Junhong **Shen**

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Research Interests

Automated machine learning, transfer learning, and developing practical ML tools for solving diverse tasks in real life

Education

Carnegie Mellon University   *Pittsburgh, PA*

Ph.D. in Machine Learning (Advisor: Ameet Talwalkar, GPA: 4.0/4.0)   *Sep. 2021 - Present*

University of California, Los Angeles   *Los Angeles, CA*

B.S. in Mathematics of Computation (GPA: 4.0/4.0)   *Sep. 2017 - June 2021*

Publications

Under Review

Cross-Modal Fine-Tuning: Align then Refine [pdf][code]
Junhong Shen, Liam Li, Lucio M. Dery, Corey Staten, Mikhail Khodak, Graham Neubig, Ameet Talwalkar

Accepted/Published articles

Efficient Architecture Search for Diverse Tasks
NeurIPS 2022 [pdf][code][blog]
Junhong Shen*, Mikhail Khodak*, Ameet Talwalkar

NAS-Bench-360: Benchmarking Neural Architecture Search on Diverse Tasks
NeurIPS 2022 Datasets and Benchmarks Track [pdf][website][blog]
Renbo Tu*, Nicholas Roberts*, Mikhail Khodak, **Junhong Shen**, Frederic Sala, Ameet Talwalkar

Iterative Teacher-Aware Learning
NeurIPS 2021 [pdf][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 [pdf][code]
Junhong Shen, Lin F. Yang

Mathematical Reconstruction of Patient-Specific Vascular Networks Based on Clinical Images and Global Optimization
IEEE Access [pdf] [code][slides]
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 [pdf] [code]
Luyao Yuan, Zipeng Fu, Jingyue Shen, Lu Xu, **Junhong Shen**, Song-Chun Zhu

* Equal Contribution

Research Experience

SAGE Lab   *Pittsburgh, PA*

Advisor: Ameet Talwalkar (CMU)   *June. 2021 - Present*

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

Lin Yang's Group   *Los Angeles, CA*

Advisor: Lin F. Yang (UCLA)   *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 *Los Angeles, CA*

ADVISOR: SONG-CHUN ZHU, YING NIAN WU (UCLA) *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

Determined AI Team, Hewlett Packard Enterprise *Pittsburgh, PA*

RESEARCH INTERN (MENTOR: LIAM LI) *Jun. 2022 - Dec. 2022*

- Work on fine-tuning large-scale pretrained models for cross-modal transfer.

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.

Professional Service

Co-organizer of AutoML Decathlon, NeurIPS 2022 Competition Track

CMU MSML Admissions Committee   Fall 2022

Conference Reviewer   NeurIPS 2022

Talks

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   *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