

Paul Pu Liang

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Personal Information

Citizenship: US Citizen
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Short Biography

Paul Liang received his Ph.D. in Machine Learning from CMU, advised by Louis-Philippe Morency and Ruslan Salakhutdinov. He studies the machine learning foundations of multisensory intelligence to design practical AI systems that can integrate, learn from, and interact with a diverse range of real-world sensory modalities. His work has been applied in affective computing, mental health, pathology, and robotics. He is a recipient of the [Siebel Scholars Award](#), Waibel Presidential Fellowship, [Facebook PhD Fellowship](#), [Center for ML and Health Fellowship](#), [Rising Stars in Data Science](#), and 3 best paper/honorable mention awards at [ICMI](#) and [NeurIPS workshops](#). Outside of research, he received the [Alan J. Perlis Graduate Student Teaching Award](#) for instructing courses on multimodal machine learning and advising students around the world in directed research.

Research Interests

- Foundations of multimodal machine learning: modality heterogeneity, connections, and interactions.
- Representation learning and foundation models for multisensory, temporal, and high-dimensional data.
- Multimodal applications in socially intelligent AI, human health and wellness, robotics, education, and multimedia AR/VR.
- Real-world human-AI interaction: improving fairness, robustness, trust, and efficiency of AI systems.

Education

- Ph.D. in Machine Learning, Carnegie Mellon University 2018–2024
Thesis: Foundations of Multisensory Artificial Intelligence
Committee: Louis-Philippe Morency (Co-advisor), Ruslan Salakhutdinov (Co-advisor), Manuel Blum, Lenore Blum, Trevor Darrell
- M.S. in Machine Learning, Carnegie Mellon University 2017–2018
Thesis: Computational Modeling of Human Multimodal Language
Advisors: Louis-Philippe Morency and Ruslan Salakhutdinov
- B.S. in Computer Science & Neural Computation, Carnegie Mellon University 2014–2017
Graduated with University Honors
Advisors: Roni Rosenfeld, Ryan Tibshirani, Tai Sing Lee

Positions

- Simons Institute at UC Berkeley, Visitor for Summer Cluster on AI, Psychology, and Neuroscience Summer 2024
- Carnegie Mellon University, Graduate Researcher with Louis-Philippe Morency & Ruslan Salakhutdinov 2018–2024
- Allen Institute of AI & University of Washington, Visiting Researcher with Jack Hessel and Yejin Choi 2023
- Harvard Medical School, Visiting Researcher with Faisal Mahmood 2022–2023
- Consultant for several startups: Primaface (affective computing), Acuity Diagnostics (medical imaging) 2022–2023
- UC Berkeley, Visiting Researcher with Manuel Blum & Lenore Blum 2021–2023
- Stanford University, Visiting Researcher with Daniel Rubin 2021
- Google DeepMind, Research Intern with Dani Yogatama, Aida Nematzadeh, Lisa Hendricks & Phil Blunsom Summer 2021
- Facebook AI Research, Research Intern with Brandon Amos, Tim Rocktäschel & Ed Grefenstette Summer 2020
- Nvidia AI, Research Intern with Yuke Zhu, Anima Anandkumar & Sanja Fidler Spring 2020
- Google Research, Research Intern with Manzil Zaheer, Yuan Wang & Amr Ahmed Summer 2019
- Riken AI Project, Visiting Researcher with Makoto Yamada, Qibin Zhao & Masashi Sugiyama Winter 2018
- Carnegie Mellon University, Undergraduate Researcher with Tai Sing Lee, Roni Rosenfeld & Ryan Tibshirani 2016–2017

Honors and Awards

- [Siebel Scholars Award](#) (\$35,000 award, 80 awardees worldwide) 2023
- [Waibel Presidential Fellowship](#) (\$100,000 funding for 1 year, 1 awardee from CMU) 2023
- [Rising Stars in Data Science](#) 2023
- [Alan J. Perlis Graduate Student Teaching Award](#) 2023
- [NeurIPS 2022 Workshop on Human in the Loop Learning Best Paper Nomination](#) 2022
- [Young Researcher Invitation to the Heidelberg Laureate Forum](#) 2022
- [Facebook PhD Fellowship](#) (\$200,000 funding over 2 years, 26 awardees out of 2100 applicants worldwide) 2021
- [Center for Machine Learning and Health Fellowship](#) (\$100,000 funding for 1 year, 10 awardees from CMU) 2021

