

Debajit Chakraborty

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in Debajit

Education

B.Tech. in Electronics with Minor in Computer Science & Micro Specialization in AI

GPA: 9.63/10.0

Indian Institute of Technology, Kharagpur

Graduating June 2022

Advisor: Prof. Partha P Chakrabarti

Research Interests

Robot Grasping and Manipulation, Robot Learning, Human-Robot Interaction, Multi-Agent Systems, Reinforcement Learning

Publications and Workshops

- P Das, B P Reddy, D Chakraborty, S Sarkar, A Mukherjee. When expertise gone missing: Uncovering the loss of prolific contributors in Wikipedia In *The 23rd International Conference on Asia-Pacific Digital Libraries, ICADL 2021* 🌐 [PDF][Slides]
 - Awarded the **Best Student Paper** at ICADL, 2021
- D Saha, N Paharia, D Chakraborty, P Saha, A Mukherjee. Ensembling strategies for Transformer-based Offensive language Detection. In *The First Workshop on Speech and Language Technologies for Dravidian Languages, EAACL 2021* 🌐 [PDF][Poster]
 - Overall **Winner** outperforming next candidate by **5%** F1-score | **1st, 1st, 2nd** in Tamil, Malayalam & Kannada respectively
 - Coined ensemble technique like Fusion Ensemble, Multi-seed Ensemble for robust hate-detection in Dravidian codemix dataset

Research Experiences

Robotic Manipulation*

Advisor: Vikash Kumar *May 2021 – Present*

- Created framework containing SOTA algorithms, encoders and expert demos in Robot Manipulation to find better representation.
- Benchmarked multiple DMC, Gym and kitchen environments for imitation learning, NPG, RAD, SLAC and SAC using encoders.
- Introduced several new kitchen tasks and working on improving hand Manipulation Techniques using latent space reference points.
Research Areas: Representation Learning, Robotic Manipulation

Multi-Agent Research Group, IIT Kharagpur* 📄 🌐

Advisor: Prof. Partha P Chakrabarti *Feb 2021–Present*

- Proposed a novel strategy of **decoupling** of local and global rewards, separate training loops and **degree of competition** factor.
- Extended the concept of **distributional RL** to multi-agent settings leading to significant speedup in more than 10 agents.
- Proposed an **Active learning** and **average sampling based approach** improving stability in collaborative-competitive games.
- *Research Areas: Multi-Agent Reinforcement Learning, Active Reinforcement Learning, Distributional Learning*

Complex Networks Research Group, IIT Kharagpur 📄 🌐

Advisor: Animesh Mukherjee *Dec 2020-Apr 2021*

- Achieved **massive improvements of 20%** in identifying Wikipedia Editors leaving the platform helping in **early retention**
- Extracted the User information of Wikipedians and performed sentiment analysis (**65% acc.**) to gauge **levels of satisfaction**
- Created **16 different features** about Wikipedians and ran Fusion Net on these features with different sentence embeddings
Research Areas: Natural Language Processing, Machine Learning, Information Retrieval (Currently accepted in ICADL 2021)

Kharagpur Robosoccer Students' Group 📄 🌐

Advisor: Alok Kanti Deb *Mar 2019 - Present*

- Built **cooperative multi-agent** systems in highly dynamic adversarial environment of RoboSoccer, Wrote coordinated plays
- Developed a **virtual simulator** for connecting local cameras with simulation client using ROS and pygame graphic user interface
- Inspected end-to-end **Warehouse Management** Solutions by implementing RRT/RRT* Planning Algorithms on real-life robots
- Worked on skills like passing & defense on top of C++ framework; Controlled movement using p-controller in ROS Turtlesim
Research Areas: Motion Planning, Reinforcement Learning, Finite State Machines, Algorithms

Compute vs Data Transfer: Memory Optimizations for Neural Networks 📄 🌐

Feb 2021-Apr 2021

- Proposed a efficient Layer-Adaptive memory optimization algorithm based on online profile, resulting in a trade-off between saving **50%** GPU memory and **100%** better execution time. Trained neural networks using lower GPU budget without sacrificing speed.
- Validated the **trade-off** between Extra Forward Computation and CPU-GPU Transfer as optimisations in training in CNNs and successfully **Implemented algorithms** based on transfer and compute sensitive layers.
Research Areas: Neural Networks, High Performance Parallel Programming, Optimization, GPU Scheduling using CudNN

High Performance Real-time Computing Lab, IIT Kharagpur

Advisor: Soumyajit Dey *Sep 2020 – May 2021*

- Experimented the behavior of privacy preserved as well as without privacy systems on various types of **time series** data showing both its robustness and stability. Used diverse solvers to solve **non-convex** problems for combinations of suppliers and consumers.
- Coded an entire system of consumers and suppliers following our **novel algorithm** for stability in Privacy preserved stable real time pricing considering real life scenarios. Achieved better, quicker and robust results than existing algorithms for privacy preservation
Research Areas: Optimization Techniques, Privacy in Grid Networks, Stability

