

Exponent®
Engineering & Scientific Consulting

Liyu Wang, Ph.D., P.E.

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Professional Profile

Dr. Wang is a licensed Professional Engineer, NVIDIA Certified Associate in Generative AI and Large Language Models, UL Certified Autonomy Safety Professional in ISO 21448 Safety of the Intended Functionality (SOTIF), certified TensorFlow Developer for deep learning, and certified SolidWorks Mechanical Designer (CSWA). His specialties include agentic artificial intelligence (AI) and Retrieval Augmented Generation (RAG) applications, development and deployment of deep learning and classic machine learning (ML) models and engineering software for cyber physical systems, robotics and control, and dimensional and tolerance analysis. He applies these technologies in solutions for Physical AI product safety, risk assessment, failure analysis, regulatory and compliance, financial forecast, predictive analytics, industrial automation, and new product introduction (NPI). He brings technical and business solutions to clients in consumer electronics, oil and gas, energy and utility, automotive and autonomous driving, industrial and manufacturing, medical devices, semiconductors, and beyond.

Dr. Wang's technical skills include AI and ML frameworks (LangChain, LangGraph, neo4j, HuggingFace, pytorch, PhysicsNeMo, tensorflow, scikit-learn, xgboost, pyspark), physics and robotics simulation platforms (Omniverse, Isaac Sim, CoppeliaSim), cloud-based data lakehouses and operation platforms (AWS SageMaker, Bedrock, Microsoft Fabric, Palantir Foundry, Databricks, Snowflake), software toolchains (Jira, Confluence, git, GitHub, Gitlab, pytest), programming languages (Python, R, C++, Matlab/Simulink, SQL, SPARQL), electromechanical prototyping tools, sensors and actuators (DC, servo, stepper motors), microcontrollers (Arduino, mbed) and single-board microcomputers (Raspberry Pi).

Beyond technical skills, Dr. Wang has practical knowledge with sustainability frameworks and experience supporting clients with sustainability reporting activities, including adopting United Nations' Sustainable Development Goals (SDGs), Global Reporting Initiative (GRI) standards, and European Union (EU) Corporate Sustainability Reporting Directive (CSRD, 2022/2464/EU) and European Sustainability Reporting Standards (ESRS, 2023/2772/EU).

Prior to joining Exponent, Dr. Wang was a data science researcher at Siemens and developed fault diagnosis algorithms for intelligent car manufacturing by integrating physics engines, ontologies and semantic web, signal processing, and artificial intelligence.

As an investment data analyst at Runway Innovation, his work on using machine learning to predict companies' future revenue earned him a finalist for The Technical Analyst Award in 2021.

During his postdoctoral research at UC Berkeley, he designed and developed an automatic robotic repair system while also performing fatigue testing on a folding-based hexapod robots using a treadmill and a motion capture system. Dr. Wang received a doctoral degree from ETH Zurich, where he developed both climbing and pick-and-place robots constructed from thermoplastic adhesives. He performed mechanical testing for adhesive strength on various materials while developing and validating model-based control of deformation using thermal imaging and temperature sensors.

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Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, ETH Zurich, Switzerland, 2014

M.Sc., Biomedical Engineering, University of Oxford, UK, 2007

B.Eng., Optoelectronics Engineering, Zhejiang University, China, 2006

The Technical Analyst Award Finalist, 2021

Siemens Fellowship, 2017

Haas Dean's Seed Fund, 2016

IET Travel Award, 2016

Swiss National Science Foundation Fellowships, 2014, 2016

Sloane Robinson Foundation Scholarship, 2007

Licenses and Certifications

Professional Engineer Mechanical, California, #41692

SOLIDWORKS Certificate in Mechanical Design

NVIDIA-Certified Associate: Generative AI LLMs

TensorFlow Developer

UL Certified Autonomy Safety Professional (UL-CASP)

Prior Experience

Investment Data Analyst and Innovation Consultant, Runway Innovation, 2020-2021

Data Science Researcher, Siemens, 2017-2018

Postdoctoral Researcher, University of California Berkeley, 2015-2019

Professional Affiliations

US Expert to ISO/IEC JTC 1/SC 42 Artificial Intelligence and member of ANSI Technical Advisory Group (TAG) INCITS

US Expert to ISO TC 299 Robotics and member of ANSI TAG A3 Automation

Institute of Electrical and Electronics Engineers (IEEE)

2023 Vice Chair, IEEE Robotics and Automation Society, Santa Clara Valley/Oakland-East Bay/San Francisco Joint Chapter

American Bar Association (ABA)

Claims and Litigation Management Alliance (CLM)

Languages

Cantonese Chinese

Chinese

English

Publications

Books and Book Chapters

M. L. Kuykendal, M. L. Mendias, S. Scally, and L. Wang, 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.

L. Wang, S. G. Nurzaman, and F. Iida, Soft-Material Robotics, Boston, MA, USA: Now Publishers, 2017. ISBN: 978-1-68083-264-8.