- MIT Fintech Innovation Prize Grant and Sandbox Innovation Program Funding 2021
- CVPR 2020 [Argoverse Competition Honorable Mention](#) 2020
- NeurIPS 2019 Workshop on Federated Learning [Distinguished Student Paper](#) 2019
- CMU Machine Learning Department Teaching Assistant Award 2019
- Princeton University Gordon Wu Fellowship (\$100,000 funding for 1 year, declined) 2018
- NSF Graduate Research Fellowship Honorable Mention 2018
- ICMI 2017 [Best Paper Honorable Mention](#) 2017
- CMU School of Computer Science University Honors 2017
- CMU School of Computer Science Dean's List 2015, 2016, 2017

Publications

(*denotes joint first-authors, [Google Scholar](#) citations: 9000, h-index: 32)

2024

58. [Foundations of Multisensory Artificial Intelligence](#)
Paul Pu Liang
 PhD Thesis. Committee: Louis-Philippe Morency, Ruslan Salakhutdinov, Manuel Blum, Lenore Blum, Trevor Darrell
57. [Foundations & Trends in Multimodal Machine Learning: Principles, Challenges, and Open Questions](#)
Paul Pu Liang, Amir Zadeh, Louis-Philippe Morency
 ACM Computing Surveys, Tutorials at ICML & ICMI 2023, CVPR & NAACL 2022 [[website](#)] [[videos 2023](#)] [[videos 2022](#)]
56. [Modeling Dense Multimodal Interactions Between Biological Pathways and Histology for Survival Prediction](#)
 Guillaume Jaume, Anurag Vaidya, Richard Chen, Drew Williamson, **Paul Pu Liang**, Faisal Mahmood
 CVPR 2024 [[code](#)]
55. FLHetBench: Benchmarking Device and State Heterogeneity in Federated Learning
 Junyuan Zhang, Shuang Zeng, Miao Zhang, Runxi Wang, Feifei Wang, Yuyin Zhou, **Paul Pu Liang**, Liangqiong Qu
 CVPR 2024
54. [Multimodal Learning Without Labeled Multimodal Data: Guarantees and Applications](#)
Paul Pu Liang, Chun Kai Ling, Yun Cheng, Alex Obolenskiy, Yudong Liu, Rohan Pandey, Alex Wilf, L.-P. Morency, R. Salakhutdinov
 ICLR 2024 [[code](#)]

2023

53. [Quantifying & Modeling Multimodal Interactions: An Information Decomposition Framework](#)
Paul Pu Liang, Yun Cheng, Xiang Fan, Chun Kai Ling, Suzanne Nie, Richard Chen, Zihao Deng, Nicholas Allen, Randy Auerbach, Faisal Mahmood, Ruslan Salakhutdinov, Louis-Philippe Morency
 NeurIPS 2023 [[code](#)]
52. [Factorized Contrastive Learning: Going Beyond Multi-view Redundancy](#)
Paul Pu Liang*, Zihao Deng*, Martin Ma*, James Zou, Louis-Philippe Morency, Ruslan Salakhutdinov
 NeurIPS 2023 [[code](#)]
51. [Localized Symbolic Knowledge Distillation for Visual Commonsense Models](#)
 Jae Sung Park, Jack Hessel, Khyathi Chandu, **Paul Liang**, Ximing Lu, Qiuyuan Huang, Peter West, Jianfeng Gao, Ali Farhadi, Yejin Choi
 NeurIPS 2023 [[code](#)]
50. [Read and Reap the Rewards: Learning to Play Atari with the Help of Instruction Manuals](#)
 Yue Wu, Yewen Fan, **Paul Pu Liang**, Amos Azaria, Yuanzhi Li, Tom Mitchell
 NeurIPS 2023, ICLR 2023 Workshop on Reincarnating RL ([oral](#)) [[code](#)]
49. [Difference-Masking: Choosing What to Mask in Continued Pretraining](#)
 Alex Wilf, Syeda Akter, Leena Mathur, **Paul Pu Liang**, Sheryl Mathew, Mengrou Shou, Eric Nyberg, Louis-Philippe Morency
 EMNLP 2023 Findings [[code](#)]
48. [Multimodal Fusion Interactions: A Study of Human and Automatic Quantification](#)
Paul Pu Liang, Yun Cheng, Ruslan Salakhutdinov, Louis-Philippe Morency
 ICMI 2023 [[code](#)]
47. [HIINT: Historical, Intra- and Inter- personal Dynamics Modeling with Cross-person Memory Transformer](#)
 Yubin Kim, Dong Won Lee, **Paul Pu Liang**, Sharifa Alghowinem, Cynthia Breazeal, Hae Won Park
 ICMI 2023
46. [Lecture Presentations Multimodal Dataset: Towards Understanding Multimodality in Educational Videos](#)
 Dong Won Lee, Chaitanya Ahuja, **Paul Pu Liang**, Sanika Natu, Louis-Philippe Morency
 ICCV 2023 [[code](#)]
45. [Cross-modal Attention Congruence Regularization for Vision-Language Relation Alignment](#)
 Rohan Pandey, Rulin Shao, **Paul Pu Liang**, Ruslan Salakhutdinov, Louis-Philippe Morency
 ACL 2023 [[code](#)]
44. [Language Models Get a Gender Makeover: Mitigating Gender Bias with Few-Shot Data Interventions](#)
 Himanshu Thakur, Atishay Jain, Praneetha Vaddamanu, **Paul Pu Liang**, Louis-Philippe Morency
 ACL 2023 [[code](#)]

