Yao-Hung Hubert Tsai

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Research Interests

My goal is to understand computational and statistical principals in human multimodal language modeling. Then, use these principals to enhance representation interpretability and improve data efficiency. I am particularly interested in statistical machine learning, graph-based representation learning, multimodal learning, and semi-supervised learning.

Education

Carnegie Mellon University, Pittsburgh, PA, USA *Aug 2016 - May 2021*

- Ph.D. in Machine Learning Department within School of Computer Science
- *Advised by Dr. Ruslan Salakhutdinov and Dr. Louis-Philippe Morency*
- GPA: 4.0/4.0

National Taiwan University, Taipei, Taiwan *Aug 2010 - Jun 2014*

- B.S. in Electrical Engineering (graduated with Department Honors)
- Undergraduate Ceremony Representative
- *Advised by Dr. Yu-Chiang Frank Wang and Dr. Shao-Yi Chien*
- GPA: 4.17/4.3

Selected Publications

Conference Publications

[1] **Yao-Hung Hubert Tsai**, Nitish Srivastava, Hanlin Goh, Ruslan Salakhutdinov. "Capsules with Inverted Dot-Product Attention Routing", *International Conference on Learning Representations (ICLR)*, 2020.

[2] Han Zhao*, **Yao-Hung Hubert Tsai***, Ruslan Salakhutdinov, Geoff Gordon. "Learning Neural Networks with Adaptive Regularization", *Neural Information Processing Systems (NeurIPS)*, 2019. (*equal contributions)

[3] **Yao-Hung Hubert Tsai**, Shaojie Bai, Makoto Yamada, Louis-Philippe Morency, Ruslan Salakhutdinov. "Transformer Dissection: A Unified Understanding of Transformer's Attention via the Lens of Kernel", *Empirical Methods in Natural Language Processing (EMNLP)*, 2019.

[4] **Yao-Hung Hubert Tsai***, Shaojie Bai*, Paul Pu Liang, J. Zico Kolter, Louis-Philippe Morency, Ruslan Salakhutdinov. "Multimodal Transformer for Unaligned Multimodal Language Sequences", *Association for Computational Linguistics (ACL)*, 2019. (*equal contributions)

[5] Paul Pu Liang, Zhun Liu, **Yao-Hung Hubert Tsai**, Qibin Zhao, Ruslan Salakhutdinov, Louis-Philippe Morency. "Learning Representations from Imperfect Multimodal Time Series Data via Tensor Rank Regularization", *Association for Computational Linguistics (ACL)*, 2019.

[6] **Yao-Hung Hubert Tsai**, Santosh Kumar Divvala, Louis-Philippe Morency, Ruslan Salakhutdinov, Ali Farhadi. "Video Relationship Reasoning using Gated Spatio-Temporal Energy Graph", *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2019.

[7] Paul Pu Liang*, Yao Chong Lim*, **Yao-Hung Hubert Tsai**, Ruslan Salakhutdinov, Louis-Philippe Morency. "A Strong and Simple Baseline for Multimodal Utterance Embeddings", *North American Chapter of the Association for Computational Linguistics (NAACL)*, 2019. (*equal contributions) **(Oral Presentation)**

[8] **Yao-Hung Hubert Tsai***, Paul Pu Liang*, Amir Zadeh, Louis-Philippe Morency, Ruslan Salakhutdinov. "Learning Factorized Multimodal Representations", *International Conference on Learning Representations (ICLR)*, 2019. (*equal contributions)

[9] Makoto Yamada*, Denny Wu*, **Yao-Hung Hubert Tsai**, Ichiro Takeuchi, Ruslan Salakhutdinov, Kenji Fukumizu. "Post Selection Inference with Incomplete Maximum Mean Discrepancy Estimator", *International Conference on Learning Representations (ICLR)*, 2019. (*equal contributions)

[10] **Yao-Hung Hubert Tsai**, Liang-Kang Huang, and Ruslan Salakhutdinov. "Learning Robust Visual-Semantic Embeddings", *International Conference on Computer Vision (ICCV)*, 2017.