Peer-Reviewed Journal Papers

L. Wang, J. Hodges, D. Yu, and R. S. Fearing, "Automatic modeling and fault diagnosis of car production lines based on first-principle qualitative mechanics and semantic web technology," Advanced Engineering Informatics vol. 49, 2021, Art no. 101248.

L. Wang, Y. Yang, Y. Chen, C. Majidi, F. Iida, E. Askounis, and Q. Pei, "Controllable and reversible tuning of material rigidity for robot applications," Materials Today, vol. 21, pp. 563–576, 2018.

L. Wang and F. Iida, "Deformation in soft-matter robotics: A categorization and quantitative characterization," IEEE Robotics and Automation Magazine, vol. 22, no. 3, pp. 125-139, 2015.

L. Wang, L. Brodbeck, and F. Iida, "Mechanics and energetics in tool manufacture and use: a synthetic approach," Journal of the Royal Society Interface vol. 11, 2014, Art no. 20140827.

L. Wang, U. Culha, and F. Iida, "A dragline-forming mobile robot inspired by spiders," Bioinspiration & Biomimetics, vol. 9, no. 1, 2014, Art no. 016006.

D. Leach, L. Wang, D. Reusser, and F. Iida, "Automatic building of a web-like structure based on thermoplastic adhesive," Bioinspiration & Biomimetics vol. 9, no. 3, 2014, Art no. 036014.

S. G. Nurzaman, U. Culha, L. Brodbeck, L. Wang, and F. Iida, "Active sensing system with in situ adjustable sensor morphology," PLoS One, vol. 8, no. 12, 2013, Art no. e84090.

L. Wang, L. Graber, and F. Iida, "Large-payload climbing in complex vertical environments using thermoplastic adhesive bonds," IEEE Transactions on Robotics, vol. 29, no. 4, pp. 864-874, 2013

L. Wang and F. Iida, "Physical connection and disconnection control based on hot melt adhesives," IEEE/ASME Transactions on Mechatronics vol. 18, no. 4, pp. 1397-1409, 2012.

Peer-Reviewed Conference Proceedings Papers (Selected)

S. Selamet, S. Chau, S. C. Ramirez, L. Wang, "Predicting structural fire response by AI", 2025 Engineering Mechanics Institute 2025 Conference, accepted.

B. Davis, B. Patrick, L. Wang, H. Watson, T. Zirkle, A. Hudgins, and Y. Bhargava, “Identification of factors to determine statistically appropriate and conservative CVN toughness values for transmission pipelines”, in Proc. the 37th International Pipeline Pigging & Integrity Management Conference (PPIM), 2025, paper ID 261.

L. Wang, Y. Yang, G. Correa, K. Karydis, and R. S. Fearing, “OpenRoACH: a durable open-source hexapedal platform with onboard robot operating system (ROS),” in Proc. IEEE International Conference on Robotics and Automation (ICRA), 2019, pp. 9466-9472.

L. Wang, M. M. Plecnik, and R. S. Fearing, “Robotic folding of 2D and 3D structures from a ribbon,” in Proc. IEEE International Conference on Robotics and Automation (ICRA), 2016, pp. 3655-3660.

A. Nagabandi, L. Wang, and R. S. Fearing, “A path planning algorithm for single-ended continuous planar robotic ribbon folding,” in Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2016, pp. 3239-3246.

L. Wang, C. Peruzzi, U. Culha, M. Jovic, and F. Iida, “Modelling of continuous dragline formation in a mobile robot,” in Proc. IEEE International Conference on Robotics and Automation (ICRA), 2014, pp. 4229-4234.

L. Wang, F. Neuschaefer, R. Bernet, and F. Iida, “Design considerations for attachment and detachment in robot climbing with hot melt adhesives,” in Proc. IEEE International Conference on Robotics and Automation (ICRA), 2012, pp. 1181-1186.

L. Wang, L. Graber, and F. Iida, “Climbing vertical terrains with a self-contained robot,” in Proc. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2012, pp. 305-310.

X. Yang, J. Fu, Z. Lou, L. Wang, G. Li, and W. J. Freeman, “Tea classification based on artificial olfaction using bionic olfactory neural network,” in Proc. International Symposium on Neural Networks, 2006, 343-348.

Project Experience

Risk Assessment, Risk Management, Risk Mitigation – Proactive

- Electric utility overhead transmission line wildfire risk assessment with development, testing, and documentation of data analytics software in Python hosted in AWS and Palantir Foundry. Data analytics uses a combination of first-principle, statistical, and machine learning based models.
- Natural gas pipeline leak versus rupture failure mode prediction with development of a classification algorithm using machine learning models in Python.
- Natural gas pipeline asset integrity management, failure pressure and fatigue life estimation with development, testing, and documentation of a fracture mechanics software in R based on industry standards including API 579 / ASME FFS-1.

