

# Sanbao Su

## QUALIFICATIONS

University of Connecticut, Storrs, CT,  
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- More than 2 years of full-time work experience as a software engineer in the world's top 500 companies
- 6 years of C++ experience, 2 years of Python experience, 1 year of Matlab experience
- Skilled at C++ library (STL) and normal data structure, familiar with ROS, numpy, PyTorch and Tensorflow
- Project experience in computer vision, such as object detection in autonomous driving and image compression
- Collaboration skills, project development experience with 50+ people and managed a team of 15 programmers
- Project experience on robotics, such as autonomous vehicles, educational robotics
- Several publications at peer-reviewed conferences and journals

## EDUCATION

<b>Ph.D. Student, Machine Learning, Department of Computer Science and Engineering</b>	09/2021 - Present
University of Connecticut, Storrs, CT	GPA: 4.00/4.00
Research field: Uncertainty Quantification, Perception, Deep Learning, Reinforcement Learning	
<b>M.A., Electronic Science and Technology, Department of Electrical and Computer Engineering</b>	03/2019
Shanghai Jiao Tong University, Shanghai, China	GPA: 3.78/4.00
Thesis: Novel Methods for Approximate Logic Synthesis	
<b>B.S., Automation, Department of Automation</b>	06/2016
Nanjing University, Nanjing, China	GPA: 4.45/5.00
Related courses: Algorithm, Operating Systems, Machine Learning, Machine Vision, Data Structure, Stochastic Process, Reinforcement Learning, C/C++ Programming Language, Operational research	

## RESEARCH EXPERIENCE

**Research Assistant** University of Connecticut, Storrs, CT, 09/2021 - Present

- Designed 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. Outcomes: We are the first ones to do it. Experimental results showed our algorithm achieves more than 4× improvement on 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 has been submitted to ICRA 2023
- Wrote code and conducted experiments for the robust multi-agent reinforcement learning algorithm with adversarial state perturbations. The paper has been submitted to AAAI 2023
- Wrote code and conducted experiments for a stable and efficient reward reallocation algorithm to motivate cooperation for multi-agent reinforcement learning. The paper was accepted by ICRA 2022

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

- Designed a novel heuristic algorithm for two-level approximate logic synthesis to identify an approximate sum-of-product expression under a given error rate constraint so that it has the fewest literals. Outcomes: Through experiments with C++, we proved our algorithm is better than the previous state-of-the-art. The paper was accepted by IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems
- Designed a novel batch error estimation method based on Monte Carlo simulation and local change propagation to improve the performance of existing multi-level approximate logic synthesis flows. Outcomes: Through experiments with C++, under the average error magnitude, it achieves an improvement of 2.3x in area. The paper was accepted by the 55th Design Automation Conference (top conference in the EDA field) and IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems

## WORK EXPERIENCE

**Full-time Software Engineer** Shanghai Huawei Technologies Company, Shanghai, China, 04/2019 - 08/2021

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

- Wrote C++ 32.5KLoc, wrote 600+ test cases, delivered 8 key requirements of gNodeB (one embedded device)
- 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 other team members for half a year, found functional problems, code style problems, and test cases design problems
- 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 requirements, 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
- Passed the C++ Professional Software Proficiency Exam in Huawei which is designed for senior software engineers, skilled in C++ and C++ STL, and familiar with Design Patterns
- Trained two new engineers, helped them quickly master business knowledge

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
- Weekly tested the software version on real autonomous vehicles (road test), found problems and reported
- Familiar with main modules of autonomous driving, such as perception, prediction, planning and control
- Familiar with ROS and rule-based behavior decision algorithm

**Deep Learning Research Intern** Cadence Design System Company, Shanghai, China, 07/2018-10/2018

- Read and introduced latest paper on deep learning
- Designed deep learning algorithms to predict the congestion map of circuits, tested these algorithms with the Tensorflow framework on Python

**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 architecture 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 architecture, such as MobileNet V1/V2, and Neural Network Quantization, finally reduced up to 50.3% running time with slight performance loss
- Submitted our work to the 2018 CVPR Challenge on Learned Image Compression and gained the comprehensive first prize

## SELECTED PUBLICATIONS

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- Sanbao Su, Yiming Li, Sihong He, Songyang Han, Chen Feng, Caiwen Ding, and Fei Miao, "Uncertainty Quantification of Collaborative Detection for Self-Driving," under review in 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, and Fei Miao, "Robust Multi-Agent Reinforcement Learning Under Adversarial State Perturbations," under review in the 2023 AAAI Conference on Artificial Intelligence
- Songyang Han, He Wang, Sanbao Su, Yuanyuan Shi, and Fei Miao, "Stable and Efficient Reward Reallocation for Cooperative Policy Learning of Connected Autonomous Vehicles," in 2022 IEEE International Conference on Robotics and Automation, Philadelphia, USA, 2022

- Sanbao Su, Chang Meng, Fan Yang, Junfeng Zhao, and Weikang Qian, "VECBEE: A Versatile Efficiency-Accuracy Configurable Batch Error Estimation Method for Greedy Approximate Logic Synthesis," in IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems
- Sanbao Su, Chen Zou, Weijiang Kong, Jie Han, and Weikang Qian, "A Novel Heuristic Search Approach for Two-level Approximate Logic Synthesis," in IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems
- 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 Conference on Computer Vision and Pattern Recognition Workshops, 2018.