

Shaobo Han

Senior Researcher, Machine Learning · NEC Laboratories America · Princeton, NJ

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Summary

My research develops machine-learning methods that generalize beyond training conditions, adapt efficiently to new domains and tasks, and operate reliably in real-world environments. My work spans foundation models, multimodal learning, probabilistic and generative learning, and sensing AI, with selected advances translated into real-world systems and field deployments.

Research interests: Generalization & adaptation · Efficient adaptation · Multimodal AI · Probabilistic & generative learning · Sensing AI

Education

DUKE UNIVERSITY	Durham, NC	UNIVERSITY OF CHINESE ACADEMY OF SCIENCES	Beijing, China
Ph.D., Electrical & Computer Engineering	2016	M.Eng., Signal & Information Processing	2010
M.S., Statistical Science	2016	XIDIAN UNIVERSITY	Xi'an, China
Advisor: Lawrence Carin		B.E., Electrical Engineering	2007

Work Experience

NEC Laboratories America, Inc.	Princeton, NJ
SENIOR RESEARCHER	Jun. 2023 - present
- Developed VB-LoRA and Uni-LoRA for extreme parameter-efficient fine-tuning of foundation models, with methods integrated into the Hugging Face PEFT ecosystem. - Led research on uncertainty-aware knowledge-distillation methods for learning from imperfect teacher models and compact audio-language models for domain-specialized acoustic perception, understanding, and reasoning. - Led the end-to-end development of Sensing AI systems for distributed fiber-optic sensing, from feasibility studies and rapid prototyping to field validation over operational telecommunication networks. - Author/coauthor of 50+ peer-reviewed papers and inventor on 19 granted U.S. patents; mentor 10+ research interns and students, with projects leading to publications, patents, open-source software, and field-tested prototypes.	
RESEARCHER	Jun. 2019 - Jun. 2023
- Developed machine-learning and signal-processing methods for distributed fiber-optic sensing, translating research ideas into technologies validated on real-world fiber infrastructure for monitoring, safety, security, and situational awareness. - Developed methods for learning with limited data and changing sensing environments, including domain adaptation, transfer learning, few-/zero-shot learning, weak supervision, anomaly detection, event recognition, and landmark localization.	
Duke University, Department of Statistical Science	Durham, NC
POSTDOCTORAL ASSOCIATE	Oct. 2016 - May. 2019
- Conducted research on statistical modeling and Bayesian inference for replicated network data. - Instructor, <i>STA 111: Probability and Statistical Inference</i>, Summer 2018.	
IBM T. J. Watson Research Center	Yorktown Heights, NY
RESEARCH INTERN	Jun. 2014 - Aug. 2014

Selected Publications

Generalization & Efficient Adaptation

VB-LoRA: Extreme Parameter Efficient Fine-Tuning with Vector Banks	NeurIPS 2024
YANG LI, SHAOBO HAN , AND SHIHAO JI	
- Introduced global parameter sharing through a vector bank across LoRA matrices, modules, and layers for extreme parameter efficiency. - Integrated into the Hugging Face PEFT library	

Learning Transferable Reward for Query Object Localization with Policy Adaptation

ICLR 2022

TINGFENG LI, **SHAOBO HAN**, MARTIN RENQIANG MIN, AND DIMITRIS N. METAXAS

- Learned transferable reward signals via ordinal metric learning for test-time policy adaptation to new tasks and environments

Provable Adaptation across Multiway Domains via Representation Learning

ICLR 2022

ZHILI FENG, **SHAOBO HAN**, AND SIMON S. DU

- Zero-shot domain adaptation across multiway domains via representation learning and low-rank tensor structure

Cross-Domain Multitask Learning with Latent Probit Models

ICML 2012

SHAOBO HAN, XUEJUN LIAO, AND LAWRENCE CARIN

- Learned sparse transformations from heterogeneous feature spaces into a shared latent domain

Multimodal Learning & Adaptation

Uncertainty-Aware Knowledge Distillation for Multimodal Large Language Models

CVPR 2026

JINGCHEN SUN, **SHAOBO HAN**, DEEP PATEL, WATARU KOHNO, CAN JIN, AND CHANGYOU CHEN

- Teacher-informed Gibbs prior with amortized inference for uncertainty-aware supervision weighting

Mix-CLAP: Adaptive Fusion of Knowledge-Distilled Audio Embeddings for Noise-Aware Audio-Language Models

ICASSP 2026

WATARU KOHNO, **SHAOBO HAN**, NORIYUKI TONAMI, TINGFENG LI, JINGCHEN SUN, AND TING WANG

- Distills complementary clean- and noise-robust student representations and adaptively fuses them to extrapolate beyond both

CLAP-S: Support Set Based Adaptation for Downstream Fiber-Optic Acoustic Recognition

ICASSP 2025

JINGCHEN SUN, **SHAOBO HAN**, WATARU KOHNO, AND CHANGYOU CHEN

- Combines parametric adaptation with explicit support-set memory for low-shot generalization under severe domain shift

