RUDRAJIT DAS

Computer Science PhD Student

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EDUCATION

• PhD in Computer Science - **GPA: 3.96/4.0**

University of Texas at Austin (Advisors: Inderjit S. Dhillon and Sujay Sanghavi)

Aug 2019 – May 2024 (Expected)

• Bachelor's and Master's (B.Tech + M.Tech) Degree in Electrical Engineering - **GPA: 9.52/10**

Indian Institute of Technology (IIT) Bombay (Advisor: Subhasis Chaudhuri, Director of IIT Bombay)

June 2014 – May 2019

Thesis: *Some Probabilistically Provable Theoretical Aspects of Neural Networks and Algorithmic Aspects of Large-Scale Optimization* [Link] - **Awarded the Undergraduate Research Award (URA-03) for exceptional work in final thesis**.

RESEARCH INTERESTS

Large-scale optimization, federated learning, differential privacy and machine learning theory.

PUBLICATIONS AND PREPRINTS

- ***Beyond Uniform Lipschitz Condition in Differentially Private Optimization***
  Rudrajit Das, Satyen Kale, Zheng Xu, Tong Zhang, Sujay Sanghavi - Submitted (Under Review).
- ***Differentially Private Federated Learning with Normalized Updates***
  Rudrajit Das, Abolfazl Hashemi, Sujay Sanghavi and Inderjit S. Dhillon - Preprint (Under Review) [Arxiv Link].
- ***Faster Non-Convex Federated Learning via Global and Local Momentum***
  Rudrajit Das, Anish Acharya, Abolfazl Hashemi, Sujay Sanghavi, Inderjit S. Dhillon, and Ufuk Topcu - Accepted in **The Conference on Uncertainty in Artificial Intelligence (UAI) 2022** [Arxiv Link].
- ***On the Benefits of Multiple Gossip Steps in Communication-Constrained Decentralized Optimization***
  Abolfazl Hashemi, Anish Acharya*, **Rudrajit Das***, Haris Vikalo, Sujay Sanghavi, and Inderjit S. Dhillon (* denotes equal contribution) - Accepted in **IEEE Transactions on Parallel and Distributed Systems** [IEEE Link], [Arxiv Link].
- ***On the Convergence of a Biased Version of Stochastic Gradient Descent***
  Rudrajit Das, Jiong Zhang and Inderjit S. Dhillon - Accepted for poster presentation in "Beyond First Order Methods in ML" workshop in **NeurIPS 2019** [Link].
- ***On the Separability of Classes with the Cross-Entropy Loss Function***
  Rudrajit Das and Subhasis Chaudhuri - Preprint [Arxiv Link].
- ***Nonlinear Blind Compressed Sensing under Signal-Dependent Noise***
  Rudrajit Das and Ajit Rajwade - Accepted in **IEEE International Conference on Image Processing (ICIP) 2019** [IEEE Xplore Link].
- ***Sparse Kernel PCA for Outlier Detection***
  Rudrajit Das, Aditya Golatkar and Suyash Awate - Accepted for **oral presentation** in **IEEE International Conference on Machine Learning and Applications (ICMLA) 2018** [Arxiv Link], [IEEE Xplore Link].
- ***iFood Challenge, FGVC Workshop, CVPR 2018***
  Parth Kothari*, Arka Sadhu*, Aditya Golatkar*, **Rudrajit Das*** (* denotes equal contribution). Finished 2nd & 3rd in the public and private leaderboards respectively, with team name "Invincibles" [Leaderboard Link]. Invited to present our method at **CVPR 2018** [Slides Link].

INTERNSHIPS

(Remote) Research Intern at Google - with Zheng Xu, Satyen Kale and Tong Zhang (June 2021 - Aug 2021)

- Clipped gradient methods are commonly used in practice for differentially private (DP) training, e.g., DP-SGD. However, a sound theoretical understanding of these methods has been elusive. We provide principled guidance on choosing the clipping threshold in DP-SGD, and also derive novel convergence results for DP-SGD in heavy-tailed settings.

Applied Scientist Intern at Amazon Search (Virtual) - Berkeley, CA (May 2020 - Aug 2020)

- Worked on customer-specific query correction by leveraging the "session data" (i.e., previous searches of the customer) using SOTA Transformer models. Our model generated better candidates than the production system.

Institute for Biomechanics, ETH Zürich - under Dr. Patrik Christen, D-HEST (May 2017 - July 2017)

- Proposed a stable linear model and a fuzzy boolean network for bone remodeling. Also developed an automated 2D-3D image registration framework for histology images from scratch. Devised an efficient sampling strategy to obtain the 2D projection of the 3D image across any plane and a good cost function to deal with the highly non-convex nature of the problem.

Altisource Business Solutions Private Limited - Bengaluru, India (May 2016 - July 2016)

- Developed a notification system using Pagerduty, a popular incident management software, and worked on the user interface of the company's monitoring dashboard built using JBoss Dashbuilder.

KEY COURSES

- **UT Austin** - Deep Probabilistic Modeling, Natural Language Processing, Large Scale Optimization, Online Learning, Sublinear Algorithms, Algorithms: Techniques/Theory, Data Mining: Mathematical Perspective, Wireless Networking.
- **IIT Bombay** - Advanced Machine Learning, Computer Vision, Advanced Image Processing, Medical Image Processing, Speech Processing, Optimization, Markov Chains, Estimation & Identification, Applied Linear Algebra, Advanced Concentration Inequalities, Probability & Random Processes, Complex Analysis, Differential Equations.

TECHNICAL SKILLS

- **Languages**: Python, MATLAB, C++/C.
- **Deep Learning**: PyTorch, Keras.

ACADEMIC ACHIEVEMENTS

- Offered NeurIPS 2019 Travel Award.
- Selected by the CS department of UT Austin to receive a Professional Development Award for travel to NeurIPS 2019.
- Awarded the Undergraduate Research Award (URA-03) for exceptional work in final thesis at IIT Bombay.
- Received a bronze medal and a cash prize for securing 3rd rank in IIT Bombay Maths Olympiad 2015.
- Awarded Merit Certificates in National Standard Examination in Physics & Chemistry 2014 for being within top 300 students across the country. Also selected for Indian National Physics Olympiad 2014 and Indian National Chemistry Olympiad 2014.
- Received a Letter of Appreciation from the Education Minister of Maharashtra for being within top 1% of the state in the Higher Secondary Examination 2014. Also awarded a scholarship of Rs 80,000 per year for five years, for higher education under the INSPIRE scheme by the Government of Maharashtra.