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# CHI-HENG (HENRY) LIN

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 [chihenglin.com](http://chihenglin.com)

ECE PhD student @ GeorgiaTech

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## Education

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- 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

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## Skills

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**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)

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## Applied Machine Learning Projects

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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 state-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.

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## Theoretical Machine Learning Projects

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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.

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## Work Experience

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Jan 2015 - Jul 2015    Network Researcher

*Academia Sinica, Taipei, Taiwan*

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

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## Publications

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### Accepted:

[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*.

### In Submission:

[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 Learning Representations of Neural Activity. *NeurIPS 2021 Workshop: Self-Supervised Learning - Theory and Practice*

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## Honors and Awards

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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