- Implemented novel techniques of CNNs on time series data instead of standard approach of RNN's on sequential data. Benchmarked Deep Learning models such as CNN,RNN+LSTM,GRU,RESNET Models on AMPDs dataset; Performed extensive literature review.
- Devised **end-to-end models** which predicted which monitored supply of electrical items given power and voltage time series data.
Research Areas: Deep Learning, Electrical Grid Networks, Convolutional Neural Networks

Work Experience

Quadeye Securities

Gurgaon, India

*Quantitative Strategist**June 2021 - July 2021*

- Built robust models which predicted price movement to generate buy-sell triggers for novel **aggressive** intraday-trading strategy
- Used an event-driven architecture to aggregate data trends and tracked various market activities through **Limit Order Book**
- Extracted features and designed indicators from daily market data to predict risk and profitability of securities with high accuracy
- Quantitatively analyzed the **correlation** between indicator values and future returns to improve reliability of predicted alphas

Graphics Research Group, IIT Delhi

Delhi, India

*Research Assistant, Virtual Endoscopy Project**Jan 2021 - Apr 2021*

- Worked with **Medical Imaging(Cryogenic)**, surveyed existing techniques, configured whole human body from millions of slices
- Registered the various human body parts, Collaborated with team of **40+** researchers for deployment after passing test routines
- Performed parameters exploration on Visible Human Dataset, working on **Large Volume Production Data**(in TeraBytes)

Complex Networks Research Group, IIT Kharagpur

IIT Kharagpur, 2021

*Summer Intern, Exploiting BERT for End-to-end Aspect Based Sentiment Analysis**May 2020 – Aug 2020*

- Formulated strategy for data **Collection, Annotation** and Preprocessing of Tourist Reviews, with aspect and opinion extraction
- Achieved state-of-art performance (**77% acc.**) in Sentiment Analysis on custom made dataset, compared to gold standard datasets
- Made an **end-to-end** pipeline of ensembled classification models with interpretable report, Performed benchmarking on 8 models

Relevant Coursework(Grade on scale of 10)

Programming: Algorithms(10), Data Structures(10), Information Retrieval(10), High Performance Parallel Programming(10)**AI:** Machine Learning*, Artificial Intelligence*, Linear Algebra for AI*, Natural Language Processing(10), Image Processing(10),**Others:** Probability & Stochastics(10), Control Systems(10), Signals and Systems(10), Digital Speech Processing(10),

*7th Semester Coursework

Technical Skills

- **Languages:** C++, C, Python, MATLAB, SQL, JAVA, CudNN, OpenMP, MPI
- **Software:** Linux Shell Utilities, Git, Robot Operating System, Slicer3D, MuJoCo
- **Frameworks:** Pytorch, DeepMind Control Suite, OpenAI Gym, D4RL, Tensorflow, PettingZoo, MAgent, Pybullet, RLlib, OpenCV

Awards and Achievements

- 2021: **Top 1%** among 1400+ undergraduate students in the institute; Ranked **4th** in department among 125+ students.
- 2021: **Second Runners Up** in **Uber Hacktag** Grand Finale among 12,000+ registered teams | Developed a MVP [*Code*]
- 2020: Part of the **only team from India(KRSSG)** to qualify for International Robocup, 2020 (Bordeaux, France) [*Code*]
- 2018: Overall **Gurgaon City Topper** as well as School Topper in Science in CBSE (**98.2%**); Felicitated by National Newspapers
- 2018: **AIR 245 (top 0.01%)** and **AIR 550 (top 0.1%)** in JEE Main and JEE Advanced respectively among 1.3 million
- 2018: Rank **29 (top 0.01%)** in West Bengal Joint Entrance Examination India among 0.25 million
- 2017: **AIR 73 (top 0.01%)** in Kishore Vaigyanik Protsahan Yojana Scholar (SA) - Indian Institute of Science, Bangalore
- 2016: National Talent Search Examination Scholar by Government of India

Mentorship and Leadership

IEEE Mentor, Winter School of AI & Robotics, IIT Kharagpur

March 2021

- Mentored a 7 day hands-on course on "**Machine Learning and basics of Computer Vision**" to 200+ 1st year students
- Formulated challenging problem statements for end-workshop evaluation and mentored students on their projects

Artificial Intelligence Team Member, Kharagpur Robosoccer Students Group

Mar 2019 – Present

- **Regular Speaker** at weekly reading groups of research Group. Mentored and Guided sophomores in various fields of Robotics.
- Co-hosted a **pan-India robosoccer simulation** knockout tournament on FIRE bots with 40+ teams.

Institute Mentor and Student Mentor, Grimoire of Code

Aug 2020 – Present

- Responsible for guiding 6 freshmen, focusing on their academic and holistic development and providing counsel
- **Mentoring** and guiding a group of 5 first year students get acquainted with competitive programming

Senior Consultant, 180DC IIT Kharagpur Chapter

Mar 2020 – Dec 2020

- Responsible for on-boarding projects; Interacting with clients; Delivered Project on child healthcare NGO(**Smile Foundation**)