Yuheng Bu

Postdoctoral Research Associate
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Research Interests

Machine learning, information theory and signal processing, with applications to wireless communications, privacy and fairness.

Education

- Ph.D. in Electrical and Computer Engineering
  University of Illinois at Urbana-Champaign, USA — Jan. 2017 - Aug. 2019
  Advisor: Venugopal V. Veeravalli
  Thesis: "Information-theoretic Bounds in Learning Algorithms"
  GPA: 4.0/4.0
- Master in Electrical and Computer Engineering
  University of Illinois at Urbana-Champaign, USA — Aug. 2014 - Dec. 2016
  Thesis: "Estimation of KL Divergence: Optimal Minimax Rate"
- B.E. (**with honors**) in Electronic Engineering
  Tsinghua University, Beijing, China — Aug. 2010 - Jul. 2014
  Major GPA: 91.27/100, ranking **7** among 240 students
  Double Major in **Economics**

Academic Appointments

- **Postdoctoral Research Associate**, Massachusetts Institute of Technology — Sep. 2019 - present
  Advisor: Gregory W. Wornell
- **Research Assistant**, University of Illinois at Urbana-Champaign — Aug. 2014 - Aug. 2019
  Advisor: Venugopal V. Veeravalli
- **UGVR (Undergraduate Visiting Research)**, Stanford University — Jun. 2013 - Sep. 2013
  Only 18 students chosen from mainland and Taiwan
  Advisor: Tsachy Weissman
  Internship: Time-series forecaster based on Online Aggregation

Publications

Journal Papers and Preprints

[1] **Y. Bu***, J. K. Lee*, P. Sattigeri, R. Panda, G. W. Wornell, L. Karlinsky, R. Feris. "A Maximal Correlation Approach to Imposing Fairness in Machine Learning." (* equal contribution), arXiv preprint, arXiv:2012.15259, 2020.

[2] **Y. Bu**, S. Zou, V. V. Veeravalli. "Tightening Mutual Information Based Bounds on Generalization Error." *IEEE Journal on Selected Areas in Information Theory*, vol. 1, no. 1, pp. 121-130, May 2020.

[3] C. Wilson, **Y. Bu**, V. V. Veeravalli. "Adaptive Sequential Machine Learning." *Sequential Analysis*, 38(4), pp.545-568, 2019.

[4] **Y. Bu**, S. Zou, V. V. Veeravalli. "Linear-Complexity Exponentially-Consistent Tests for Universal Outlying Sequence Detection." *IEEE Transactions on Signal Processing*, vol. 67, no. 8, pp. 2115-2128, Apr. 2019.

[5] **Y. Bu**, J. Lu, V. V. Veeravalli. "Active and Adaptive Sequential Learning." arXiv preprint, arXiv:1805.11710, 2018.

[6] **Y. Bu***, S. Zou*, Y. Liang, V. V. Veeravalli. "Estimation of KL Divergence: Optimal Minimax Rate." (* equal contribution), *IEEE Transactions on Information Theory*, vol. 64, no. 4, pp. 2648-2674, Apr. 2018.

Conference Papers

[1] **Y. Bu***, J. K. Lee*, D. Rajan, P. Sattigeri, R. Panda, S. Das, G. W. Wornell. "Fair Selective Classification via Sufficiency." (* equal contribution), in *Proc. International Conference on Machine Learning (ICML)*, Jul. 2021 (**Oral**, **Top 3%**)

[2] G. Aminian*, **Y. Bu***, L. Toni, M. Rodrigues, G. W. Wornell. "Characterizing the Generalization Error of Gibbs Algorithm with Symmetrized KL information." (* equal contribution), *ICML Workshop on Information-Theoretic Methods for Rigorous, Responsible, and Reliable Machine Learning*, 2021.

[3] **Y. Bu**, T. Wang, G. W. Wornell. "SDP Methods for Sensitivity-Constrained Privacy Funnel and Information Bottleneck Problems." in *Proc. IEEE International Symposium on Information Theory (ISIT)*, Melbourne, Australia, Jul. 2021.

