Yuntianyi Chen

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EDUCATION

Ph.D. Candidate in Software Engineering 2021.09—Present
Donald Bren School of Information and Computer Sciences
University of California, Irvine, USA

Bachelor of Computer Science and Technology 2016.09—2020.06
School of Computer
Wuhan University, China

WORK EXPERIENCES

- **Graduate Student Researcher** in University of California, Irvine 2021.09—Present
- **Teaching Assistant** in University of California, Irvine 2021.09—Present
- **Research Assistant** in Wuhan University 2020.07—2021.07
- **Undergraduate Student Researcher** in Wuhan University 2017.11—2020.06
- **Teaching Assistant** in Wuhan University 2017.09—2017.12

PUBLICATIONS

[1] Yuntianyi Chen, Yuqi Huai, Yirui He, Shilong Li, Changnam Hong, Qi Alfred Chen, Joshua Garcia. “A Comprehensive Study of Bug-Fix Patterns in Autonomous Driving Systems”. Proc. ACM Softw. Eng. 2, FSE (2025). (**FSE 2025**)

[2] Yuntianyi Chen, Yuqi Huai, Shilong Li, Changnam Hong, Joshua Garcia. “Misconfiguration Software Testing for Failure Emergence in Autonomous Driving Systems”. Proc. ACM Softw. Eng. 1, FSE (2024), 1913–1936. (**FSE 2024**)

[3] Yuqi Huai, Sumaya Almanee, Yuntianyi Chen, Xiafa Wu, Qi Alfred Chen, Joshua Garcia. “scenoRITA: Generating Diverse, Fully Mutable, Test Scenarios for Autonomous Vehicle Planning”. IEEE Trans. Software Eng. 49, 10 (2023), 4656–4676. (**TSE 2023**)

[4] Yuqi Huai, Yuntianyi Chen, Sumaya Almanee, Tuan Ngo, Xiang Liao, Ziwen Wan, Qi Alfred Chen, Joshua Garcia. “Doppelgänger Test Generation for Revealing Bugs in Autonomous Driving Software”. In 45th IEEE/ACM International Conference on Software Engineering, ICSE 2023, Melbourne, Australia, May 14-20, 2023. IEEE, 2591–2603. (**ICSE 2023**)

[5] Yongfeng Gu, Yuntianyi Chen, Xiangyang Jia, Jifeng Xuan. “Multi-Objective Configuration Sampling for Performance Ranking in Configurable Systems”. In 26th Asia-Pacific Software Engineering Conference, APSEC 2019, Putrajaya, Malaysia, December 2-5, 2019. IEEE, 150–157. (**APSEC 2019**)

[6] Yuntianyi Chen, Yongfeng Gu, Lulu He, and Jifeng Xuan. “Regression Models for Performance Ranking of Configurable Systems: A Comparative Study”. In Structured Object-Oriented Formal Language and Method - 9th International Workshop, SOFL+MSVL 2019, Shenzhen, China, November 5, 2019. Springer, 243–258. (**SOFL+MSVL 2019**)

RESEARCH PROJECTS

A Comprehensive Study of Bug-Fix Patterns in Autonomous Driving Systems

- Skills: Node.js, Typescript, MongoDB, Python, Data Analysis, Data Visualization
- Proposed a hierarchy of ADS bug-fix pattern study classified by modularization granularity and contributed a benchmark of 1,331 ADS bug-fix instances from two open-source ADSes.
- Conducted the first empirical study of bug-fix patterns in the ADS domain that introduces and differentiates the concepts of syntactic and semantic bug-fix patterns, which serve as a practical guide for ADS software maintenance and identify opportunities for improved bug identification and repair.

