# Ishaan Watts

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## Education

**Indian Institute of Technology (IIT), Delhi, India** *July 2019 - May 2023*
*Bachelor of Technology;* ***Major:*** *Engineering Physics;* ***Minor:*** *Computer Science;* ***Department Rank:*** *4/49* ***CGPA:*** *8.996/10*

## Publications

- Divyanshu Aggarwal*, Ashutosh Sathe*, **Ishaan Watts**, and Sunayana Sitaram, **MAPLE: Multilingual Evaluation of Parameter Efficient Finetuning of Large Language Models**, arXiv preprint [arXiv]
- Sanchit Ahuja, Divyanshu Aggarwal, Varun Gumma, **Ishaan Watts**, Ashutosh Sathe, Millicent Ochieng, Rishav Hada, Prachi Jain, Maxamed Axmed, Kalika Bali, and Sunayana Sitaram, **MEGAVERSE: benchmarking large language models across languages, modalities, models and tasks**, North American Chapter of the Association for Computational Linguistics (**NAACL 2024**) [arXiv]

## Experience

**Research Intern, Microsoft Research India** May 2023 - Present
*Guide: Sunayana Sitaram | Multilingual Evaluation of LLMs* *Bengaluru, India*

- Evaluated multilingual capabilities of LLMs across 22 datasets & 81 languages - **accepted at NAACL 2024**.
- Studied different LoRA configurations for efficient **multilingual PEFT** in LLMs - **submitted at ACL 2024**.
- Extended RTP RAI dataset to 28 languages and testing **LLMs as evaluators** for multilingual **toxicity detection**.
- Building **Indic-LLM evaluation** leaderboard using human and LLM ELO ratings in collaboration with **Karya**.

*Guide: Akshay Nambi & Tanuja Ganu | Shiksha CoPilot [article]*

- Engineered **Shiksha CoPilot** web app to help teachers create engaging content for students using Gen-AI.
- Deployed CoPilot in **20 schools** across Karnataka and conferred with 1st prize in Microsoft Hackathon 2023.

**Machine Learning Engineer Intern, Torch Investment Management** Sept 2022 - Dec 2022
*Mentor: Amit Sharma | Stock Price Modelling* *Noida, Uttar Pradesh*

- Refactored LightGBM model codebase to predict Top30 US S&P500 stocks and modelled Saudi market data.
- Curated a new feature using NLP techniques determining correlation between stock price and tweet sentiment.
- Scraped Twitter using snscrape, **topic-based filtering** using BART and **sentiment analysis** using FinBERT.

**Data Scientist Intern, Udaan** May 2022 - July 2022
*Mentor: Pranjal Singh | Holistic User-Embeddings via GNNs* *Bengaluru, India*

- Developed framework to generate generic **user-embeddings** from interaction graph for better segmentation.
- Implemented **DeepWalk** as baseline, then built more complex multi-relational & multi-entity interaction graph.
- Applied **Hetero-Graph AutoEncoder** on new graph improving Udaan fraud detection by 2.45% - **offered PPO**.

**Research Intern, Griffith University** May 2021 - July 2021
*Guide: Saiful Islam | Malware Detection* *Queensland, Australia*

- Performed **malware detection** and **program analysis** of binaries from VirusShare using machine learning.
- Constructed Control Flow Graphs from binaries through static analysis and used opcodes as features for nodes.
- Applied tf-idf vectorisation on dataset & designed **Graph Convolutional Network** to achieve **89.1%** accuracy.

