



Exponent[®]
Engineering & Scientific Consulting

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

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Professional Profile

Dr. Wang is a licensed Professional Engineer, certified TensorFlow Developer, and certified SolidWorks Mechanical Designer. He specializes in mechanical design, engineering analysis, engineering software development, big data analytics and visualization, time-series data science modelling, anomaly detection and failure analysis. He brings value to clients in consumer electronics, oil and gas, energy and utility, industrial and manufacturing, medical devices, semiconductors, law firms, investment firms and beyond, by providing technical and scientific solutions to their most challenging problems.

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

As a senior researcher at Runway Innovation, he used machine learning to predict companies' future revenue based on present innovation effort and helped Fortune Global 500 companies with their digital transformation journey. He also performed technology due diligence and deal flow analysis for venture capital investors and asset management firms. For his work and expertise, he was made a finalist for The Technical Analyst Award.

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 deformation models using thermal imaging and temperature sensors.

As a Sustainable Development Goals Positive Change Ambassador by Rotterdam School of Management, Dr. Wang is knowledgeable in quantifying electromechanical systems' environmental impacts.

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

TensorFlow Developer

Prior Experience

Consultant and Researcher, Runway Innovation, 2020-2021

Research Fellow, Siemens, 2017-2018

Postdoctoral Researcher, University of California Berkeley, 2015-2019

Graduate Research Assistant, ETH Zurich, 2009-2014

Professional Affiliations

Institute of Electrical and Electronics Engineers (IEEE)

ASTM International

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

Voting Member, IEEE P2940 Standard for Measuring Robot Agility Working Group

Voting Member, ASTM Committee F45 on Robotics, Automation, and Autonomous Systems

Languages

Cantonese Chinese

Chinese

English

Publications

Books

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)

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)*, 2014, pp. 4229-4234.

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

Mechanical Design and Prototyping

- Designed a test fixture using SolidWorks for thermal testing of capital equipment components.
- Designed and 3D printed test fixtures for simulate space launch acceleration testing of consumer products, and fatigue testing of in-vivo medical device components.
- Analyzed tolerance stack-up of consumer products involving GD&T.
- Reviewed dimensional compliance of consumer products according to international standards.
- Reviewed kinematics of consumer robot products.

Control of Robotic and Electromechanical Systems

- Used PID control based on temperature sensors and PLC controllers for thermal testing of capital equipment components
- Developed open-loop control of simulated space launch acceleration testing of consumer products using Arduino microcontroller in C++.
- Developed open-loop control of fatigue testing of in-vivo medical device components using PLC controllers.
- Reviewed control system for intellectual property litigation cases.

Mechanical Testing

- Tensile testing of electronics boards and automotive service equipment.
- Simulated space launch acceleration testing of consumer products.
- Thermal testing of capital equipment components.
- Fatigue testing of electronic packaging and in-vivo medical device parts.
- Impact testing of consumer products.

Engineering Software Development and Engineering Analysis

- Co-developed a fracture mechanics software in R for failure pressure, fatigue life and leak versus rupture analysis of utility pipes based on industry codes.

- Co-developed a risk assessment software in Python for power transmission lines.
- Developed a Python code for vibration damping ratio and loss function analysis for automotive Lidar sensor design.

Data Analytics, Data Science, Machine Learning

- Developed time series big data analytics and visualization in Python (pandas, numpy, scipy, scikit-learn, matplotlib, plotly) of oil platforms.
- Developed alarm log time series data analytics and visualization in Python (pandas, numpy, plotly) of consumer electronics products.
- Developed categorical data analytics in Python (pandas) of aircraft components.
- Developed image meta data analysis in Python for auto insurance claim.
- Conducted user experience UX research with high-fidelity human behavior and environment data collection.

Additional Education & Training

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

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

Fusion 360, Autodesk, August 2021

SQL for Data Science, UC Davis, May 2021

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

Editorships & Editorial Review Boards

Guest Editor, Special Topic on Novel Designs for Untethered Soft Robots, Frontiers in Robotics and AI

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