NIRJHAR DAS

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Education

Indian Institute of Technology Delhi (IITD)

Jul 2019 - Present, New Delhi

Bachelor of Technology in Electrical Engineering (Power and Automation)

- Expected Graduation - 06/23
- Cumulative Grade Point Average (CGPA) - **9.331/10**
- Department Rank **3** out of 55 students in 6th semester
- Department Specialization in **Cognitive and Intelligent Systems** (C & IS)

WWA Cossipore English School

Apr 2005 - May 2019, Kolkata

- Indian School Certificate (Class XII) - **99.75%**
- Indian Certificate for School Examination (Class X) - **98.20%**

Publications

A View Independent Classification Framework for Yoga Postures

Sep 2022

Mustafa Chasmai, **Nirjhar Das**, Aman Bhardwaj, Rahul Garg
In *Springer Nature Computer Science, Vol. 3*, https://doi.org/10.1007/s42979-022-01376-7

Gene expression based inference of cancer drug sensitivity

Sep 2022

Smriti Chawla, Anja Rockstroh, Melanie Lehman, Ellca Ratther, Atishay Jain, Anuneet Anand, Apoorva Gupta, Namrata Bhattacharya, Sarita Poonia, Priyadarshini Rai, **Nirjhar Das**, Angshul Majumdar, Jayadeva, Gaurav Ahuja, Brett G. Hollier, Colleen C. Nelson, Debarka Sengupta
In *Nature Communications, Vol. 13*, https://doi.org/10.1038/s41467-022-33291-z

Work Experience

Artificial Intelligence Intern, AI Garage, Mastercard

Jun 2022 - Jul 2022, Gurgaon

- Developed a Semi-supervised Deep Learning Technique for Fraud Detection in credit card transactions
- Investigated the method using multiple ablation studies to demonstrate the effectiveness of each component of the proposed scheme
- Built an end-to-end pipeline on company's internal dataset for real-time detection with high precision and recall
- Researched and implemented methods of Learning with Noisy Labels and its applications for better semi-supervised learning in class imbalanced data
- Validated the methods on public dataset demonstrating **high F1-score (0.78) and high recall (0.78)** under **extreme class imbalance** (training data - 1.1e+5:190)

Machine Learning Intern, Creatospace

Sep 2020 - Jan 2021, New Delhi

- Developed a Question/Answer Recommender System Model for Stack Overflow-like forums where users are recommended with questions to answer and with answers that may be relevant to their interests
- Used Content-Based and Model-Based approaches as baseline and researched on SVD and Neural Network based approaches

Project Experience

Constrained Inverse Reinforcement Learning

Dec 2021 - Present, Dept. of EE, IIT Delhi

Advisor: Prof. Arpan Chattopadhyay

- Developed fundamental algorithms for inverse reinforcement learning in constrained Markov Decision Processes using Maximum Likelihood Estimation, Convex Optimization and Online Learning
- Working on providing theoretical results on convergence and performance of the proposed algorithms
- Developed simulations to test the proposed algorithms empirically

Linear Bandits with Rotting Rewards

Sept 2022 - Present, Dept. of EE, IIT Delhi

Advisor: Prof. Arpan Chattopadhyay

- Formulated the problem of rotting multi-armed bandits in a linear reward setting
- Developing UCB-like algorithm for this problem with proper regret analysis
- Creating simulations to test the performance of the developed algorithm in practice

Graph UMAP

Jan 2022 - Apr 2022, Dept. of EE, IIT Delhi

Advisor: Prof. Sandeep Kumar

- Developed the graph version of UMAP using Graph Convolution Networks to extend the method to Graph data
- Modified the UMAP Loss function to incorporate the pre-existing graph structure of the data to obtain a richer embedding
- Demonstrated the superiority of our method on standard Graph datasets like CORA and PubMed over vanilla UMAP

Independent Study: Explorations in Machine Learning [Report] [Code]

Aug 2021 - Nov 2021, Dept. of EE, IIT Delhi

Advisor: Prof. Jayadeva

- Extensively studied Tensor Factorization and its use in data compression and applied it in Minimal Complexity Machine to generate a faster and more interpretable pipeline
- Developed a Separability based Classification Loss function for Neural Networks and demonstrated result on MNIST for classification task with better separation

A View Independent Classification Framework for Yoga Postures [Paper] [Code]

Mar 2021 - Jul 2021, Dept. of CSE, IIT Delhi

Advisor: Prof. Rahul Garg

- Built Yogasana classifier from video frame data using Deep Learning based Pose Estimation and Random Forest
- Developed pipeline is simple and fast but performs better than all the existing methods with an accuracy of over 98%
- Developed a novel tri-level evaluation framework that gives a better estimate of the generalizability of the models as the existing methods suffer from target leakage
- Work has been published in *Springer Nature Computer Science*. Paper can be found at *https://doi.org/10.1007/s42979-022-01376-7*

