Chengjie Lu

+47-413-16-813 | Oslo, Norway | chengjielu@simula.no | www.simula.no/people/chengjielu

Google Scholar | Chengjie-Lu | GitHub

PROFILE

My research focuses on ensuring the safety and trustworthiness of AI-driven autonomous systems, particularly in autonomous driving and robotics, through automated test generation, uncertainty quantification, and foundation models to build robust and reliable AI systems. Beyond academia, I have applied these methods in industrial and societal contexts, gaining experience in leading technical projects, collaborating with international teams, and publishing in top venues such as IEEE TSE, ICSE, FSE, and ICST.

EDUCATION

- **University of Oslo** 06.2022 - Now
  Ph.D. in Computer Science, Expected Graduation: 06.2026 Oslo, Norway
  - Research Interests: Quality Assurance for Autonomous Systems, encompassing Autonomous Driving, Robotics, Embodied AI, and AI-driven Healthcare Systems
- **Nanjing University of Aeronautics and Astronautics** 09.2019 - 04.2022
  M.Sc. in Computer Science Nanjing, China
  - Research Interests: Autonomous Driving System Testing, Automated Test Generation
- **Nanjing University of Aeronautics and Astronautics** 09.2015 - 06.2019
  B.Sc. in Software Engineering Nanjing, China

PROFESSIONAL EXPERIENCE

- **Simula Research Laboratory, Department of ComplexSE** 06.2022 - Present
  Ph.D. Research Fellow. I am mainly involved in three projects: Oslo, Norway
  - **RoboSapiens (EU Horizon Project)**
    This project studies the safety and trustworthiness of self-adaptive robots in unforeseen environments. My contributions are:
    - Led Task T1.3 on uncertainty quantification for AI-driven robotic systems. Successfully delivered all planned outputs that passed the Phase I&II reviews.
    - Contributed to Task T2.4 on verification of functional and safety requirements for robotic systems, developing automated verification tools based on advanced techniques; deliverables successfully passed the Phase I&II reviews.
  - **Co-Evolver (Research Council of Norway Project)**
    This project develops coevolution designs for self-adaptive CPSs using model-based engineering, evolutionary computation, and machine learning. My contributions are:
    - Led adaptive testing and verification for autonomous driving systems.
    - Developed automated testing frameworks using techniques like machine learning, supporting simulation testing, adaptive assessment, and system validation.
  - **AIT4CR (Research Council of Norway Project)**
    This project develops an AI-powered testing infrastructure for a Cancer Registry System to enhance system quality, data accuracy, and usability for healthcare stakeholders, with potential deployment to other registries. My contributions are:
    - Applied digital twins and deep learning techniques to support the evolution of the cancer registry system, enabling the simulation of stakeholders' and policymakers' socio-technical behaviors.

RESEARCH PROJECTS

- **Autonomous Vehicle Testing with Epigenetic Algorithm and Attention Mechanism [1], *IEEE TSE, 2024*** [GitHub]
  - Developed *EpiTESTER*, an epigenetics-inspired method to find critical unsafe scenarios for AVs.
  - Designed a fusion transformer to extract features from multi-modal environmental data.
  - Validated the approach on the **CARLA** simulation platform using state-of-the-art AV controllers (InterFuser and TCP), achieving up to a 3× improvement in collision detection over baselines with faster execution.
- **Autonomous Vehicle Testing with Reinforcement Learning (RL) [2], *IEEE TSE, 2022*** [GitHub]
  - Developed *DeepCollision*, an RL-based method to generate critical and effective test scenarios for AVs.
  - Designed a light-weight framework providing 52 environmental configuration REST API endpoints.
  - Released *DeepScenario* [5] dataset, with over 30K scenarios to support AV development, **published at MSR 2023**.
  - Validated the approach on **Baidu Apollo**, achieving a 2.6× improvement in collision detection while reducing execution time to 0.73× of the baselines.

- **Uncertainty and Quality Evaluation of Vision-Language-Action Model (VLA)-Enbaled Robots [14]** [GitHub]
  - Conducted uncertainty and quality evaluation of existing VLA models and proposed eight uncertainty metrics and five quality metrics for VLA-enabled robotic systems.
  - Validated on over 908 successful executions across three state-of-the-art VLA models and four types of robotic tasks.
  - Results demonstrated that multiple metrics significantly correlate with expert assessments, and some metrics can differentiate execution quality even without explicit test oracles.
  - Manuscript submitted to IEEE TSE.