43. [Nano: Nested Human-in-the-Loop Reward Learning for Few-shot Language Model Control](#)
Xiang Fan, Yiwei Lyu, **Paul Pu Liang**, Ruslan Salakhutdinov, Louis-Philippe Morency
ACL Findings 2023, NeurIPS 2022 Workshop on Human in the Loop Learning ([oral](#), [best paper nomination](#)) [[code](#)]
42. [MultiViz: Towards Visualizing and Understanding Multimodal Models](#)
Paul Pu Liang, Yiwei Lyu, Gunjan Chhablani, Nihal Jain, Zihao Deng, Xingbo Wang, Louis-Philippe Morency, Ruslan Salakhutdinov
ICLR 2023, CHI 2023 Late-Breaking Work [[code](#)]
41. [FindAdaptNet: Find and Insert Adapters by Learned Layer Importance](#)
Junwei Huang, Karthik Ganesan, Soumi Maiti, Young Min Kim, Xuankai Chang, **Paul Liang**, Shinji Watanabe
ICASSP 2023
40. [Face-to-Face Contrastive Learning for Social Intelligence Question-Answering](#)
Alex Wilf, Martin Ma, **Paul Pu Liang**, Amir Zadeh, Louis-Philippe Morency
FG 2023 [[code](#)]
39. [Beyond the Imitation Game: Quantifying and Extrapolating the Capabilities of Language Models](#)
442 authors including **Paul Pu Liang**
TMLR 2023 [[code](#)]

2022

38. [High-Modality Multimodal Transformer: Quantifying Modality & Interaction Heterogeneity for High-Modality Representation Learning](#)
Paul Pu Liang, Yiwei Lyu, Xiang Fan, Jeffrey Tsaw, Yudong Liu, Dani Yogatama, Louis-Philippe Morency, Ruslan Salakhutdinov
TMLR 2022 [[code](#)]
37. [MultiZoo & MultiBench: A Standardized Toolkit for Multimodal Deep Learning](#)
Paul Pu Liang, Yiwei Lyu, Xiang Fan, Arav Agarwal, Yun Cheng, Louis-Philippe Morency, Ruslan Salakhutdinov
JMLR. 2022 [[website](#)] [[code](#)]
36. [Brainish: Formalizing A Multimodal Language for Intelligence and Consciousness](#)
Paul Pu Liang
Association for the Scientific Study of Consciousness 2022, Models of Consciousness 2022 ([oral](#))
35. [Uncertainty Quantification with Pre-trained Language Models: A Large-scale Empirical Analysis](#)
Yuxin Xiao, **Paul Pu Liang**, Umang Bhatt, Willie Neiswanger, Ruslan Salakhutdinov, Louis-Philippe Morency
EMNLP Findings 2022 [[code](#)]
34. [GEMv2: Multilingual NLG Benchmarking in a Single Line of Code](#)
77 authors including **Paul Pu Liang**
EMNLP Demo Track 2022 [[code](#)]
33. [PACS: Physical Audiovisual Commonsense Reasoning](#)
Samuel Yu, Peter Wu, **Paul Pu Liang**, Ruslan Salakhutdinov, Louis-Philippe Morency
ECCV 2022 [[code](#)]
32. [DIME: Fine-grained Interpretations of Multimodal Models via Disentangled Local Explanations](#)
Yiwei Lyu, **Paul Pu Liang**, Zihao Deng, Ruslan Salakhutdinov, Louis-Philippe Morency
AIES 2022 [[code](#)]
31. [Rethinking Architecture Design for Tackling Data Heterogeneity in Federated Learning](#)
Liangqiong Qu*, Yuyin Zhou*, **Paul Pu Liang***, Yingda Xia, Feifei Wang, Li Fei-Fei, Ehsan Adeli, Daniel Rubin
CVPR 2022 [[code](#)]

