

Sudeep Salgia

*Fourth Year PhD candidate
Electrical and Computer Engg. Dept.
Cornell University*

317 Rhodes Hall
Cornell Univ., Ithaca, NY - USA, 14850
☎ +1-607-379-8156
✉ ss3827@cornell.edu
📄 <https://sudeepsalgia.github.io/>

Research Interests

My research interests are on theoretical aspects of Machine Learning, in the broad areas of statistical learning, stochastic optimization, bayesian optimization, bandits and active online learning. I am passionate about math-intensive problems that contribute to a better understanding and wider applications of fundamental principles of Machine Learning.

Education

Aug'18-Present **Cornell University.**

PhD Electrical and Computer Engineering
Advisor: Prof. Qing Zhao
CGPA 4.16/4.0

July'14-May'18 **Indian Institute of Technology Bombay.**

Bachelor of Technology in Electrical Engineering (with Honors)
Minor in Computer Science
CGPA 9.74/10

Publications and Submissions

- 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
- An order-optimal adaptive test plan for noisy group testing under unknown noise models
Sudeep Salgia, Qing Zhao
International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2021
- Stochastic Coordinate Minimization with Progressive Precision for Stochastic Convex Optimization [[Paper](#)]
Sudeep Salgia, Qing Zhao, Sattar Vakili
International Conference on Machine Learning (ICML), 2020
- 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
- On Bandlimited Spatiotemporal Field Sampling with Location and Time Unaware Mobile Sensors [[Paper](#)]
Sudeep Salgia, Animesh Kumar
International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2018

- As Easy as ABC: Adaptive Binning Coincidence Test for Uniformity Testing [[Preprint](#)]
Sudeep Salgia, Qing Zhao, Lang Tong
Submitted to Algorithmic Learning Theory (ALT), 2022
- Kernel-based Federated Learning with Personalization
Sudeep Salgia, Sattar Vakili, Qing Zhao
Submitted to International Conference on Artificial Intelligence and Statistics (AISTATS), 2022
- Disagreement-based Active Learning in Online Settings [[Preprint](#)]
Boshuang Huang, **Sudeep Salgia**, Qing Zhao
Submitted to IEEE Transactions on Signal Processing
- Noisy Group Testing under Unknown Noise Models
Sudeep Salgia, Qing Zhao
Under submission to IEEE Transactions on Signal Processing
- Stochastic Coordinate Minimization with Progressive Precision for Stochastic Convex Optimization
Sudeep Salgia, Qing Zhao, Sattar Vakili
Under submission to Mathematics of Operation Research

Internship

- May'21-Aug'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
 - Assessed efficacy and fit of various ML approaches (*Amazon Lookout for Equipment*, *Amazon Forecast* and custom models) to be used for Predictive Maintenance in drug manufacturing

Research Projects

- **Algorithm for Gaussian Process Bandits with Order-Optimal Regret** (*Published in NeurIPS'21*)
 - Proposed an algorithm for blackbox optimization that achieves optimal regret order, closing the existing gap between upper and lower bounds
 - Proposed approach is a generic framework that reduces the computational complexity of UCB based algorithms by a factor of $O(T^{2d-1})$
- **Adaptive Strategies for Uniformity Testing** (*Submitted to ALT'22*)
 - Developed a sequential version of the Coincidence test with order optimal sample complexity that adapts to the distance of the underlying distribution to the uniform distribution
 - Extended the algorithm for testing uniformity of continuous distributions based on an adaptive binning of the domain that leverages the adaptivity of the above algorithm
- **Noisy Quantitative Group Testing** (*Published in ICASSP'21*)
 - Developed a new adaptive test plan consisting of a hierarchy of biased random walks guided by a novel local sequential test for noisy group testing under unknown noise models
 - Established the order-optimal performance of the proposed strategy in terms of both the population size and the error rate

- **Kernel-based Federated Learning** (*Submitted to AISTATS'22*)
 - Developed an order-optimal algorithm for federated learning with personalization where the objective functions belong to an RKHS
 - Proposed a communication efficient variant of above algorithm based on sparse Gaussian Process approximation to address the communication issues in federated learning setups
- **Progressive Coordinate Minimization** (*Published in ICML'20*)
 - Developed a general framework for extending low-dimensional stochastic optimization routines to high-dimensional problems while preserving their performance
 - Extended the coordinate minimization algorithm for stochastic optimization by using a low-dimensional routine for minimization along a coordinate upto a controlled level of precision
 - Established the optimality of the proposed minimization precision in each iteration and its independence from the low-dimensional routine
- **Stochastic Gradient Descent on a Tree** (*Published in Allerton'19*)
 - Developed an adaptive and robust algorithm for one dimensional stochastic optimization based on inducing a biased random walk on a binary interval tree
 - Designed an improved local sequential test based on Law of Iterated Logarithm resulting in optimal performance of the above algorithm
- **Disagreement-based Active Learning in Online Settings** (*Submitted to Trans. Sig. Proc.*)
 - Proposed a new active learning algorithm in online settings with a finite regret and $O(\log^2 T)$ label complexity under Massart Noise conditions
 - Extended the algorithm for Tsybakov Noise model and established an optimal regret performance
 - Derived novel lower bounds on label complexity for fixed regret performance in online settings to establish the optimality of the proposed algorithm
- **Sampling and Estimation of Bandlimited fields** (*UG Thesis, Published in ICASSP 2018*)
 - Obtained bounds on the reconstruction error in estimating a spatially bandlimited field sampled at unknown locations obtained from an unknown autoregressive process
 - Extended the above analysis to obtain similar bounds for reconstructing spatiotemporally varying fields from samples obtained at unknown locations and unknown time stamps

Scholastic Achievements and Awards

- 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

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

EE Optimal Control, Stochastic Systems : Estimation and Control, Information Theory,
Signal Processing
Programming MATLAB, Python

Positions of Responsibilities

- Jul'21-Present **Board Member of Cornell India Association, Cornell University.**
◦ Responsible for heading the Logistics of various events throughout the year
- Sep'18-Dec'19 Member of Graduate team of International Students Union at Cornell University
- May'17-Apr'18 **Department Academic Mentor, IIT Bombay.**
◦ Selected among 22 students based on interpersonal skills and academic performance to mentor students with academic backlogs and to help them address concomitant social problems
- Jan'18-Apr'18 **Teaching Assistant for Linear Algebra, IIT Bombay.**
- Jul'17-Apr'18 **Volunteer, Abhyasika, IIT Bombay.**
◦ Abhyasika is an initiative that runs tutorials for underprivileged children and supports them in their education
- May'16-Apr'17 **Manager, Technical Projects, IIT Bombay.**
◦ Shouldered key responsibility for evaluation and allocation of student driven socio-technical projects
◦ Spearheaded collaboration with London School of Economics for their Enactus program and creation of National Innovation Club at IIT Bombay

Co-Curricular Activities

- Secured sixth position in a global Creative Writing competition in Mood Indigo 2014 - the cultural fest of IIT Bombay
- Amongst top active contributors at [Math StackExchange](#) (top 11%)
- Was a Moderator at [Brilliant.org](#), a community based platform for development of skills in Math and Science for international competitive exams
- Articles published in various print media (English and Hindi) during the last ten years
- Hobbies: Painting, Sketching, Badminton, Cricket