Li Wu

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RESEARCH INTEREST

My research focuses on enhancing the resilience and sustainability of large-scale distributed systems, including cloud computing, edge computing, and cyber-physical systems, with a particular emphasis on machine learning workloads and microservices.

EDUCATION

Technische Universität Berlin, Germany

09/2018 - 11/2021

Ph.D in Computer Science

Advisor: Prof. Odej Kao, Prof. Johan Tordsson, Prof. Erik Elmroth

• Thesis: Automatic Performance Diagnosis and Recovery in Cloud Microservices (Magna Cum Laude)

Southeast University, China

09/2012 - 04/2015

M.S. in Information and Communication Engineering

Advisor: Prof. Lijun Chen

• Thesis: Research on Furnace Temperature Field Reconstruction Based on Acoustic Wave Theory

Hohai University, China

09/2008 - 06/2012

B.S. in Telecommunication Engineering

Advisor: Prof. Changping Zhu

■ Honors: Top 1% of Class, Best Thesis Award

GRANTS & FELLOWSHIPS

Marie Skłodowska-Curie Scholarship

2018 - 2021

European Commission

Budget: \$ 115k

Huawei Research Grant (Indirect)

2021 - 2023

Huawei Munich Budget: \$ 300k

Huawei Research Grant (Indirect)

2024 - 2026

Huawei Munich Budget: \$ 300k

ACSOS Travel Grant

2021

Awarded for conference participation

ACADEMIC EXPERIENCE

University of Massachusetts Amherst, United States

06/2023 - Present

Postdoctoral Research Fellow Advisor: Prof. Prashant Shenoy

• Research on edge resiliency, security, and sustainability.

Technische Universität Berlin, Germany

09/2018 - 11/2021

Research Associate Advisor: Prof. Odej Kao

• Research on root cause analysis and recovery for cloud microservices.

Southeast University, China

09/2012 - 04/2015

Research Associate

Advisor: Prof. Lijun Chen

• Research on algorithms for temperature distribution reconstruction (published 2 journal papers).

Hohai University, China

09/2009 - 06/2012

Research Associate

Advisor: Prof. Chenping Zhu

• Research on circuit design for ultrasonic washing machines (published 1 journal paper).

INDUSTRY EXPERIENCE

Bosch Research, China

03/2022 - 06/2023

Senior Research Scientist, Reliable Distributed System (5 patents)

- Led research on reliable distributed systems for autonomous driving.
- Directed teams to integrate solutions into products, impacting industry standards.
- Developed 5 patents related to distributed systems.

Elastisys, Sweden

09/2018 - 12/2021

System Scientist, Advisors: Johan Tordson, Erik Elmorth (MicroX papers)

- Research on performance diagnosis and recovery in cloud microservices.
- Published MicroX papers.
- Developed and open-sourced the MicroRCA project.

Las Naves, Spain

09/2020 - 03/2021

Researcher, Advisors: Guillaume Pierre (LivingFog platform and hackathon)

- Design and implement the LivingFog platform for IoT devices.
- Organized and presented at a hackathon centered around the LivingFog platform.
- Authored a paper published in ICIN'22.

IBM, China

05/2015 - 09/2018

Software Developer/Site Reliable Engineer, IBM Cloud (1 patent)

- Developed and operated key cloud computing techniques, including Kubernetes and OpenStack.
- Issued 1 US patent.

PUBLICATIONS

Highly Cited Papers

MicroRCA: Root cause localization of performance issues in microservices

2020

Wu L, Tordsson J, Elmroth E, Kao O

2020 IEEE/IFIP Network Operations and Management Symposium (NOMS)

Citations: 190+

Fog computing applications: Taxonomy and requirements

2019

Ahmed, A., Arkian, H., Battulga, D., Fahs, A. J., Farhadi, M., Giouroukis, D., ... & Wu, L (Contributed equally)

arXiv:1907.11621 Citations: 70+

MicroDiag: Fine-grained performance diagnosis for microservice systems

2021

Wu L, Tordsson J, Bogatinovski J, Elmroth E, Kao O

IEEE/ACM International Workshop on Cloud Intelligence (CloudIntelligence)

Citations: 50+

Performance diagnosis in cloud microservices using deep learning

2020

Wu L, Bogatinovski J, Nedelkoski S, Tordsson J, Kao O

Service-Oriented Computing – ICSOC 2020 Workshops: AIOPS

Citations: 40+

Other Notable Publications

Enhancing Resilience in Distributed ML Inference Pipelines for Edge Computing

2024

Wu L, Hanafy WA, Souza A, Abdelzaher T, Verma G, Shenoy P

2024 IEEE Military Communications Conference (MILCOM)

2024

Li J, Chen Y, Kimura T, Wang T, Wang R, Kara D, Hu Y, **Wu L**, Hanafy WA, Souza A, Shenoy P

33rd International Conference on Computer Communications and Networks (ICCCN)

SLO-Power: SLO and Power-aware Elastic Scaling for Web Services

Acies-OS: A Content-Centric Platform for Edge AI Twinning and Orchestration

2024

Savasci M, Souza A, Wu L, Irwin D, Ali-Eldin A, Shenoy P

24th IEEE International Symposium on Cluster, Cloud and Internet Computing (CCGrid)

