Marco Bornstein

My overarching research goal is to make edge and distributed learning algorithms more realistic, efficient, and secure

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RESEARCH & WORK EXPERIENCE

Graduate Assistant | Huang Research Group 2020 – PRESENT
Federated Learning (FL), Asynchrony, Compression, & Mechanism Design

- Constructing memory- and computational-efficient distributed algorithms via asynchronous and compression methods.
- Building mechanisms to incentivize FL participation & performance

Applied ML Scientist | Alcority 2022 – PRESENT
Large-Scale Training of Physics-Informed Neural Networks

- Constructing efficient and scalable ML algorithms for physical applications
- Building large-scale distributed training architectures

Doctoral Internship | Pacific Northwest National Lab 2022 – 2023
Distributed Algorithms for Micro-grid Applications

- Researched edge-computing algorithms with applications to inverter-based micro-grids with high renewable penetration
- Constructed a model-agnostic distributed algorithm so edge devices can collaboratively train irrespective of cost or memory constraints

PUBLICATIONS

M. Bornstein, N. Nazir, J. Drgona, S. Kundu, & V. Adetola. "Finding MIDDLE Ground: Scalable and Secure Distributed Learning". *Conference on Information and Knowledge Management*, 2024.
M. Bornstein, T. Rabbani, E. Wang, A. Bedi, & F. Huang. "SWIFT: Rapid Decentralized Federated Learning via Wait-Free Model Communication". *International Conference on Learning Representations*, 2023.
M. Bornstein*, T. Rabbani*, & F. Huang. "Large-Scale Distributed Learning via Private On-Device LSH". *Neural Information Processing Systems*, 2023.
M. Bornstein, T. Tullius, & Y. Bayazitoglu. "Optimal nanoparticles for heat absorption and cost." *International Journal of Heat and Mass Transfer*, 2019.

`Workshops:`

M. Bornstein, A. Bedi, A. Sahu, & F. Huang. "RealFM: A Realistic Mechanism to Incentivize Data Contribution and Device Participation". *NeurIPS Federated Learning Workshop*, 2023.

`Preprints:`

M. Bornstein, J. Liu, J. Li, & F. Huang. "Escaping From Saddle Points Using Asynchronous Coordinate Gradient Descent", 2022.

`Under Submission:`

M. Bornstein, A.Bedi, A. Mohamed, & F. Huang. "FACT or Fiction: Can Truthful Mechanisms Eliminate Federated Free Riding?".
T. Rabbani, B. Feng, **M. Bornstein**, & F. Huang. "Federated Learning of Large Networks on Constrained Clients via Sketching".

M. Bornstein*, T. Rabbani*, M. Ding, & F. Huang. "Training Extreme Recommender Systems using Compressed Virtual Labels".

EDUCATION

2019 – PRESENT **Ph.D. Candidate**
Applied Mathematics
University of Maryland
GPA: 3.95/4.00

2019 – 2021 **Master of Science**
Applied Mathematics
University of Maryland
GPA: 3.95/4.00

2015 – 2019 **Bachelor of Science**
Mechanical Engineering
Bachelor of Arts
Comp. & Applied Mathematics
Rice University
GPA: 3.77/4.00

AWARDS

2024 **Hauptman Fellowship**
University of Maryland

2019-2020 **Aziz-Osborn Gold Medal in Teaching Excellence**
University of Maryland

2019 **Best Energy-Related Design**
Rice University Design Showcase

2017 **NSF Travel Grant Scholarship**
34th QPRC Conference

2017 **Best Poster and Presentation**
7th Eubank Conference

PRESENTATIONS

2022 **Oral Presentation of** SWIFT
NeurIPS Federated Learning Workshop

TEACHING EXPERIENCE

2019-2020 **Calculus I**, *University of Maryland*

PROGRAMMING SKILLS

Python, PyTorch, TensorFlow, MATLAB, Open MPI