

Richeek Das

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🐙 [sudoRicheek](https://github.com/sudoRicheek)



RESEARCH INTERESTS

Image Processing, Compressed Sensing, Graph Neural Networks, Causal Statistics, Sparse Representation

EDUCATION

Indian Institute of Technology Bombay

MH, India

Bachelor of Technology in Computer Science and Engineering

2019 - 2023 (Expected)

- Pursuing **Honors** in Computer Science and Engineering. **Major GPA : 9.56/10.0**

PUBLICATIONS, PREPRINTS AND WORKING PAPERS

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 EXPERIENCE AND INTERNSHIPS

Feature Gating for Deeper Graph Convolution Networks

Dec 2020 - Jun 2021

Guide: Prof. Shanmuganathan Raman | Research Intern

CVIG Lab, IIT Gandhinagar, Gujarat

- Introduced feature gating and formulated a heuristic to award importance scores to 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.
- Performed ablation studies on GCN, GAT, GFGN, GCNII, GRAND with DropEdge, Residual connections and Gating, visualising node importances in t-SNE and feature scores in colour-maps for the Planetoid datasets.

Dependence Contribution Kernel for Non-linear Causal Clustering

May 2021 - Oct 2021

Guide: Prof. Moritz Grosse-Wentrup | Research Intern

Neuroinformatics Lab, Universität Wien

- Simulated non-linear causal datasets to establish evaluative bounds on the performance of the distance covariance-based dependence contribution kernel and compare it with standard RBF and Polynomial kernels.
- Built a module to imitate the problem of causal structure learning in the setting of heterogeneous populations.
- Visualised the dependence contribution map (projected kernel space) of causal structure samples by finding an appropriate dimensionality reduction heuristic for the high-dimensional space of causal ancestral graphs.

Belief Elicitation on the Impact of Algorithmic Decision Making

May 2021 - Oct 2021

Guide: Prof. Ujwal Gadiraju | Research Intern

Technische Universiteit Delft, Netherlands

- 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 12 frontend, PostgreSQL DB application coupled with Redis + Celery task management, on a Heroku + GitHub deployment pipeline to host 2700+ crowdsource workers.
- Analysed the incentivized subject beliefs and showed statistically consistent results that responders predicting income maximization for the AI agent overwhelmingly override economic self-interest to avoid the algorithm.


KEY TECHNICAL PROJECTS

Active Learning using Node Embeddings in Partially Observed Networks   Aut 2021
Prof. Abir De | CS768: Learning With Graphs IIT Bombay

- Combined the SINE: Scalable Incomplete Network Embedding framework and ALPINE: Active Link Prediction Using Network Embedding to build an end-to-end module for Active Learning in Partially Observed Networks.
- Proposed ALNEPON, an algorithm for Active Link Prediction in PONs with Incomplete Node Embeddings.
- Proposed an Information Density weighting technique to make the node-pair query strategies robust to outliers.

Compressed Sensing Over Graph Structures   Spring 2021
Prof. Ajit Rajwade | CS754: Advanced Image Processing IIT Bombay

- Implemented the DICE nod algorithm for finding the top information flow hot spots in social networks using compressive sensing with only end-to-end measurements without full knowledge of network topology.
- Verified and elucidated the recovery guarantees of the sparse Betweenness Centrality Vector from the proposed Sensing Matrix using properties of Lossless Bipartite Expander Graphs and the Erdős–Rényi generator.

Video from a Single Exposure Coded Snapshot  Spring 2021
Advanced Image Processing Assignment IIT Bombay

- 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.
- Performed patch-wise reconstruction using OMP algorithm assuming sparsity in a learned dictionary.

UnPlag - Unsupervised Plagiarism Checker   Aut 2020
Prof. Amitabha Sanyal | CS251: Software Systems Lab IIT Bombay

- Worked in a team of 3 to build an effective web-based pairwise plagiarism checker for source code files.
- Applied TF-IDF metric on Abstract Syntax Trees for C++ and Python using Clang and ast module.
- Integrated the computational model with a multithreaded Django REST Framework backend, an Angular 9 frontend and a NodeJS CLI with a secure file-server and stateless JWT authentication.



X-Ray Anomaly Detection Using CNNs   Summer 2020
Institute Technical Summer Project | Ranked among the Top 3 out of 80 projects IIT Bombay


- Led a team of 4 to build a Web-App and an Open-API endpoint to automate the process of examining CXRs.
- Built a 5 model ensemble which accurately classifies and CAM localizes up to 5 common thoracic diseases in a heat map overlay with an AUC of 0.915, which is quite close to the present SOTA of 0.94.



Gesture Recognition in 3D Space  Summer 2020
WnCC Club | Seasons of Code IIT Bombay

- Implemented Transfer Learning based CNN models, for multi-label classification of up to 5 different hand gestures, based on a self-created data set consisting of 2750 samples, with a F1 Score of 0.9959.
- Built Siamese Neural Networks to study sample size threshold on the accuracy of One-Shot Learning.

