Hsin-Yuan Huang (Robert)

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EDUCATION

Ph.D., California Institute of Technology Oct. 2018 - Now

Advised by John Preskill (Physics) and Thomas Vidick (CS, Math).
Participated in "Quantum Machine Learning for High Energy Physics" led by Maria Spiropulu (Caltech), Seth Lloyd (MIT) and Daniel Lidar (USC).

B.S., National Taiwan University Sep. 2014 - Jun. 2018

Studied in Computer Science (major) and Physics (minor). GPA: 4.30/4.30, Rank: 1/120.
Member of the Machine Learning and Data Mining Group; Advisor: Chih-Jen Lin

RESEARCH EXPERIENCE

Research Assistant, Institute for Quantum Information and Matter, Caltech	Oct. 2018 - Now
Research Intern, Google AI Quantum, Mentor: Jarrod R. McClean	Jun. 2020 - Oct. 2020
Visitor, Centre for Quantum Technologies, Host: Patrick Rebentrost	Jul. 2019 - Aug. 2019
Research Intern, Allen Institute for Artificial Intelligence, Mentor: Wen-tau Yih	Jun. 2018 - Sep. 2018
Research Intern, Microsoft Research, Redmond, USA, Mentor: Chenguang Zhu	Jun. 2017 - Sep. 2017
Research Assistant, Dept. of Computer Science, NTU, PI: Chih-Jen Lin	Sep. 2014 - Jun. 2018
Research Assistant, Dept. of Life Science, NTU, PI: Hsueh-Fen Juan	May 2013 - Aug. 2014
Research Assistant, Institute of Earth Sciences, Academia Sinica, PI: Fong Chao	Mar. 2012 - Mar. 2013

ACADEMIC PAPERS

[1] **H.-Y. Huang**, R. Kueng, J. Preskill. Provable machine learning algorithms for quantum many-body problems. In preparation.

[2] J. Cotler, D. Mark, **H.-Y. Huang (Co-first author)**, F. Hernandez, J. Choi, A. L. Shaw, M. Endres, S. Choi. Emergent quantum state designs from individual many-body wavefunctions. arXiv preprint, arxiv:2103.03536, 2021.

[3] J. Choi, A. Shaw, I. Madjarov, X. Xie, J. Covey, J. Cotler, D. Mark, **H.-Y. Huang**, A. Kale, H. Pichler, F. Brandao, S. Choi, M. Endres. Emergent quantum state designs from individual many-body wavefunctions. arXiv preprint, arxiv:2103.03535, 2021.

[4] **H.-Y. Huang**, R. Kueng, J. Preskill. Information-theoretic bounds on quantum advantage in machine learning. arXiv preprint, arxiv:2101.02464, 2021. In *24th Annual Conference on Quantum Information Processing (QIP-21)*, 2021 (Talk title: Fundamental aspects of solving quantum problems with machine learning).

[5] Y. Su, **H.-Y. Huang**, E. Campbell. Nearly-tight Trotterization of interacting electrons. arXiv preprint, arxiv:2012:09194, 2020. In *24th Annual Conference on Quantum Information Processing (QIP-21)*, 2021.

[6] **H.-Y. Huang**, M. Broughton, M. Mohseni, R. Babbush, S. Boixo, H. Neven, J. R. McClean. Power of data in quantum machine learning. arXiv preprint, arxiv:2011.01938, 2020. In *24th Annual Conference on Quantum Information Processing (QIP-21)*, 2021 (Talk title: Fundamental aspects of solving quantum problems with machine learning).

[7] C.-F. Chen, **H.-Y. Huang (Co-first author)**, R. Kueng, J. Tropp. Quantum simulation via randomized product formulas: Low gate complexity with accuracy guarantees. arXiv preprint, arxiv:2008.11751, 2020.

[8] A. Elben, R. Kueng, **H.-Y. Huang**, R. van Bijnen, C. Kokail, M. Dalmonte, P. Calabrese, B. Kraus, J. Preskill, P. Zoller, B. Vermersch. Mixed-state entanglement from local randomized measurements. Physical Review Letter, 2020.

[9] **H.-Y. Huang**, R. Kueng, J. Preskill. Predicting many properties in a quantum system from very few measurements. Nature Physics, 2020.

[10] **H.-Y. Huang**, K. Bharti, P. Rebentrost. Near-term quantum algorithms for linear systems of equations. arXiv preprint, arxiv:1909.07344, 2019.

[11] **H.-Y. Huang**, R. Kueng. Predicting features of quantum systems using classical shadows. In *23rd Annual Conference on Quantum Information Processing (QIP-20)*, 2020. (single-track talk)

[12] **H.-Y. Huang**, E. Choi, W. Yih. FlowQA: grasping flow in history for conversational machine comprehension. In *7th International Conference on Learning Representations (ICLR-19)*, 2019.

