# Tirthankar Mittra

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## EDUCATION

Research-Based master's in computer science — ***Aug 2022 – Present.***
University Of Colorado Boulder — ***CGPA: 4 / 4***

Bachelor of Engineering (Electronics & Telecommunication) — ***Aug 2014 – May 2018.***
Jadavpur University (West Bengal) ranked 9th in engineering in India ~ 2017 HRD ministry report. — ***CGPA: 8.9 / 10***

## RELEVANT GRADUATE LEVEL COURSES

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

## RELEVANT UNDERGRADUATE COURSES

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.

## PROFESSIONAL EXPERIENCE-

***1. Qualcomm (Interim Software Engineer)*** — ***Summer 2023 Intern.***

Created a verification environment for testing the 5G Base station's MAC layer and establishing a prototype unit test and a test development workflow. This experience deepened my proficiency in Python modules such as Pytest framework, logging, and subprocess. Additionally, I expanded my expertise in utilizing Gerrit and Git for seamless collaboration.

***2. Samsung R&D Bangalore (Lead Software Engineer)*** — ***2018 – 2022.***

Read and conducted extensive research on new topics in 5G networks and machine learning, improved existing 5G algorithms by introducing machine learning and deep learning techniques, and published patents. Designed, implemented, and tested Uplink Control Channel for 5G base station's network protocol stack. Provided frequent guidance, feedback & communicated project goals to new team members. Gained deeper understanding of writing code in C and testing code using Google Test Framework in C++.

***Achievements***

- Cleared Samsung professional software competency exam, in 2018.
- Was awarded the Samsung Citizen Award for my contributions to the 5G project.
  https://github.com/tirthankar95/CompletionCertificates/blob/main/SamsungCitizenAward.jpg

## SKILLS AND AWARDS:

1. Following are the various skills that I have honed over the years.

Advanced Skills

- Python, C, C++, Algorithm & Data Structure - Regularly use online coding platforms like LeetCode and Code Chef.
- Deep Learning, Computer Vision, NLP, Reinforcement Learning, Machine Learning, Large Language Models.

Intermediate Skills

- Operating Systems - Books read, "operating system concepts by Galvin".
- System Design - Books read, "System Design Interview by Alex Xu", and "Designing Data-Intensive Applications by Martin Kleppmann", Hadoop, PySpark, Docker Container, Kubernetes, Google Cloud Platform, REST, PyCuda, ROS, OpenCV, JIRA(Agile), Redis, MinIO object store.
- Computer Organization, DBMS - NPTEL Video Lectures, Computer Networks, Ethical Hacking.

Beginner Skills

- RabbitMQ, Flask, gRPC.
- HTML, CSS, JS -
  Built my version of the famous Google T-Rex Dinosaur game.
  [Code Link] https://github.com/tirthankar95/T-Rex-Run
  [Website Link] https://tirthankar95.github.io/T-Rex-Run/
  Built a dummy restaurant website for both PC & mobile users. (Coursera's Assignment)
  [Code Link] https://github.com/tirthankar95/HTML-CSS-JS-WebDev
  [Website Link] https://tirthankar95.github.io/HTML-CSS-JS-WebDev/

2. My "Test Scores" on various important national exams.
[JEE MAINS - 99.2 percentile | JEE ADVANCED - 99.5 percentile | WBJEE - 99.7 percentile]

3. Participated in social work and created study materials for underprivileged children in collaboration with IIM Calcutta.
https://github.com/tirthankar95/CompletionCertificates/blob/main/SocialWorkCertificate.pdf

4. Participated in a marketing management internship, conducted by IIM Lucknow. I was awarded a special certificate of excellence for my performance.
https://github.com/tirthankar95/CompletionCertificates/blob/main/MarketingManagementCertificate.pdf
https://github.com/tirthankar95/CompletionCertificates/blob/main/MarketingManagementSpecialCertificateOfExcellence.pdf

5. Sometimes I participate in Competitive Coding (Best Code Chef Global Rank ~ 314 out of 11809 [April Challenge 2019]).
https://www.codechef.com/users/tirthankar_95

## TECHNICAL PAPERS/PUBLICATIONS

**1. Modelling the learning of numbers in children using reinforcement learning** **( Independent Study | CU Boulder )**
https://github.com/tirthankarCU/NLP_RL_Docker_Version
In this ongoing project, I'm utilizing state-of-the-art Neural Networks, including BERT and ResNet, to develop a deep reinforcement. learning PPO model. The focus is on investigating the role of language in children's number learning and its potential transferability to other tasks. The aim is to present this research at ML conferences like ICML, NeurIPS etc. Also used docker containers and google cloud.

