Sanbao Su

University of Connecticut, Storrs, CT,
susanbaonju@gmail.com   (959) 929-9265
Website: https://sanbaos.com/

QUALIFICATIONS

- Collaboration skills, project development with 50+ people and managed a team of 15 programmers.
- Strong object oriented programming experience: 8 years of C++ experience, 4 years of Python experience.
- Skilled at PyTorch, Tensorflow, C++ library (STL) and data structures.
- Strong research experience on autonomous vehicles, Computer Vision and robotics.
- 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.
- Several publications at conferences and journals, including ICRA, CVPR, DAC, RAL, TMLR.

EDUCATION

Ph.D., Machine Learning, Department of Computer Science and Engineering   09/2021 - Present
University of Connecticut, Storrs, CT, USA   GPA: 4.00/4.00
Research field: Uncertainty Quantification, Perception, Reinforcement Learning, Autonomous Vehicles

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

RESEARCH EXPERIENCE

Research Assistant   Computer Science and Engineering, University of Connecticut, CT, USA, 09/2021 - Present

- Developed the framework to quantify the uncertainty of collaborative object detection and propagate the uncertainty to multiple object tracking in order to demonstrate the importance of uncertainty quantification in both object detection and tracking of autonomous driving (the first one to do it). Outcomes: Experimental results showed our algorithm achieves a 2% improvement in accuracy and a 2.67X reduction in uncertainty. The paper was accepted by IEEE Robotics and Automation Letters.
- Developed the uncertainty qualification algorithm for the 3D cooperative object detection of connected autonomous vehicles (CAVs) in order 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 $4\times$ improvement in uncertainty score and more than 3% accuracy improvement, compared with the state-of-the-art. Designed Algorithm, wrote code, conducted experiments, and analyzed the results with Pytorch on Python. The paper was accepted by ICRA 2023.
- Collaborated in designing the state-adversarial multi-agent reinforcement learning algorithm. The paper was accepted by Transactions on Machine Learning Research (Second Author). Collaborated in designing 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 accepted by ICRA 2022 (Third Author).

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

- Developed a Vision Transformer-Assisted Active Testing for Label-Efficient Evaluation that provides computational efficiency, flexibility for tasks such as object detection and segmentation, and adaptability to varying levels of sample complexity (Active testing carefully selects the test points to label, ensuring sample-efficient model evaluation). Outcomes: Compared to baselines, achieve 6X improvement. Specifically, our approach achieves a 1.36% error rate in risk estimation with only 0.07% labels, which has 10X improvement compared to baselines. Submit to CVPR 2024.

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

- Designed algorithms and did experiments with C++ for two projects on approximate logic synthesis. Published three papers for these two projects in the top conference 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, wrote 40+ test cases, and delivered 2 key requirements of the planning module of autonomous driving which are about planning with traffic lights in the Behavior Decision Maker Group.
- Conducted weekly tests of software version on real autonomous vehicles, found and reported problems.
- Experience on ROS and rule-based behavior decision algorithms.

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

- Wrote C++ 32.5KLoc, wrote 600+ test cases, delivered 8 key requirements of gNodeB (embedded, RTOS).
- Refactored four function modules so that reduced 5KLoc, and improved the expandability and readability of codes; fully understand the concept of refactoring and clean code.
- Reviewed code of others for half a year, focused on functional, code style problems, and test case design.
- 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.
- Played the function owner in 4 key software projects, managed teams of 6-15 programmers, formulated the delivery plan, organized weekly meetings, constructed hardware experimental environment, tested codes, and finally submitted the codes without any basic function problems before the deadline.

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

- Used H266 as the baseline of image compression, designed one post-processing algorithm which is composed of convolutional layers and residual blocks with the Tensorflow framework on Python
- Applied and tested different model acceleration technologies on the post-processing, such as MobileNet V1/V2, and Network Quantization, finally reduced up to 50.3% running time with slight performance loss.
- Gained the comprehensive first prize at the 2018 CVPR Challenge on Learned Image Compression.

SKILLS

- Programming: Python, C++, C, MATLAB.
- Algorithm: Data Structure, Machine Learning, Deep Learning, Reinforcement Learning, Computer Vision.

SELECTED PUBLICATIONS (6/13)

- Sanbao Su, Xin Li, Thang Doan, Sima Behpour, Wenbin He, Liang Gou, Fei Miao, Liu Ren "ViTAL: Vision Transformer-Assisted Active Testing for Label-Efficient Evaluation of Complex Vision Tasks", submitted to the 2024 IEEE / CVF Computer Vision and Pattern Recognition Conference, under review.
- Sanbao Su, Songyang Han, Yiming Li, Zhili Zhang, Chen Feng, Caiwen Ding, Fei Miao, "Collaborative Multi-Object Tracking with Conformal Uncertainty Propagation", accepted by IEEE Robotics and Automation Letters. Website: https://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," accepted by the 2023 IEEE International Conference on Robotics and Automation. Website: https://coperception.github.io/double-m-quantification/.
- 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?" accepted by Transactions on Machine Learning Research. Website: https://songyanghan.github.io/what_is_solution/
- Sanbao Su, Yi Wu, and Weikang Qian, "Efficient Batch Statistical Error Estimation for Iterative Multi-level Approximate Logic Synthesis," in 55th Design Automation Conference, San Francisco, CA, USA, 2018.
- 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 Workshops, 2018.