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# CHI-HENG (HENRY) LIN

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## Education

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- 09/2017 - present      Ph.D. in Electrical and Computer Engineering  
*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

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## Research Projects

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**Understanding the role of data augmentations in self-supervised learning**, Neural Data Science Lab, Georgia Tech

- Analyzed the smoothing effect of the double descent and the occurrence of benign overfitting with data augmentation.
- Characterized the generalization curves of linear regression with augmentation, including crop, adding noise, and mixup.
- Applied augmentations with self-supervised learning methodologies to the neural spike train and 1-d MNIST dataset.

**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 momentum acceleration of neural networks**, 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.

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## Publications

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**Under Review:**

[1] Mehdi Azabou, Mohammad Gheshlaghi Azar, Ran Liu, **Chi-Heng Lin**, Erik Christopher Johnson, Kiran Bhaskaran Nair, Max Dabagia, Bernardo Avila Pires, Lindsey Kitchell, Keith B Hengen, William Gray-Roncal, Michal Valko, Eva L Dyer. Mine Your Own view: self-supervised learning through across-sample prediction. *Submitted to NeurIPS 2022.*

[2] 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. *Submitted to NeurIPS 2022*.

#### Accepted:

[1] **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*.

[2] **Chi-Heng Lin**, Joseph D Miano, Eva L Dyer. Bayesian optimization for modular black-box systems with switching costs. *UAI 2021*.

[3] 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*.

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

[5] 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*.

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

[7] 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*.

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## 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

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## Work experience

Jan 2016 - Jul 2016	Research Assistant <i>Academia Sinica</i> <b>Project title:</b> Development of multi-view 3D video broadcast protocol <b>Accomplishment:</b> Publish "Efficient Error-Resilient Multicasting for Multi-View 3D Videos in Wireless Networks" in <i>IEEE GLOBECOM 2016</i> .
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## Skills

**Programming Languages:** R, Python, MATLAB, Wolfram Mathematica

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