Sudeep Salgia

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Electrical and Computer Engineering
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Google Scholar

Professional Experience

09.23 - Present **Carnegie Mellon University**
Postdoctoral Research Associate, Electrical and Computer Engineering
Supervisor: Prof. Yuejie Chi
- Established fundamental trade-offs between accuracy, communication and privacy in federated reinforcement learning and federated learning
- Working on developing improved RLHF (Reinforcement Learning with Human Feedback) techniques for **multi-objective fine tuning of LLMs**

05.21-08.21 **Machine Learning Solutions Lab, Amazon,** *Applied Scientist Intern*
Identifying and building ML solutions to address business problems of clients
Hosted by Daniel Horowitz and Emmanuel Salawu
- Critically evaluated the efficiency of *Amazon Personalize* by comparing it against state-of-the-art recommendation models to help design a User Personalized Recommendation system for a leading news organization that **increases user engagement by** 10%
- Assessed efficacy of ML models and approaches (*Amazon Lookout for Equipment*, *Amazon Forecast* and custom models) to obtain 12% **improvement** over baselines for Predictive Maintenance in drug manufacturing

Education

2018-23 **Cornell University**.
Ph.D., Electrical and Computer Engineering (CGPA 4.18/4.0)
Advisor: Prof. Qing Zhao

2014-18 **Indian Institute of Technology Bombay**.
Bachelor of Technology in Electrical Engineering (with Honors), Minor in CS
Institute Silver Medalist, CGPA 9.74/10

Research Interests

My research focuses on **provably efficient** and **resource-aware data-driven decision-making** in real world settings for sequential learning problems arising in **Reinforcement Learning, Federated Learning, Privacy-Preserving ML, and Stochastic Optimization**. I am currently working on developing methods for statistically and computationally efficient **inference and alignment of large-scale models.** My research employs tools from **high-dimensional statistics, large-scale optimization, probability**, and **machine learning** and offers a unique perspective that blends statistical and systemic design aspects .

Selected Publications

1. The Sample-Communication Complexity Trade-off in Federated Q-Learning [Paper]
   Sudeep Salgia, Yuejie Chi
   Neural Information Processing Systems (NeurIPS), 2024. ***Oral Presentation (top*** 0.4% ***of accepted papers)***.
2. Random Exploration in Bayesian Optimization: Order-Optimal Regret and Computational Efficiency [Paper]
   Sudeep Salgia, Sattar Vakili, Qing Zhao
   International Conference on Machine Learning (ICML), 2024. ***Resolves an open COLT problem***.

3. Characterizing Accuracy-Communication-Privacy Trade-off in Distributed Stochastic Convex Optimization [Preprint]
   Sudeep Salgia, Nikola Pavlovic, Yuejie Chi, Qing Zhao
   International Conference on Artificial Intelligence and Statistics (AISTATS), 2025
4. Order-Optimal Regret in Distributed Kernel Bandits using Uniform Sampling with Shared Randomness [Preprint]
   Nikola Pavlovic, **Sudeep Salgia**, Qing Zhao
   Preliminary version in NeurIPS BDU Workshop, 2024
   International Conference on Artificial Intelligence and Statistics (AISTATS), 2025
5. Differentially Private Kernelized Contextual Bandits
   Nikola Pavlovic, **Sudeep Salgia**, Qing Zhao
   International Conference on Artificial Intelligence and Statistics (AISTATS), 2025
6. Adaptive Binning Coincidence Test for Uniformity Testing [Paper]
   Sudeep Salgia, Xinyi Wang, Qing Zhao, Lang Tong
   IEEE Transactions on Signal Processing, 2024
7. A Communication-Efficient Adaptive Algorithm for Federated Learning under Cumulative Regret [Paper]
   Sudeep Salgia, Tamir Gabay, Qing Zhao, Kobi Cohen
   IEEE Transactions on Signal Processing, 2024
8. Distributed Linear Bandits under Communication Constraints [Paper]
   Sudeep Salgia, Qing Zhao
   International Conference on Machine Learning (ICML), 2023
9. Provably and Practically Efficient Neural Contextual Bandits [Paper]
   Sudeep Salgia, Sattar Vakili, Qing Zhao
   International Conference on Machine Learning (ICML), 2023
10. Collaborative Learning in Kernel-based Bandits for Distributed Users [Paper]
    Sudeep Salgia, Sattar Vakili, Qing Zhao
    IEEE Transactions on Signal Processing, 2023
11. A Domain-Shrinking based Bayesian Optimization Algorithm with Order-Optimal Regret Performance [Paper]
    Sudeep Salgia, Sattar Vakili, Qing Zhao
    Neural Information Processing Systems (NeurIPS), 2021
12. An order-optimal adaptive test plan for noisy group testing under unknown noise models [Paper]
    Sudeep Salgia, Qing Zhao
    International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2021
13. Stochastic Coordinate Minimization with Progressive Precision for Stochastic Convex Optimization [Paper]
    Sudeep Salgia, Qing Zhao, Sattar Vakili
    International Conference on Machine Learning (ICML), 2020
14. Stochastic Gradient Descent on a Tree: an Adaptive and Robust Approach to Stochastic Convex Optimization [Paper]
    Sattar Vakili, **Sudeep Salgia**, Qing Zhao
    Annual Allerton Conference on Communication, Control and Computing, 2019

