

Junhong Shen

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Research Interests

Developing data-centric ML and AutoML techniques for long-tail ML applications, addressing efficiency, data scarcity & heterogeneity

Education

Carnegie Mellon University

PH.D. IN MACHINE LEARNING, ADVISOR: [AMEET TALWALKAR](#) (QPA: 4.11/4.33)

Pittsburgh, PA

Sep. 2021 - Present

University of California, Los Angeles

B.S. IN MATHEMATICS OF COMPUTATION (GPA: 4.0/4.0)

Los Angeles, CA

Sep. 2017 - June 2021

Publications

PREPRINT

Tag-LLM: Repurposing General-Purpose LLMs for Specialized Domains

Under Review [\[paper\]](#)

Junhong Shen, Neil Tenenholtz, James Brian Hall, David Alvarez-Melis, Nicolò Fusi

ACCEPTED/PUBLISHED ARTICLES

Cross-Modal Fine-Tuning: Align then Refine

ICML 2023 (Oral, top 158/6538) [\[paper\]](#) [\[code\]](#) [\[talk\]](#) [\[website\]](#)

Junhong Shen, Liam Li, Lucio M. Dery, Corey Staten, Mikhail Khodak, Graham Neubig, Ameet Talwalkar

Efficient Architecture Search for Diverse Tasks

NeurIPS 2022 [\[paper\]](#) [\[code\]](#) [\[blog\]](#)

Junhong Shen*, Mikhail Khodak*, Ameet Talwalkar

NAS-Bench-360: Benchmarking Neural Architecture Search on Diverse Tasks

NeurIPS 2022 Datasets and Benchmarks Track [\[paper\]](#) [\[website\]](#) [\[blog\]](#)

Renbo Tu*, Nicholas Roberts*, Mikhail Khodak, **Junhong Shen**, Frederic Sala, Ameet Talwalkar

AutoML Decathlon: Diverse Tasks, Modern Methods, and Efficiency at Scale

NeurIPS 2022 Competitions Track [\[paper\]](#) [\[website\]](#)

Nicholas Roberts, ... 24 authors ..., **Junhong Shen**, Evan Sparks

Iterative Teacher-Aware Learning

NeurIPS 2021 [\[paper\]](#) [\[code\]](#)

Luyao Yuan, Dongruo Zhou, **Junhong Shen**, Jingdong Gao, Jeffrey Chen, Quanquan Gu, Ying Nian Wu, Song-Chun Zhu

Theoretically Principled Deep RL Acceleration via Nearest Neighbor Function Approximation

AAAI 2021 [\[paper\]](#) [\[code\]](#)

Junhong Shen, Lin F. Yang

Mathematical Reconstruction of Patient-Specific Vascular Networks Based on Clinical Images and Global Optimization

IEEE Access [\[paper\]](#) [\[code\]](#) [\[talk\]](#)

Junhong Shen, Abdul Hannan Faruqi, Yifan Jiang, Nima Maftoon

Emergence of Pragmatics from Referential Game between Theory of Mind Agents

NeurIPS 2019 Emergent Communication Workshop [\[paper\]](#) [\[code\]](#)

Luyao Yuan, Zipeng Fu, Jingyue Shen, Lu Xu, **Junhong Shen**, Song-Chun Zhu

* Equal Contribution

Work Experience

Scribe

SENIOR MACHINE LEARNING RESEARCH ENGINEER

- Working on LLM-based web agents.

Pittsburgh, PA

Feb. 2024 - Present

Fundamental AI Research (FAIR), Meta

RESEARCH INTERN (MENTOR: [CHUNTING ZHOU](#), [OMER LEVY](#))

- Will work on multi-modal foundation models.

Seattle, WA

May 2024 (Expected)

Microsoft Research, New England

RESEARCH INTERN (MENTOR: [DAVID ALVAREZ-MELIS](#), [NICOLÒ FUSI](#))

- Worked on adapting LLMs to specialized domains (e.g., low-resource languages, protein sequences, chemical formulas) via prompt tuning.

Cambridge, MA

May 2023 - Aug. 2023

Determined AI, Hewlett Packard Enterprise

RESEARCH INTERN (MENTOR: [LIAM LI](#))

- Worked on fine-tuning LLMs and vision transformers for scientific modalities (e.g., PDE, genomics) via distribution alignment.

Pittsburgh, PA

Jun. 2022 - Dec. 2022

Face ID Team, SenseTime

PRODUCT MANAGER INTERN

- Worked on 3D-structured-light Face ID; participated in 5 software version releases, bug fixing, and testing.
- Designed the Face ID demo app; performed user requirements analysis and competitive product analysis, delivered to the team.

