# 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 – Dec 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 and Robust Optimization, Federated Learning, Differential Privacy, Knowledge Distillation.

## PAPERS

- ***Understanding Self-Distillation in the Presence of Label Noise***
  **Rudrajit Das** and Sujay Sanghavi - Accepted in **ICML 2023** [arXiv 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 - Accepted in **ICML 2023** [arXiv Link].
- ***Differentially Private Federated Learning with Normalized Updates***
  **Rudrajit Das**, Abolfazl Hashemi, Sujay Sanghavi and Inderjit S. Dhillon - Preprint [arXiv Link]. Short version accepted in OPT2022 workshop of **NeurIPS 2022**.
- ***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 **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) - 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 in "Beyond First Order Methods in ML" workshop of **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* 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

**(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++.
- **Deep Learning**: PyTorch.

# 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 3$^{rd}$ 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.