2021

30. [MultiBench: Multiscale Benchmarks for Multimodal Representation Learning](#)
Paul Pu Liang, Yiwei Lyu, Xiang Fan, Z. Wu, Y. Cheng, J. Wu, L. Chen, P. Wu, M.Lee, Y. Zhu, R. Salakhutdinov, L.-P. Morency
NeurIPS 2021 [[website](#)] [[code](#)]
29. [Understanding the Tradeoffs in Client-side Privacy for Speech Recognition](#)
Peter Wu, **Paul Pu Liang**, Jiatong Shi, Ruslan Salakhutdinov, Shinji Watanabe, Louis-Philippe Morency
Asia Pacific Signal and Information Processing Association Annual Summit and Conference 2021 [[code](#)]
28. [Towards Understanding and Mitigating Social Biases in Language Models](#)
Paul Pu Liang, Chiyu Wu, Louis-Philippe Morency, Ruslan Salakhutdinov
ICML 2021 [[code](#)]
27. [Learning Language and Multimodal Privacy Preserving Markers of Mood from Mobile Data](#)
Paul Pu Liang*, Terrance Liu*, A. Cai, M. Muszynski, R. Ishii, N. Allen, R. Auerbach, D. Brent, R. Salakhutdinov, L.-P. Morency
ACL 2021 ([oral](#))
26. [Cross-Modal Generalization: Learning in Low Resource Modalities via Meta-Alignment](#)
Paul Pu Liang*, Peter Wu*, Liu Ziyin, Louis-Philippe Morency, Ruslan Salakhutdinov
ACM Multimedia 2021 ([oral](#)) [[code](#)]
25. [StylePTB: A Compositional Benchmark for Fine-grained Controllable Text Style Transfer](#)
Yiwei Lyu*, **Paul Pu Liang***, Hai Pham*, Eduard Hovy, Barnabás Póczos, Ruslan Salakhutdinov, Louis-Philippe Morency
NAACL 2021 [[code](#)]

24. [Anchor & Transform: Learning Sparse Embeddings for Large Vocabularies](#)

Paul Pu Liang, Manzil Zaheer, Yuan Wang, Amr Ahmed
ICLR 2021 [\[code\]](#)

2020

23. [MOSEAS: A Multimodal Language Dataset for Spanish, Portuguese, German and French](#)

Amir Zadeh, Yansheng Cao, Simon Hessner, **Paul Pu Liang**, Soujanya Poria, Louis-Philippe Morency
EMNLP 2020

22. [Diverse and Admissible Trajectory Prediction through Multimodal Context Understanding](#)

Seong Hyeon Park, Gyubok Lee, Manoj Bhat, Jimin Seo, Minseok Kang, Jon Francis, Ashwin Jadhav, **Paul Liang**, L.-P. Morency
ECCV 2020, CVPR 2020 Argoverse competition ([honorable mention award](#)) [\[code\]](#)

21. [Towards Debiasing Sentence Representations](#)

Paul Pu Liang, Irene Li, Emily Zheng, Yao Chong Lim, Ruslan Salakhutdinov, Louis-Philippe Morency
ACL 2020 [\[code\]](#)

20. [On Emergent Communication in Competitive Multi-Agent Teams](#)

Paul Pu Liang, Jeffrey Chen, Ruslan Salakhutdinov, Louis-Philippe Morency, Satwik Kottur
AAMAS 2020 ([oral](#)) [\[code\]](#)

19. [Empirical and Theoretical Studies of Multimodal Co-learning](#)

Amir Zadeh, **Paul Pu Liang**, Louis-Philippe Morency
Elsevier Information Fusion 2020

2019

18. [Think Locally, Act Globally: Federated Learning with Local and Global Representations](#)

Paul Pu Liang*, Terrance Liu*, Liu Ziyin, Nick Allen, Randy Auerbach, David Brent, Ruslan Salakhutdinov, Louis-Philippe Morency
NeurIPS 2019 Workshop on Federated Learning ([oral, distinguished student paper award](#)) [\[code\]](#)