## Relevant Coursework

- **Programming**: Data Structures and Algorithms | Digital Electronics | Machine Learning | Special Topics in Computer Applications (Social Computing) | Computer Networks | Analysis and Design of Algorithms
- **Mathematics and Physics:** Linear Algebra and Differential Equations | Calculus | Probability and Stochastic Processes | Signals and Systems | Mathematical Physics | Computational Physics | Statistical Physics

## Major Awards & Achievements

- Bagged **1st position** in Topic Challenge and Honours in Executive Challenge at Microsoft Global Hackathon. *2023*
- Secured **6th position amongst 5000** teams all over India in the Amazon ML Challenge 2023. *2023*
- Granted **Merit Award** in 3 semesters for ranking in top 3 out of 49 in Physics Department, IIT Delhi. *2021-2022*
- Achieved Rank 1635 in JEE-Advanced & 99.94 percentile in JEE-MAINS from over 1.4 million candidates. *2019*
- Recipient of the prestigious **KVPY Fellowship** (Kishore Vaigyanik Protsahan Yojana), Rank 1281/100,000. *2018*

## Selected Technical Projects

**Particle Identification using Eigen Faces, CNNs and GNNs (B.Tech Project - 2)** Jan 2023 - May 2023
*Guide: Prof. Abhishek Iyer, IIT Delhi* [Code] [Report]

- Implemented **Eigen-Faces** decomposition to reduce image dimensionality and classified on euclidean distance.
- Proposed different **GNN** architectures for classification by converting images to **point-cloud representations**.
- Benchmarked CNNs with **0.8078** and GNNs with **0.597** (vanilla) & **0.710** (skip connections) ROC-AUC scores.

**Anomalous Signal Detection at Large Hadron Collider (B.Tech Project - 1)** Aug 2022 - Nov 2022
*Guide: Prof. Abhishek Iyer, IIT Delhi* [Code] [Report]

- Utilized CERN's ROOT framework to obtain energy and momenta of proton collision for **anomaly detection**.
- Inspected features derived applying physics to calculate 2.719 signal discovery significance of distributions.
- Designed Neural Networks and **Auto-Encoders** with **96.3%** and **80%** accuracy and optimized using Optuna.

**Peer Server Peer (PSP) Networks (Computer Networks)** Sep 2022 - Oct 2022
*Guide: Prof. Abhijnan Chakraborty, IIT Delhi* [Code]

- Implemented PSP file sharing system with **LRU cache** in server to facilitate efficient data storage and retrieval.
- Used **socket programming** abstraction ensuring secure file transmission to clients using TCP & UDP Protocol.
- Applied concurrency principles for efficient load balancing between clients and analysed scalability with size.

**Social Network Analysis of the Indian Stock Market (Social Computing)** Jan 2022 - May 2022
*Guide: Prof. Abhijnan Chakraborty, IIT Delhi* [Code] [Report]

- Sourced NIFTY 4 year OHLC data from NSE, India and Yahoo Finance for social network and Covid19 analysis.
- Performed **time-series** decomposition estimating return, visualised stock-split and **40%** log deviation in Covid.
- Visualised stock graphs using Winner Takes All & MST method with Louvain **community detection** via Gephi.

**Yoga Pose Estimator using CNNs (Machine Learning)** Sep 2021 - Nov 2021
*Guide: Prof. Rahul Garg, IIT Delhi* [Code]

- Designed **Deep CNN** model using **transfer learning** in PyTorch to detect yoga pose at different camera angles.
- Transformed images containing 19 Asanas to avoid background misrecognition & better feature interpretation.
- Developed hybrid Densenet121 architecture achieving **83%** accuracy leveraging GPU acceleration using HPC.

## Skills

- **Languages**: Python, Java, SQL, Bash, C, C++, LaTeX, Spark **Technologies**: Git, Docker, ROOT, Azure, Databricks
- **Libraries**: PyTorch, TensorFlow, OpenCV, Numpy, Pandas, Matplotlib, Ploltly, Streamlit, Langchain, LlamaIndex

## Extra Curricular Activities

- **Reviewer** for AI-ML Systems 2023, an Indian conference on Systems Engineering and Artificial Intelligence.
- Attended **Winter School on Deep Learning** organised by Indian Statistical Institute (ISI), Kolkata in Spring 2023.
- Mentored six freshmen undergraduates for their academic wellbeing through **BSW Student Mentorship Program**.
- Prepared Care-Packages comprising poems & articles under **NSS Mental Health Project** during the pandemic.
- Completed **A1 level course in Spanish** as non-credited course of the Humanities and Social Sciences Department.