LightGBM based BotNet Detection Tool [Code]

Aug 2020, IIT Kanpur

Cybersecurity Hackathon

- Developed a Botnet Detection Tool on network packet capture data using Gradient Boosted Decision Tree based LightGBM implementing feature extraction, and feature design and compared it with AdaBoost and Random Forest
- Our pipeline was faster in training as well as inference while performing better in precision, recall and F1-score ($\sim$ 99%)
- Won the 3rd Prize for the tool among 1200+ participants from various countries

Resource Monitoring and Scheduling Algorithms (Course Project) [Code]

Jan 2022 - Feb, 2022, Dept. of EE, IIT Delhi

Advisor: Prof. Smruti R. Sarangi

- Created system calls for listing the running processes, the amount of memory available, and the number of context switches a process undergoes
- Implemented 3 types of scheduling algorithm–First-come-first-serve, Multi-level-queue and Dynamic-multi-level-queue and obtained the process statistics like average ready, run and sleep duration
- The project was developed on the popular xv6 operating system

Honors & Awards

Research Week with Google, 2023	Selected to attend the conference from **among final year UG and PG students** across India
Top 7% Merit Award, Sem 1, 2022-23	Achieved in 1st semester of 4th year out of 55 students **in the department**
Top 7% Merit Award, Sem 2, 2021-22	Achieved in 2nd semester of 3rd year out of 55 students **in the department**
Top 7% Merit Award, Sem 1, 2019-20	Achieved in 1st semester of 1st year out of **1100+** students in the **Freshman Batch**
Swami Vivekananda Scholarship	Awarded by **Hon'ble Chief Minister** of West Bengal for excellent performance in ISC 2019
JEE Advanced 2019	All India Rank **721** out of **150,000** students
JEE Main 2019	All India Rank **1005** out of **1,300,000** students
WBJEE 2019	All State Rank **32** out of **125,000** students in **West Bengal**
KVPY 2018	All India Rank **94** out of **150,000** students in Class XII
KVPY 2017	All India Rank **175** out of **130,000** students in Class XI
ISC 2019	All India **2nd** Rank out of **100,000** students in Class XII Boards
ICSE 2017	All India **6th** Rank out of **120,000** students in Class X Boards

Technical Skills

Programming Languages	Python, C/C++, JAVA, MATLAB
Deep Learning Frameworks	TensorFlow, Keras, PyTorch
Data Science Libraries	NumPy, SciPy, Matplotlib, OpenCV, Sci-kit Learn, Pandas
Optimization Softwares	CVXPY, Lingo
Computing Platforms	High Performance Clusters (PBS), Amazon Web Services
Utilities	Linux, Git, Excel, LaTeX

Coursework

Concentration Inequalities and their Applications (ongoing)
Online Learning and Optimization (A)
Advanced Machine Learning (Audit)
Reinforcement Learning and Stochastic Control (A)
Optimization for Electrical Engineers (A)
Independent Study (Project course on Machine Learning) (A)
Machine Intelligence and Learning (A)
Mathematical Foundation for Machine Learning (A)
Operating System (A^-)
Computer Architecture
Probability and Stochastic Process
Signals and Systems (A^-)
Linear Algebra and Differential Equations (A)
Calculus (A)

Activities

Teaching Assistant, **ELL729: Stochastic Control and Reinforcement Learning**, IIT Delhi — *Jan 2023 - Present*

- Assisting the coordinator in various course components and guiding the students in their course projects

Mentor, **Board for Student Welfare**, IIT Delhi — *Jul 2021 - Mar 2022*

- Mentored five Freshmen throughout their first year of study, helping them in their professional and personal growth

Academic Mentor, **Board for Student Welfare**, IIT Delhi — *Nov 2021 - Mar 2022*

- Selected to help Fresher students in their course Engineering Mechanics by conducting regular tutorial sessions

Co-Founder, **AI & ML Club**, IIT Delhi — *Nov 2020 - Jul 2021*

- Founded the club to create a community of students passionate about machine learning and artificial intelligence
- Organized talks, seminars, lectures, and podcasts; wrote articles for the website and conducted workshops, paper discussions and hackathons

Journalist, **Board for Student Publication**, IIT Delhi — *Sep 2020 - Apr 2021*

- Organized Literary Fest, conducted interviews, arranged talks, conducted surveys and interpreted the data for the welfare of the IITD community

Executive, **Electrical Engineering Society**, IIT Delhi — *Sep 2020 - Apr 2021*

- Organized events, workshops, technical competitions, seminars and conducted interviews

Volunteer, **National Services Scheme**, IIT Delhi — *Aug 2019 - Present*

- Teaching underprivileged children from nearby slum areas to serve the society through meaningful interactions