Industrial Collaboration Projects

- **Vision Language Model (VLM)-Based Testing of Autonomous Mobile Robots (AMRs) [6], *ICSE2026*** [GitHub]
  - Collaborated with **PAL Robotics**, Spain, a leading robotic company. [Globe]
  - Developed a VLM-based scenario generation method, *RVSG*, to test AMR safety and functionality.
  - Designed prompt templates and memory-feedback mechanisms for multi-turn generation of human behavior.
  - Validated the approach on an industrial robot in Gazebo simulation, achieving on average 3.5× improvement in collision detection and 1.63× higher scenario diversity compared to baselines.

- **Assessing the Uncertainty and Robustness of the Laptop Refurbishing Robots [4], *ICST2025*** [GitHub]
  - Collaborated with **Danish Technological Institute**, Denmark, a leading insitute in robotics. [Globe]
  - Developed an uncertainty evaluation framework for DL–enabled laptop refurbishing robots.
  - Designed benchmark datasets using two vision language models (DALL-E and Stable Diffusion).
  - Conducted empirical evaluation of six DL–enabled laptop refurbishing software and provided guidelines for software selection based on the evaluation results.

- **Active Transfer Learning for Evolving Cyber-cyber Digital Twins in Cancer Registry [3], *ESEC/FSE2023*** [GitHub]
  - Collaborated with **Cancer Registry of Norway**, Norway, a national institute of 1.7 million cancer patients. [Globe]
  - Developed an DL–based cyber-cyber digital twin (CCDT) for the cancer registry system.
  - Developed *EvoClinical*, an active transfer learning evolution method, to support the evolution of CCDT.
  - Validated on three evolution processes, including six system versions, showing *EvoClinical*'s effectiveness with accuracy, recall, and F1 scores all beyond 91%.

Honors and Awards

- **the Chinese Government Award for Outstanding Self-financed Students Abroad, Group A** 2025
- **Bronze Medal, ACM Student Research Competition Grand Final** 2024
- **Gold Medal, ACM Student Research Competition@ICSE** 2023
- **NUAA Outstanding Graduate & Master Thesis Award** 2022

Academic Services

- **Academic Journal Reviewer**
  - IEEE Transactions on Software Engineering
  - ACM Transactions on Software Engineering and Methodology
  - IEEE Transactions on Intelligent Transportation Systems
  - IEEE Transactions on Industrial Informatics
  - Science of Computer Programming

- **Conference Program Committee Member**
  - ISSRE2024 Artifact Evaluation Track
  - ICST2024 Workshop, ICST2025 Workshop
  - SE4ADS2025/2026

Supervisory Experience

Co-supervised one master student for his thesis, guiding research design, methodology, analysis, and thesis writing.

Skills and Interests

- **Languages:** English (Fluent); Chinese (Native); Norwegian (A2 Level)
- **Technical Skills:** Python, PyTorch, Tensorflow, LaTeX, ChatGPT/OpenAI APIs
- **Interests:** Oslo Obstacle Race (Completed), Nanjing Marathon (Completed), Swimming (1 km in 24 minutes)

SELECTED PUBLICATIONS

A = Accepted, S = Submitted SEE FULL LIST ON ▷ GOOGLE SCHOLAR

[1,A] **Chengjie Lu**, Shaukat Ali, and Tao Yue. (2024). EpiTESTER: Testing Autonomous Vehicles With Epigenetic Algorithm and Attention Mechanism. *IEEE Transactions on Software Engineering*, Vol. 50, Issue 10, pp. 2614-2632.

[2,A] **Chengjie Lu**, Yize Shi, Huihui Zhang, Man Zhang, Tiexin Wang, Tao Yue, and Shaukat Ali. (2023). Learning Configurations of Operating Environment of Autonomous Vehicles to Maximize their Collisions. *IEEE Transactions on Software Engineering*, Vol. 49, Issue 1, pp. 384-402.