[11] Wei-Yu Chen, Tzu-Ming Harry Hsu, **Yao-Hung Hubert Tsai**, Yu-Chiang Frank Wang, and Ming-Syan Chen. "Transfer Neural Trees for Heterogeneous Domain Adaptation", *European Conference on Computer Vision (ECCV)*, 2016.

[12] **Yao-Hung Hubert Tsai**, Yi-Ren Yeh, and Yu-Chiang Frank Wang. "Learning Cross-Domain Landmarks for Heterogeneous Domain Adaptation", *Computer Vision and Pattern Recognition (CVPR)*, 2016.

[13] **Yao-Hung Hubert Tsai**, Cheng-An Hou, Wei-Yu Chen, Yi-Ren Yeh, and Yu-Chiang Frank Wang. "Domain-Constraint Transfer Coding for Imbalanced Unsupervised Domain Adaptation", *Association for the Advancement of Artificial Intelligence (AAAI)*, 2016.

[14] Tzu-Ming Harry Hsu, Wei-Yu Chen, Cheng-An Hou, **Yao-Hung Hubert Tsai**, Yi-Ren Yeh, and Yu-Chiang Frank Wang. "Unsupervised Domain Adaptation with Imbalanced Cross-Domain Data", *International Conference on Computer Vision (ICCV)*, 2015.

Workshop or Preprints

[15] Yanbin Liu*, Makoto Yamada*, **Yao-Hung Hubert Tsai**, Tam Le, Ruslan Salakhutdinov, Yi Yang. "LSMI-Sinkhorn: Semi-supervised Squared-Loss Mutual Information Estimation with Optimal Transport", *arXiv:1909.0237 (arXiv)*, 2019. (*equal contributions)

[16] Muqiao Yang*, Martin Q. Ma*, Dongyu Li*, Yao-Hung Hubert Tsai, Ruslan Salakhutdinov. "Complex Transformer: A Framework for Modeling Complex-Valued Sequence", *NeurIPS Science meets Engineering of Deep Learning Workshop (NeurIPS SEDL†)*, 2019. (*equal contributions †**Oral Presentation**)

[17] **Yao-Hung Hubert Tsai**, Han Zhao, Ruslan Salakhutdinov, and Nebojsa Jojic. "Learning Markov Chain in Unordered Dataset", *arXiv:1711.03167 (arXiv)/NeurIPS Time Series Workshop (NIPS TSW†)*, 2017. (†**Oral Presentation**)

[18] **Yao-Hung Hubert Tsai** and Ruslan Salakhutdinov. "Improving One-Shot Learning through Fusing Side Information", *arXiv:1710.08347 (arXiv)/NIPS Learning with Limited Labeled Data: Weak Supervision and Beyond (NIPS LLD)*, 2017/*Bay Area Machine Learning Symposium (BayLearn†)*, 2017. (†**Best Poster**)

Journal Publications

[19] Wei-Yu Chen, Tzu-Ming Harry Hsu, **Yao-Hung Hubert Tsai**, Yu-Chiang Frank Wang, and Ming-Syan Chen. "Transfer Neural Trees: Heterogeneous Domain Adaptation and Beyond", *IEEE Transactions on Image Processing (TIP)*, 2019.

[20] Cheng-An Hou, **Yao-Hung Hubert Tsai**, Yi-Ren Yeh, and Yu-Chiang Frank Wang. "Unsupervised Domain Adaptation with Label and Structural Consistency", *IEEE Transactions on Image Processing (TIP)*, 2016.

Research & Work Experiences

Graduate Research Assistant, Carnegie Mellon University *Aug 2016 - May 2021*

- Researching in Deep Learning and its applications, especially on statistical machine learning, graph-based representation learning, multi-modal learning, and semi-supervised learning.
- *Advisor: Dr. Ruslan Salakhutdinov and Dr. Louis-Philippe Morency*

Visiting Scholar, Kyoto University *Nov 2019*

- Researching in the topics of optimal transportation, alignments, and mutual information.

Visiting Scholar, RIKEN AIP *Dec 2017 - Jan 2018, Dec 2018 - Jan 2019*

- Researching in the intersection between Kernel and Deep Learning.

