

Richeek Das

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Research Interests

Event-based Vision, Self Supervised Learning, Robotic Perception, Multimodal Sensing

Education

University of Pennsylvania
PhD in Computer and Information Science
Advisor: Prof. Pratik Chaudhari

Philadelphia, USA
2023 - Ongoing

Indian Institute of Technology Bombay
Bachelor of Technology with Honors in Computer Science and Engineering
Advisor: Prof. Preethi Jyothi

Mumbai, India
2019 - 2023
GPA: 9.62/10.0

Thesis: Code-switched Text Modelling for Natural Language Understanding
Received the **Research Excellence Award** for undergraduate thesis

Journal Papers

1. **Richeek Das**, Aaron Jerry Ninan, Adithya Bhaskar, Ajit Rajwade, **Performance Bounds for LASSO under Multiplicative LogNormal Noise: Applications to Pooled RT-PCR testing**, *accepted at the Signal Processing Journal* 2024

Conference Papers

5. **Richeek Das**, Samuel Dooley, **Fairer and More Accurate Tabular Models Through NAS**, *accepted at the Algorithmic Fairness through the Lens of Time workshop of NeurIPS* 2023
4. **Richeek Das**, Sahasra Ranjan, Shreya Pathak, Preethi Jyothi, **Pretraining Techniques for Improved Code-switched Natural Language Understanding**, *accepted at the ACL 2023 (Association for Computational Linguistics)* - 🏆 **ACL Outstanding Paper Award (top 1%)**
3. Alex Markham, **Richeek Das**, Moritz Grosse-Wentrup, **A Distance Covariance-based Kernel for Nonlinear Causal Clustering in Heterogeneous Populations**, *accepted at the CLear 2022 (1st conference on Causal Learning and Reasoning)*
2. Alexander Erlei, **Richeek Das**, Lukas Meub, Avishek Anand, Ujwal Gadiraju, **For What It's Worth: Humans Overwrite Their Economic Self-interest to Avoid Bargaining With AI Systems**, *accepted at the ACM CHI 2022 (Conference on Human Factors in Computing Systems)*
1. Ashish Tiwari, **Richeek Das**, Shanmuganathan Raman, **Exploring Deeper Graph Convolutions For Semi-Supervised Node Classification**, *accepted at the IEEE ICASSP 2022 (International Conference on Acoustics, Speech, and Signal Processing)*

Research and Work Experience

Neural Architecture Search Toolkit for Computer Vision | Sony AI, Japan 🌐

Guide: Takuya Narihira, Hsingying Ho

May 2022 - Jul 2022

- Proposed a novel Once-For-All based NAS framework for Semantic Segmentation in NNabla NAS, with plug-and-play features for building dynamic sub-networks with differing hardware-constraints without any re-training
- Adapted the method to DeepLabv3+ with dynamic sub-networks – 15% increase in MIoU and 2× latency reduction

Fairer and More Accurate Tabular Models Through NAS | Abacus.AI 🔗

Guide: Dr. Samuel Dooley

May 2023 - Jul 2023

- Proposed a novel multi-objective NAS technique to utilize the implicit fairness in model architectures
- Performed extensive experiments over model search spaces and proved the existence of architectures that are inherently fair and accurate – enabling us to search for these models which surpass current SOTA debiasers

Extracting Scene Material Properties from Radar Signals | UPenn, WAVES Lab 🔗

Guide: Prof. Mingmin Zhao

Aug 2023 - Jan 2024

- Built hardware – a handheld device with synchronized iPad LiDAR, TI mmWave radar, camera and an onboard computer to capture data in real 3D indoor scenes with diverse materials and geometries
- Built software – a differentiable radar simulator to model wave propagation, antenna patterns and ray tracing in 3D scenes, and a novel SSL framework for extracting material properties using the physics of wave-material interactions

Code-Switched Natural Language Understanding | Google India + IIT Bombay, CSALT 🔗

Guide: Prof. Preethi Jyothi

Jul 2022 - Jan 2023

- Implemented intelligent masking strategies for MLM pretraining and built architectures specific to code-switched tasks with significant improvements in downstream Question Answering and Sentiment Analysis
- Built a generalized framework to adapt existing language translation models for low-resource code-switched text generation with multiple constraints: formality, politeness, toxicity, semantic similarity and more

Kernel methods for Non-linear Causal Clustering | Universität Wien, Neuroinformatics Lab 🔗

Guide: Prof. Moritz Grosse-Wentrup

May 2021 - Oct 2021

- Implemented a distance covariance-based kernel to measure the similarity between underlying nonlinear causal structures of samples – clustering according to their parent causal structures in heterogeneous populations
- Simulated causal datasets with non-linear relations to numerically evaluate the performance bounds of the distance covariance-based dependence contribution kernel and compare it with standard RBF and Polynomial kernels

