

# RUDRAJIT DAS

Computer Science PhD Candidate

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## EDUCATION

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- 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

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Large-Scale and Adaptive Optimization, Knowledge Distillation, Differential Privacy, Federated Learning.

## PAPERS

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- *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 - ICML 2024 [\[arXiv Link\]](#).
- *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 2<sup>nd</sup> & 3<sup>rd</sup> in the public and private leaderboards respectively, with team name "Invincibles" [\[Leaderboard Link\]](#). Invited to present our method at CVPR 2018 [\[Slides Link\]](#).

# INTERNSHIPS

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## 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

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- **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

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

# ACADEMIC ACHIEVEMENTS

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- 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 3<sup>rd</sup> 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.