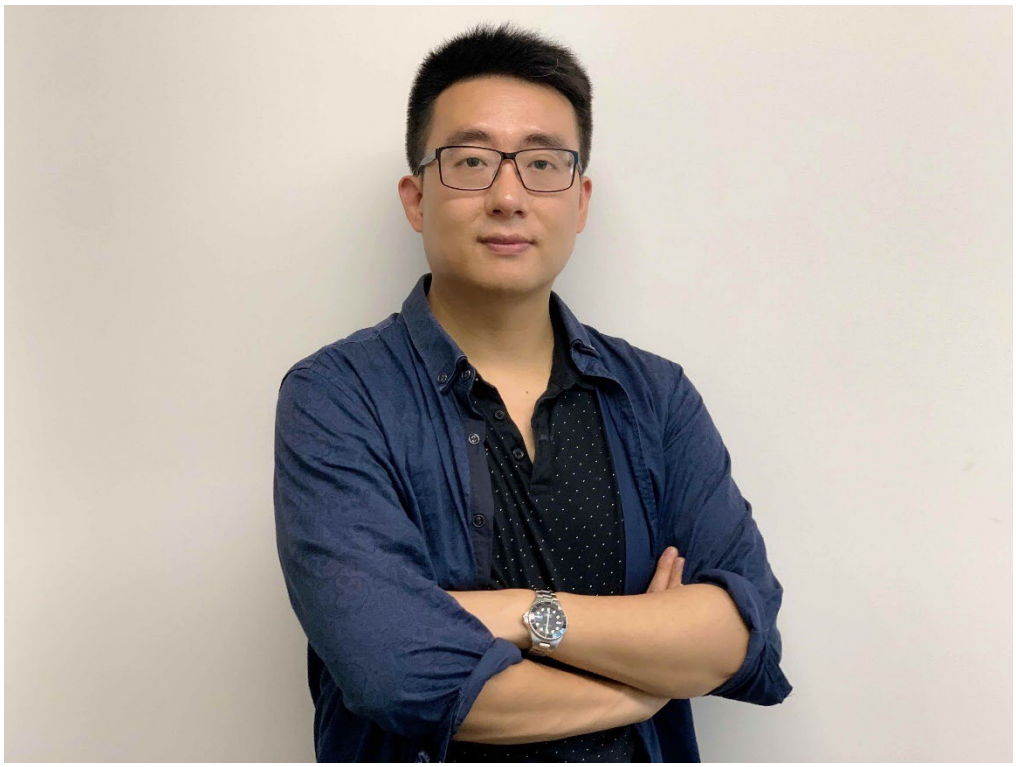
[MUICT-AST] MUICT x Macquarie University: Exploring World's Research Frontiers in Intelligent Autonomous Systems



Dr. James Xi Zheng

Title	Testing Learning Enabled Cyber - Physical Systems: Current Approaches and Future Directions
Bio	Dr. Xi Zheng earned his Ph.D. in Software Engineering from the University of Texas at Austin in 2015. He is awarded Australian Research Council Future Fellow in 2024. Between 2005 and 2012, he was the Chief Solution Architect for Menulog Australia. Currently, he occupies several leadership roles at Macquarie University, Australia: Director of the Intelligent Systems Research Group (ITSEG.ORG), Director of International Engagement in the School of Computing, Associate Professor (effective 1st Jan 2025) and Deputy Program Leader in Software Engineering. His research areas include Cyber-Physical Systems Testing and Verification, Safety Analysis,

	Distributed Learning, Internet of Things, and the broader spectrum of Software Engineering. Dr. Zheng has successfully secured over $2.4 million in competitive funding from the Australian Research Council (1 Future Fellow, 2 Linkages and 1 Discovery) and Data61 (CRP) projects focused on safety analysis, model testing and verification, and the development of trustworthy AI for autonomous vehicles. He has been recognized with several awards, including the Deakin Industry Researcher Award (2016) and the MQ Early Career Researcher Award (Runner-up 2020). His academic contributions include numerous highly cited papers and best conference paper awards. He has served as a Program Committee member for leading Software and System conferences, such as FSE (2022, 2024) and PerCom (2017-2025), and as PC chair for IEEE CPSCom-2021 and IEEE Broadnets-2022. Additionally, he has taken on the role of associate editor for ACM Distributed Ledger Technologies and editor for the Springer Journal of Reliable Intelligent Environments. In 2023, Dr. Zheng is a visiting professor at both UCLA and UT Austin and co-founder of the international workshop on trustworthy autonomous cyber-physical systems.
Abstract	Learning-enabled Cyber-Physical Systems (LE-CPS), including autonomous vehicles and unmanned drones, hold great promise but also raise significant concerns about safety and reliability. Unlike traditional software, these LE-CPS integrate deep neural networks with logic-based modules, creating unique challenges for software testing. Despite advances in testing techniques, the practical needs of industry practitioners for safety and formal guarantees have not yet been fully addressed. To tackle these complex challenges, I have led a team of world-leading experts to establish the Trusted Autonomy Working Group

	(TACPS.org). In this presentation, I will first briefly discuss two of our FSE'22 papers that provide a comprehensive study of current testing practices and test reduction strategies in autonomous vehicles. I will then highlight a recent FSE'24 paper that revives model-based testing in LE-CPS using large language models, followed by related work in TSE'24 and ICSE'25 on generating driving scenarios with large language models and creating an online testing environment to enhance drone autolanding systems. Finally, I will cover our recent paper on the neuro-symbolic paradigm, which aims to improve the interpretability, testability, and verifiability of LE-CPS.