Richeek Das

Computer Science PhD Student, University of Pennsylvania, PA, USA

www.seas.upenn.edu/~richeek/ | richeek@seas.upenn.edu | sudoRicheek

Research Interests

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

Education

University of Pennsylvania — Philadelphia, USA
PhD in Computer and Information Science — *2023 - Ongoing*
Advisor: Prof. Pratik Chaudhari

Indian Institute of Technology Bombay — Mumbai, India
Bachelor of Technology with Honors in Computer Science and Engineering — *2019 - 2023*
Advisor: Prof. Preethi Jyothi — *GPA: 9.62/10.0*
Thesis: Code-switched Text Modelling for Natural Language Understanding
Received the **Research Excellence Award** for undergraduate thesis

Journal Papers

2. **Richeek Das**, Kostas Daniilidis, Pratik Chaudhari, **Fast Feature Field (F^3): A Predictive Representation of Events**, *in submission 2025*

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

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 properies using the physics of wave-material interactions

Real-time Multirotor Simulation Software | **UPenn, GRASP Lab**

Guide: Prof. Pratik Chaudhari *March 2025 - Ongoing*

- A fast and modular simulation environment for multirotors with onboard IMUs, RGB, event, depth and semantic cameras. Playground to test real high-speed agile flight algorithms in simulation – control, planning, perception
- Built CUDA modules for event generation – efficiently integrating Habitat with RotorPy (∼2400 FPS on RTX4090)

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

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

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 Dooie, 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 | *Prof. Biplab Banerjee, Prof. Manjesh Hanawal* Spring 2023

Teaching Practicum for TAs | *Dept. of Computer Science and Engineering* Autumn 2022, Spring 2023

Software Systems Lab (Excellence in CSE TAship Award) | *Prof. Amitabha Sanyal* Autumn 2021

Computer Networks | *Prof. Vinay Ribeiro* Autumn 2022

Computer Programming and Utilization | *Prof. Kameswari Chebrolu* Spring 2021

Engineering Drawing | *Prof. Atul Sharma* Summer 2021