Shruti Maralappanavar

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A PhD graduate working on distributed machine learning algorithms particularly focusing on federated learning, bilevel optimization, online learning.

EDUCATION

AUG 2019 - JULY 2025 — **Ph.D. Department of Electrical, Electronics and Communication**
Indian Institute of Technology Dharwad, Karnataka
Focus: Federated Learning (FL) and FL Algorithms — Advisor: Dr. Bharath B N

AUG 2016 — **M. Tech. Electrical & Communication Engineering**
VTU University, Belgaum, Karnataka
Focus: Digital Communication and Networking — Percentage: 74/100

AUG 2014 — **B.E. Electronics and Communication**
Goa University, Goa

WORK EXPERIENCE

AUG 2019 - JULY 2025 — **PhD** - *Indian Institute of Technology Dharwad, Karnataka*
Working towards designing distributed learning algorithms under different settings such as the online, offline, single level and bilevel optimization cases.

- **Linear convergence of Federated Learning ALgorithms** [1], [3]: Federated Averaging (FedAvg) is the algorithm of choice for many FL applications. Though its quite popular algorithm its performance is not very well understood in modern overparametrized neural networks. For the first time we show that FedAvg in both the centralized and decentralized setting enjoys linear convergence rate. In the centralized setting the server co-ordinates the information sharing among nodes in FL whereas in the case of decentralized setting only the neighboring clients communicate depending on the network topology.
- **Federated Bilevel Optimization in presence of Byzantine** [4]: We consider the problem of Byzantine robustness for the federated Bilevel optimization problems. We propose a computationally efficient and robust algorithm for solving Federated Bilevel Optimization with Byzantine that considers the lower-level objective is non-convex and satisfies the Polyak- Łojasiewicz (PL)-inequality.
- **Online Bilevel Optimization** [5]: In this work, we consider an online bilevel optimization (OBO) problem in which the upper and lower-level objective functions change over time. We develop a novel algorithm for the OBO problem that works under the assumption that the lower-level objective is non-convex and satisfies the Polyak- Łojasiewicz (PL)-inequality, and is fully first-order and does not rely on Hessian (and Jacobian) evaluations.

JAN 2017- JULY 2019 — **Lecturer** - *KLE University, Hubli*

SKILLS & INTERESTS

- **Programming Languages**: MATLAB, Python, C, C++.
- **Tools & Libraries**: Scipy, Numpy, Pandas, Matplotlib, Tensorflow, PyTorch, LaTeX
- **Research Interests**: Data Analysis, Machine Learning, Online Learning, Federated Learning, Optimization, LLM, NLP, Bilevel Optimization, Deep Learning.

RELEVANT COURSES

Probability Theory and Random processes | Linear Algebra | Optimization | Machine Learning | Distributed Optimization

TEACHING ASSISTANT (IIT Dharwad)

Mathematics for Data Science | Introduction to Probability | Pattern Recognition for Machine Learning | Communication Systems Lab | Analog Lab

Awards and Certificates

2023 Best Paper Student Finalist at 2023 Asilomar Conference, USA

PUBLICATIONS

[1] Sawan Singh Mahara, Shruti P Maralappanavar, and Bharath B N, "Multi-Task Federated Edge Learning (MTFeeL) With SignSGD", *in 2022 National Conference on Communications (NCC), 2022, pp. 379-384.*

[2] Shruti P Maralappanavar, Prashant Khanduri and Bharath B N, "FedAvg for Minimizing Polyak-Łojasiewicz Objectives: The Interpolation Regime", *in 2023 57th Asilomar Conference on Signals, Systems, and Computers. IEEE, 2023, pp. 607–613.* ***(Best student paper award fialist!)***

[3] Shruti P Maralappanavar, Prashant Khanduri and Bharath B N, "Linear Convergence of Decentralized FedAvg for PL Objectives: The Interpolation Regime", *in* ***Transactions on Machine Learning Research****, 2025. [Online]. Available: https://openreview.net/pdf?id=Og3VxBFhwj*

[4] Shruti P Maralappanavar, Bharath B N and Prashant Khanduri, "Dynamic Regret and Constraint Violation Bounds for Low Complexity Online Bilevel Optimization Algorithms", *Submitted to a top-tier (A*) conference in machine learning.*

[5] Shruti P Maralappanavar and Bharath B N, "A Robust and Hessian-Free Approach to Federated Bilevel Optimization with Byzantine Nodes", accepted in TMLR, 2025.