

Junhong Shen

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Research Interests

Automated machine learning (AutoML) and developing practical ML tools for real-life applications in general

Education

Carnegie Mellon University

PH.D. IN MACHINE LEARNING (ADVISOR: [AMEET TALWALKAR](#), GPA: 4.0/4.0)

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

MANUSCRIPTS UNDER REVIEW

[1] **Efficient Architecture Search for Diverse Tasks**, Submitted to ICML 2022 [[pdf](#)][[code](#)]
Junhong Shen*, Mikhail Khodak*, Ameet Talwalkar

ACCEPTED/PUBLISHED ARTICLES

[1] **Iterative Teacher-Aware Learning**, NeurIPS 2021 [[pdf](#)]
Luyao Yuan, Dongruo Zhou, Junhong Shen, Jingdong Gao, Jeffrey Chen, Quanquan Gu, Ying Nian Wu, Song-Chun Zhu

[2] **Theoretically Principled Deep RL Acceleration via Nearest Neighbor Function Approximation**, AAAI 2021 [[pdf](#)][[code](#)]
Junhong Shen, Lin F. Yang

[3] **Mathematical Reconstruction of Patient-Specific Vascular Networks Based on Clinical Images and Global Optimization**,
[[pdf](#)] [[slides](#)] [[code](#)]
Junhong Shen, Abdul Hannan Faruqi, Yifan Jiang, Nima Maftoon

[4] **Emergence of Pragmatics from Referential Game between Theory of Mind Agents**,
NeurIPS 2019 Emergent Communication Workshop [[pdf](#)] [[code](#)]
Luyao Yuan, Zipeng Fu, Jingyue Shen, Lu Xu, Junhong Shen, Song-Chun Zhu

* Equal Contribution

Research Experience

SAGE Lab

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

Pittsburgh, PA

June. 2021 - Present

- Ph.D. research on developing efficient and effective methods for automated machine learning on diverse, practical tasks.

Lin Yang's Group

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

Los Angeles, CA

Jan. 2020 - June 2021

- Studied sample-efficient reinforcement learning.
- Proposed a deep reinforcement learning acceleration technique which estimates the value functions using the nearest neighbor (NN) function approximator; provided theoretical justification that the sample complexity of the NN approximator is near-optimal for deterministic control in metric spaces and depends on the intrinsic rather than the external complexity of the state space.

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

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

Los Angeles, CA

Jan. 2019 - June 2021

- Studied how *theory of mind* (ToM), which states that people regularly reason about others' mental states, can be integrated into machine learning to improve algorithm efficiency. In reinforcement learning, ToM is achieved by allowing agents to model their partners' policies.
- **Project 1: Multi-Agent Deep Reinforcement Learning with ToM**
 - We 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; we also studied the emergent communication protocol between the agents.
- **Project 2: Efficient Learners in Iterative Machine Teaching**
 - We employed ToM in machine teaching and improved teaching efficiency by having the learners model the teacher's training sample selection strategy with maximum likelihood estimation.
- **Project 3: Meta Machine Teaching**
 - We studied how meta-learning can be combined with machine teaching in regression and classification tasks. The teacher monitors a group of students' learning processes, deduces their initial beliefs and learning models, and adapts its teaching scheme to each learner.

Computational Metastasis Lab, Fields Institute for Research in Mathematical Sciences

Toronto, Canada

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

Jul. 2019 - Sep. 2019

- Developed a vascular network reconstruction framework that uses (1) the main vessel skeletons segmented from clinical images and (2) global constructive optimization with physiological constraints to generate patient-specific cerebral vascular models; validated the geometric (lengths, radii) and hemodynamic (pressure, shear stress) properties of the models by histogram analysis and blood flow simulation, respectively.

MOE Key Laboratory of Protein Sciences, Tsinghua University

Beijing, China

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

Sep. 2015 - June 2017

- Researched on the catalytic mechanism of enzyme HPPD and investigated its protein structure using X-ray diffraction.

Work Experience

Linear Algebra (MATH 115A), UCLA

Los Angeles, CA

GRADER

Jan. 2019 - Mar. 2021

- Graded exams and weekly problem sets for 6 academic quarters; wrote quiz solutions; worked for 360+ hours.

Face ID Team, Beijing SenseTime Technology Development Company

Beijing, China

PRODUCT MANAGER INTERN

Jun. 2018 - Sep. 2018

- Assisted in the 3D-structured-light Face ID project; helped with face data collection; collaborated with engineers in software updates, bug fixing, and testing; participated in 5 software version releases.
- Participated in designing the SenseTime Face ID demo app; sketched the wireframe; wrote the demo user guide, the evaluation tool user guide, and the Face ID SDK specification; performed user requirements analysis and competitive product analysis; presented to team members.

Honors & Awards

2021 **Daus Prize**, UCLA

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 , Tensorflow, PyTorch, Scikit-learn, OpenCV, OpenAI Gym, Google Cloud Platform, Docker, SolidWorks

Related Coursework

CS

Machine Learning, Artificial Intelligence, Information Theory, Computer Vision, Pattern Recognition, Algorithms and Complexities, Advanced Programming, Operating Systems Principles, 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