Beijing, China

Jun. 2018 - Sep. 2018

Research Experience

SAGE Lab

ADVISOR: [AMEET TALWALKAR](#) (CMU)

- Ph.D. research on developing effective and efficient ML/AutoML tools for solving diverse tasks in practice.

Pittsburgh, PA

June. 2021 - Present

Lin Yang's Group

ADVISOR: [LIN F. YANG](#) (UCLA)

- Studied sample-efficient reinforcement learning; proposed an algorithm for estimating the value functions using nearest neighbor function approximator; provided theoretical justification on the sample complexity.

Los Angeles, CA

Jan. 2020 - June 2021

Center for Vision, Cognition, Learning, and Autonomy (VCLA), UCLA

ADVISOR: [SONG-CHUN ZHU](#), [YING NIAN WU](#) (UCLA)

- Studied how theory of mind (ToM) can be integrated into various ML settings to improve algorithm efficiency.
- Project 1: Multi-Agent Deep Reinforcement Learning with ToM**
 - Proposed an adaptive ToM algorithm in a referential game setting where the teacher and the student model each other's action likelihood while learning their own Q-functions; studied the emergent communication protocol between the agents.
- Project 2: Efficient Learners in Iterative Machine Teaching**
 - Integrated ToM into machine teaching; improved teaching efficiency by having the learners model the teacher's training sample selection strategy with maximum likelihood estimation.
- Project 3: Meta Machine Teaching**
 - Studied how meta-learning can be combined with machine teaching: the teacher monitors a group of students' learning processes, deduces their initial beliefs and learning models, and adapts its teaching scheme to each learner.

Los Angeles, CA

Jan. 2019 - June 2021

Computational Metastasis Lab, Fields Institute for Research in Mathematical Sciences

ADVISOR: [NIMA MAFTOON](#) (UNIVERSITY OF WATERLOO)

- Developed a vascular network reconstruction framework that uses (i) the main vessel skeletons segmented from clinical images and (ii) global constructive optimization algorithm to generate patient-specific cerebral vascular models; validated the geometric (lengths, radii) and hemodynamic (pressure, shear stress) properties of the models via histogram analysis and blood flow simulation.

Toronto, Canada

Jul. 2019 - Sep. 2019

MOE Key Laboratory of Protein Sciences, Tsinghua University

ADVISOR: [JIA-WEI WU](#) (TSINGHUA UNIVERSITY)

- Studied the catalytic mechanism of enzyme HPPD and investigated its protein structure via X-ray diffraction.

Beijing, China

Sep. 2015 - June 2017

Professional Service

Co-organizer of [AutoML Decathlon](#), NeurIPS 2022 Competition Track

CMU MSML Admissions Committee Fall 2022

CMU MLD Open House Committee Spring 2024

Conference Reviewer NeurIPS (2022/2023), ICLR (2024), ICML (2024)

Teaching Assistant Deep Learning Systems (CMU 10714), Linear Algebra (UCLA Math 115A)

Talks

Nov. 2023 [Machine Learning for Diverse Tasks](#), Guest Lecture, ML with Large Datasets, CMU 10605

Nov. 2023 [Bridging LLMs and Long Tail ML Applications](#), Catalyst Reading Group, CMU

Mar. 2023 [Cross-Modal Fine-Tuning](#), AI4Science Talks

Dec. 2022 [DASH: How to Search Over Convolutions](#), The AutoML Podcast

Oct. 2022 [Tackling Diverse Tasks with Neural Architecture Search](#), DLML Journal Club, Mayo Clinic

Honors & Awards

2021 **Daus Prize**, UCLA ([5 top-performing undergraduate students](#) in mathematics)

Los Angeles, CA

2017 - 21 **Dean's Honors List**, UCLA

Los Angeles, CA

Professional Skills

Coding Proficient: Python, C, C++, Bash, R Familiar: MATLAB, Java, Arduino

Tools Git, \LaTeX , PyTorch, Tensorflow, Scikit-learn, OpenCV, OpenAI Gym, Google Cloud Platform, Docker, SolidWorks

Related Coursework

CS	Machine Learning, Artificial Intelligence, Information Theory, Computer Vision, Algorithms and Complexities, Advanced Programming, Operating Systems Principles, Deep Learning Systems, Computer Network Fundamentals
Math	Linear Algebra, Multivariable Calculus, Differential Equations, Discrete Mathematics, Probability Theory, Stochastic Processes, Mathematical Analysis, Complex Analysis, Optimization, Applied Numerical Methods, Game Theory
Stats	Statistical Modeling in Vision and Cognition, Computing and Inference in Vision and Cognition, Data Analysis and Regression