CHI-HENG (HENRY) LIN

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chihenglin.com

ECE PhD student @ GeorgiaTech

Education

09/2017 - 12/2022 (Expected)
Ph.D. in Electrical and Computer Engineering. Advisor: Eva L. Dyer
Georgia Institute of Technology, Atlanta, GA
GPA: 4, Selected Courses: Advanced digital signal processing, Machine learning theory, Nonlinear optimization

09/2015 - 12/2016
M.A. in Statistics
Columbia University, New York, NY
GPA: 4, Selected Courses: Financial engineering, Game theory, Probability theory, Information theory

09/2007 - 06/2013
B.S. & M.S. in Electrical Engineering
National Taiwan University (NTU), Taipei, Taiwan
GPA: 3.8, Selected Courses: Real analysis, Communication theory, Stochastic processes

Skills

Programming Languages / Packages: Python, Pytorch, MATLAB, Wolfram Mathematica, LaTeX, R, SQL, Linux

Technical Expertise: Bayesian optimization, Gaussian processes, Optimal transport, Nonlinear optimization

Languages: Chinese (native), English (full professional proficiency)

Applied Machine Learning Projects

2020 - present **Domain Adaption for Digital Recognition,** Neural Data Science Lab, Georgia Tech

- Developed a low-cost domain adaption method LOT that calibrates model predictions from the source to the target domain and is free of model retraining based on a fast optimal transport algorithm.
- Applied our algorithm to digital recognition data sets USPS, MNIST in balanced and unbalanced cases, and synthetic data set generated by multi-class Gaussian mixture models, with and without data augmentation.
- Analyzed the proposed algorithm's geometric properties, time complexity, transport cost, and sampling complexity and verified the method with extensive empirical simulations on real and synthetic data sets.

2020 - present **Self-Supervised Learning for Image Recognition,** Neural Data Science Lab, Georgia Tech

- Extended the applicability of DeepMind's self-supervised learning algorithm BYOL to scenarios when efficient data augmentation is scarce using novel modules of kNN operator and cascaded projectors.
- Applied to computer vision and neural image data sets CIFAR, ImageNet, multi-neuron recordings from primate brains. The results achieve stat-of-the-art performance in classification accuracy.
- Analyzed our algorithm using advanced analysis on the representation learning dynamics.

2018 - 2019 **Hyperparameter Tuning for Large Neural Network Training**, Neural Data Science Lab, Georgia Tech

- Designed the state-of-the-art and cost-efficient hyperparameter tuning algorithm LaMBO for a modular pipelined system using a novel combination of Bayesian optimization and a multi-armed bandit algorithm.
- Applied to neuroimaging reconstruction that automatically tunes the fully convolutional network and various pre-and post-processing hyperparameters in a multi-stage neuroimaging pipeline.
- Our algorithm saves an additional 30% cost compared with other baselines in neuroimaging and synthetic tasks.

Theoretical Machine Learning Projects

2021 - present **Analysis of the domain adaptation with Data Augmentation,** Neural Data Science Lab, Georgia Tech

- Analyzed the pros and cons of different data augmentation for domain adaptation in linear regression.

2019 - 2020 **Analysis on Momentum-based Network Training**, Machine Learning Theory Group, Georgia Tech

- Proved acceleration rate for the optimizations of deep linear networks and shallow ReLU networks.

Work Experience

Jan 2015 - Jul 2015 Network Researcher

Academia Sinica, Taipei, Taiwan

Job Description: Development of a multi-view 3D video broadcast protocol.

Publications

[1] Ran Liu, Mehdi Azabou, Max Dabagia, *Chi-Heng Lin*, Mohammad Gheshlaghi Azar, Keith B Hengen, Michal Valko, Eva L Dyer. Drop, Swap, and Generate a Self-Supervised Approach for Generating Neural Activity. ***NeurIPS 2021 Selected for Oral Presentation (<1%).***

[2] *Chi-Heng Lin*, Mehdi Azabou, Eva L Dyer. Making Transport More Robust and Interpretable by Moving Data through a Small Number of Anchor Points. ***ICML* 2021 *(21.5%)***.

[3] *Chi-Heng Lin*, Joseph D Miano, Eva L Dyer. Bayesian Optimization for Modular Black-Box Systems with Switching Costs. ***UAI* 2021 *(26%)***.

[4] Jun-Kun Wang, *Chi-Heng Lin*, Jacob Abernethy. A Modular Analysis of Provable Acceleration via Polyak's Momentum: Training a Wide ReLU Network and a Deep Linear Network. ***ICML* 2021 *(21.5%).***

[5] Jun-Kun Wang, *Chi-Heng Lin*, Jacob Abernethy. Escaping Saddle Points Faster with Stochastic Momentum. ***ICLR* 2020 *(26.5%)***.

[6] Ebrahim Baktash, *Chi-Heng Lin*, Xiaodong Wang, Mahmood Karimi. Downlink Linear Precoders based on Statistical CSI for Multi-Cell MIMO-OFDM. ***Wireless Communications and Mobile Computing***.

[7] *Chi-Heng Lin*, De-Niang Yang, Ji-Tang Lee, Wanjium Liao. Efficient Error-Resilient Multicasting for Multi-View 3D Videos in Wireless Networks. ***IEEE GLOBECOM* 2016 *(36.7%)***.

[8] Fan-Min Tseng and *Chi-Heng Lin* and Kwang-Cheng Chen. In-network Computations of Machine-to-Machine Communications for Wireless Robotics. ***Wireless Pers Commun***.

[9] Mehdi Azabou, Max Dabagia, Ran Liu, *Chi-Heng Lin*, Keith B. Hengen, Eva L. Dyer. Using Self-Supervision and Augmentations to Build Insights into Neural Coding. ***NeurIPS 2021 Workshop: Self-Supervised Learning - Theory and Practice***

[10] Mehdi Azabou, Mohammad Gheshlaghi Azar, Ran Liu, *Chi-Heng Lin*, Erik Johnson, Kiran Bhaskaran-Nair, Max Dabagia, Bernardo Avila Pires, Lindsey Kitchell, Keith Hengen, William Gray Roncal, Michal Valko, Eva Dyer. Mine Your Own vieW: a Self-Supervised Approach for L earning Representations of Neural Activity. ***NeurIPS 2021 Workshop: Self-Supervised Learning - Theory and Practice***

Honors and Awards

Oct 2020 **IDEaS-TRIAD Research Scholarship** - Georgia Tech

Jan, Jun 2016 **Davis Fellowships (two times)** - Department of Statistics in Columbia University

Aug 2017 **Scholarship to Study Abroad** - Taiwan Ministry of Education

Aug 2017 **M&H Bourne Fellowship** - ECE Department in Georgia Tech

Aug 2010 **Presidential Award** - EE Department in National Taiwan University