17. [Deep Gamblers: Learning to Abstain with Portfolio Theory](#)

Liu Ziyin, Zhikang Wang, **Paul Pu Liang**, Ruslan Salakhutdinov, Louis-Philippe Morency, Masahito Ueda
NeurIPS 2019 [\[code\]](#)

16. [Learning Representations from Imperfect Time Series Data via Tensor Rank Regularization](#)

Paul Pu Liang*, Zhun Liu*, Yao-Hung Hubert Tsai, Qibin Zhao, Ruslan Salakhutdinov, Louis-Philippe Morency
ACL 2019

15. [Multimodal Transformer for Unaligned Multimodal Language Sequences](#)

Yao-Hung Hubert Tsai, Shaojie Bai, **Paul Pu Liang**, Zico Kolter, Louis-Philippe Morency, Ruslan Salakhutdinov
ACL 2019 [\[code\]](#)

14. [Social-IQ: A Question Answering Benchmark for Artificial Social Intelligence](#)

Amir Zadeh, Michael Chan, **Paul Pu Liang**, Edmund Tong, Louis-Philippe Morency
CVPR 2019 ([oral](#)) [\[code\]](#)

13. [Strong and Simple Baselines for Multimodal Utterance Embeddings](#)

Paul Pu Liang*, Yao Chong Lim*, Yao-Hung Hubert Tsai, Ruslan Salakhutdinov, Louis-Philippe Morency
NAACL 2019 ([oral](#)) [\[code\]](#)

12. [Learning Factorized Multimodal Representations](#)

Yao-Hung Hubert Tsai*, **Paul Pu Liang***, Amir Zadeh, Louis-Philippe Morency, Ruslan Salakhutdinov
ICLR 2019 [\[code\]](#)

11. [Found in Translation: Learning Robust Joint Representations by Cyclic Translations Between Modalities](#)

Hai Pham*, **Paul Pu Liang***, Thomas Manzini, Louis-Philippe Morency, Barnabás Póczos
AAAI 2019 [\[code\]](#)

10. [Words can Shift: Dynamically Adjusting Word Representations Using Nonverbal Behaviors](#)

Yansen Wang, Ying Shen, Zhun Liu, **Paul Pu Liang**, Amir Zadeh, Louis-Philippe Morency
AAAI 2019 [\[code\]](#)

2018

9. [Computational Modeling of Human Multimodal Language: The MOSEI Dataset and Interpretable Dynamic Fusion](#)

Paul Pu Liang, Ruslan Salakhutdinov, Louis-Philippe Morency
Master's Thesis, CMU Machine Learning Data Analysis Project ([first runner-up award](#)) [\[code\]](#)

8. [Multimodal Language Analysis with Recurrent Multistage Fusion](#)

Paul Pu Liang, Ziyin Liu, Amir Zadeh, Louis-Philippe Morency
EMNLP 2018 ([oral](#))

7. [Multimodal Local-Global Ranking Fusion for Emotion Recognition](#)

Paul Pu Liang, Amir Zadeh, Louis-Philippe Morency
ICMI 2018

6. [Multimodal Language Analysis in the Wild: CMU-MOSEI Dataset and Interpretable Dynamic Fusion Graph](#)

Amir Zadeh, **Paul Pu Liang**, Jon Vanbriesen, Soujanya Poria, Edmund Tong, Erik Cambria, Minghai Chen, Louis-Philippe Morency
ACL 2018 ([oral](#)) [\[code\]](#)

5. [Efficient Low-rank Multimodal Fusion with Modality-Specific Factors](#)
Zhun Liu, Ying Shen, Varun Lakshminarasimhan, **Paul Pu Liang**, Amir Zadeh, Louis-Philippe Morency
ACL 2018 ([oral](#)) [[code](#)]
4. [An Empirical Evaluation of Sketched SVD and its Application to Leverage Score Ordering](#)
Hui Han Chin, **Paul Pu Liang**
ACML 2018
3. [Multi-attention Recurrent Network for Human Communication Comprehension](#)
Amir Zadeh, **Paul Pu Liang**, Soujanya Poria, Prateek Vij, Erik Cambria, Louis-Philippe Morency
AAAI 2018 ([oral](#)) [[code](#)]
2. [Memory Fusion Network for Multi-view Sequential Learning](#)
Amir Zadeh, **Paul Pu Liang**, Navonil Mazumder, Soujanya Poria, Erik Cambria, Louis-Philippe Morency
AAAI 2018 ([oral](#)) [[code](#)]

