# Samarth Gupta

## Personal Information


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| Address | : E3, Collaborative Innovation Center, Carnegie Mellon University, Pittsburgh, 15213 |
| Email | : samarthg@andrew.cmu.edu |
| Webpage | : www.andrew.cmu.edu/user/samarthg/ |
| Interests | : Online Learning, Statistical Learning, Federated Learning, Hyperparameter Optimization |


## Education

Aug 2017 - May 2022 **Carnegie Mellon University**, Pittsburgh, PA
PhD Candidate, $4^{th}$ year
Electrical and Computer Engineering
*Advisors:* Gauri Joshi, Osman Yağan
GPA: **4.0/4.0**

Jul 2012 - Jun 2017 **Indian Institute of Technology Bombay**, Mumbai, India
Dual Degree (Bachelor of Technology + Master of Technology in Electrical Engineering)
*Thesis:* Effect of Recommendation on Serving Content with Unknown Demand
CGPA: **9.01/10**

## PhD Research

Aug 2017 - **Sequential Decision Making from Noisy and Correlated Observations**
**Carnegie Mellon University**, Pittsburgh | *Advisors:* Gauri Joshi, Osman Yağan
Developed a novel framework to sequentially select the best action from a set of available actions, where the rewards corresponding to different actions are correlated and noisy. Proposed novel online learning algorithms that exploit the knowledge of correlations. Analyzed the algorithms theoretically and empirically through experiments on recommendation system datasets. Applying this work to study the problem of hyperparameter optimization and the problem of client selection in Federated Learning

## Internships

May 2019 - Aug 2019 **Uncertainty Aware Failsafe Predictions for Self -Driving Vehicles**
**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 a safety oriented deep learning model for trajectory prediction, that activates when the mainline prediction's performance is below par.

May 2015 - Jul 2015 **Trust Region Optimization for Estimating Bond Curve Parameters**
**Morgan Stanley**, Mumbai | *Team :* Core Analytics, Strats and Modeling
Modified trust region optimization strategies to estimate the bond curve parameters. Obtained a speedup of 10x relative to industrial standard NAG optimizer. The designed optimizer is currently used in production as a generic optimizer for several applications.

## Relevant Skills and Graduate Coursework

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| Skills | C++, Python, PyTorch, Tensorflow |
| CMU | Machine Learning, Advanced Machine Learning, Deep 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 |

## Publications

**Journal**

**Samarth Gupta**, Gauri Joshi and Osman Yağan "Best-Arm Identification in Correlated Multi-Armed Bandits" IEEE Journal on Selected Areas of Information Theory, Special Issue on Sequential, Active and Reinforcement Learning, 2021. Link

**Samarth Gupta**, Shreyas Chaudhari, Gauri Joshi and Osman Yağan "Multi-Armed Bandits with Correlated Arms" IEEE Transactions on Information Theory 2021. Preliminary version appeared in RL Theory workshop at ICML 2020. Link

**Samarth Gupta**, Shreyas Chaudhari, Subhojyoti Mukherjee, Gauri Joshi and Osman Yağan "A unified approach to translate classical bandit algorithms to the structured bandit setting". IEEE Journal on Selected Areas of Information Theory: Estimation and Inference . Link

**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

**Conference**

Yae Jee Cho, **Samarth Gupta**, Gauri Joshi and Osman Yağan "Bandit-based communication-efficient client-selection strategies for federated learning" Asilomar 2020. Link

**Samarth Gupta**, Shreyas Chaudhari, Subhojyoti Mukherjee, Gauri Joshi and Osman Yağan "A unified approach to translate classical bandit algorithms to structured bandits". ICASSP 2021. Link

**Samarth Gupta**, Gauri Joshi and Osman Yağan "Correlated Multi-Armed Bandits with Latent Random Source" ICASSP 2020. Link

**Samarth Gupta**, Gauri Joshi and Osman Yağan "Active Distrbution 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" in COMSNETS 2017. Link

## Awards and Honors

- Awarded the David H. Barakat and LaVerne Owen-Barakat CIT Dean's Fellowship for 2019-20
- 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

## Teaching Assistant

- Introduction to Machine Learning for Engineers: Spring 2020 at CMU
- 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