Invited Talks

12.24 The Sample-Communication Complexity Trade-off in Federated Q-Learning
Neural Information Processing Systems (NeurIPS), Oral presentation

09.24 The Sample-Communication Complexity Trade-off in Federated Q-Learning
Allerton Conference, UIUC

Scholastic Achievements and Awards

2022,2023 Top Reviewer at NeurIPS Conference

2018 Awarded Jacobs Scholar Fellowship at Cornell University

2018 Silver Medalist in the Class of 2018, IIT Bombay

2014 Secured All India Rank 214 in JEE Advanced 2014 among 150,000 selected candidates from over all India

2017 Selected for the final round of Honda YES Scholarship, among top 20 students in India on the basis of views on and contribution to eco-technology

2015 Best Application Award for our project on Sign Language to Text Converter at the Tech & RnD Expo, IIT Bombay

2005-2012 Stood among Top 100 in India in various Math, Science and Cyber Olympiads

Skills and Coursework

Programming Hands-on experience in Python (4 years), PyTorch, numpy, pandas, MATLAB, LaTeX

Math Measure Theory, Probability, Linear Algebra, Statistical Learning Theory, Convex Optimization, Real Analysis

EE Optimal Control, Stochastic Systems, Information Theory, Signal Processing

Teaching and Community involvement

Teaching **Teaching Assistant**.

- Statistical Inference and Decision, Introduction to Probability (*Cornell University*)
- Linear Algebra, Electromagnetism (*IIT Bombay*)

Reviewing Reviewer for ICML (2021-25), NeurIPS (2021-24), AISTATS (2022-25), ICLR (2023, 2025), IJCAI (2024), ISIT (2023-24), AAAI (2025), IEEE/ACM Transactions on Networking, IEEE Transactions on Information Theory, IEEE Transactions on Signal Processing

Volunteer **Abhyasika**, *IIT Bombay*.

- Abhyasika is an initiative that runs tutorials for underprivileged children and supports them in their education

Mentorship

12.23 - Pre Nikola Pavlovic, PhD Student, Cornell University

06.24 - 09.24 Tonghe Zhang, Visting UG student, Tsinghua University

05.22 - 04.23 Tamir Gabay, Masters student, Ben-Gurion University of the Negev

08.22 - 12.22 Danyu Hu, Masters student, Cornell University (Curr. Quantitative Analyst)

08.22 - 12.22 Owen Deng, Masters student, Cornell University (Curr. Design Ver. Eng. at Apple)

08.21 - 02.22 Omer Serbetci, Masters student, Cornell University (Curr. PhD student at USC)

References

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