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Engineering & Scientific Consulting

Luke Demo, Ph.D., P.E.

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Professional Profile

Dr. Luke Demo specializes in structural design and analysis, forensic evaluation, advanced sensing technologies, machine learning, and structural health monitoring. Dr. Demo brings extensive professional design experience in steel, concrete, wood and FRP composites structures, along with a rigorous background in research and experimental testing.

Throughout Dr. Demo's design experience, he has delivered cost-effective structural solutions for numerous new and existing buildings in California. He has developed innovative finite element analysis (FEA) models, including for the design of large retaining walls and post-tensioned concrete structures. He provided strategic leadership, directly managing project coordination with architects, contractors, and owners, and led comprehensive plan check meetings with municipal building departments.

Dr. Demo has peer reviewed critical infrastructure projects, such as the $9.5 billion JFK Airport New Terminal One where he identified and helped resolve over 100 potential deficiencies. Additionally, Dr. Demo led research at Columbia University, pioneering self-sensing damage detection technologies for fiber-reinforced polymer (FRP) composites used in electric vehicle battery enclosures. His innovations substantially reduced production costs and enhanced predictive maintenance through AI-driven fatigue life prediction models.

Dr. Demo is a licensed professional engineer in California and New York and actively contributes to professional organizations such as SEAoNY and SEAONC to advance post-disaster structural safety assessments.

Academic Credentials & Professional Honors

Ph.D., Civil Engineering and Engineering Mechanics, Columbia University, 2024

M.Phil., Civil Engineering and Engineering Mechanics, Columbia University, 2024

M.S., Civil Engineering and Engineering Mechanics, Columbia University, 2021

B.S., Structural Engineering, University of California, San Diego, 2015

Licenses and Certifications

Professional Engineer Civil, California, #90483

Professional Engineer, New York, #103198

California CalSAFE SAP (Safety Assessment Program) Evaluator Certified (CA)

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Academic Appointments

Instructor, Civil Engineering and Engineering Mechanics, Columbia University, 2023

Prior Experience

Project Engineer, Harrell Kane Structural Engineers, 2015 - 2019

Professional Affiliations

Structural Engineers Association of Northern California

Structural Engineers Association of New York

American Society of Civil Engineers

Patents

US Patent 20230366846: Carbon Fiber Composite Panel with Integrated Fault Detection and Health Monitoring, November 2023 (Feng MQ, Aitharaju VR, Demo LD, Tronci EM)

Publications

Demo LB, Nieduzak TB, Feng MQ, Aitharaju VR. Fatigue life prediction of self-sensing hybrid FRP composites via electrical resistance monitoring and LSTM neural network. Composite Structures 2025; 367:119238. doi:10.1016/j.compstruct.2025.119238

Demo LB, Tronci EM, Nieduzak TB, Feng MQ, Aitharaju VR. Low-cost sensor-based damage localization for large-area monitoring of FRP composites. Smart Materials and Structures 2024; 33(6):065042. IOP Publishing. https://doi.org/10.1088/1361-665x/ad4e7b

Demo LB, Tronci EM, Feng MQ. Multifunctional fiber-reinforced polymer composites for damage detection and memory. Journal of Composites Science 2023; 7(9):383. MDPI AG. https://doi.org/10.3390/jcs7090383

Nieduzak TB, Tronci EM, Zhou T, Demo LB, Feng MQ, Aitharaju V. Heat transfer model for temperature-sensing polymer composite EV battery enclosure. Composites. Part B, Engineering 2025; 296:112258. doi:10.1016/j.compositesb.2025.112258

Demo LB, Tronci EM, Nieduzak TB, Feng MQ. 2024, May 9. Damage localization in large-area FRP composites using a parallel array of self-sensing carbon fiber tows. In: Nondestructive Characterization and Monitoring of Advanced Materials, Aerospace, Civil Infrastructure, and Transportation XVIII. Shull PJ, Yu T, Gyekenyesi AL, Wu HF (eds). doi:10.1117/12.3010864

Nieduzak TB, Tronci EM, Zhou T, Demo LB, Feng MQ. 2024, May 9. Heat transfer analysis through hybrid FRP composite for self-sensing lithium-ion battery enclosure. In: Nondestructive Characterization and Monitoring of Advanced Materials, Aerospace, Civil Infrastructure, and Transportation XVIII. Shull PJ, Yu T, Gyekenyesi AL, Wu HF (eds). doi:10.1117/12.3010566

Tronci EM, Nagakubo S, Hieda H, Demo L, Feng MQ. 2022, April 18. Low-power multi-hop wireless sensor network for vibration monitoring of large structures. In: Nondestructive Characterization and Monitoring of Advanced Materials, Aerospace, Civil Infrastructure, and Transportation XVI. Shull PJ, Yu T, Gyekenyesi AL, Wu HF (eds). doi:10.1117/12.2615700