

RUDRAJIT DAS

Computer Science PhD Candidate

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EDUCATION

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

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

📅 August 2019 – April/May 2025 (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 and Adaptive Optimization, Knowledge Distillation, Differential Privacy, Federated Learning.

PAPERS

- *Towards Quantifying the Preconditioning Effect of Adam*
Rudrajit Das, Naman Agarwal, Sujay Sanghavi and Inderjit S. Dhillon - Preprint [\[arXiv Link\]](#).
- *Understanding the Training Speedup from Sampling with Approximate Losses*
Rudrajit Das, Xi Chen, Bertram leong, Parikshit Bansal and Sujay Sanghavi - Preprint [\[arXiv Link\]](#).
- *Understanding Self-Distillation in the Presence of Label Noise*
Rudrajit Das and Sujay Sanghavi - ICML 2023 [\[Link\]](#).
- *On the Unreasonable Effectiveness of Federated Averaging with Heterogeneous Data*
Jianyu Wang, Rudrajit Das, Gauri Joshi, Satyen Kale, Zheng Xu and Tong Zhang - Preprint [\[arXiv Link\]](#).
- *Beyond Uniform Lipschitz Condition in Differentially Private Optimization*
Rudrajit Das, Satyen Kale, Zheng Xu, Tong Zhang and Sujay Sanghavi - ICML 2023 [\[Link\]](#).
- *Differentially Private Federated Learning with Normalized Updates*
Rudrajit Das, Abolfazl Hashemi, Sujay Sanghavi and Inderjit S. Dhillon - Preprint [\[arXiv Link\]](#). Short version presented in OPT2022 workshop of NeurIPS 2022 [\[Link\]](#).
- *Faster Non-Convex Federated Learning via Global and Local Momentum*
Rudrajit Das, Anish Acharya, Abolfazl Hashemi, Sujay Sanghavi, Inderjit S. Dhillon and Ufuk Topcu - UAI 2022 [\[Link\]](#).
- *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) - 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 - NeurIPS 2019 Beyond First Order Methods in ML workshop [\[Link\]](#).
- *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 - IEEE International Conference on Image Processing (ICIP) 2019 [\[IEEE Xplore Link\]](#).
- *Sparse Kernel PCA for Outlier Detection*
Rudrajit Das, Aditya Golatkar and Suyash Awate - IEEE International Conference on Machine Learning and Applications (ICMLA) 2018 Oral [\[arXiv Link\]](#), [\[IEEE Xplore Link\]](#).
- *iFood Challenge, FGVC Workshop, CVPR 2018*
Parth Kothari*, Arka Sadhu*, Aditya Golatkar* and 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

Google Research (November 2023 - March 2024)

- Working on improving label differential privacy (DP) using ideas from self-distillation with theoretical analysis.

Google DeepMind (June 2023 - October 2023)

- Derived new theoretical results to quantify the preconditioning effect of the Adam optimizer, and empirically benchmarked several optimization algorithms based on Adam.

Google Research (June 2021 - August 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.

Amazon Search (May 2020 - August 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 (May 2017 - July 2017)

- Proposed a stable linear model (with closed-form solution) and a fuzzy boolean network for bone remodeling. Also developed an automated 2D-3D image registration framework for histology images from scratch.

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++.
- **Deep Learning:** PyTorch, JAX.

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 and ICML 2023.
- 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.