

# SAMARTH GUPTA

## PERSONAL INFORMATION

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ADDRESS : E3, Collaborative Innovation Center, Carnegie Mellon University, Pittsburgh, 15213  
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WEBPAGE : [www.andrew.cmu.edu/user/samarthg/](http://www.andrew.cmu.edu/user/samarthg/)  
INTERESTS : Online Learning, Multi-Armed Bandits, Statistical Inference, Performance Modeling

## EDUCATION

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AUG 2017 - [Carnegie Mellon University, Pittsburgh, PA](#)  
PhD Student  
**Electrical and Computer Engineering**  
*Advisors:* Gauri Joshi, Osman Yağın  
GPA: **4.0/4.0**

JUL 2012 - [Indian Institute of Technology Bombay, Mumbai, India](#)  
JUN 2017 - Dual Degree (Bachelor of Technology + Master of Technology)  
B. Tech in **Electrical Engineering**  
M. Tech in **Communications and Signal Processing**  
CGPA: **9.01/10**

## PUBLICATIONS

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PREPRINT **Samarth Gupta**, Shreyas Chaudhari, Gauri Joshi and Osman Yağın “Multi-Armed Bandits with Correlated Arms” submitted to SIGMETRICS 2020. [Link](#)

**Samarth Gupta**, Gauri Joshi and Osman Yağın “Correlated Multi-Armed Bandits with Latent Random Source” submitted to International Conference on Acoustics, Speech and Signal Processing (ICASSP) 2020. [Link](#)

**Samarth Gupta**, Shreyas Chaudhari, Subhojyoti Mukherjee, Gauri Joshi and Osman Yağın “A unified approach to translate classical bandit algorithms to the structured bandit setting”. Submitted to International Conference on Artificial Intelligence and Statistics (AISTATS) 2020. [Link](#)

CONFERENCE **Samarth Gupta**, Gauri Joshi and Osman Yağın “Active Distribution Learning from Indirect Samples” Allerton Conference on Control, Communication and Computing, 2018. [Link](#)

**Samarth Gupta** and Sharayu Moharir “Effect of Recommendations on Serving Content with Unknown Demand” poster paper in ACM Mobihoc 2017 (**recipient of best poster award**).

**Samarth Gupta** and Sharayu Moharir “Request Pattern and Caching for VoD Services with Recommendation Systems” International Conference on Communication Systems and Networks 2017. (COMSNETS). [Link](#)

JOURNAL **Samarth Gupta** and Sharayu Moharir “Effect of Recommendations on Serving Content with Unknown Demand” in ACM Transactions on Modeling and Performance Evaluation of Computer Systems. [Link](#)

**Samarth Gupta** and Sharayu Moharir “Modeling Request Patterns in VoD Services with Recommendation Systems”, Lecture Notes in Computer Science, Volume 10340, 2017. [Link](#)

Satish Grandhi, Bo Yang, Christian Spagnol, **Samarth Gupta** and Emanuel Popovici “An EDA Framework for Reliability Estimation and Optimization of Combinational Circuits” Journal of Low Power Electronics, Vol.12, 1-17,2016 [Link](#)

## INTERNSHIPS

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- MAY 2019 - **Generating Failsafe predictions for the self-driving car**  
AUG 2019 **Uber ATG**, Pittsburgh | *Team* : Prediction Analytics  
Worked on evaluating the performance of mainline prediction, that predicts the trajectory of actors around the self driving vehicle. Incorporated new performance metrics that account for the uncertainties present in the prediction. Designed and trained a safety oriented *fail-safe* prediction model, that activates when the mainline prediction's performance is below par.
- MAY 2015 - **Trust Region Optimization for Estimating Bond Curve Parameters**  
JUL 2015 **Morgan Stanley**, Mumbai | *Team* : Core Analytics, Strats and Modeling
- MAY 2014 - **Synthesis of Reliable Circuits from Unreliable Components**  
JUL 2014 *Guide*: Prof. Emanuel Popovici, **University College Cork, Ireland**

## AWARDS AND HONORS

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- Awarded the CyLab Presidential Fellowship for 2018-19
- Awarded the Carnegie Institute of Technology Dean's Fellowship for 2017-18
- Received the Temasek Foundation LEARN scholarship for the semester exchange program at Nanyang Technological University in Fall 2015 (Awarded to 54 students across 14 countries)
- Qualified the Regional Mathematics Olympiad in 2010
- Awarded Merit Certificate from CBSE for securing a CGPA of 10/10 in Matriculation 2010
- Awarded Merit Certificate from KVS for securing 95.6% in CBSE Intermediate(Grade 12) 2012

## RELEVANT GRADUATE COURSEWORK

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- CMU            Machine Learning, Advanced Machine Learning, Foundation of Cloud and ML Infrastructure, Optimization, Estimation Detection and Learning, Martingales: Concentration inequalities and Sequential Analysis
- IIT-  
BOMBAY       Information Theory and Coding, Science of Information Statistics and Learning, Advanced Data Networks, Random Graphs, Markov Chain and Queuing System, Advanced Concentration Inequalities, Probabilistic Models, Communication Networks, Wireless Communication, Adaptive Signal Processing, Audio Signal Processing, Image Processing, Computer Vision, Multimedia Systems, Advanced computing for electrical engineers, Number Theory and Cryptography