2017

1. [Multimodal Sentiment Analysis with Word-level Fusion and Reinforcement Learning](#)
Minghai Chen*, Sen Wang*, **Paul Pu Liang***, Tadas Baltrušaitis, Amir Zadeh, Louis-Philippe Morency
ICMI 2017 ([oral](#), [best paper honorable mention](#)) [[code](#)]

Teaching

- Co-Instructor: [11-877 Advanced Topics in Multimodal ML](#) with Daniel Fried, CMU Spring 2024
Created course content, designed assignments, led discussion groups, and advised student research.
- Co-Lecturer: [11-777 Multimodal Machine Learning](#) with Louis-Philippe Morency, CMU Fall 2023
Created and delivered 10 lectures, advised student research.
- Co-Instructor: [Tutorial on Multimodal ML](#) at ICML, ICMI, CVPR, NAACL with Louis-Philippe Morency 2022-2023
- Instructor: Multimodal Artificial Intelligence, [African Masters of Machine Intelligence](#) Summer 2023
Designed and taught a week-long course for the AMMI graduate program in Dakar, Senegal.
- Co-Instructor: [11-866 Artificial Social Intelligence](#) with Louis-Philippe Morency, CMU Spring 2023
Co-created this new course, created course content, designed assignments, led discussion groups, and advised student research.
- Co-Instructor: [11-877 Advanced Topics in Multimodal ML](#) with Louis-Philippe Morency, CMU Spring 2023
Created course content, designed assignments, and led discussion groups.
- Co-Lecturer: [11-777 Multimodal Machine Learning](#) with Louis-Philippe Morency, CMU Fall 2022
Completely revamped course content, created and delivered 8 lectures.
- Co-Instructor: [11-877 Advanced Topics in Multimodal ML](#) with Louis-Philippe Morency and Amir Zadeh, CMU Spring 2022
Co-created this new course, created course content, designed assignments, led discussion groups, and advised student research.
- Head TA & Lecturer: [11-777 Multimodal Machine Learning](#) by Louis-Philippe Morency, CMU Fall 2020
Created course content, delivered 4 lectures on multimodal tasks [[slides](#)] [[video](#)], deep generative models [[slides](#)] [[video](#)], reinforcement learning [[slides](#)] [[video](#)], and multimodal RL [[slides](#)] [[video](#)]. Public videos on YouTube have amassed more than 10000 views.
- Head TA & Lecturer: [11-777 Multimodal Machine Learning](#) by Louis-Philippe Morency, CMU Fall 2019
Created course content, delivered 2 lectures on reinforcement learning [[slides](#)] and multimodal RL [[slides](#)].
- TA: [10-708 Probabilistic Graphical Models](#) by Eric Xing, CMU Spring 2019
- TA: [10-715 Advanced Introduction to Machine Learning](#) by Maria-Florina Balcan, CMU Fall 2018
- TA: [10-601 Introduction to Machine Learning](#) by Roni Rosenfeld, CMU Fall 2016
- TA: [15-213/18-213/15-513 Introduction to Computer Systems](#) by Brian Railing, CMU Summer 2016

Invited Talks

- **Foundations of Multisensory Artificial Intelligence**
UC Berkeley Simons Institute for the Theory of Computing, June 2024
University of Maryland CS, April 2024
MIT Media Lab and Schwarzman College of Computing, April 2024
University of Southern California CS, March 2024
Johns Hopkins University CS, March 2024
UIUC School of Information Sciences, March 2024
UT Dallas CS and ECE, March 2024
University of Washington ECE, Feb 2024
UT Austin CS, Feb 2024
Boston University Computing & Data Sciences, Feb 2024
University of Virginia CS and Data Science, Feb 2024
Stanford University Management Science and Engineering, Feb 2024
Georgia Tech CS, Feb 2024
Duke University CS and ECE, Feb 2024
Harvard Medical School Rajpurkar Lab, Feb 2024
University of Chicago & UC San Diego Rising Stars in Data Science, Nov 2023