Failure-Resilient ML Inference at the Edge through Graceful Service Degradation

2023

Hanafy WA, **Wu L**, Abdelzaher T, Diggavi S, Shenoy P

2023 IEEE Military Communications Conference (MILCOM)

Failure identification from unstable log data using deep learning Bogatinovski J, Nedelkoski S, Wu L , Cardoso J, Kao O.	2022
22nd IEEE International Symposium on Cluster, Cloud and Internet Computing (CCGrid)	
LivingFog: Leveraging fog computing and LoRaWAN technologies for smart marina m (experience paper)	anagement 2022
Battulga D, Farhadi M, Tamiru MA, Wu L , Pierre G (Contributed equally) 5th Conference on Innovation in Clouds, Internet, and Networks (ICIN)	2022
Causal inference techniques for microservice performance diagnosis: Evaluation at recommendations	nd guiding 2021
Wu L , Tordsson J, Elmroth E, Kao O 2021 IEEE International Conference on Autonomic Computing and Self-Organizing Systems (A	ACSOS)
MicroRAS: Automatic recovery in the absence of historical failure data for microservice sy $Wu\ L$, $Tordsson\ J$, $Acker\ A$, $Kao\ O$	
13th International Conference on Utility and Cloud Computing (UCC)	
Journal Papers	
Experimental Study on Sound Wave Transit Time Measurement in Furnace Acoustic To Measurement Wu L, Chen Lijun	emperature 2018
Acoustic Technology	
Experimental Evaluation of Sound Wave Propagation Characteristics in Waveguides Xu C, Wu L, Chen Lijun Acoustics and Electronic Engineering	2015
Research on Matching Technology for Ultrasonic Fruit and Vegetable Washing Machines Wu L, Zhu Changping Acoustics and Electronic Engineering	s 2013
Under Review	
Leveraging Fine-grain Spatial Carbon-Intensity Variations for Edge Computing Wu L, Hanafy WA, Souza A, Shenoy P	2024
In Preparation	
Resilient Model Inference at Resource-Constrained Edge Wu L, Hanafy WA, Souza A, Shenoy P OSDI'25 / ATC'25	2024
Enabling Device-to-device Collaboration in Dynamic IoT Environments Shastri H, Wu L,Shenoy P Mobisys'25	2024
Granted Patents	
Testing an online system for service oriented architecture (SOA) services <i>L Cai, YM Yin, L Wu, XG Ding US Patent 11,169,905</i>	2021
Pending Patents	
5 Patents on reliable distributed systems for autonomous driving.	
 Best of IBMer: Best new SRE of Cloud Foundation Services, IBM SEU Alumnus Scholarship for Outstanding Students The Third Prize in the National Graduate Student Mathematical Contest in Modeling 	2017 2013 – 2014 2013

PATENTS

HONORS & AWARDS

	 Best Bachelor Thesis (Top 1%) National Scholarship (Top 0.2% nationwide), The Chinese Ministry of Education 2nd Prize in the Physical and Experimental Science Technology Innovation 1st Prize in the TI Cup Electronic Design competition 1st Prize in the Physics Contest of HHU 1st Prize in the Mathematics Contest of HHU HHU Academic Excellence Scholarship, Science and Technology Innovation Scholarship 	2012 2011 2011 2010 2010 2009 2008 – 2012	
INVITED TALKS	Automatic Performance Diagnosis and Recovery in Cloud Microservices <i>Zscaler, US</i>	08/2024	
	MicroRCA: Root Cause Localization of Performance Issues in Microservices <i>Ericsson, Sweden</i>	08/2021	
SERVICE TO	Conference Organization		
PROFESSION AND UNIVERSITY	Second International Workshop on Artificial Intelligence for IT Operations at ICSOC	2021	
UNIVERSITI	The 16th IEEE International Conference on Autonomic Computing (ICAC)	2019	
	Reviewer		
	IEEE Transactions on Services Computing	2024	
	Sustainable Computing: Informatics and Systems	2024	
	Journal of Parallel and Distributed Computing	2024	
	Performance Evaluation	2024	
	International World Wide Web Conference	2020	
	Hackathon Organization: Hack the fog ■ Organized and coordinated the event.	2021	
	Workshop Leadership: 15th Cloud Control Workshop ■ Led the discussion panel on "Anomaly detection in edge/fog computing".	2019	
	Outreach: UMass Turing Summer Program Role: Organizer and Coordinator	2024	
	 Promoted and organized the program to attract high school participants in western Massachusetts. Coordinated with professors and lecturers to ensure the smooth execution of the three-week program. 		
TEACHING	University of Massachusetts Amherst UMass Turing Summer Program – https://none.cs.umass.edu/turing/	2024	
	 Coordinator and Teacher Syllabus, class, and tutorial preparations. Delivered lectures on "Introduction to Python Programming". 		
	 Capstone projects coordination and supervision. 	2020 2024	
	Technische Universität Berlin Teaching Assistant: Distributed and Operating System Seminar	2020-2021	
	 Prepared and organized research topics for seminar students. 		
	 Guided students in developing research ideas, crafting their reports, and preparing presenta Managed grading and provided feedback on student work. 	itions.	
	 Hackathon: Hack the fog – http://www.fogguru.eu/living-lab/hackthefog/ Coordinator and Teacher Delivered lectures on "Using Node-Red for the IoT and fog platform". 	2021	
	 Supervised and mentored participating teams. 		

 ADVISING &
 07/2023 - Present:
 Hetvi Shastri (Ph.D.)

 MENTORING
 09/2023 - 05/2024:
 Khai Nguyen (MSc)

08/2022 - 06/2023: Xiangyu Wu (MSc, University of Science and Technology of China)

06/2024 - Present: Riley Kim Connell (BSc., REU) **Summer, 2024:** Akshay Prabhu (MSc., Summer Intern)

09/2020 - 11/2021: +4 BSc./MSc. students in research seminar (Technische Universität Berlin)

09/2023 - Present: +3 MSc. students in *Independent studies*.