Tyler LaBonte

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Research Interests

I am interested in foundational aspects of **generalization in machine learning**. My research goal is to advance our scientific and mathematical understanding of deep learning and leverage theoretical insights to design practical algorithms. My current focus includes:

- Generalization theory of neural networks and feature learning
- Robustness under distribution shift, task shift, and spurious correlations
- Reasoning capabilities of large-scale vision and language models

Education

GEORGIA INSTITUTE OF TECHNOLOGY 2021–Present
Ph.D., Machine Learning
Minor in Mathematics
Advisors: Vidya Muthukumar and Jacob Abernethy

UNIVERSITY OF SOUTHERN CALIFORNIA 2017–2021
B.S., Applied and Computational Mathematics, *magna cum laude*
Minor in Computer Science
Advisor: Shaddin Dughmi

Publications

An asterisk (*) denotes equal contribution.

CONFERENCE ARTICLES

1. Task Shift: From Classification to Regression in Overparameterized Linear Models
   Tyler LaBonte*, Kuo-Wei Lai*, and Vidya Muthukumar
   AISTATS 2025
2. The Group Robustness is in the Details: Revisiting Finetuning under Spurious Correlations
   Tyler LaBonte, John C. Hill, Xinchen Zhang, Vidya Muthukumar, and Abhishek Kumar
   NeurIPS 2024
3. Towards Last-layer Retraining for Group Robustness with Fewer Annotations
   Tyler LaBonte, Vidya Muthukumar, and Abhishek Kumar
   NeurIPS 2023
4. Scaling Novel Object Detection with Weakly Supervised Detection Transformers
   Tyler LaBonte, Yale Song, Xin Wang, Vibhav Vineet, and Neel Joshi

WACV 2023

JOURNAL ARTICLES

1. Student Misconceptions of Dynamic Programming: A Replication Study
   Michael Shindler, Natalia Pinpin, Mia Markovic, Frederick Reiber, Jee Hoon Kim, Giles Pierre Nunez Carlos, Mine Dogucu, Mark Hong, Michael Luu, Brian Anderson, Aaron Cote, Matthew Ferland, Palak Jain, Tyler LaBonte, Leena Mathur, Ryan Moreno, and Ryan Sakuma.
   Computer Science Education, 32(3):288–312, 2022

2. Quantifying the Unknown Impact of Segmentation Uncertainty on Image-Based Simulations
   Michael C. Krygier, Tyler LaBonte, Carianne Martinez, Chance Norris, Krish Sharma, Lincoln N. Collins, Partha P. Mukherjee, and Scott A. Roberts
   Nature Communications, 12(1):5414, 2021

WORKSHOP ARTICLES

1. On the Unreasonable Effectiveness of Last-layer Retraining
   John C. Hill, Tyler LaBonte, Xinchen Zhang, and Vidya Muthukumar
   ICLR 2025 Workshop on Spurious Correlations and Shortcut Learning

2. Saving a Split for Last-layer Retraining can Improve Group Robustness without Group Annotations
   Tyler LaBonte, Vidya Muthukumar, and Abhishek Kumar
   ICML 2023 Workshop on Spurious Correlations, Invariance, and Stability

3. Dropout Disagreement: A Recipe for Group Robustness with Fewer Annotations
   Tyler LaBonte, Vidya Muthukumar, and Abhishek Kumar
   NeurIPS 2022 Workshop on Distribution Shifts

4. Scaling Novel Object Detection with Weakly Supervised Detection Transformers
   Tyler LaBonte, Yale Song, Xin Wang, Vibhav Vineet, and Neel Joshi
   CVPR 2022 Workshop on Transformers in Vision

THESES

1. Finding the Needle in a High-Dimensional Haystack: Oracle Methods for Convex Optimization
   Tyler LaBonte
   Undergraduate Thesis, University of Southern California, 2021
   Winner of the USC Discovery Scholar distinction

MANUSCRIPTS

1. We Know Where We Don't Know: 3D Bayesian CNNs for Credible Geometric Uncertainty
   Tyler LaBonte, Carianne Martinez, and Scott A. Roberts
   Manuscript, 2019

Awards

1. 2nd Place Research Talk/Poster Presentation – DOD NDSEG CONFERENCE 2023
2. Simons Institute Deep Learning Theory Workshop Travel Grant ($2,000) 2022
3. DoD National Defense Science and Engineering Graduate Fellowship ($170,000) 2021
   - One of two undergraduates to receive both DoD NDSEG and NSF GRFP in Computer Science

4. NSF Graduate Research Fellowship ($138,000—declined) 2021
5. USC Discovery Scholar (Research distinction for <100 USC graduates) 2021
6. USC Viterbi & USC Dornsife Dean's List 2017–2021
7. Neo Scholar (Top ~100 CS undergraduates in America) – NEO 2020
8. U.S.S. Bowfin Memorial Scholarship ($5,000) 2020
9. 1st Place Computer Vision Project – TREEHACKS, STANFORD UNIVERSITY 2019
10. 1st Place Healthcare AI Project – TREEHACKS, STANFORD UNIVERSITY 2019
11. 1st Place Data Analytics Project – HACKSC, USC 2019
12. Admiral Bernard Clarey Memorial Scholarship ($7,000) 2018
13. National Top 20 Ethical Hacking Finalist – MAJOR LEAGUE HACKING 2018
14. USC Trustee Scholar ($250,000) 2017
15. USC Viterbi Fellow ($24,000) 2017
16. Dolphin Scholarship ($13,600) 2017
17. Rear Admiral Paul Lacy Memorial Scholarship ($6,500) 2017
18. National Merit Scholar ($3,000) 2017