[3,A] **Chengjie Lu**, Qinghua Xu, Tao Yue, Shaukat Ali, Thomas Schwitalla, and Jan F. Nygård. (2023). EvoCLINICAL: Evolving Cyber-Cyber Digital Twin with Active Transfer Learning for Automated Cancer Registry System. In *Proceedings of the 31st ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 2023)*, pp. 1973–1984. ACM. 2023, San Francisco, CA, USA.

[4,A] **Chengjie Lu**, Jiahui Wu, Shaukat Ali, and Mikkel Labori Olsen. (2025). Assessing the Uncertainty and Robustness of the Laptop Refurbishing Software. In *2025 IEEE Conference on Software Testing, Verification and Validation (ICST)*, pp. 406-416. IEEE. 2025, Napoli, Italy.

[5,A] **Chengjie Lu**, Tao Yue, and Shaukat Ali. (2023). DeepScenario: An Open Driving Scenario Dataset for Autonomous Driving System Testing. In *2023 IEEE/ACM 20th International Conference on Mining Software Repositories (MSR)*, pp. 52-56. IEEE. 2023, Melbourne, Australia.

[6,A] Jiahui Wu, **Chengjie Lu**, Aitor Arrieta, Shaukat Ali, Thomas Peyrucain. (2025). Vision Language Model-based Testing of Industrial Autonomous Mobile Robots. In *2026 IEEE/ACM 48th International Conference on Software Engineering, Software Engineering in Practice (SEIP) Track*.

[7,A] Jiahui Wu, **Chengjie Lu**, Aitor Arrieta, Tao Yue, and Shaukat Ali. (2024). Reality Bites: Assessing the realism of driving scenarios with large language models. In *Proceedings of the 2024 IEEE/ACM First International Conference on AI Foundation Models and Software Engineering (FORGE '24)*, pp. 40–51. ACM. 2024, Lisbon, Portugal.

[8,A] **Chengjie Lu**, Huihui Zhang, Tao Yue, and Shaukat Ali. (2021). Search-Based Selection and Prioritization of Test Scenarios for Autonomous Driving Systems. In *13th International Symposium on Search Based Software Engineering (SSBSE 2021)*, pp. 41-55. Springer. 2021, Bari, Italy.

[9,A] Yize Shi, **Chengjie Lu**, Man Zhang, Huihui Zhang, Tao Yue, and Shaukat Ali. (2021). Restricted Natural Language and Model-based Adaptive Test Generation for Autonomous Driving. In *2021 ACM/IEEE 24th International Conference on Model Driven Engineering Languages and Systems (MODELS)*, pp. 101-111. IEEE. 2021, Fukuoka, Japan.

[10,A] **Chengjie Lu**. (2023). Test Scenario Generation for Autonomous Driving Systems with Reinforcement Learning. In *2023 IEEE/ACM 45th International Conference on Software Engineering: Companion Proceedings (ICSE-Companion)*, pp. 317-319. IEEE. 2023, Melbourne, Australia. **1st Place Winner at SRC@ICSE2023**.

[11,S] **Chengjie Lu**, Pablo Valle, Jiahui Wu, Erblin Isaku, Hassan Sartaj, Aitor Arrieta, and Shaukat Ali. Foundation Models for Software Engineering of Cyber-Physical Systems: the Road Ahead. Manuscript under major revision in *ACM Transactions on Software Engineering and Methodology (TOSEM)*.

[12,S] **Chengjie Lu**, Tao Yue, Man Zhang, and Shaukat Ali. Multi-Modal Reinforcement Learning-based Testing of Autonomous Driving Systems. Manuscript submitted for publication in *Journal of Systems and Software (JSS)*.

[13,S] **Chengjie Lu**, Jiahui Wu, Shaukat Ali, Malaika Din Hashmi, et al. UAMTERS: Uncertainty-Aware Mutation Analysis for DL-enabled Robotic Software. Manuscript submitted for publication in *ACM Transactions on Software Engineering and Methodology (TOSEM)*.

[14,S] Pablo Valle, **Chengjie Lu**, Shaukat Ali, and Aitor Arrieta. Evaluating Uncertainty and Quality of Visual Language Action-enabled Robots. Manuscript submitted for publication in *IEEE Transactions on Software Engineering*.