

Exponent®
Engineering & Scientific Consulting

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Professional Profile

Michelle Kuykendal, Ph.D., P.E., CFEI, CVFI, is a principal engineer in Exponent's Computer, Data, and Security Science practice with over 12 years of experience in robotics, ADAS, automotive electronics, and fire investigations. She specializes in performing product liability, functional safety, and failure analysis evaluations of automated driving and physical AI systems for OEMs, insurers, and law firms.

ADAS & Automated Vehicles

Dr. Kuykendal advises clients on the performance, safety, and limitations of advanced driver assistance systems (ADAS) across all levels of vehicle automation, from Level 1 driver support features through Level 4 and Level 5 automated operation. Her evaluations address automatic emergency braking (AEB), forward collision warning (FCW), adaptive cruise control (ACC), lane-keeping assist, and electronically controlled throttle actuation to analyze how these systems behave under real-world environmental variability, edge-case scenarios, and adversarial conditions.

Dr. Kuykendal applies both design-level analysis and structured performance testing — including non-impact and simulated-failure testing protocols — to assess whether a system performed as designed, and as a reasonable consumer would expect. Her work in this domain supports product liability litigation, class action matters, and functional safety assessments including under ISO 26262 and ISO 21448, known as Safety of the Intended Functionality (SOTIF). She has served as an expert witness in automotive product liability and class action proceedings involving ADAS and automated vehicle technology.

Robotics & Physical AI

As physical AI and automated machines move from controlled environments into public and commercial spaces, Dr. Kuykendal helps manufacturers, insurers, and legal teams answer the engineering questions surrounding their reliability, sensor integration, and failure behavior in both product development and litigation contexts. She consults on the safety, performance, and failure modes of robotic systems, including humanoid robots, delivery robots, and warehouse automation platforms, evaluating system architectures, control logic, and real-world performance against design intent and applicable safety standards. Her background in closed-loop control systems and real-time sensor feedback — developed through doctoral research in neural stimulation and extended through years of applied consulting — provides a rigorous technical foundation for these assessments.

Robotics & Automated Vehicle Sensor Performance

Dr. Kuykendal evaluates the performance and limitations of the sensor suites that underpin robotics, ADAS, and automated vehicles, including cameras, radar, lidar, and ultrasonic sensors, as well as the

sensor fusion algorithms that integrate their outputs into a unified environmental model. She has extensive experience investigating the myriad ways sensor functionality can be limited and sensor data streams can degrade, fail, and produce unreliable outputs under conditions ranging from adverse weather and lighting to physical contamination and electromagnetic interference. Her consulting work addresses how these degradation mechanisms affect system-level behavior and whether a system's response to sensor uncertainty was appropriate. This work supports both defense and plaintiffs in product liability matters, as well as pre-litigation technical assessments for manufacturers seeking to understand their exposure.

Automotive Electronics, In-Vehicle Networks & Functional Safety

Dr. Kuykendal provides consulting on automotive electrical and electronic (E/E) architecture, including embedded control systems, electronic control units (ECUs), and in-vehicle communication networks such as CAN, LIN, FlexRay, and MOST. She evaluates computer and control modules, and their behavior in the context of both normal operation and failure scenarios. Her Functional Safety Practitioner certification (Automotive ISO 26262) enables her to assess whether a system's safety lifecycle — from hazard analysis and risk assessment through design, verification, and validation — was conducted appropriately. This work is particularly relevant to class action litigation and product liability matters involving alleged defects in automotive electronics, where the question is not only whether a system failed but whether its design adequately anticipated and mitigated the risk of failure.

Fire Investigation & Root Cause

As a Certified Fire and Explosion Investigator (CFEI) and Certified Vehicle Fire Investigator (CVFI), Dr. Kuykendal conducts failure analysis and root-cause investigations for vehicle fires, consumer product fires, and fires involving electrical and electronic systems. She applies systematic root-cause analysis methodologies — consistent with NFPA 921 and NFPA 1033 — to determine the ignition source, first fuel ignited, and contributing factors in fire events. Her technical background in electrical systems, battery technology, and automotive electronics allows her to evaluate fire hypotheses that involve lithium-ion battery thermal runaway (battery fire), electrical arcing, resistive faults, and component overheating with a level of depth that generalist fire investigators cannot match. She serves clients including legal counsel, manufacturers, and insurers in both subrogation and product liability contexts.

Academic Credentials & Professional Honors

Ph.D., Bioengineering, Georgia Institute of Technology, 2014

M.S., Electrical and Computer Engineering, Georgia Institute of Technology, 2008

B.S., Electrical Engineering, Missouri University of Science and Technology, 2005

B.S., Computer Engineering, Missouri University of Science and Technology, 2005

National Science Foundation Graduate Research Fellow (NSF GRFP), Recipient 2006

National Science Foundation IGERT Fellow, 2006-2008

Licenses and Certifications

Professional Engineer Electrical, Arizona, #68650

Functional Safety Practitioner (Automotive ISO 26262)

Certified Fire and Explosion Investigator (CFEI)

Certified Vehicle Fire Investigator (CVFI)

Professional Affiliations

Institute of Electrical and Electronics Engineers (IEEE)

Society of Automotive Engineers (SAE)

Society of Women Engineers (SWE)

Languages

Spanish

Publications

Kaplan, L., Easter, C., and Kuykendal, M., "Consideration of Vehicle Weight Class for Driver-Assist Feature Regulation." 2025 IEEE International Symposium on Product Compliance Engineering (2025).