Industry Research Experience

1. MICROSOFT RESEARCH Redmond, WA
   Machine Learning Research Intern 2025
   Advisor: Vibhav Vineet
   Investigated reasoning proficiency of multimodal vision-language models.
2. GOOGLE Sunnyvale, CA
   Machine Learning Research Intern 2023
   Advisor: Kun Lin
   Developed techniques to leverage Gemini LLM to improve hardware-software code design.
3. MICROSOFT RESEARCH Redmond, WA
   Machine Learning Research Intern 2021–2022
   Advisor: Neel Joshi
   Designed Transformer for weakly supervised object detection via multiple instance learning.
4. GOOGLE X Mountain View, CA
   Machine Learning Research Intern 2020
   Advisor: Daniel R. Silva
   Designed CNN-LSTM architecture for temporal identity preservation in object tracking.
5. SANDIA NATIONAL LABORATORIES Albuquerque, NM
   Machine Learning Research Intern 2019–2020
   Advisors: Carianne Martinez and Scott A. Roberts
   Developed Bayesian deep learning model for geometric uncertainty in engineering applications.

Talks

1. Georgia Tech School of Industrial & Systems Engineering – Atlanta, GA 2024
   Task Shift: From Classification to Regression via Benign Overfitting
2. Georgia Tech Machine Learning Center – Atlanta, GA 2024
   Task Shift: From Classification to Regression via Benign Overfitting
3. Google DeepMind – Mountain View, CA 2023
   Towards Last-layer Retraining for Group Robustness with Fewer Annotations
4. Google Cloud Technical Infrastructure – Sunnyvale, CA 2023
   Large Language Models for Hardware-Software Code Design
5. DoD NDSEG Conference – San Antonio, TX 2023
   Towards Last-layer Retraining for Group Robustness with Fewer Annotations
6. Microsoft Research – Redmond, WA 2021
   Weakly Supervised Detection Transformers for Effortless Computer Vision
7. USC Computer Science Theory Group – Los Angeles, CA 2021
   The Distance Oracle for Convex Optimization
8. Google X – Mountain View, CA 2020
   Temporal Identity Preservation in Multiple Object Tracking
9. USC Computer Science Theory Group – Los Angeles, CA 2019
   3D Bayesian CNNs for Credible Geometric Uncertainty
10. USC Center for Artificial Intelligence in Society – Los Angeles, CA 2019
    3D Bayesian CNNs for Credible Geometric Uncertainty
11. USC Center for Artificial Intelligence in Society – Los Angeles, CA 2019
    Machine Learning Fairness in Word Embeddings

Advising

1. Xinchen Zhang – Georgia Tech MS 2024–2025
2. John C. Hill – Georgia Tech BS/MS → Georgia Tech PhD 2022–2024

Teaching

1. Lecturer/Teaching Assistant (8 lectures) | Georgia Institute of Technology 2024
   CS 7545: Machine Learning Theory
2. Lecturer/Teaching Assistant (12 lectures) | Georgia Institute of Technology 2023
   CS 7545: Machine Learning Theory
3. Undergraduate Teaching Assistant | University of Southern California 2021
   CSCI 270: Introduction to Algorithms and Theory of Computing
4. Instructor | USC Center for Artificial Intelligence in Society 2019
   Introduction to Machine Learning

5. Undergraduate Teaching Assistant | University of Southern California 2018
   CSCI 170: Discrete Methods in Computer Science

Academic Service

1. Program Committee, ICLR Workshop on Spurious Correlations and Shortcut Learning 2025
2. Reviewer, International Conference on Machine Learning 2025
3. Organizer, Georgia Tech ML Theory Reading Group 2021–2023, 2025
4. System Administrator, Georgia Tech ML Theory GPU Cluster 2022–2025
5. Reviewer, International Conference on Learning Representations 2024
6. Reviewer, Conference on Neural Information Processing Systems 2023, 2024
7. Student Organizer, Learning Theory Alliance Mentorship Workshop 2023

Open Source Software

1. Milkshake: Quick and extendable experimentation with classification models 2023
   https://github.com/tmlabonte/milkshake ★ 5 ⑂ 3
2. WS-DETR: Weakly supervised Transformers for scaling novel object detection 2021–2022
   https://github.com/tmlabonte/weakly-supervised-detr ★ 10 ⑂ 6
3. BCNN: 3D Bayesian CNNs for credible geometric uncertainty 2019–2020
   https://github.com/sandialabs/bcnn ★ 62 ⑂ 19
   Transitioned to a production environment by Sandia National Laboratories
   19th most starred Sandia repository out of 693 (March 2025)
4. Tendies: Decoupling deep learning development and deployment 2018
   https://github.com/tmlabonte/tendies ★ 37 ⑂ 11
   Transitioned to a production environment by the Air Force Research Laboratory

Other Activities

1. Fleet Captain, Georgia Tech Sailing Club 2023–2025
2. House Chair, USC Hawai'i Club 2020–2021
3. Vice President of Finance, USC Hawai'i Club 2019–2020