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Systemic Risk of Using AI-Generated Synthetic Data for Training and Testing of Autonomous Vehicles

AI-generated synthetic data is accelerating progress in autonomous vehicles (AVs), but large-scale reliance on it introduces systemic risks that extend beyond individual AVs to the safety, efficiency, and fairness of entire transportation ecosystems. This presentation reports findings from a mixed-methods study that combines a targeted literature review with extensive stakeholder engagement (surveys, interviews, and workshops), alongside a quantitative study of state-of-the-art generative models for AV synthetic data generation. We identify and synthesise 12 risk areas—spanning hallucination and inaccuracies, lack of realism and coverage gaps, and representational and societal bias—that can degrade AV perception and decision-making and, through correlated behaviours across fleets, trigger cascading failures and inequitable outcomes. Building on this taxonomy, we introduce evaluation frameworks for assessing synthetic data, offering actionable guidance for governing synthetic data across the AV lifecycle

Keywords

Autonomous Vehicles, Synthetic Data, Systemic Risk, Generative Models

Biography

Dr Lu is an Assistant Professor specialising in connected and autonomous driving vehicles. Her current research centers on risk assessment for AV safety and security assurance, GenAI in AV systems, AV verification and validation, AV control systems, and teleoperated vehicles. Dr. Lu has attracted significant research funding, including an AI Safety Grant and a Royal Society Short Industrial Fellowship, and she is a Co-Investigator on the Innovate UK-funded “Certus” project. She has published high-impact research papers, holds multiple patents in autonomous driving, and was the 2019 TATA Innovista European Regional Winner.