[13] **H.-Y. Huang**, C. Zhu, Y. Shen, W. Chen. FusionNet: Fusing via Fully-aware attention with application to machine comprehension. In *6th International Conference on Learning Representations (ICLR-18)*, 2018. (top 3% in review score)

[14] H.-F. Yu, **H.-Y. Huang**, I. S. Dhillon, C.-J. Lin. A unified algorithm for one-class structured matrix factorization with side information. In *31st AAAI Conference on Artificial Intelligence (AAAI-17)*, 2017. (acceptance rate: 24.6%)

[15] **H.-Y. Huang**, C.-J. Lin. Linear and kernel classification: When to use which? In *SIAM International Conference on Data Mining (SDM-16)*, 2016. (acceptance rate: 25.8%)

[16] C.-Y. Chen, A. Ho, **H.-Y. Huang**, H.-F. Juan and H.-C. Huang. Dissecting the human protein-protein interaction network via phylogenetic decomposition. In *Scientific Reports*, 4, 7153 (2014).

SELECTED AWARDS AND HONORS

Awards for Academic Excellence:

First Place Scholarship, Ministry of Education (awarded to Olympiad medalists ranking top 1) *2015, 2016, 2017, 2018*

Presidential Award, National Taiwan University (awarded to students ranking top 5%) *Fall / Spring 2015, 2016, 2017, 2018*

Awards for Competition in Algorithm and Informatics:

25th International Olympiad in Informatics, Bronze Medal *Jul. 2013*
2013 Asia-Pacific Informatics Olympiad, Silver Medal *May 2013*
National Informatics Olympiad in Taiwan, First Place *Dec. 2012*

ORAL AND POSTER PRESENTATIONS

[1] "Power of data in quantum machine learning". Invited talk at SIAM Conference on Computational Science and Engineering, Mar. 3rd, 2021.

[2] "Fundamental aspects of solving quantum problems with machine learning". Caltech Institute for Quantum Information and Matter (IQIM) Seminar, Feb. 26th, 2021.

[3] "Fundamental aspects of solving quantum problems with machine learning". QuICS Seminar, University of Maryland, Feb. 17th, 2021.

[4] "Fundamental aspects of solving quantum problems with machine learning". Contributed talk, 24rd Annual Conference on Quantum Information Processing (QIP-21), Jan. 30-31, 2021.

[5] "Predicting Many Properties of a Quantum System from Very Few Measurements", National Taiwan University, Center for Quantum Science and Engineering, Dec. 18th, 2020.

[6] "Predicting Many Properties of a Quantum System from Very Few Measurements", University College London, Quantum Information Seminar, Nov. 27th, 2020.

[7] "Power of data in quantum machine learning", Centre for Quantum Technologies, Quantum Machine Learning Seminar, Nov. 26th, 2020.

[8] "Predicting Many Properties of a Quantum System from Very Few Measurements", Caltech Institute for Quantum Information and Matter (IQIM) Seminar, Apr. 17th, 2020.

[9] "Predicting Features of Quantum Systems using Classical Shadows", Single-track talk, 23rd Annual Conference on Quantum Information Processing (QIP-20), Jan. 6-10,2020.

[10] "Understanding Machine Reading Comprehension", Invited Talk, Academia Sinica, Oct 16, 2017.

[11] "A Unified Algorithm for One-class Structured Matrix Factorization with Side Information", 31st AAAI Conference on Artificial Intelligence (AAAI-17), Feb. 4-9, 2017.

[12] "Linear and Kernel Classification: When to Use Which?", SIAM International Conference on Data Mining (SDM16), May 5-8, 2016.

[13] "Linear and Kernel Classifier: When to Use Which?", Spotlight presentation (acceptance rate: 11%), Machine Learning Summer School (MLSS'15), Kyoto University, August 23-September 4, 2015.

[14] "Brief Introduction to Automatic Machine Learning", Science Exploration Forum, National Taiwan University, August 11, 2015.

[15] "Dissecting Human Protein-Protein Interaction Network via Phylogenetic Decomposition." 14th International Conference on Systems Biology (ICSB2013), August 30-September 3, 2013.

SYNERGISTIC ACTIVITY

Conference review: 34th Conference on Neural Information Processing Systems (2020), 23rd Annual Conference on Quantum Information Processing (2019).

Journal review: Physical Review A (2020), Quantum Machine Intelligence by Springer (2019).

Teaching Assistant: Introduction to the Theory of Computation (2017).

Conference volunteer: AAAI Conference on Artificial Intelligence (2017).

Conference review: Asia Pacific Bioinformatics Conference (2017).

Journal review: Data Mining and Knowledge Discovery (2016).

OTHER AWARDS AND HONORS

J. Yang Scholarship — *Oct. 2020*
Kortschak Scholarship — *Oct. 2018*
The Phi Tau Phi Scholastic Honor Society of the Republic of China — *Jun. 2018*
Undergraduate Research Project Exhibition, First Place — *Jun. 2017*
Appier Scholarship — *Apr. 2016, Feb. 2017*
AAAI Conference on Artificial Intelligence 2017 Scholarship — *Feb. 2017*
Shih-Liang Chien Memorial Award — *May. 2016*

SIAM International Conference on Data Mining 2016 Travel Award	*Apr. 2016*
Machine Learning Summer School 2015 Travel Award	*Oct. 2015*
Wang Da Gang Natural Science Scholarship	*May 2013*
Taiwan International Science Fair, Third Prize	*Nov. 2012*
Science Research Grant for High School Student, First Prize	*Nov. 2012*
Taipei High School Informatics Competition, First Place	*Oct. 2012*
Taipei High School Informatics Competition, Third Place	*Oct. 2011*