ARCHIT MANGRULKAR | 20CS10086

COMPUTER SCIENCE & ENGG. (B.Tech 4Y)

EDUCATION

Year	Degree/Exam	Institute	CGPA/Marks
2024	B.TECH	IIT Kharagpur	8.72 / 10
2020	AISSCE (CBSE XII)	New Greenfield Public Academy	95.6%
2018	AISSE (CBSE X)	Choithram School North Campus	94.8%

PUBLICATIONS

Leveraging Pre-trained Language Models for Stance And Premise Classification | COLING 2022 [Jun 2022 - Aug 2022]

- Predicted **stance and premise** in **COVID tweets** by harnessing transformer-based pre-trained language models such as BERT, RoBERTa, BART & DeBERTa
- Incorporated features from **dependency parse tree** and **POS tags** to capture syntactic structure, and **TF-IDF score** for semantic overlap of the sentences
- Utilized **contrastive pretraining** using a supervised contrastive loss function, **beating baseline score by 40%** to achieve first position on leaderboard

INTERNSHIPS

Vision & Learning Lab | University of Alberta, Canada | Onsite [May 2023 - Aug 2023]

- Fabricated a multimodal human scene dataset consisting of **RGBD images**, eye-tracking information, **speech data** collected using Azure Kinects, GoPros
- Programmed a **multithreaded C++ server** and Python **GUI client** using **PyQt5** to achieve concurrent image capture, video recording, & camera calibration
- Devised a 3D human pose **tracking and clustering** module for multi-view images using **YOLOv5** and **DeepSORT** for tracking, and **DBSCAN** for clustering
- Investigated multi-view **Neural Radiance Fields** for scene reconstruction; 3D human **instance segmentation** in point clouds using Vision Transformers

Chair of Processor Design | TU Dresden, Germany | Onsite [May 2022 - Aug 2022]

- Designed neural operators as **C static libraries** to approximate multiplication for faster 8-bit **FPGA inference** of neural networks using **TensorflowLite**
- Experimented with **cross-layer granularity** combining signed 8-bit **lookup tables**, polynomial regression modelling and **EvoApproxLib multipliers**
- Improved baseline **inference time by 2x** using **OpenMP**'s mutlithreaded parallelizations, autovectorization, compiler flags and **cache optimizations**

COMPETITION/CONFERENCE

DevRevs Domain-Specific QA Challenge | Silver | Inter-IIT Tech Meet 11.0 [Dec 2022 - Feb 2023]

- Developed a closed domain **question answering chatbot** system on **SQuAD**-like datasets and generative augmentations based on **BART, T5, GPT3**
- Utilized **FedAvg algorithm** over semantically similar themes, Reptile meta-learning, **Incremental Replay** mechanism to handle d**omain adaptation**
- Enhanced Facebook's DrQA retriever **latency by 3x** using sentence-level improvisation, improved **runtime by 2.65x** using caching**, ONNX, & quantization**

DRDOs UAV Guided UGV Navigation | Gold | Inter-IIT Tech Meet 10.0 [Feb 2022 - Mar 2022]

- Led vision sub-team developing an **unmanned ground vehicle** (UGV) and **aerial vehicle** (UAV) for stable **mapping & navigation** in mountainous terrain
- Implemented blurring, bilateral blurring, contour detection & Darknet for **real-time YOLOv3 inference** on UAV's camera feed for **UGV Localization**
- Derived precise UGV **GPS coordinates** from **ECEF coordinates** employing extrinsic local camera frame transformations & the **Jijie Zhu's algorithm**

PROJECTS

Unix Shell and IPC | Operating Systems | Course Project [Jan 2023 - Feb 2023]

- Developed a **robust Unix shell** in **C++**, featuring process execution, interruption, input/output redirection, **piping**, and **command history** management
- Engineered **signal handlers** for foreground and background processes, squashbug feature with **custom heuristics** for **malware detection** & termination
- Employed a **shared memory graph** with producers adding nodes, while consumers applying a **3x optimized Dijkstra**'s for shortest path calculation

MyHTTP | Computer Networks | Course Project [Feb 2023 - Mar 2023]

- Designed a **TCP concurrent** command line interface browser utilizing **OpenSSL** for secure sockets to retrieve files from remote **HTTP/HTTPS servers**
- Developed a HTTP 1.1 server for diverse file format (PDF, TXT, JPG) **GET and PUT requests**, including **AccessLog** for tracking, & **status code** responses

ARMA based Trading Strategy | Quant Club [Oct 2022 - Nov 2022]

- Strategically analyzed diverse **time series models** incorporating volume and price indicators using **BackTrader** for optimizing 'AAPL' stock performance
- Achieved remarkable gains of **10%** in **maximum profit** alongside a **Sharpe ratio** of **1.5**, leveraging the **Autoregressive Moving Average** (ARMA) strategy
- Elevated **profits** by **23%**, employing RSI, MACD indicators; assessed **volatility** against **S&P 500 index** via Autoregressive Conditional Heteroskedasticity

AWARDS AND ACHIEVEMENTS

- Offered **department change** to **B.Tech CSE** program for being among **top 16** out of **1800** students after securing 10.0 CGPA in theory subjects
- **MITACS Globalink Scholarship 2023** - University of Alberta, Canada **| Erasmus+ Scholarship 2022** - Technische Universität Dresden, Germany
- Achieved a maximum rating of **1285** on **CodeForces** [profile: ZetaCoder]. Attained global rank **1213** out of **25k participants** in Pinely Round 2 (Div. 1+2)
- Achieved the **second position** in **Sigmoid Data Science Hackathon** 2022 on text-based emotion detection team event winning **75k cash prize**
- Secured an **All India Rank of 1517** (99.87 percentile) in **JEE Mains** (among 1M candidates) and **978** in **JEE Advanced 2020** (among 170k candidates)
- Ranked among **top 800** (98.4 percentile) students nationwide qualifying for **Indian National Chemistry Olympiad** (INChO) out of 50k candidates

POSITIONS OF RESPONSIBILITY

Data Head | Quant Club [Jun 2021 - Present]

- Directed two **Summer of Quant** editions, a summer school centered on **derivatives, algorithmic trading**, & ML in finance drawing **3000+ participants**
- Co-authored blog on **Quantitative Easing**, presented white paper on **Meta Learning Strategies**, developed & backtested alphas using **Backtrader**

Student Member | Kharagpur Data Analytics Group [Aug 2021 - May 2022]

- Organized a national-level data science **hackathon** attracting **2100 teams, Python for ML workshop** at IIT Kharagpur drawing **250+ participants**
- Co-authored blog on **Decision Trees**, presented research paper on **Neural Style Transfer**, delivered the **OOPs sessions** in Python for ML Workshop

COURSEWORK INFORMATION

Operating Systems* | Computer Networks* | Machine Learning | Compilers* | Algorithms I* II | Database Management Systems* | Systems Programming* | Information Retrieval | Probability and Statistics | Computer Organisation and Architecture* | Software Engineering* | Scalable Data Mining (* with lab)

SKILLS AND EXPERTISE

Languages: *Proficient*: C/C++, Python, Bash | *Familiar*: Java, LaTeX, MIPS, SQL (Postgres, MySQL) | **Tools**: GCC, GDB, Grep, Valgrind, Git, Docker, Jupyter
Libraries: PyTorch, TensorFlow, Keras, Scikit-learn, HuggingFace, NumPy, Pandas, Seaborn, Matplotlib, PIL, Tkinter, rapidxml, OpenCV, Open3D, OpenPose

!Self declared by the student, CDC could not verify the relevant documents