CHI-HENG (HENRY) LIN

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Education

09/2017 - present
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, Advanced calculus, Stochastic processes

Research Projects

Understanding the Implicit Regularization with Data Augmentations, Neural Data Science Lab, Georgia Tech

- Characterized the bias and variance of generalization error in linear regression with various data augmentations.
- Systematically analyzed the implicit regularization arisen from data augmentation's bias and covariance operator.
- Empirical studies on augmentations in neural network training using the neural spike train and 1-d MNIST dataset.

Analyzing the Representations with Mined Views in Self-Supervised Learning, Neural Data Science Lab, Georgia Tech

- Analyzed the mechanism behind boosting representation learning from similar data in the feature space.
- Extended the SSL framework of BYOL's applicability to scenarios where efficient data augmentation is unknown/scarce.
- Applied the algorithm Mine Your Own vieW to CIFAR, ImageNet dataset, and neuro data from the primate brain.

Optimal Transport for Interpretable Data Alignment, Neural Data Science Lab, Georgia Tech

- Developed a low-rank distribution alignment method using the concept of unsupervised hierarchical optimal transport.
- Applied to GMM models, domain adaptations of USPS/MNIST, and MNIST/MNIST with drop-out augmentations.
- Derived the geometric properties of the proposed latent Wasserstein discrepancy and provided an optimal cost guarantee.

Theoretical Analysis on the Neural Network Training, Machine Learning Theory Group, Georgia Tech

- Proved Polyak's momentum acceleration on convex functions, deep linear networks, and two-layer ReLU networks.
- Characterized the nonasymptotic convergent rate as functions of condition number with a compact modular analysis.

Bayesian Optimization for Modular Black-box Systems with Switching Costs, Neural Data Science Lab, Georgia Tech

- Designed a cost-efficient hyperparameter tuning algorithm for a modular pipelined system using a novel combination of Bayesian optimization and a slowly moving bandit algorithm, and proved the asymptotic optimality in augmented regret.
- Applied to 3D image reconstruction in a neuroimaging task consisting of a U-Net and multiple data processing stages.

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 (oral).***

[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**.

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

[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**.

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

[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**.

[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***.

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

Work Experience

Jan 2016 - Jul 2016

Research Assistant

Academia Sinica

Project Title: Development of a multi-view 3D video broadcast protocol.

Accomplishment: Published "Efficient Error-Resilient Multicasting for Multi-View 3D Videos in Wireless Networks" in *IEEE GLOBECOM* 2016.

Skills

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

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