- **The Future of Large Language Models: Multimodality and Safety**
American Society for Clinical Pharmacology & Therapeutics Annual Meeting, March 2024
ACM Multimedia Workshop on Multimodal and Responsible Affective Computing, Oct 2023
Microsoft Research, July 2023
IBM Zurich, March 2023
- **Foundations of Multimodal Machine Learning: Principles, Challenges, and Open Questions**
Guest lectures at CMU 10-707 Deep Learning, Peking University, University of Florida, 2023
CIFAR DLRL Summer School, July 2023
ICLR Workshop on Multimodal Representation Learning, April 2023
Guest lectures at CMU 10-707 Deep Learning, 05-618 Human AI Interaction, 17-728 Machine Learning and Sensing, 2022
Harvard Medical School AI for Pathology Lab, Oct 2022
Heidelberg Laureate Forum, Sept 2022
UC Berkeley Speech Group, Sept 2022
Stanford University MedAI Group, Sept 2022
National University of Singapore, Aug 2022
Amazon AI, Aug 2022
Allen Institute of AI, June 2022
Carnegie Mellon University, May 2022
- **Brainish: Formalizing A Multimodal Language for Intelligence and Consciousness**
Peking University, March 2023
Models of Consciousness Conference, Sept 2022
International Joint Conference on Theoretical Computer Science, Aug 2022
- **Towards Real-World Socially Intelligent AI**
Facebook Fellowship Summit, Sept 2021
DeepMind Multimodal Team, Sept 2021
IJCAI Workshop on Multimodal Analytics, Aug 2021
Big Data and AI Conference, July 2021
Agency for Science, Technology, and Research Singapore, June 2021
Adobe Research, Jan 2021
- **Mitigating Social Biases in Language Models**
DeepMind Language Team, Sept 2021
- **Think Locally, Act Globally: Federated Learning with Local and Global Representations**
Agency for Science, Technology and Research Singapore, June 2021
NeurIPS 2019 Workshop on Federated Learning, Dec 2019
- **Computational Modeling of Human Multimodal Language**
Google Research, July 2019
Riken AIP Tokyo Machine Learning Seminar, Jan 2019
Riken AIP Kyoto Machine Learning Seminar, Dec 2018
CMU MLD Data Analysis Project Presentation, Apr 2018

Student Advising

- Samuael Adnew (AMMI)
NLP for Amharic language and Ge'ez script
- Fay Elhassan and Phanie Negho (AMMI)
ML for energy grids and agriculture
- Shentong Mo (CMU MS)
Multimodal ML for internet-of-things
- Haofei Yu (CMU MS → UIUC PhD)
Multimodal autonomous agents
- Richard Zhu (Princeton MS)
Multimodal autonomous agents
- Siyuan Wu (Tsinghua BS)
Multimodal affective computing
- Marian Qian (CMU BS)
Social commonsense reasoning
- Rana Muhammad Shahroz Khan (Vanderbilt BS → UNC PhD)
Efficiency and robustness
- Haoli Yin (Vanderbilt BS)
Multiview learning
- Yun Cheng (CMU BS, MS → Princeton PhD)
Information theory and multimodal interactions
- Rulin Shao (CMU MS → University of Washington PhD)
Stagewise multimodal fusion
- Yuxin Xiao (CMU MS → MIT PhD)
Robust multimodal learning
- Dong Won Lee (CMU BS, MS → MIT PhD)
Multimodal learning for education
- Yiwei Lyu (CMU BS, MS → University of Michigan PhD)
Text style transfer and multimodal learning
CRA undergrad research award honorable mention, 2021
Summer research fellowship winner, 2020
- Peter Wu (CMU BS, MS → UC Berkeley PhD)
Speech representation learning
- Chiyu Wu (CMU MS → University of Waterloo PhD)
Fair representation learning
- Terrance Liu (CMU MS → CMU PhD)
Federated learning for healthcare
- Chengfeng Mao (CMU MS → MIT PhD)
Language bias in multimodal learning
- Irene Li (CMU BS, MS → SoundHound)
Fair representation learning
CRA undergrad research award honorable mention, 2019
- Yao Chong Lim (CMU MS → DSO National Labs Singapore)
Fair representation learning
- Zhun Liu (CMU MS → Microsoft Research)
Tensors for multimodal learning