[4] **Y. Bu**, W. Gao, S. Zou, V. V. Veeravalli. "Information-theoretic Understanding of Population Risk Improvement with Model Compression." in *Proc. AAAI Conference on Artificial Intelligence (AAAI)*, New York, Feb. 2020.

[5] **Y. Bu**, K. Small. "Active Learning in Recommendation Systems with Multi-level User Preferences." *AAAI Workshop on Interactive and Conversational Recommendation Systems (WICRS)*, New York, Feb. 2020.

[6] **Y. Bu**, J. Lu, V. V. Veeravalli. "Active and Adaptive Sequential learning." in *Proc. IEEE Asilomar Conference on Signals, Systems, and Computers*, Pacific Grove, CA, Nov. 2019.

[7] **Y. Bu**, S. Zou, V. V. Veeravalli. "Tightening Mutual Information Based Bounds on Generalization Error." in *Proc. IEEE International Symposium on Information Theory (ISIT)*, Paris, France, Jul. 2019.

[8] **Y. Bu**, J. Lu, V. V. Veeravalli. "Model Change Detection with Application to Machine Learning." in *Proc. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Brighton, UK, May 2019.

[9] **Y. Bu**, S. Zou, V. V. Veeravalli, "Linear-Complexity Exponentially-Consistent Tests for Universal Outlying Sequence Detection." in *Proc. IEEE International Symposium on Information Theory (ISIT)*, Aachen, Germany, Jun. 2017.

[10] **Y. Bu***, S. Zou*, Y. Liang, V. V. Veeravalli. "Estimation of KL Divergence Between Large-Alphabet Distributions." (* equal contribution), in *Proc. IEEE International Symposium on Information Theory (ISIT)*, Barcelona, Spain, Jul. 2016.

[11] **Y. Bu**, S. Zou, Y. Liang, V. V. Veeravalli. "Universal Outlying Sequence Detection for Continuous Observations." in *Proc. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Shanghai, China, Mar. 2016.

Professional Experiences

- Amazon.com Inc., Core machine learning group Jun. 2017 - Dec. 2017
  (Currently known as **Amazon AI Lab**)
  Title: Applied scientist intern
  - Built a conversational agent that can actively learn users interests to make recommendations.
  - Conducted extensive research on customer purchase history with Yelp data.

Teaching Experiences

- Teaching and developing contents for **IDSS MicroMaster** program Fall 2019 - Summer 2020, MIT
  MITx - 6.86x Machine Learning with Python-From Linear Models to Deep Learning
  MITx - 14.310x Data Analysis for Social Scientists (live recitation and video recording)
- Teaching assistant:
  ECE 365: Data Science and Engineering Spring 2019, UIUC
  ECE 398: Making Sense of Big Data Fall 2018, UIUC
- Grader:
  ECE 398: Making Sense of Big Data Spring 2017, UIUC
  ECE 598: Computational Inference and Learning Fall 2016, UIUC

Honors & Awards

- **Yi-Min Wang and Pi-Yu Chung** Research Award, UIUC 2019
- Nominee for Graduation Day at **IEEE ITA Workshop** 2019
- Student Travel Grant, **IEEE ISIT** 2016, 2017
- Student Travel Grant, **IEEE ICASSP** 2016
- **Outstanding graduate**, Tsinghua University 2014
- **Deputy President**, Student Association for Science and Technology,
  EE Department, Tsinghua University 2012-2014
- **National Scholarship** Granted by Ministry of Education of China (**top 2%**), 2012 and 2013
- **Third prize**, "Challenge Cup" the Tsinghua University
  Student extra-curricular academic science and technology competitions 2012
- **Second prize**, Shing-Tung Yau secondary school mathematics competition 2009

Service & Professional Activities

- **Membership:** IEEE, IEEE Information Theory Society, IEEE Signal Processing Society
- **Reviewer:** IEEE Transactions on Information Theory, IEEE Journal on Selected Areas in Information Theory, IEEE Transactions on Signal Processing, Transactions on Information Forensics & Security, IEEE Transactions on Vehicular Technology
  NeurIPS, ICML, AAAI, IJCAI, ISIT, ICASSP