer Science and Engineering **Expected 05/2025**
University of Connecticut, Storrs, CT, USA *GPA: 4.00/4.00*
Research field: Uncertainty Quantification, Perception, Reinforcement Learning, Vision Language Model

M.A., Electronic Science, Department of Electrical and Computer Engineering **03/2019**
Shanghai Jiao Tong University, Shanghai, China *GPA: 3.78/4.00*
Thesis: Novel Methods for Approximate Logic Synthesis Research field: EDA, approximate computing

B.S., Automation, Department of Automation **06/2016**
Nanjing University, Nanjing, China *GPA:4.45/5.00*

INDUSTRY RESEARCH EXPERIENCE

Applied Scientist Intern **Amazon, Westborough, MA, USA, 08/2024 - 12/2024**

- Designing models on object tracking systems at Scanless Technologies team of Amazon Robotics.

Student Researcher **Google, Mountain View, CA, USA, 05/2024 - 08/2024**

- Developed the semantic-aware localization algorithm for the indoor scenario in AR Core team. Achieved 0.2 meters RMSE on position and 10 degrees RMSE on orientation for the collected dataset.
- Implemented and presented our algorithm with an indoor navigation demo on the Google Pixel phone.

Research Intern **Bosch Research Center, Sunnyvale, CA, USA, 05/2023 - 08/2023**

- Developed a Vision Transformer-Assisted Active Testing algorithm for Label-Efficient Evaluation of dense recognition tasks (object detection and segmentation). Adaptable to varying levels of sample complexity. Active testing estimates models' performance on an unlabeled test dataset with a limited annotation budget.
- Compared to baselines, achieve 6X improvement. Specifically, our approach achieves a 1.36% error rate in risk estimation with only 0.07% labels. The paper was accepted by ECCV 2024.

Deep Learning Research Intern **Tocodec Information Tech. Company, Shanghai, China, 03/2018 - 06/2018**

- Used H266 as the baseline of image compression, and developed a post-processing algorithm which is composed of convolutional layers and residual blocks with the Tensorflow framework on Python.
- Gained the comprehensive first prize at the 2018 CVPR Challenge on Learned Image Compression.

ACADEMIC RESEARCH EXPERIENCE

Research Assistant **Computer Science and Engineering, UCONN, CT, USA, 09/2021 - Present**

- Developing the uncertainty-aware Vision Language Model (VLM) algorithm.

- Developed an uncertainty-aware camera-based 3D semantic scene completion method for autonomous vehicles, including uncertainty propagation and conformal prediction. Outcomes: Experimental results showed our algorithm achieves a 14.61% improvement in accuracy and an 85% reduction in uncertainty.
- Developed the uncertainty qualification algorithm for the 3D cooperative object detection of connected autonomous vehicles (CAVs) to improve the performance of the later module of autonomous driving such as prediction and planning (the first one to do it). Outcomes: Experimental results showed our algorithm achieves more than 4× improvement in uncertainty score and more than 3% accuracy improvement, compared with the state-of-the-art. The paper was published in ICRA 2023.
- Developed the state-adversarial multi-agent reinforcement learning algorithm. The paper was published in Transactions on Machine Learning Research (Second Author). Developed a stable and efficient reward reallocation algorithm to efficiently reallocate the system's total reward to motivate stable cooperation among autonomous vehicles. The paper was published in ICRA 2022 (Third Author).

Research Assistant **UM-SJTU Joint Institute, Shanghai, China, 09/2016 - 03/2019**

- Developed algorithms and did experiments with C++ for two projects on approximate logic synthesis. Published three papers for these two projects in the top conferences and journals.

WORK EXPERIENCE

Full-time Software Engineer **Shanghai Huawei Technologies Company, Shanghai, China, 04/2019 - 08/2021**
At the Autonomous Vehicle Software Department, 03/2021-08/2021:

- Wrote C++ 3KLoc and 40+ test cases for 2 key projects of autonomous vehicles, focusing on planning with traffic lights in the Behavior Decision Maker Group.
- Engineering experience on ROS and rule-based behavior decision algorithms of the autonomous vehicle.

At the 5G Software Development Department, 04/2019-03/2021:

- Wrote C++ 32.5KLoc and 600+ test cases for 8 key projects of gNodeB (embedded, RTOS).
- Optimized code performance for one year, mainly reduced memory fragmentation, such as replacing the memory allocation with the shared memory pool, removing memset and memcpy operations.

SKILLS

Language: Python, C++, C, Pytorch, Tensorflow, MATLAB, LaTeX.
Algorithm: Machine Learning, Deep Learning, Reinforcement Learning, Vision Language Model, Computer Vision.

SELECTED PUBLICATIONS (7/14)

- **Sanbao Su**, Nuo Chen, Juefei Xu, Chen Feng, and Fei Miao "Uncertainty-Aware Camera-based 3D Semantic Scene Completion", submitted to 2024 Conference on Neural Information Processing Systems, under review.
- **Sanbao Su**, Xin Li, Thang Doan, Sima Behpour, Wenbin He, Liang Gou, Fei Miao, and Liu Ren "MetaAT: Active Testing for Label-Efficient Evaluation of Dense Recognition Tasks", accepted by 2024 European Conference on Computer Vision (ECCV).
- **Sanbao Su**, Songyang Han, Yiming Li, Zhili Zhang, Chen Feng, Caiwen Ding, and Fei Miao, "Collaborative Multi-Object Tracking with Conformal Uncertainty Propagation", published in IEEE Robotics and Automation Letters. Website: coperception.github.io/MOT-CUP.
- **Sanbao Su**, Yiming Li, Sihong He, Songyang Han, Chen Feng, Caiwen Ding, and Fei Miao, "Uncertainty Quantification of Collaborative Detection for Self-Driving," published in 2023 IEEE International Conference on Robotics and Automation (ICRA). Website: coperception.github.io/double-m-quantification.
- **Sanbao Su**, Yi Wu, and Weikang Qian, "Efficient Batch Statistical Error Estimation for IterativeMulti-level Approximate Logic Synthesis," in 55th Design Automation Conference, San Francisco, CA, USA, 2018.
- Songyang Han, **Sanbao Su**, Sihong He, Shuo Han, Haizhao Yang, Shaofeng Zou, and Fei Miao, "What is the Solution for State-Adversarial Multi-Agent Reinforcement Learning?" published in TMLR, 2024.
- Lei Zhou, Chunlei Cai, Yue Gao, **Sanbao Su**, and Junmin Wu, "Variational Autoencoder for Low Bit-rate Image Compression," in the IEEE / CVF Computer Vision and Pattern Recognition (CVPR) Workshops, 2018.