Sensing AI

Manhole Localization and Condition Diagnostics in Telecom Networks Using Distributed Acoustic and Temperature Sensing

Journal of Lightwave Technology
2026

SHAOBO HAN[†], MING-FANG HUANG, YAOWEN LI, GLENN A. WELLBROCK, TIEJUN J. XIA, SCOTT KOTRLA, JEFFREY A. MUNDT, JAMES M. MOORE, PHILIP N. JI, TINGFENG LI, YUHENG CHEN, TING WANG, AND YOSHIKI AONO

- Extended journal version of the **OFC 2025 Top-Scored Paper**, validated over deployed telecom networks

Energy-Based Generative Models for Distributed Acoustic Sensing Event Classification in Telecom Networks

ECOC 2025 **Top-Scored Paper**

SHAOBO HAN[†], MING-FANG HUANG, TINGFENG LI, SCOTT KOTRLA, JEFFREY A. MUNDT, TING WANG, AND YOSHIKI AONO

- Energy-based generative classification with semi-supervised density modeling and uncertainty calibration

Deep Learning-Based Intrusion Detection and Impulsive Event Classification for Distributed Acoustic Sensing Across Telecom Networks

Journal of Lightwave Technology
2024

SHAOBO HAN[†], MING-FANG HUANG, TINGFENG LI, JIAN FANG, ZHUOCHENG JIANG, AND TING WANG

- Investigates how inductive biases affect learning under different sensing conditions, with validation through field experiments.

Ambient Noise-Based Weakly Supervised Manhole Localization Methods over Deployed Fiber Networks

Optics Express 2023

ALEXANDER BUKHARIN, **SHAOBO HAN**[†], YUHENG CHEN, MING-FANG HUANG, YUE-KAI HUANG, YAO XIE, AND TING WANG

- Weakly supervised localization from ambient traffic using selective data sampling and attention-based multiple-instance learning

Probabilistic Modeling & Inference

VAE Learning via Stein Variational Gradient Descent

YUNCHEN PU, ZHE GAN, RICARDO HENAO, CHUNYUAN LI, **SHAOBO HAN**, AND LAWRENCE CARIN

NIPS 2017

Variational Gaussian Copula Inference

SHAOBO HAN, XUEJUN LIAO, DAVID B. DUNSON, AND LAWRENCE CARIN

AISTATS 2016

Dynamic Rank Factor Model for Text Streams

SHAOBO HAN*, LIN DU*, ESTHER SALAZAR, AND LAWRENCE CARIN

NIPS 2014

Integrated Non-Factorized Variational Inference

SHAOBO HAN, XUEJUN LIAO, AND LAWRENCE CARIN

NIPS 2013

* Equal contribution † Corresponding author

Honors & Awards

2025	Spotlight	NeurIPS 2025
2024–2025	Top-Scored Paper × 3	OFC 2024, OFC 2025, ECOC 2025
2024	Senior Member	IEEE
2023	Top Reviewer	UAI 2023
2022	Outstanding Performance Award	NEC Global Innovation Unit
2021	Tingye Li Innovation Prize Finalist	OFC 2021
2020–2026	Business Contribution Awards × 9	NEC Laboratories America
2019	Extra Mile Award	NEC Corporation of America
2018	Top 30% Reviewer	NeurIPS 2018
2014	Charles Rowe Vail Memorial Outstanding Graduate Teaching Award	Duke University

Selected Patents — 19 Granted U.S. Patents

Multilinear Domain-Specific Domain Generalization

SHAOBO HAN

US12561841B2

2026

Learning Ordinal Representations for Deep Reinforcement Learning Based Object Localization

SHAOBO HAN, MARTIN RENQIANG MIN, AND TINGFENG LI

US12205327B2

2024

Context Encoder-Based Fiber Sensing Anomaly Detection

SHAOBO HAN, MING-FANG HUANG, AND ERIC COSATTO

US11733089B2

2023

Contrastive Learning of Utility Pole Representations from Distributed Acoustic Sensing Signals

SHAOBO HAN, YUE TIAN, SARPEN OZHARAR, YANGMIN DING, AND TING WANG

US11698290B2

2023

Selected Invited Talks & Tutorials

Machine Learning for Optical Fiber Sensing: Generalization, Adaptation, and Real-World Deployment

INVITED TUTORIAL, 30TH INTERNATIONAL CONFERENCE ON OPTICAL FIBER SENSORS (OFS30)

Raleigh, NC

2026

Extreme Parameter-Efficient Fine-Tuning of Foundation Models

INVITED TALK, POSTECH-KAIST-NEC JOINT RESEARCH WORKSHOP

Seoul, South Korea

2026

Generative AI for Distributed Acoustic Sensing over Telecom Networks

INVITED WORKSHOP TALK & PANELIST, OECC/PSC

Sapporo, Japan

2025

Professional Service

Associate Editor: IEEE Transactions on Big Data

Area Chair: ICASSP 2026

Reviewer: NeurIPS, ICML, ICLR, CVPR, AAAI, AISTATS, UAI, IJCAI, JMLR, JASA, IEEE TSP, Optics Express