Sudeep Salgia

Third Year PhD student
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Research Interests

I am passionate about math-intensive problems that contribute to a better understanding and wider applications of fundamental principles of learning. I like to work on theoretical aspects of Machine Learning, broadly around the fields of Statistical Learning, Stochastic Optimization, non-parametric Bayesian Optimization, Hypothesis Testing, and Active Learning in online setups.

Education

Aug'18-Present   **Cornell University**.
PhD Electrical and Computer Engineering
Advisor: Prof. Qing Zhao
CGPA 4.18/4.0

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

○ 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

○ Disagreement-based Active Learning in Online Settings [Preprint]
Boshuang Huang, **Sudeep Salgia**, Qing Zhao
Submitted to IEEE Transactions on Information Theory

○ A Computationally Efficient Approach to Black-box Optimization using Gaussian Process Models [Preprint]
Sudeep Salgia, Sattar Vakili, Qing Zhao
Submitted to International Conference on Artificial Intelligence and Statistics (AISTATS), 2021

○ An order-optimal adaptive test plan for noisy group testing under unknown noise models
Sudeep Salgia, Sattar Vakili, Qing Zhao
Submitted to Intl. Conference on Acoustics, Speech and Signal Processing (ICASSP), 2021

Research Projects

○ **Computationally Efficient Algorithms for Gaussian Process Bandits** (*Sub. to AISTATS'21*)
  - Proposed a general approach that reduces the computational complexity of UCB based algorithms by a factor of $O(T^{2d-1})$ while preserving the same regret order
  - Developed a tree-based localized search strategy rooted in the methodology of domain shrinking to achieve increasing accuracy with a constant-size discretization
  - Designed a local optimization routine to identify regions of the domain that contain points with function values greater a given threshold to avoid the global optimization of the UCB score

○ **Progressive Coordinate Minimization** (*Published in ICML 2020*)
  - 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 the minimization precision in each iteration and its independence from the low-dimensional routine
  - Designed termination rules for two popular stochastic optimization algorithms tuned to achieve the aforementioned optimal control

○ **Stochastic Gradient Descent on a Tree** (*Published in Allerton 2019*)
  - 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. Info. Theory*)
  - 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

○ **Noisy Quantitative Group Testing** (*Submitted to ICASSP 2021*)
  - 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

○ **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 Medallist 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, C++

Positions of Responsibilities

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

Jan'16-Apr'16 **Teaching Assistant for Electromagnetism**, *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