Product Safety – Proactive and Reactive

- Level 4 autonomous driving system (ADS) post-collision forensic analysis of subsystems including perception, localization and mapping, motion planning, and control, in response to requests from a US federal regulator (NHSTA) and a state regulator (CPUC).

- Consumer recreational product mechanical design evaluation with tolerance stack-up analysis according to the ASME Y14.5 GD&T standard.
- Review of American, Canadian, European Union (EU), Chinese, and South Korean safety standards (e.g. UL 3100, IEC 62368-1, ISO 13482) on information service robots or humanoid robots.

Regulatory and Compliance - Proactive

- Diesel engine products Auxiliary Emissions Control Device (AECD) and Auxiliary Emission Strategy (AES) disclosure regulatory compliance support with draft disclosure document review and revision, engine aftertreatment system control source code review in Matlab Simulink in compliance with U.S. 40 CFR Part 86, Subpart A and EU regulations EU 2017/1151, EU 2018/858, and EU 2023/443.
- Technical support for the U.S. Food and Drug Administration (FDA) approval of an in-vivo medical device, by providing test fixture design and fabrication, test setup and control (PLC controller), and fatigue testing with data acquisition systems (DAQ).
- 3D model generation using Conditional Variational Auto-Encoder (VAE) neural network development and evaluation.

Predictive Analytics - Proactive

- Electric utility undergrounding distribution line construction cost forecast ML model development and deployment in Palantir Foundry, explanation and interpretation, continuous evaluation and monitoring, reaching AACE Class 2 Expected Accuracy Range for early stage projects.
- Soil moisture 1-3 days prediction long-short-term-memory (LSTM) neural network development and evaluation in Palantir Foundry.
- Gas turbine engine maintenance event prediction LSTM neural network development and evaluation.
- Physical impact prediction for passenger car advanced driver-assistance systems (ADAS) automatic emergency braking (AEB) feature high-speed testing termination with ML model development in Python, explanation and interpretation.

New Product Introduction - Proactive

- Mechanical design consulting for a semiconductor manufacturing equipment component using customized thermal testing setup, including test fixture mechanical design (Solidworks) and test setup control (PID control based on temperature sensors and PLC controllers).
- Simulated space launch acceleration testing for a consumer electronics product using customized setup, including test fixture mechanical design (Solidworks), 3D printing, and test setup control (Arduino microcontroller in C++).
- Quantitative user experience UX research and collection of high-fidelity human biometric, human behavior and environment data in the US and in Europe for a virtual reality (VR) / augmented reality (AR) consumer electronics product.

Failure Analysis - Proactive and Reactive

- Aircraft engine failure analysis with dimensional analysis according to the ASME Y14.5 GD&T standard using PolyWorks.
- Robot vacuum cleaner debris ingress failure analysis with kinematics and dimensional analysis using Solidworks.
- Offshore oil pipeline leak incident root cause analysis with sensor time series analytics and visualization in Python.
- Fault tree analysis for failures from bearings to autoparking systems.

Claim Disputes - Reactive

- Review of software architecture documentations and source code files for an automative engine control unit (ECU) defeat device dispute case.
- Review of patents related to automatic control systems for an intellectual property dispute case.
- Automotive insurance claim dispute support with image meta data analysis in Python.

Additional Education & Training

AWS Cloud Technical Essentials, Amazon Web Services, November 2023

TensorFlow for Artificial Intelligence, Machine Learning, and Deep Learning, DeepLearning.AI, July 2022

GD&T and Stack-Up, Udemy, June 2022

Advanced CSRD Practitioner, Earth Academy, December 2024

Introduction to Foundry & AIP for Enterprise Organization, Palantir, February 2025

Planetary Scale Earth Observation with Google Earth Engine, Google Cloud, February 2025

Collaborative Robot Safety: Design & Deployment, SUNY Buffalo, February 2025

Introduction to CSRD and Reporting with ESRS, GRI, December 2024

ISO 26262 Functional Safety Mastery, Udemy, June 2024

Foundations of Project Management, Google, May 2023

Fusion 360, Autodesk, August 2021

SQL for Data Science, UC Davis, May 2021

Applied Data Science with Python, University of Michigan, June 2020

Management of Technology Innovation, UC Berkeley, May 2016

Editorships & Editorial Review Boards

Guest Editor, Special Issue on Design Optimization of Soft Robots, IEEE Robotics and Automation Magazine

Guest Editor, Special issue on Morphological Computation in Soft Robotics, Journal of Advanced Robotics

Peer Reviews

IEEE/ASME Transactions on Mechatronics

IEEE Transactions on Robotics

IEEE Robotics and Automation Magazine

IEEE Robotics and Automation Letters

Bioinspiration & Biomimetics

Advanced Robotics

Applied Bionics and Biomechanics

Artificial Life

Computer

Extreme Mechanics Letters

Robotics & Autonomous Systems

Soft Robotics

IEEE International Conference on Automation Science and Engineering

IEEE/RSJ International Conference on Intelligent Robots and Systems

IEEE International Conference on Robotics and Automation