- Ying Shen (CMU MS → Virginia Tech PhD)
Multimodal representation learning
- Seong Hyeon Park (Hanyang University MS → KAIST PhD)
Multimodal trajectory forecasting
- Arav Agarwal (CMU MS → CMU Project Scientist)
Multimodal benchmarks and model selection
- Xiang Fan (CMU BS → University of Washington PhD)
Language and multimodal controllability
CRA undergrad research award honorable mention, 2022
- Jivat Neet (BITS Pilani BS → MSR → UC Berkeley PhD)
Multimodal reinforcement learning
- Rohan Pandey (CMU BS → Reworkd AI, YC S23)
Compositionality in vision-language models
Glushko prize for best senior thesis, 2023
- Zihao Deng (CMU BS → University of Pennsylvania MS)
Visualization and interpretation
- Xiangru Tang (Chinese Academy of Sciences BS → Yale PhD)
Social knowledge graphs
- Gunjan Chhablani (BITS Pilani BS → Georgia Tech MS)
Visualization and interpretation
- Adejuwon Fasanya (CMU BS → Google)
Physical commonsense reasoning
- Samuel Yu (CMU BS → Jump Trading)
Audio-visual reasoning
CRA undergrad research award finalist, 2022
Summer research fellowship winner, 2021
- Holmes Wu (CMU BS → CMU PhD)
Offline RL for social interactions
- Ziyin Liu (CMU BS → University of Tokyo PhD)
Multimodal attention and recurrence
- Edmund Tong (CMU BS → Facebook AI Research)
Datasets for multimodal language modeling

Professional Service

- Workflow Chair: ICML 2019
- Area Chair: ACL, EMNLP, ACL Rolling Review
- Session Chair: AAAI 2019
- Co-organizer: Workshop on Machine Learning for Cognitive and Mental Health at AAAI 2024
- Co-organizer: Artificial Social Intelligence Workshop and Challenge at ICCV 2023
- Co-organizer: Tutorial on Multimodal Machine Learning at ICML 2023, ICMI 2023, CVPR 2022, NAACL 2022
- Co-organizer: Workshop on Foundation Models in Vision and Language at ICDM 2022
- Co-organizer: Workshop on Multimodal Artificial Intelligence at NAACL 2022, NAACL 2021
- Co-organizer: Workshop on Tensor Networks in Machine Learning at NeurIPS 2020
- Co-organizer: Grand Challenge and Workshop on Human Multimodal Language at ACL 2020, ACL 2018
- Conference Program Committee: NeurIPS, ICML, ICLR, ACL, EMNLP, NAACL, EACL, COLING, IJCNLP, AACL, COLM, ACL Rolling Review, CVPR, ICCV, ECCV, WACV, ACCV, AAAI, IJCAI, AISTATS, CHI, ICMI, FG, ACML, ML4H, CHIL, ACM Multimedia, ACM Multimedia Asia, ICASSP, Interspeech
- Workshop Program Committee: NeurIPS workshop on Meta-Learning, NeurIPS workshop on ML for Health, ICLR workshop on Embodied Multimodal Learning, ICLR workshop on Never-ending RL, ICLR workshop on Enormous Language Models, ACL workshop on Multimodal Language, EMNLP workshop on NLP Open Source Software, EMNLP workshop on NLP Beyond Text, NAACL workshop on Trustworthy NLP, IJCAI workshop on Federated Learning, WWW workshop on NLP Beyond Text, ICRA workshop on Social Intelligence in Humans & Robots, NeurIPS workshop on Human Evaluation of Generative Models, NeurIPS workshop on Self-Supervised Learning, EMNLP workshop on Generation, Evaluation & Metrics
- Journal Reviewer: IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE Transactions on Affective Computing, IEEE Transactions on Audio, Speech and Language Processing, IEEE Transactions on Multimedia, IEEE Transactions on Cybernetics, IEEE Computational Intelligence Magazine, IEEE Signal Processing Letters, Elsevier Information Fusion, Elsevier Computer Speech and Language, Machine Learning, Transactions on Machine Learning Research, Neural Networks, Journal of Artificial Intelligence Research, Journal of Machine Learning Research, Medical Image Analysis, ACM Transactions on Sensor Networks, Proceedings of the National Academy of Sciences
- CMU Machine Learning Blog Editorial Board: 2019, Chief Editor: 2020, 2021, 2022, 2023
- CMU AI Undergraduate Research Mentor: 2018, 2019, 2020, 2021
- CMU Graduate Applicant Support Program Organizer: 2020
- CMU Machine Learning Department PhD Admissions Committee: 2018, 2019, 2020, 2021, 2022, 2023
- CMU Machine Learning Department Masters Admissions Committee: 2017, 2018
- CMU Singapore Students Association Co-President: 2015

Skills

- Languages: English (fluent), Chinese (fluent)
- Programming Languages: Python, C, C++, R, MATLAB, Standard ML, Haskell, SystemVerilog
- Software: PyTorch, Tensorflow, Theano, Keras, \LaTeX