Shourya Bose

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ABOUT ME

I am a fourth-year Ph.D. candidate with the ECE Department at UC Santa Cruz. My research covers reinforcement learning, federated learning, and ML-based optimization for power grid applications. Having a strong mathematical background, I excel at converting mathematical AI/ML (and other) models into efficient code. I have interned at Argonne National Laboratory to work on Federated Learning, and have received awards and competition victories related to simulating power grids in reinforcement learning settings.

EDUCATION

1. **Ph.D. Electrical and Computer Engineering**   **Sep 2020-**

   University of California Santa Cruz, California, USA
   - Part of Energy, Optimization & Data Analytics Lab with PI Dr. Yu Zhang.
   - Recipient of Chancellor's Fellowship. Completed my master's coursework with a 3.96 GPA and now focusing on research.
   - Studying the intersection of machine learning, optimization, and control theory for applications in electric power systems.

2. **B.E. Electrical and Electronics Engineering & M.Sc. Mathematics**   **2014-2019**

   BITS Pilani Goa Campus, Goa, India
   - Graduated with a dual degree, B.E. in EEE and an M.Sc in Mathematics.
   - Spent last year of studies at Department of Electrical Engineering, Indian Institute of Science (IISc) for thesis.

WORK EXPERIENCE

1. **Givens Associate, then Visiting Student**   **Jun 2023 - Present**

   Argonne National Laboratory, Illinois, USA
   - Researching distributed machine learning with privacy-protection of load forecasting data with Dr. Kibaek Kim.
   - Working with PyTorch APPFL package.
   - Working remotely as visiting student after end of on-site duration in September.

2. **Project Associate**   **Mar 2020 - Aug 2020**

   Indian Institute of Science, Bengaluru, India
   - Worked with the same group as the previous internsip.
   - Theoretical research led to publication of first-author article in IET Control Theory and Applications.

3. **Research Intern**   **Jan 2019 - Feb 2020**

   Indian Institute of Science, Bengaluru, India
   - Worked as a part of the Control & Network Systems Group.
   - On the theoretical side, I explored the problem of event-triggered control in linear systems with unreliable communications. On the applied side, I simulated a multi-scale search algorithm for a UAV with downward pointing sensor in MATLAB (original work: Dr. S. Carpin, UCM).

4. **Research Intern**   **Jan 2019 - Dec 2019**

   Pixxel, Bengaluru, India
   - Volunteered to do some orbital simulations to reckon number of satellites needed in constellation for parameters like coverage, revisit time, etc. Used AGI STK and NASA GMAT software, along with some post-processing in MATLAB.

SKILLS

1. *Programming languages*   Python (with pytorch), Matlab (and Simulink), C, SQL (work-in-progress), LaTeX
2. *Description of Graduate Courses*   Optimization & Economics of Power Systems, Machine Learning, Numerical & Convex Optimization, Control Theory & Optimal Control, Analysis of Algorithms
3. *Description of Undergrad Courses*   Various abstract math & numerical computation courses, Various control, power electronics & systems courses, Electrodynamics
4. *Teaching*   TA for CSE20 (Python programming), ECE30 (Engineering principles of electronics), ECE13 (Computer Systems and C Programming), Mentor for SIP 2021 & 2022

FIRST-AUTHOR PUBLICATIONS - JOURNALS

1. "Federated Short-Term Load Forecasting with Personalization Layers for Heterogeneous Clients", **S. Bose** and K. Kim, Under Review at *IEEE Transactions on Smart Grid*, 2023, arXiv Link.
2. "Learning to Optimize: Accelerating Optimal Power Flow via Data-driven Constraint Screening", **S. Bose**, K. Chen, Y.Zhang, Under Review at *IEEE Transactions on Power Systems*, 2023, arXiv Link.
3. "Load Restoration in Islanded Microgrids: Formulation and Solution Strategies", **S. Bose** and Y. Zhang, *IEEE Transactions on Control of Network Systems*, 2023, Link.
   - **Award:** INFORMS Energy, Natural Resources and the Environment (ENRE) 2021 early-career best paper award.
4. "Event-Triggered Second-Moment Stabilisation under Action-Dependent Markov Packet Drops", **S. Bose** and P. Tallapragada, *IET Control Theory & Applications*, 2019, Link.

FIRST-AUTHOR PUBLICATIONS - CONFERENCES

1. "Privacy-Preserving Load Forecasting for Personalized Model Obfuscation", **S. Bose**, Y. Zhang and K. Kim, *submitted to IEEE PES-GM 2024*, arXiv Link.
2. "On LinDistFlow Model Congestion Pricing: Bounding the Changes in Power Tariffs", **S. Bose**, K. Chen and Y. Zhang, *IEEE ISGT 2023*, Link.
   - **Award:** IEEE Student and Young Professional (SYPA) Travel Grant, UCSC Dean's Travel Grant
3. "Co-optimization of Battery Routing and Load Restoration for Microgrids with Mobile Energy Storage Systems", **S. Bose** and Y. Zhang, *IEEE PES-GM 2022*, Link.
4. "Differentially Private Load Restoration for Microgrids with Distributed Energy Storage", **S. Bose** and Y. Zhang, *IEEE ISGT 2022 NA*, Link.
5. "Event-Triggered Second Moment Stabilization under Markov Packet Drops", **S. Bose** and P. Tallapragada, *Fifth Indian Control Conference, 2019*, Link.

OTHER PUBLICATIONS

1. "Unsupervised Deep Learning for AC Optimal Power Flow via Lagrangian Duality", K. Chen, **S. Bose** and Y. Zhang, *IEEE GLOBECOM 2022*, Link.
2. "Numerical Solution for a System of Fractional Differential Equations with Applications in Fluid Dynamics and Chemical Engineering", B. Prakash, A. Setia and **S. Bose**, *International Journal of Chemical Reactor Engineering*, 2017, Link.

AWARDS AND HONORS

These are excluding the awards for specific conferences or papers.

1. **Learning to Run a Power Network (L2RPN, 2023) by TU Delft:** Competition to use RL and RL-adjacent techniques to ensure reliable operation of power grids. Our team (myself, Q. Yang, Y. Zhang) placed **first** among 30+ teams and won 1500 euros.
2. **Chancellor's Fellowship, UCSC:** Highly competitive scholarship to financially cover first year of PhD studies.
3. **Hult Prize Regionals, 2016:** Social entrepreneurship competition organized by Hult Institute. Our team placed first.