Yao-Hung Hubert Tsai

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Research Summary

I work on Deep Learning and its applications in Computer Vision, Natural Language Processing, and Speech Processing. I leverage statistical machine learning techniques to design better multi-view representation learning algorithms, which are interpretable, robust to the noisy and incomplete views, and generalizable across supervised and unsupervised settings.

Education

Carnegie Mellon University, Pittsburgh, PA, USA *Aug 2016 - Aug 2021 (Expected)*

- Ph.D. in Machine Learning Department within School of Computer Science (GPA: 4.0/4.0)

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

- B.S. in Electrical Engineering (graduated with Department Honors) (GPA: 4.17/4.3)
- Undergraduate Ceremony Representative

Research Experiences

Graduate Research Assistant, Carnegie Mellon University *Aug 2016 - Present*

- Project I: Providing an information-theoretical explanation for the effectiveness of the unsupervised or self-supervised learned representations [1]. The explanation inspires new loss function designs [1,2].
- Project II: Tractable and scalable uncertainty measurement [2,3].
- Project III: Human language analysis via cues from from spoken text, facial attributes, and tones of voice [4,8,9].
- Project IV: Learning modality-invariant feature space across vision and text [12,13].
- Other Projects: Deep neural networks regularization [6] and Transformer architecture explanation [7].
- Advisor: Dr. Ruslan Salakhutdinov & Dr. Louis-Philippe Morency

Visiting Scholar, RIKEN AIP/ Kyoto University *Winter 2017, Winter 2018, Winter 2019*

- Projects: Optimal transportation, high-dimensional feature selection, semi-supervised mutual information estimation, and linear-time distribution divergence measurement [publications available at the complete list of the publications].
- Host: Dr. Masashi Sugiyama & Dr. Makoto Yamada

Graduate Research Intern, Facebook AI Research *Summer 2020*

- Project: Improving and providing a better understanding for self-supervised speech representation learning. Works include 1) incorporating temporal structures within representations, 2) unifying different loss function designs, and 3) introducing weak supervision from fast and cheap clustering [publications in preparation].
- Host: Dr. Abdelrahman Mohamed

Graduate Research Intern, Apple Inc. *Summer 2019*

- Project I: 3D object recognition from multi-sensory data, spanning LiDAR, Radar, and RGB sensors.
- Project II: Improving the scalability and stability of routing mechanism in Capsule networks [5].
- Host: Dr. Nitish Srivastava & Dr. Ruslan Salakhutdinov

Graduate Research Intern, Allen Institute for Artificial Intelligence *Summer 2018*

- Project: Video spatiotemporal relationships modeling for common sense retrieval [10].
- Host: Dr. Santosh Kumar Divvala & Dr. Ali Farhadi

Graduate Research Intern, Microsoft Research *Summer 2017*

- Project: Temporal order discovery in unordered dataset [11].
- Host: Dr. Nebojsa Jojic

Selected Publications (complete list at `https://yaohungt.github.io/research.html`)

[1] **Yao-Hung Hubert Tsai**, Yue Wu, Ruslan Salakhutdinov, Louis-Philippe Morency. "Self-supervised Learning from a Multi-view Perspective", *submitted to International Conference on Learning Representations (ICLR) 2021. arXiv:2006.05576 (arXiv)*, 2020.

[2] **Yao-Hung Hubert Tsai**, Martin Q. Ma, Muqiao Yang, Han Zhao, Louis-Philippe Morency, Ruslan Salakhutdinov. "Self-supervised Representation Learning with Relative Predictive Coding", *submitted to International Conference on Learning Representations (ICLR) 2021.*

[3] **Yao-Hung Hubert Tsai**, Han Zhao, Makoto Yamada, Louis-Philippe Morency, Ruslan Salakhutdinov. "Neural Methods for Point-wise Dependency Estimation", *Neural Information Processing Systems (NeurIPS)*, 2020. **(Spotlight Presentation)**

[4] **Yao-Hung Hubert Tsai***, Martin Q. Ma*, Muqiao Yang*, Ruslan Salakhutdinov, Louis-Philippe Morency. "Multimodal Routing: Improving Local and Global Interpretability of Multimodal Language Analysis", *Empirical Methods in Natural Language Processing (EMNLP)*, 2020.

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

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

[7] **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.

[8] **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.

[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.

[10] **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.

[11] **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**)

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

[13] **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**)

[14] **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.

[15] **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.

Selected Honors & Awards

Facebook Fellowship, Facebook *2020-2022*
AI2 Fellowship, Allen Institute for Artificial Intelligence *2018-2019*
Government Scholarship to Study Abroad (GSSA), Taiwan Ministry of Education *2016-2018*
CMU Graduate Research Fellowship, Carnegie Mellon University *2016-2021*
Undergraduate Ceremony Representative, National Taiwan University *2014*
Presidential Awards, National Taiwan University *2011/2012/2014*
Bronze Medal & Outstanding Paper Award, Altera Innovate Asia FPGA Design Competition *2013*
National Representative Honorable Mention, International Physics Olympiad Selection Camp *2009/ 2010*
1st Runner-Up/Third Prize, Regional/National Physics Olympiad for Senior High School *2009*
Honorable Mention, International Junior Science Olympiad Selection Camp *2008*

Professional Services

Conferences Reviewer: *ICML*, *NIPS*, *ICLR*, *ICCV*, *CVPR*, *AISTATS*, *ACL*, *EMNLP*.

Journals Reviewer: *TPAMI*, *TIP*.

CMU Machine Learning Department: *PhD Admission*, *Master Admission*, *Speaking Skills*.