Graduate Research Intern, Apple Inc. *May 2019 - Aug 2019*

- Working on AI Applications
- *Advisor: Dr. Nitish Srivastava & Dr.Ruslan Salakhutdinov*

Graduate Research Intern, Allen Institute for Artificial Intelligence *May 2018 - Aug 2018*

- Working on Videos Common Sense Retrieval
- *Advisor: Dr. Santosh Kumar Divvala & Dr. Ali Farhadi*

Graduate Research Intern, Microsoft Research *May 2017 - Aug 2017*

- Working on Deep Generative Models
- *Advisor: Dr. Nebojsa Jojic*

Research Assistant, CITI, Academia Sinica *Aug 2015 - Aug 2016*

- Working on Person Re-Identification, Domain Adaptation, and Transfer Learning
- *Advisor: Dr. Yu-Chiang Frank Wang*

Undergraduate Research Assistant, National Taiwan University *Sep 2012 - Jun 2014*

- Working on Heterogeneous Face Recognition, Augmented Reality, and Real-Time Pose Tracking
- *Advisor: Dr. Yu-Chiang Frank Wang and Dr. Shao-Yi Chien*

Teaching Experiences

Head Teaching Assistant, Carnegie Mellon University *Aug 2017 - Jan 2018*

- Course: 10-716 Advanced Machine Learning (New Statistical Machine Learning)
- *Instructor: Dr. Pradeep Ravikumar*

Teaching Assistant, Carnegie Mellon University *Aug 2017 - Jan 2018*

- Course: 10-707 Topics in Deep Learning
- *Instructor: Dr. Ruslan Salakhutdinov*

Academic Talks

[1] **Yao-Hung Hubert Tsai**. "Transformer Dissection: A Unified Understanding for Transformer's Attention via the Lens of Kernel", *Kyoto University*, Nov 2019.

[2] **Yao-Hung Hubert Tsai**. "Learning Factorized Multimodal Representations", *Kyoto University*, Jan 2019.

[3] **Yao-Hung Hubert Tsai**. "Learning Factorized Multimodal Representations", *RIKEN Machine Learning Seminar*, Jan 2019.

[4] **Yao-Hung Hubert Tsai**. "Discover Orders in Unordered Datasets: Generative Markov Networks", *NVIDIA GPU Technology Conference (GTC)*, Mar 2018.

[5] **Yao-Hung Hubert Tsai**. "Improve Low-Shot Visual Recognition by Bridging Visual-Semantic Gap", *RIKEN Machine Learning Seminar*, Jan 2018.

[6] **Yao-Hung Hubert Tsai**. "Discovering Order in Unordered Datasets: Generative Markov Networks", *Neural Information Processing Systems Time Series Workshop (NIPS TSW)*, Dec 2017.

Academic Services

Reviewer:

- Conferences: *ICML*, *NIPS*, *ICLR*, *ICCV*, *CVPR*, *AISTATS*, *ACL*, *EMNLP*, etc.
- Journals: *TIP*

Selected Honors & Awards

Travel Award, NeurIPS *2019*

AI2 Fellowship Award, Allen Institute for Artificial Intelligence *2018*

Government Scholarship to Study Abroad (GSSA), Taiwan Ministry of Education *2016/2017*

Undergraduate Ceremony Representative, National Taiwan University *2014*

Presidential Awards, National Taiwan University *2011/2012/2014*

Best Tourism App Award, Chunghwa Telecom Hami Apps Competition *2014*

Bronze Medal & Outstanding Paper Award, Altera Innovate Asia FPGA Design Competition *2013*

Direct Admission with Recommendation, International Physics Olympiad Selection Camp *2010*

National Representative Honorable Mention, International Physics Olympiad Selection Camp *2009*

1st Runner-Up/Third Prize, Regional/National Physics Olympiad for Senior High School *2009*

Honorable Mention, International Junior Science Olympiad Selection Camp *2008*

Skills

Toolbox/Software	PyTorch, TensorFlow, Theano, Keras, Torch, Caffe, CUDA, cuDNN, LaTeX
Programming Languages	Python, MATLAB, R, C/C++, Lua, C#, JAVA, Verilog, JavaScript, HTML5