OTHER PROJECTS

TAGE and L-TAGE in ChampSim | *CS305: Computer Architecture*   Aut 2021
• Implemented TAGE and L-TAGE branch predictors in ChampSim and performed extensive comparisons with baselines Hashed Perceptron and Bi-modal branch predictors.

Compressed Sensing Tomography | *CS754: Advanced Image Processing*  Spring 2021
• Implemented a compressed sensing solution for tomographic reconstruction of MRI images of the brain.
• Implemented coupled CS-based reconstruction assuming the similarity of consecutive tomographic acquisitions.

16-bit Multicycle RISC Processor | *CS226: Digital Logic Design*   Spring 2021
• Designed a 16-bit multi-cycle processor with the ISA based on the Little Computer Architecture.
• Used VHDL as the HDL and demonstrated the complete controller and FSM design on FPGA.


Quadrees for Fast Image Transformations | *CS213: Data Structures & Algorithms*  Aut 2020
• Coded a C++ library to represent large images in a Quadtree data structure. Formulated algorithms to perform fast spatial transformations like union, intersection, complement, resize and cropping operations.

Image Enhancer using SRGANs | *Hobby-dev*  Aut 2020
• Developed an Open-Source, PyQt5 based Desktop application for up-scaling images using SRGANs.
• Implemented x2 and x4 up-scaling algorithms like WDSR, EDSR and SRGAN from the NTIRE challenge.

SCHOLASTIC ACHIEVEMENTS

- Among **top 13 out of 1148** students to be awarded a Branch Change to the department of **CSE**. (2020)
- Received an **Advanced Performer(AP)** grade for exceptional performance in Calculus(**MA105**). (2019)
- Secured an **AIR of 497** in JEE Main and **544** in JEE Advanced among **1.2 million** candidates. (2019)
- Secured a perfect **10.0** Semester Performance Index(**SPI**) in Autumn semester of first-year. (2019)
- Received the **INSPIRE** scholarship, awarded to **top 1%** of the **80k+** students in the **ISC** Exam. (2019)
- Awarded for being in the Statewise **Top 1%** of **NSEC** and **NSEP**, conducted by **IAPT**. (2019)
- Received **KVPY Fellowship** for securing **AIR 77** out of **50k+** candidates nationwide. (2018)
- Attained **All India Rank(AIR) of 4** and a **State Rank of 2** in **ICSE** out of **180k+** candidates. (2017)
- Received the **Mamraj Agarwal Rashtriya Puraskar** from the **Governor of West Bengal**. (2017)

TEACHING AND POSITIONS OF RESPONSIBILITY

Teaching Assistant

CS251 - *Software Systems Lab* | Prof. Amitabha Sanyal (Aut 2021)

- Ideated, framed and graded lab assignments to introduce new frameworks to over **175 CSE sophomores**.
- Guided over **30 sophomores** in building a multi-framework functional course **project** to completion.

CS101 - *Computer Programming and Utilization* | Prof. Kameswari Chebrolu (Nov '20 - Mar '21)

- Selected for **teaching** and **closely interacting** with a batch of **13 first-year** students.
- Responsible for conducting regular **coding course labs**, clearing **doubts** and to **evaluate** answer sheets.

ME119 - *Engineering Drawing* | Prof. Atul Sharma (Mar '21 - Jun '21)

- Responsible for conducting and evaluating engineering drawing labs for over **170+ first-year** students.

ExoFly IITB | *Controls Subsystem* (May '21 - Ongoing)

- Working on **SIMULINK** models of the controls subsystem in a team that aims to build an **e-VTOL**.

TECHNICAL SKILLS

Programming Languages C++, Python, Java, Bash, sed, AWK, Typescript, SQL, VHDL, Prolog, MIPS
Software Skills MATLAB, OpenCV, PostgreSQL, Django, Angular, L^AT_EX, Quartus
ML & DL Skills Simulink, DRF, Redis, Celery, BS4, AutoCAD, SolidWorks, Wireshark
PyTorch, Keras, TensorFlow, Pandas, NumPy, Scikit-Learn

KEY COURSES UNDERTAKEN

Advanced Image Processing	Design and Analysis of Algorithms	Digital Logic Design
Logic for Computer Science	Data Analysis & Interpretation	Computer Networks
Software Systems Lab	Data Structures and Algorithms	Discrete Structures
Computer Architecture	Foundations of Intelligent Learning Agents	Operating Systems
Machine Learning and AI	Deep Learning: Theory and Practice	Learning with Graphs

EXTRA CURRICULARS

- Completed **80 hours** of **NSS community** work and mentioned for **exemplary volunteering**. (2020)
- Served as a **mentor** in **Institute Technical Summer Project** for a team of **4 freshmen**. (2021)
- Awarded **2nd** position in **Ad-making** division of **Freshiezza 2k19** under **SilverScreen IITB**. (2019)
- Participated in the **FOSS Hack 2020** and built an **Email Tracker** for easy bulk follow-up. (2020)
- Participated in the **Quantum Computing Workshop 2020** held by **MnP Club IIT Bombay**. (2020)