

DEEP LEARNING-DRIVEN INFRASTRUCTURE INSPECTION AND THE DIGITAL TRANSFORMATION OF AEC PRACTICE: A PORTFOLIO-LEVEL PERSPECTIVE

Speaker

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Abstract

This keynote presents a consolidated portfolio of digital innovation across the architecture, engineering, and construction (AEC) sector, with a focal emphasis on deep learning for automated infrastructure inspection. It benchmarks eight convolutional neural network architectures for highway pavement crack detection, offering comparative insights into accuracy, efficiency, and deployment trade-offs. To address data scarcity in heritage assets, the talk further explores few-shot and scarce-learning paradigms that enable reliable AI-assisted decision-making under extreme data limitations. Collectively, these projects transcend isolated case studies, delivering an integrated roadmap that bridges algorithmic development with real-world engineering constraints. The presentation equips both researchers and practitioners with a holistic, strategic view of how digital technologies—from vision-based sensing to adaptive learning—are systematically reshaping inspection workflows, maintenance planning, and lifecycle management, thereby charting a coherent path forward for the AEC community in an era of rapid technological evolution.

Biography

Prof Farzad Pour Rahimian is Full Professor of Digital Engineering and Manufacturing at the Architecture, Building and Civil Engineering department, Loughborough University. He was previously Full Professor and Centre Lead for the Centre for Sustainable Engineering (CSE) at Teesside University, directing a community of over 100 academics across four research groups. He is Editor-in-Chief of Smart and Sustainable Built and previously Associate Editor of Automation in Construction. Farzad has a robust research track record with over 154 Scopus documents (250+ total outputs), garnering 7,485 citations (Google Scholar H-index: 45; i10-index: 94) and 4,281 Scopus citations (H-index: 35; 198 co-authors; FWCI: 2.72). He has authored 12 books published by Routledge and Springer Nature. 51.1% of his publications rank in the top citation percentiles worldwide, and 74% appear in top 25% journals by CiteScore.

Farzad's research spans Digital Engineering, Digital Twins, Artificial Intelligence and Machine Learning, Building Information Modelling (BIM), Industry 4.0/5.0, Extended Reality (XR/VR/AR), Circular Construction, Smart Energy Systems, IoT, Blockchain, and Offsite Manufacturing. He has successfully led and co-led high-profile research projects funded by EU Horizon Europe, Innovate UK, AHRC, ERDF, CSIC, SFC, DATALAB, British Council, and major industry partners, with visiting professorships at four international universities across Europe, Asia, and Southeast Asia. His directly secured research income exceeds £3M as PI, contributing to a cumulative project portfolio exceeding £20M. He has graduated 14 PhD students as Director of Studies, with graduates now at Cambridge, Edinburgh, Salford, and in senior industry roles. Farzad's standing is recognised through the Bill Curtin Medal (ICE, 2024), two Outstanding KTP Awards (Innovate UK, 2020 & 2023), the KTP Future Leaders' Award (Innovate UK, 2021), the Special Distinction Award (buildingSMART International, 2018), and the Innovation of the Year Award (Scottish Knowledge Exchange Awards, 2018). He is one of only two UK representatives on the buildingSMART International Regulators' Room, co-authored a Digital Trade Technology and Policy report for HMRC, and is an Expert Evaluator for the European Commission, UKRI, EPSRC, Innovate UK, Swiss NSF, Qatar NRF, and NSERC Canada.



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Room 3574 (Lift 27/28),
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