Belief Elicitation on the Impact of AI Systems | TU Delft, Delft AI Labs 🔗

Guide: Prof. Ujwal Gadiraju

May 2021 - Oct 2021

- Implemented Binarized Scoring Rule based criterion for Belief Elicitation of user behaviour, presumptions and trust on the usage of Decision Support Systems (AI-System) for Algorithmic Bargaining
- Built and deployed a DRF backend, Angular frontend, PostgreSQL DB application coupled with Redis + Celery task management, on a Heroku + GitHub deployment pipeline to host 2700+ crowdsource submissions

Feature Gating for Deeper Graph Convolution Networks | IIT Gandhinagar, CVIG Lab

Guide: Prof. Shanmuganathan Raman

Dec 2020 - Jun 2021

- Introduced feature gating and formulated a heuristic to award importance scores to graph nodes and node features
- Proposed the use of identity mapping, a modified form of residual connection and feature gating to create deep GCN models which tackle oversmoothing and achieve SOTA results for semi-supervised node classification

Weighted LASSO under Multiplicative LogNormal Noise | IIT Bombay 🔗

Guide: Prof. Ajit Rajwade

Jan 2022 - Feb 2023

- Theoretically justified and interpreted the use of Tapestry Pooling across hospitals for pooled RT-PCR group testing
- Proposed a novel Weighted LASSO algorithm with data-dependent weights to perform sparse signal recovery under multiplicative LogNormal noise (example Gaussian) – performance backed using simulations on real RT-PCR data

Selected Projects

Video from a Single Exposure Coded Snapshot 🔗

Spring 2021

- Implemented a MATLAB solution for coded aperture compressive temporal imaging to recover a sequence of frames from a single coded-snapshot to achieve temporal gains in video acquisition without spatial compromise

Compressed Sensing in Tomographic Reconstruction 🔗

Spring 2021

- Implemented compressed sensing solution for tomographic reconstruction of brain MRI scans with small number of measurement angles – performed coupled reconstruction assuming similarity of consecutive acquisitions

Cluster Monitoring and Alert System

Spring 2022

- Built a web-app with DRF, Angular and InfluxDB – telegraf servers on host machines to perform cluster profiling and alert low-resource warnings in real-time using socket-servers, based on thresholds set by users

Branch Predictors for trace-based Simulators

Autumn 2021

- Implemented branch predictors TAGE and L-TAGE in ChampSim, and performed extensive comparisons with Bi-modal and Hashed Perceptron on the metrics of tag width, MPKI, TAGE Table Size and history length

Compiler for C-like Language

Spring 2022

- Constructed a compiler handling a subset of the C language, designing a recursive descent parser using lex and yacc – supports type inference, semantic checks and translation of AST to linear three-address codes

Extending xv6 Operating System

Autumn 2021

- Extended the xv6 OS with syscalls for demand paged memory allocation and custom fork implementations. Implemented thread synchronization, semaphores and a simple linux-based disk emulated filesystem in C

Selected Achievements and Awards

- Received the **Paul S. Darnell** named CIS PhD fellowship at UPenn. (2023)
- Received the **Thomas Doobie, Class of 1974 Research Excellence Award** for B.Tech Thesis. (2023)
- Among the select few undergrads to attend the **Google Research Week** hosted in Bangalore, India (2023)
- Secured a rank of **497** in JEE Main and **544** in JEE Advanced among **1.2 million** candidates (2019)
- Received the **INSPIRE** scholarship, awarded to **top 1%** of the **80k+** students in the **ISC** Exam (2019)
- Received the **KVPY Fellowship** for securing **77th** rank out of **150k+** candidates in all of India (2018)
- Secured **4th rank in India** in **ICSE** out of **180k+** candidates (2017)

Teaching Experience

Introduction to Machine Learning <i>Prof. Biplab Banerjee, Prof. Manjesh Hanawal</i>	Spring 2023
Teaching Practicum for TAs <i>Dept. of Computer Science and Engineering</i>	Autumn 2022, Spring 2023
Software Systems Lab (Excellence in CSE TAs hip Award) <i>Prof. Amitabha Sanyal</i>	Autumn 2021
Computer Networks <i>Prof. Vinay Ribeiro</i>	Autumn 2022
Computer Programming and Utilization <i>Prof. Kameswari Chebrolu</i>	Spring 2021
Engineering Drawing <i>Prof. Atul Sharma</i>	Summer 2021