

# RUDRAJIT DAS

Computer Science PhD Student

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## EDUCATION

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- 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

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

## PUBLICATIONS AND PREPRINTS

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- *On the Unreasonable Effectiveness of Federated Averaging with Heterogeneous Data*  
Jianyu Wang, Rudrajit Das, Gauri Joshi, Satyen Kale, Zheng Xu, Tong Zhang - Preprint (Under Review) [\[Arxiv Link\]](#).
- *Beyond Uniform Lipschitz Condition in Differentially Private Optimization*  
Rudrajit Das, Satyen Kale, Zheng Xu, Tong Zhang, Sujay Sanghavi - Preprint (Under Review) [\[Arxiv Link\]](#).
- *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 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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(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**

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

## **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.
- 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.