**2. Multi agent collaborative reinforcement learning using novel attention mechanism** **( Independent Study | CU Boulder )**
I am currently developing a novel attention-based algorithm for multi-agent reinforcement learning, aiming to demonstrate its superior performance in collaborative tasks, such as object collection in a warehouse. The project is ongoing, and I also intend to incorporate (EKF SLAM) for state estimation in the presence of noise.

**3 . Optimal LDPC Decoder**
https://github.com/tirthankar95/Patents-Papers/blob/main/LDPC_.pdf
Optimized LDPC decoder algorithm with gradient descent on piecewise linear approximations & Deep Neural Networks. Tried to publish my work at the GLOBECOM conference.

**4. Reinforcement learning enhancements on Layered LDPC Decoder**
https://github.com/tirthankar95/Patents-Papers/blob/main/LDPC_RL.pdf
Spearheaded research on how Reinforcement Learning(RL) can be used to find a policy for selected the order of layers in a Layered LDPC decoder to improve its performance.

**5. Traffic Balancing & maintaining other KPIs in 5G systems: An open-ended intelligent search approach.**
https://github.com/tirthankar95/Patents-Papers/blob/main/TrafficBalancing_AI.pdf
Implemented a form of deep RL(open-ended search) to solve load/traffic balancing among several (UAV)-mounted base stations while maintaining different system KPIs (optimal throughput, the transmission of data with less power, etc.) for dynamically changing traffic & channel conditions.

## RELEVANT PROJECTS

***Datacenter Scale Computing, CU Boulder*** ***Oct 2022-Dec 2022.***
https://github.com/tirthankarCU/SpeedyBotFlag
Built a cloud-hosted service with low-latency text classification and flagging capabilities for social media platforms. The rest front end would do low latency risk averse text classification using simple NLP models like bag of words. The backend workers would use large models like BERT, pop out the texts from MinIO object store and once the classification is done it would notify the user and the post would be deleted from the user's feed if it violated platform guidelines. User authentication and posts are tracked using Redis key value store.

***Mind Driven Typewriter (Final Year Project), Jadavpur University.*** ***Dec 2017-March 2018.***
Worked as part of a 3-member team, where a typewriter was built for deaf, dumb & blind people, it would work on EEG signals from the brain. Wavelet transform was used for feature extraction, LDA & Neural Networks were then used on extracted features for classification.
https://github.com/tirthankar95/Mind-Driven-typewriter/blob/master/FinalyrReport.pdf

***Data Analytics, IIM Lucknow.*** ***May 2017-June 2017.***
In this internship, I learned about hypothesis testing, central limit theorem, adjusted R-squared test, chi-squared test, Fischer's score, data visualization techniques, and various machine learning models like linear/logistic regression, decision trees, etc. Finally, solved a case study by using a random forest model.

[Certificate] https://github.com/tirthankar95/CompletionCertificates/blob/main/DatatScienceCertificate.pdf

## INDEPENDENT LEARNINGS

***1.***Neural Networks and Deep Learning, Coursera **2019 (1 WEEK).**
https://github.com/tirthankar95/CompletionCertificates/blob/main/CourseraDeepLearning.pdf

***2.***Mathematics for Machine Learning: Linear Algebra, Coursera **2019 (1 WEEK).**
https://github.com/tirthankar95/CompletionCertificates/blob/main/CourseraMathematicsForML.pdf

***3.***Camera and Imaging, Coursera **2022 (1 WEEK).**
https://github.com/tirthankar95/CompletionCertificates/blob/main/Camera%26ImagingCertificate.pdf