## TEACHING AND MENTORSHIP

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- 2016 -        **Teaching Assistant**
- Performance Modeling and Design of Computer Systems: Fall 2018, Fall 2019 at CMU
  - Markov Chains and Queuing Systems, Spring 2017 at IIT Bombay
  - Data Analysis and Interpretation, Fall 2016 at IIT Bombay
- APR 2016-   **Institute Student Mentor** | Student Mentorship Program, IIT Bombay  
MAY 2017    • Selected as part of the 81 member team of senior student mentors at IIT Bombay  
                 • Guided 12 freshmen on their academic and extra-curricular endeavours during 2016-17

## EXTRA CURRICULAR ACTIVITIES

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- Awarded Hostel 8 Sports Special Mention for performances in Tennis, Table Tennis, Soccer during 2013-14
- Writer and Editor for Memoir team; Compiled experiences of exchange students at NTU Singapore
- Secured 2nd Position in Inter Hostel Table Tennis Championship 2013, Captained the team in 2016
- Won Institute Table Tennis League 2015 as Manager and Player of the team, lead a team of 12 to victory
- Participated in Summer School of Sports, Tennis during May - June 2016

## SELECTED RESEARCH PROJECTS

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JUL 2018 - **A Unified Approach to Translate Classical Bandit Algorithms to the Structured Bandit Setting**  
Oct 2019

*Guide: Prof. Gauri Joshi, Prof. Osman Yağın, Department of ECE, CMU*

Multi-Armed bandit problem is a sequential decision making problem in which a player chooses one amongst many actions and receives a reward corresponding to the action taken. The goal is to maximize cumulative reward by balancing the exploration-exploitation tradeoff. We study the structured bandit problem where mean rewards corresponding to different actions are related to one another. Such problems are useful in the context of online recommendation systems, where recommendations need to be provided without knowing contextual information of the users. We propose a novel approach that extends any classical multi-armed bandit algorithm to the structured bandit setting while improving the performance significantly as demonstrated through our theoretical results and experiments on the movielens recommendation system dataset.

AUG 2017 - **Multi-Armed Bandits with Correlated Arms**  
JUN 2018

*Guide: Prof. Gauri Joshi, Prof. Osman Yağın, Department of ECE, CMU*

We develop a novel Multi-Armed Bandit problem in which the rewards obtained from different actions are correlated with each other. The new multi-armed bandit model is very useful for the applications in advertisements, where a company needs to decide best ad for the display, and responses of users for those ads are typically correlated. Other applications include medical testing, where effects of different drugs during testing are correlated with each other. We propose novel algorithms for this setting, leading to significant improvement in the performance over classical bandit algorithms. Our proposed algorithm achieves  $\mathcal{O}(1)$  regret in certain regimes as opposed to typical logarithmic regret scaling in multi-armed bandit algorithms. The effects are illustrated through our experiments on Goodreads and Movielens datasets.

AUG 2017 - **Active Distribution Learning from Indirect Samples**  
JUN 2018

*Guide: Prof. Gauri Joshi, Prof. Osman Yağın, Department of ECE, CMU*

We study the problem of learning the distribution of a random variable through indirect samples. We look at this problem in an active setting, where the learner has control over the sample collection procedure. This active setting is useful for applications where sample collection is expensive and statistical inference needs to be performed in as few samples as possible. We design active algorithms and analyze errors bounds in statistical estimation under this setting.

JUL 2016- **Serving Content with Unknown Demand in Distributed Content Delivery Networks**  
MAR 2017

*Guide: Prof. Sharayu Moharir, Department of Electrical Engineering, IIT Bombay*

Most large scale VoD services deliver content to users via a distributed network of servers. A lot of such VoD services, like YouTube, also include a recommendation engine. The popularity of videos offered by VoDs is not known a priori and needs to be learned from request arrivals. We studied several content placement strategies for delivering contents in a distributed CDN. We theoretically proved that any scheme that separates the task of learning and placement is order wise strictly suboptimal. Using the knowledge of recommendations, we designed and evaluated an adaptive content replication policy which outperform static learning policies theoretically and numerically.

SUMMER **Trust Region Optimization for Estimating Bond Curve Parameters**  
2015

Morgan Stanley, Mumbai | *Team* : Core Analytics, Strats and Modeling

A key step involved in pricing of bonds involves estimating the bond curve parameters. Estimation of bond curve parameters can be formulated as a non linear minimization problem. We used trust region optimization techniques to design a fast minimizer that maintains a granular API. Modified the Dogleg method to produce results with same accuracy in 90% less evaluation counts compared to industrial standard NAG minimizer. The designed minimizer is currently being used in production as a generic minimizer library for multiple different applications