Misconfiguration Software Testing for Failure Emergence in Autonomous Driving Systems

- Skills: Python, C++, Unsupervised Machine Learning, Software Testing, Multi-objective Optimization
- Proposed ConfVE, the first configuration testing approach in the autonomous driving system (ADS) domain, which serves as a testing framework that utilizes scenarios from ADS scenario-generation techniques and a genetic algorithm to produce alternative configurations to identify emerged failures.
- Evaluated ConfVE on two open-source versions of production-grade ADSes using 9 violation oracles. Designed 3 novel module-level oracles that detect bug-revealing violations in ADS scenarios.

scenoRITA: Generating Diverse, Fully Mutable, Test Scenarios for Autonomous Vehicle Planning

- Skills: Python, C++, Unsupervised Machine Learning, Software Testing, Multi-objective Optimization
- Introduced scenoRITA, a search-based testing framework, with a novel gene representation and domain-specific constraints, that automatically generates valid and effective driving scenarios.
- Employed an unsupervised clustering technique to group driving scenarios with similar violations according to extracted features, to automate the process of identifying and eliminating duplicate violations.
- Implemented 5 test oracles and the first search-based testing technique for AV software that uses multiple test oracles simultaneously and considers both comfort and safety violations as part of those oracles.

Doppelgänger Test Generation for Revealing Bugs in Autonomous Driving Software

- Skills: Python, C++, Software Testing, Multi-objective Optimization
- Presented DoppelTest, a framework that generates bug-revealing scenarios by making every vehicle an autonomous vehicle (AV) and models traffic control (e.g., traffic signals), which automatically addresses the key challenge of determining responsibility after an AV is involved in a violation (e.g., collision).

Multi-Objective Configuration Sampling in Configurable Systems

- Skills: Python, Multi-objective Optimization, Performance Prediction, Sampling
- Proposed a multi-objective sampling method, MoConfig, which uses Pareto optimization to minimize the number of samples we need to measure and maximize the ability to rank good configurations to the front. The research aims to balance the trade-off between the measurement cost and the ranking ability in the performance ranking problem.

Regression Models for Performance Ranking of Configurable Systems: A Comparative Study

- Skills: Python, Supervised Machine Learning, Performance Prediction, Sampling
- Conducted a comparative study on 4 different machine learning regression methods for the problem of performance ranking of configurable systems on 21 evaluation scenarios of 16 real world systems.
- Empirically studied the saved cost of sampling configurations and the correlation between evaluation measurements. Served as the first study that compares the regression models in terms of their ability to find good configurations and the measurement cost of sampling.

SERVICES

- **Reviewer**, IEEE Transactions on Software Engineering (TSE), Journal Paper 2024.11
- **Web & Publicity Chair, PC Member, & Reviewer**, 47th IEEE/ACM International Conference on Software Engineering (ICSE 2025), 1st International Workshop on Software Engineering for Autonomous Driving Systems (SE4ADS 2025) 2024.09
- **PC Member & Reviewer**, 47th IEEE/ACM International Conference on Software Engineering (ICSE 2025), Artifacts Evaluation Track 2024.09
- **Reviewer**, ACM Transactions on Software Engineering and Methodology (TOSEM), Journal Paper 2024.07
- **PC Member & Reviewer**, ACM Conference on Computer and Communications Security (CCS 2024), Artifacts Evaluation Track 2024.05
- **PC Member & Reviewer**, 21st International Conference on Software Architecture (ICSA 2024), Artifacts Evaluation Track 2024.03
- **Reviewer**, IEEE Robotics and Automation Letters (RA-L), Journal Paper 2024.01

HONORS & SCHOLARSHIPS

- ACM SIGSOFT CAPS Award in 2024
- NSF Student Travel Award in 2023
- Chair's Award, University of California, Irvine in 2021
- Scholarship for Outstanding Students (Top 10%) in 2017-2018, 2016-2017, and 2018-2019
- Chinese Undergraduate Computer Design Contest (Provincial Level, Second Prize) in 2018

TECH STACK

- **Programming Languages:** Python, C++, C, Java, Javascript, TypeScript, SQL, R, Matlab, Shell
- **Full-Stack**: React, HTML, CSS, Bootstrap, Node.js, Django, Flask, RESTful APIs, Unit Testing
- **Data Science**: MySQL, PostgreSQL, MongoDB, NumPy, Pandas, Matplotlib, BeautifulSoup4
- **Artificial Intelligence:** PyTorch, Scikit-learn, Machine Learning, Deep Learning, Transfer Learning
- **DevOps & Tools:** AWS, Kubernetes, Docker, CI/CD, Ansible, Bazel, Git, JIRA, Linux