Safaoui, S., Koszegi, G., and Kuykendal, M. "Safety Risks for EV DC Fast Charging Adapters." 2025 IEEE International Symposium on Product Compliance Engineering (2025).

Kuykendal, M., Easter, C., Koszegi, G., Paradiso, M., Scally, S., and Alexander, R. "Advanced Driver Assistance Systems (ADAS): Assessing the Efficacy of Non-Impact Testing for Evaluating the Performance of Frontal Collision Mitigation Technology." SAE Technical Paper. 2025-01-8056 (2025).

Kuykendal, M., Mendias, M., Scally, S., and Wang, L. "Advanced Driver Assistance Systems Sensor Technology," in Computer Engineering Applications in Electronic, Biomedical, and Automotive Systems (B. D'Andrade Ed.), Nova Science Publishers, 2024. ISBN: 979-8-89-113488-1.

Kuykendal, M., Mendias, M., and Garrido Menacho, R. "Battery Management Systems: From Consumer Electronics to Electric Vehicles," in Computer Engineering Applications in Electronic, Biomedical, and Automotive Systems (B. D'Andrade Ed.), Nova Science Publishers, 2024. ISBN: 979-8-89-113488-1.

Scally, S., Paradiso, M., Koszegi, G., Easter, C., Kuykendal, M., et al. "Advanced Driver Assistance System (ADAS) Performance Variability with Partial Overlap Targets." SAE Technical Paper 2024-01-2038, 2024.

Faenza, N., Spray, R., and Kuykendal, M. "Understanding the Fundamental Mechanisms of Battery Thermal Runaway Propagation and Mitigation." SAE Technical Paper 2023-01-1515, 2023.

Kuykendal, M., Kingsley, D. "Tin Whiskers and Automotive Electronics." IEEE ISPCE 2019, San Jose, CA, May, 2019.

Kuykendal, M., Lele, S. "A Hazard-Based Approach to Product Safety Assessment." IEEE SPCE 2019, Austin, TX, November, 2019.

Kuykendal ML, DeWeerth SP, Grover MA. "Optimization of stimulation parameters for targeted activation of multiple neurons using closed-loop search methods." Processes 2017; 5(4):81.

Kuykendal ML, Guvanasen GS, Potter SM, Grover MA, DeWeerth SP. "Closed-Loop Characterization of Neuronal Activation Using Electrical Stimulation and Optical Imaging." Processes 2017, 5(2):30.

Kuykendal ML, Potter SM, Grover, DeWeerth SP. "Targeted Stimulation Using Differences in Activation

Probability across the Strength-Duration Space." Processes 2017; 5(2):14.

Pinnangudi B, Kuykendal M, Bhadra S. "Smart Grid Energy Storage." Chapter 4 in: The Power Grid: Smart, Secure, Green and Reliable 1st Edition, D'Andrade B (ed), 2017.

Guvanasen GS, Mancini ML, Calhoun WA, Rajaraman S, DeWeerth SP. "Polydimethylsiloxane Microstencils Molded on 3-D-Printed Templates." Journal of Microelectromechanical Systems 2014 Oct; 23(5):1045-1053.

Presentations

Kuykendal, M., Kingsley, D., Tin Whiskers and Automotive Electronics, ISPCE 2019, San Jose, CA, May, 2019.

Kuykendal, M., Lele, S., A Hazard-Based Approach to Product Safety Assessment, SPCE 2019, Austin, TX, November, 2019.

Martens, J., Kuykendal, M., Bracher, D., Arora, A. Functional Safety That Your Boss Will Understand. 2019 Association of Equipment Manufacturers Product Safety & Compliance Seminar, Des Moines, IA, May 1, 2019.

Kuykendal ML, Guvanasen GS, Grover MA, Potter SM, DeWeerth SP. Automated closed-loop extracellular electrical stimulation and optical recording for increasing the selectivity of the stimulus-evoked response within a neuronal population. Poster presented at: Biomedical Engineering Society Annual Meeting, Atlanta, GA, October 24-27, 2012.

Kuykendal ML, Guvanasen GS, Grover MA, Potter SM, DeWeerth SP. Closed-loop multisite extracellular electrical stimulation and optical recording for measuring and controlling the evoked response of a neuronal population. Poster presented at: Neuroscience 2011, Washington, D.C., November 12-16, 2011.

Kuykendal ML, Guvanasen GS, Grover MA, Potter SM, DeWeerth SP. Closed-loop targeted electrical stimulation for excitation of selective neuronal populations. Biomedical Engineering Society Annual Meeting, Austin, TX, October 6-9, 2010.

Kuykendal ML, Guvanasen GS, Grover MA, Potter SM, DeWeerth SP. Real-time characterization of neuronal response for selective stimulation. Poster presented at 7th International Meeting on Substrate-Integrated Microelectrode Arrays, Reutlingen, Germany, June 29-July 2, 2010.

Kuykendal ML, Ross JD, Potter SM, DeWeerth SP. Real-time characterization of neural excitability by multisite extracellular stimulation. Poster presented at Neuroscience, Washington, D.C., November 15-19, 2008.

Kuykendal ML, Ross JD, Potter SM, DeWeerth SP. Real-time characterization of multisite extracellular stimulation. Short talk presented at Biomedical Engineering Society Annual Meeting, St. Louis, MO, October 2-4, 2008.

Kuykendal ML, Ross JD, DeWeerth SP. The spatial quantification of evoked neural responses to excitatory and inhibitory stimulus waveforms. Poster session presented at IGERT Project Meeting, Arlington, VA, May 18-20, 2008.