

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] Muqiao Yang*, Martin Q. Ma*, Dongyu Li*, **Yao-Hung Hubert Tsai**, Ruslan Salakhutdinov. “Complex Transformer: A Framework for Modeling Complex-Valued Sequence”, *International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2020. (*equal contributions)
- [2] **Yao-Hung Hubert Tsai**, Nitish Srivastava, Hanlin Goh, Ruslan Salakhutdinov. “Capsules with Inverted Dot-Product Attention Routing”, *International Conference on Learning Representations (ICLR)*, 2020.
- [3] Han Zhao*, **Yao-Hung Hubert Tsai***, Ruslan Salakhutdinov, Geoff Gordon. “Learning Neural Networks with Adaptive Regularization”, *Neural Information Processing Systems (NeurIPS)*, 2019. (*equal contributions)
- [4] **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.
- [5] **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)
- [6] 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.
- [7] **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.
- [8] 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**)
- [9] **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)
- [10] 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)
- [11] **Yao-Hung Hubert Tsai**, Liang-Kang Huang, and Ruslan Salakhutdinov. “Learning Robust Visual-Semantic Embeddings”, *International Conference on Computer Vision (ICCV)*, 2017.

- [12] 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.
- [13] **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.
- [14] **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.
- [15] 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

- [16] Mathis Petrovich*, Chao Liang*, Yanbin Liu, **Yao-Hung Hubert Tsai**, Linchao Zhu, Yi Yang, Ruslan Salakhutdinov, Makoto Yamada. “Feature Robust Optimal Transport for High-dimensional Data”, *arXiv:2005.12123 (arXiv)*, 2020. (*equal contributions)
- [17] **Yao-Hung Hubert Tsai***, Martin Q. Ma*, Muqiao Yang*, Ruslan Salakhutdinov, Louis-Philippe Morency. “Interpretable Multimodal Routing for Human Multimodal Language”, *arXiv:2004.14198 (arXiv)*, 2020. (*equal contributions)
- [18] 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)
- [19] **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**)
- [20] **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

- [21] 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.
- [22] 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

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- | | |
|--|---|
| Graduate Research Assistant , Carnegie Mellon University | <i>Aug 2016 - May 2021</i> |
| <ul style="list-style-type: none"> • Researching in Deep Learning and its applications, especially on statistical machine learning, graph-based representation learning, multi-modal learning, and semi-supervised learning. • <i>Advisor: Dr. Ruslan Salakhutdinov and Dr. Louis-Philippe Morency</i> | |
| Visiting Scholar , Kyoto University | <i>Nov 2019</i> |
| <ul style="list-style-type: none"> • Researching in the topics of optimal transportation, alignments, and mutual information. | |
| Visiting Scholar , RIKEN AIP | <i>Dec 2017 - Jan 2018, Dec 2018 - Jan 2019</i> |
| <ul style="list-style-type: none"> • Researching in the intersection between Kernel and Deep Learning. | |
| Graduate Research Intern , Apple Inc. | <i>May 2019 - Aug 2019</i> |
| <ul style="list-style-type: none"> • Working on AI Applications • <i>Advisor: Dr. Nitish Srivastava & Dr. Ruslan Salakhutdinov</i> | |
| Graduate Research Intern , Allen Institute for Artificial Intelligence | <i>May 2018 - Aug 2018</i> |
| <ul style="list-style-type: none"> • Working on Videos Common Sense Retrieval • <i>Advisor: Dr. Santosh Kumar Divvala & Dr. Ali Farhadi</i> | |
| Graduate Research Intern , Microsoft Research | <i>May 2017 - Aug 2017</i> |
| <ul style="list-style-type: none"> • 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.

PROFESSIONAL SERVICES

Reviewer:

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

Admission Committee:

- CMU Machine Learning Department PhD Admission Committee
- CMU Machine Learning Department Master Admission Committee

SELECTED HONORS & AWARDS

Facebook Fellowship, Facebook

2020-2021(or 2022)

Travel Award, NeurIPS

2019

AI2 Fellowship, Allen Institute for Artificial Intelligence

2018-2019

Government Scholarship to Study Abroad (GSSA), Taiwan Ministry of Education

2016-2018

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

SKILLS

Toolbox/Software

PyTorch, TensorFlow, Theano, Keras, Torch, Caffe, CUDA, cuDNN, L^AT_EX

Programming Languages

Python, MATLAB, R, C/C++, Lua, C#, JAVA, Verilog, JavaScript, HTML5