

Tirthankar Mitra

Software Engineer Experience delivering products used by 100M+ users.

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EDUCATION

UNIVERSITY OF COLORADO BOULDER - Boulder, CO

August 2022 – December 2023

Master of Science in Computer Science

GPA: 4

Relevant coursework: Data Center Scale Computing-Methods Systems & Techniques, Linux system administration, Computer Security and Ethical Hacking, Neural Networks & Deep Learning, Deep Reinforcement Learning, Advanced Robotics, Chaotic Dynamics, Numerical Linear Algebra, Foundations of Quantum Engineering, Advanced topics in Computer Vision.

JADAVPUR UNIVERSITY - Kolkata, India

August 2014 – May 2018

Bachelor of Engineering in Electronics & Telecommunication

GPA: 3.6

Relevant coursework: Computer Language & Data Structures, Programming Lab, Numerical Analysis Lab, Data Structures & Algorithms, Computer Organization & Architecture, System Software, Computer Comm. Networks, Neuro-fuzzy Control, Operating Systems, Computer Architecture & System Software Lab.

TECHNICAL SKILLS

Functional : Agile, JIRA , Git, Gerrit, Jenkins, Perforce, Linux, Windows, CI/CD.

Technical : Python, C, C++, JAVA, HTML, CSS, Computer Vision, NLP, Reinforcement Learning, Machine Learning, Large Language Models, Deep Learning, Hadoop, PySpark, Docker Container, Kubernetes, Google Cloud Platform, PyCuda, ROS, System Design, REST, AWS, Computer Networks, Cyber Security, RabbitMQ, Flask, gRPC, Operating Systems, Algorithm & Data Structure, Redis, MinIO object store, MySQL, Pytorch, GDB, TensorFlow, Node.js, JavaScript, Database, NoSQL, Spring framework.

Framework : Spring Boot, Pytest, Gtest.

Machine Learning : Pytorch, Tensorflow, Large Language Model, Computer Vision.

PROFESSIONAL EXPERIENCE

QUALCOMM - SAN DIEGO, CALIFORNIA

May 2023 – August 2023

Interim Software Engineer

- **Led the development of a PYTEST framework** verification environment for rigorous testing of the 5G base station's MAC layer. Established a prototype unit test and development workflow, laying the foundation for future test case expansions. **Utilized Python LOGGING and SUBPROCESS modules** and deepened expertise in **GIT and GERRIT** version control systems. The framework resulted in a 30% enhancement in testing efficiency.
- Collaborated seamlessly with cross-functional higher-layer teams within the 5G network protocol stack to develop MAC unit test cases. **Enabled PF TRACE for unit tests** to log MALLOC counts, CONTEXT SWITCHES, and PAGE FAULTS; this increased the reliability of all test cases by 25%.
- Performed **data analysis with Python's PANDAS and NUMPY packages** to formulate robust pass-fail criteria for unit tests. Implemented extended test scenarios by creating bash scripts, identifying latent faults in legacy code, and fixing them, thus increasing code reliability by 5%.

SAMSUNG R&D - BANGALORE, INDIA

June 2018 – August 2022

Lead Software Engineer

- **Led the development of 5G Base Station's** physical uplink control channel's **feature releases and patches for Samsung's diverse customer base**. Also, customized features for specific clients based on High-Level Designs and 3GPP specifications, following **agile workflow**, continuous integration, and continuous development (**CI/CD**) practices. **Mentored two junior team members** in MAC-PHY software development; all these efforts reduced the team's ability to release new software features by 30%.
- **Improved log comprehension** and accessibility by developing an **HTML, CSS, and JAVASCRIPT-based parser** that was hosted on a server and could aggregate logs of a specific type into a downloadable Excel sheet which could then be utilized for analysis such as calculating DOWNLINK BLER and throughput, the log parser reduced the average analysis time by 90%.
- **Enhanced legacy code** by optimizing PUCCH resource allocation from $O(n^2)$ to $O(n)$ through efficient hashing techniques resulting in the reduction of average runtime by 20%.
- **Fixed legacy bugs**, for example, in one situation by implementing the bakery algorithm to resolve a critical section problem caused by parallel PUCCH reports overwriting a shared memory. This correction resulted in a 20% increase in DOWNLINK throughput.

- **Implemented PUCCH unit tests powered by Google's Gtest in C++** and set up Jenkins for nightly testing, which included the logging of CPU cycle consumption per module. **Automated email notifications for team-wide updates on results**, enhancing overall testing efficiency. The framework reduced bugs by 50% and was also used to increase code coverage from 20% to 75%.
- **Led pioneering research** in advancing **5G algorithms through MACHINE LEARNING** techniques. Developed an **improved LDPC layered decoder using Pytorch**, incorporating reinforcement learning and a dense neural network for function approximation which led to a 15% increase in decoder accuracy. Proposed innovative traffic balancing strategies in 5G systems through an open-ended intelligent search for multiple UAV base stations. Co-led a team in introducing a novel HARQ chase combining technique, for which a patent was awarded.

PROJECTS

FAST BOT CLASSIFIER, CU BOULDER

October 2022 – December 2022

Individual Contributor

<https://github.com/tirthankarCU/SpeedyBotFlag>

- **Created** a novel **cloud-hosted service** with low-latency **text classification and flagging** capabilities for social media platforms. The **REST front end would classify low-latency risk-averse text** using simple NLP models like a Bag of Words, which decreased the response latency by 35%.
- **Deployed backend workers** to use large models like **BERT** to pop out the **texts from the MinIO object store** and do classification. Workers deleted user posts if they violated the platform guidelines. **Redis key-value store** managed user authentication. This deployment removed 95% of problematic tweets.

MUSIC SEPARATION AS A SERVICE, CU BOULDER

September 2022 – October 2022

Individual Contributor

<https://github.com/tirthankar95/demucs-kubernetes-tirthankarCU>

- Implemented a **Kubernetes cluster** to **build a scalable Python FLASK-driven REST API** for music separation, making the process 100% automatic.
- Managed API requests, MP3 analysis, and data retrieval through a Redis queue system, employed **cloud object storage (e.g., Min.io)** for result caching; this architecture allows scaling up of workers performing music separation separately, thus reducing the cost of operations by 50% as it would now be a function of worker load.

MODELLING THE LEARNING OF NUMBERS IN CHILDREN, DELLAB CU BOULDER

January 2022 – December 2023

Graduate Research Assistant

https://github.com/tirthankarCU/NLP_RL_Docker_Version

- Investigated the role of language in children's number learning and its potential transferability to other tasks. A novel reinforcement learning environment was built using **OpenAI's gym framework**, and a **DOCKER container** was created to improve the reliability of experiments on different platforms.
- Implemented **state-of-the-art Neural Network models** like **BERT, ResNet, and ATTENTION** networks to **create a deep reinforcement learning (proximal policy optimization) PPO algorithm**. The models were **deployed on the Google Cloud Platform**, where the hand-built attention network produced a 20% performance improvement over other pre-trained models.

ACHIEVEMENTS

- **Cleared the Samsung professional software competency** exam in 2018, ranking in the top 16% of employees in the organization.
- **Was awarded the Samsung Citizen Award** for my contributions to the 5G project.
<https://github.com/tirthankar95/CompletionCertificates/blob/main/SamsungCitizenAward.jpg>
- Participated in **Competitive Coding**, achieving a Best Code Chef Global Rank of approximately **314 out of 11809** in the April Challenge 2019. https://www.codechef.com/users/tirthankar_95