Aditya Deshmukh

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EDUCATION

University of Illinois at Urbana-Champaign — Aug 2017 - Dec 2023
PhD. Candidate, Electrical and Computer Engineering — GPA: 3.97/4.0
Advisor: Prof. Venugopal V. Veeravalli

Indian Institute of Technology, Madras — Aug 2012 - May 2017
Dual Degree (B.Tech & M.Tech) in Electrical Engineering — GPA: 8.81/10.0
Advisor: Prof. Srikrishna Bhashyam

RESEARCH INTERESTS

Theoretical & algorithmic aspects of Statistical Inference, Machine Learning, Optimization & Information Theory

RESEARCH EXPERIENCE

Distributed and adaptive feature compression
Towards PhD. Thesis — *Collaborators: Prof. Venugopal Veeravalli, Gunjan Verma*

- Proposed a framework for optimizing communication-constrained data-stream pipelines from sensors to a fusion center with pretrained learning model without compromising performance of downstream task
- Characterized and developed optimal and adaptive compressors for the case of linear regression. Proposed VQ-VAE based compression scheme for compressing distributed multi-modal data for the case of a general pretrained model at the fusion center and validated its effectiveness through experiments

Robust estimation and learning
Towards PhD. Thesis — *Collaborators: Dr. Jing Liu, Prof. Venugopal Veeravalli*

- Proposed novel ℓ_p-minimization framework with theoretical guarantees for the problem of robust mean estimation and proposed a near-linear time optimal algorithm (applications include Robust Federated Learning)
- Designed optimal algorithms for the problem of robust linear regression and other robust estimation problems based on an extension of the aforementioned framework

Network flow optimization for inference
IoBT Project — *Collaborators: Dr. Jing Liu, Prof. Venugopal Veeravalli, Gunjan Verma*

- Proposed a novel optimization problem to optimize rates in a sensor network tasked with an inference objective
- Showed that for most inference objectives, the problem can be cast as a Network Utility Maximization problem and demonstrated empirical gain over Sum Rate Maximization technique

Sequential controlled sensing for composite multihypothesis testing
Towards PhD. Thesis — *Collaborators: Prof. Venugopal Veeravalli, Prof. Srikrishna Bhashyam*

- Extended Chernoff's work on sequential design of experiments to the case of composite multihypothesis testing
- Designed an asymptotically optimal policy for detecting the true hypothesis with minimum expected delay in the fixed confidence setting. Applications include best-arm identification and other problems in multi-armed bandits

Odd arm identification in multi-armed bandits
Master's thesis — *Advisor: Prof. Srikrishna Bhashyam*

- Conducted information-theoretic analysis of the problem of anomaly detection in multi-armed bandits
- Designed an asymptotically optimal policy for detecting the odd arm with minimum expected delay in the fixed confidence setting

Online energy efficient packet scheduling
Tata Institute of Fundamental Research, Mumbai — *Advisor: Prof. Rahul Vaze*

- Studied and analyzed the problem of packet scheduling to minimize the required conventional grid energy for transmitting a fixed number of packets given a common deadline
- Developed online algorithms with provable competitive ratio logarithmic in the total number of packets in both scenarios: with and without energy harvesting

SELECTED CONFERENCE PUBLICATIONS

A. Deshmukh, V. Veeravalli, and Gunjan Verma, "Distributed and Adaptive Feature Compression using VQ-VAEs", under preparation

Y. Shi, **A. Deshmukh**, Y. Mei, and V. Veeravalli. "Robust High-Dimensional Linear Discriminant Analysis under Training Data Contamination." 2023 IEEE Int. Symposium on Information Theory (ISIT), pp. 2099-2104

A. Deshmukh, J. Liu and V. Veeravalli, "Robust Mean Estimation in High Dimensions: An Outlier Fraction Agnostic and Efficient Algorithm", 2022 IEEE Int. Symposium on Information Theory (ISIT), pp. 1115-1120

A. Deshmukh, J. Liu, and V. Veeravalli, "Information Flow Maximization in Inference Networks", 2020 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), pp. 8289-8293

A. Deshmukh, S. Bhashyam, and V. Veeravalli, "Controlled Sensing for Composite Multihypothesis Testing with Application to Anomaly Detection", 2018 Asilomar Conference, pp. 2109-2113

JOURNAL PUBLICATIONS

A. Deshmukh, J. Liu, and V. Veeravalli, "Robust Mean Estimation in High Dimensions: An Outlier Fraction Agnostic and Efficient Algorithm", IEEE Transactions on Information Theory (2023)

A. Deshmukh, J. Liu, V. Veeravalli, and G. Verma."Information Flow Optimization for Estimation in Linear Models Using a Sensor Network." IEEE Signal Processing Letters 30 (2023): 170-174.

A. Deshmukh, S. Bhashyam, and V. Veeravalli, "Sequential controlled sensing for composite multihypothesis testing", Sequential Analysis (2021): 1-38

A. Deshmukh and R. Vaze, "Online Energy-Efficient Packet Scheduling for a Common Deadline With and Without Energy Harvesting", IEEE Journal on Selected Areas in Communications 34.12 (2016): 3661-3674

SCHOLASTIC ACHIEVEMENTS

- Recipient of **Mavis Future Faculty Fellowship** (conferred by UIUC in 2021)
- Recipient of the **Joan and Lalit Bahl Fellowship** (conferred by UIUC in 2021)
- Recipient of the **Dr. Ok Kyun Kim Fellowship** (conferred by UIUC in 2019)
- Secured an **All India Rank 599** in IIT-JEE 2012 among half million applicants
- Selected for **Kishore Vidnyan Protsahan Yojana (KVPY)** Scholarship (2011 SX Stream) by the Department of Science and Technology, Government of India
- Awarded **National Talent Search Examination (NTSE)** Scholarship in 2008

PROFESSIONAL EXPERIENCE

Research Scientist Intern May 2021 - Aug 2021
Amazon Inc.

- Worked with the Alexa team on the problem of online defect identification using feature selection and supervised machine learning algorithms to improve output of Alexa's NLP model

Graduate Research Assistant Aug 2017 - Dec 2023
Dept. of Electrical and Computer Engineering, UIUC

Graduate Teaching Assistant Fall 2019, 2020, 2023 & Spring 2021
Dept. of Electrical and Computer Engineering, UIUC

- Assisted the instructors in courses: ECE365 (Data Science and Engineering), ECE490 (Intro to Optimization), ECE561 (Statistical Inference for Engineers and Data Scientists), ECE566 (Computational Inference)

Junior Research Fellow May 2015 - July 2015
School of Technology and Computer Science, TIFR

Summer Intern March 2014 - July 2014
Phasorz Technologies, IITM Research Park

- Developed DocsApp - an android based messaging and consulting platform for patients and doctors