Utkarsh Patel

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Education

May 2023 **Indian Institute of Technology Kharagpur** *Kharagpur, India*
Dual Degree (B.Tech + M.Tech) in Electronics & Electrical Communication Engineering | CGPA 9.45/10
Minor in Computer Science and Engineering

Publications

2023 **Identifying and Characterizing Ad Hominem Fallacy Usage in the Wild**
Utkarsh Patel*, Animesh Mukherjee, Mainack Mondal. ICWSM 2023.

Awards and Achievements

2023 **Research Grant:** Awarded $1200 from Association for the Advancement of Artificial Intelligence (AAAI)
2023 **Research Grant:** Awarded ₹150k from IIT Kharagpur for undergraduate research
2021 **Global Rank 70** among 12,000+ contestants in **Google Kick Start** (Round C)
2021 Qualified for Round 2 of **Facebook Hacker Cup**

Work Experience

May 2022 – Jul 2022 **Software Engineering Intern, The D. E. Shaw Group** *Hyderabad, India*
- Worked in the Front Office R&D Tech division on firm's **core analytical engine** for discretionary strategies
- Developed an **end-to-end** feature to enable efficient searching, filtering, and on-the-fly vectorized computation of complex symbolic expressions across cached time-series data for various instrument attributes
- Created optimized **RESTful API** endpoints for analyzing custom time-series in Tableau via Web connector
- Received a return offer for full-time role based on performance during the internship

Research Experience

Aug 2022 – Apr 2023 **Logical Fallacy Detection** | *Advisors: Prof. Mainack Mondal and Prof. Animesh Mukherjee*
- Proposed a novel approach to logical fallacy detection by using **dependency-aware** large-language models
- Achieved state-of-the-art results by concatenating final hidden states of language models with node embeddings obtained from syntactic dependency trees using **node2vec** algorithm

Feb 2021 – Apr 2022 **Ad hominem Fallacies in the Wild** | *Advisors: Prof. Mainack Mondal and Prof. Animesh Mukherjee*
- Implemented explainable models to detect **ad hominem** fallacies and provide linguistic insight into their triggers
- Achieved state-of-the-art results on sparsely annotated datasets using **SS-GAN** schema applied over **BERT**
- Performed network studies on the users to understand user dynamics in debate portals and social media sites

Aug 2020 – Jan 2021 **Detection of Autism Spectrum Disorder** | *Advisor: Prof. Debasis Samanta*
- Worked on the **ABIDE** dataset to extract and process resting-state functional MRI data using **nilearn**
- Used correlation-based approach to determine functional connectivity between regions of interest
- Achieved test accuracy of **0.68** and **0.65** using **Support Vector Machines** and **K-Nearest Neighbors**

Term Projects

Spring 2023 **Quorum Generation for Mutual Exclusion** | *Distributed Systems*
- Investigated and analyzed **Maekawa's** algorithm for achieving **mutual exclusion** in **distributed systems**
- Designed and implemented a solution in **C** to generate quorum sets for each site in the distributed system using ideas from **projective planes** and **bipartite matching**

Spring 2023 **Parallel Image Morphing via Affine Transformation** | *Parallel Programming*
- Engineered a highly efficient parallel **C++** implementation utilizing **OpenMP** to perform the **Affine** transformation of **Delaunay's** triangles for advanced image morphing techniques

Spring 2023 **Parallel Sieve of Eratosthenes** | *Parallel Programming*
- Implemented a highly efficient and scalable solution by leveraging the block-level distribution scheme in **MPI**, enabling simultaneous execution of the Sieve of Eratosthenes algorithm across multiple nodes

Spring 2023 **GPU Acceleration for ORB-SLAM** | *CUDA Programming*
- Spearheaded a team of **7** students in optimization of the **ORB-SLAM** source code to leverage GPU acceleration
- Proficiently analyzed and optimized the GPU code responsible for the **keypoint** calculation, achieving significant improvements in computational efficiency and execution speed

Spring 2023 **Out-of-Order CPU Simulation** | *Computer Architecture*
- Configured an **out-of-order** CPU with a list of various micro-architectural parameter combinations
- Simulated the CPU in **gem5** and ran the **blocked matrix multiplication** benchmark program on it

Fall 2022 **Priority Queue as Loadable Kernel Module** | *Operating Systems*
- Developed a loadable **kernel module** that provides functionality of a **priority-queue** inside kernel mode
- Added support for concurrency, mutual exclusion, memory management, process management, and IO control

Fall 2022 **Smart Contracts on Hyperledger Fabric** | *Theory & Applications of Blockchain*
- Developed **smart contracts** to simulate binary search tree and student register in **Hyperledge Fabric** network
- Engineered a **Node.js** application designed for the seamless deployment and execution of the smart contracts

Spring 2022 **Defog: Single Image Defogging by Multiscale Depth Fusion** | *Computer Vision*
- Implemented inhomogeneous **Laplacian–Markov** random field regularized with smoothing and edge-preservation
- Used **max-flow min-cut** algorithm for energy minimization with **alpha-beta swap** for depth map estimation

Winter 2021 **Facebook Scraper** | *Web Scraping*
- Developed a web crawler to scrape posts, comments and replies from public Facebook pages
- Used **selenium** to automate the browsing and **Beautiful Soup** for parsing the page source

Fall 2021 **Jarvis: Chatbot for Customer Support** | *Natural Language Processing*
- Implemented a **Seq2Seq** architecture based chatbot with **Luong** attention mechanism in **PyTorch**
- Trained the model on **Customer Support on Twitter** dataset with **teacher forcing** and **gradient clipping**

Fall 2021 **User Authentication using Keystroke Dynamics** | *Machine Learning*
- Implemented an **Artificial Neural Network** to authenticate users using keystroke dynamics of their mood data
- Extracted hold time and latency values for different keys and used them as feature vectors for classification

Spring 2021 **Create-Debate Scraper** | *Web Scraping*
- Developed a web crawler to scrape all the debates from CreateDebate.com using **Beautiful Soup**
- Used **NetworkX** to construct graphs representing the nested structure of the comments in the threads

Winter 2020 **Targeted Aspect-based Sentiment Analysis** | *Natural Language Processing*
- Transformed the task to sentence-pair classification by constructing auxiliary sentences from target-aspect pairs
- Fine-tuned **BERT** on **SentiHood** dataset, achieved aspect F1-score 0.90 and sentiment AUC **0.98**

Technical Skills

Languages C/C++ (Proficient), Python (Proficient), JavaScript, Golang, Bash, Solidity

Frameworks Pandas, NumPy, PyTorch, Scikit-learn, TensorFlow, Node.js

Teaching

Spring 2023 **Basic Electronics Lab** (EC29001). TA. IIT Kharagpur

Fall 2022 **Basic Electronics Lab** (EC29001). TA. IIT Kharagpur

Relevant Coursework

Algorithms	Programming & Data Structures	Data Structures & Object Representation
Computer Networks	Computer Arch. & Operating Systems	High Performance Computer Architecture
Distributed Systems	Advances in Operating Systems Design	High Performance Parallel Programming
Machine Learning	Machine Intelligence & Expert Systems	Natural Language Processing
Image Processing	Probability & Stochastic Processes	Pattern Recognition & Image Understanding
Matrix Algebra	Theory & Applications of Blockchain	Digital Signal Processing