Mrinaal Dogra

Masters in Computer Science · UC San Diego

+1 (858) 518-3496 | mdogra@ucsd.edu | mrinaald.github.io | mrinaald | mrinaald

Education

Year	Degree	Institute	CPI/%
2024-Present	Masters in Computer Science	UC San Diego	3.9/4.0
2015-2019	B.Tech Computer Science and Engineering	IIT Kanpur	9.0/10.0

Work Experience

Samsung R&D Institute India - Bangalore *Bangalore, India*

Lead Engineer, Machine Learning *Mar. 2023 - Aug. 2024*

- Led the development of an **automated Python-based Android profiling tool** to benchmark rendering uniformly across devices, identifying bottlenecks (scroll janks) and enhancing rendering performance through improvements in the Android framework source.
- Led the development of **four edge-based personalization LLM solutions**, deriving actionable insights to enhance user experience.
- Fine-tuned the **FLAN-T5 LLM model** for our specific use-case, optimizing performance & achieving a $\sim$ **92% evaluation score**.
- Collaborated with cross-functional teams to improve the quality of $\sim$ **15k samples** for one of the said personalization solutions.

Senior Software Engineer, Machine Learning *Mar. 2021 - Feb. 2023*

- Designed an **edge ML solution** to analyze phone usage data and **detect boredom** with $\sim$ **80% accuracy**, enhancing user experience. Built an Android app for **real-time inference with under 50ms latency**, showcasing the model's effectiveness.
- Pioneered a **Federated Learning (FL)**-based solution to **predict gender and demographic age**, **enhancing privacy** for $\sim$ **10k users**. Explored innovative distributed learning techniques and tested diverse FL algorithms across 20+ input and model configurations, laying the groundwork for future privacy-preserving AI advancements.
- Developed a **differential privacy-based** ML solution for assigning semantic tags to locations frequently visited by a user.

Software Engineer, Machine Learning *Jun. 2019 - Feb. 2021*

- Developed the Robot Camera Visualization Android app for **real-time visualization** of depth maps and 3D point-clouds from a ToF camera at **30 FPS**, with gesture-based UI features for enhanced user interaction, tailored to stakeholder requirements.
- Engineered a **privacy-preserving edge ML solution** for **Next App Recommendation**, published in **IEEE ICSC 2022**, by designing a memory-efficient model (**99% size reduction**) to minimize FL bandwidth costs. Trained and deployed the model in Java using **DL4J**, integrating it on Android edge devices with a User Trial (UT) app for **training and inference across 500+ devices**

Samsung R&D Institute India - Bangalore *Bangalore, India*

Undergraduate Software Developer Internship *May 2018 - Jul. 2018*

- Designed and developed a **neural network model** to **predict a user's location** based on recent travel data and time of day.
- Created a **Python-based simulation environment** to model cell tower connectivity while a user is in transit.
- Built a **machine learning classification model** to predict the most likely cell tower a user is connected to at any given time, achieving **Top-1 and Top-3 accuracies of 85-90% and 90-95%**, respectively, on the in-house evaluation dataset.

Hike Private Limited *New Delhi, India*

Undergraduate Software Developer Internship *May 2017 - Jul. 2017*

- Implemented **CNN** models in Python using **TensorFlow** for **image classification**, leveraging Google ML Engine APIs to accelerate training on Google Cloud. Deployed the model with **TensorFlow Serving** to expose REST APIs for generating model predictions.

Skills

Programming	Python, JAVA, C/C++, Shell Script(Bash), Go, LaTeX
Libraries	Tensorflow, Scikit-learn, DeepLearning4Java(DL4J), Flask, MPICH C++, OpenCV, CUDA C/C++
Software & Tools	Git, Perforce Helix Core, GDB, ROS
OS and Platforms	Linux, Windows, Raspberry-Pi, Arduino
Languages	English(Fluent), Hindi(Native Speaker)

Patents and Publications

Publications

Memory Efficient Federated Recommendation Model *[link]* *2022*

2022 IEEE 16th International Conference on Semantic Computing (ICSC)

Patents

System and Method for Distributed Learning of Universal Vector Representations on Edge Devices *[link]* *2023*
US 17/946349

Methods and Electronic Devices for Behavior Detection using Federated Learning *[link]* *2023*
US 18/191403

One more patent has been filed and is in the publication process *2023*

Projects

Multi-task Learning with ToolkenGPT Framework
UC San Diego

Course Project: Large Model Reasoning , Prof. Lianhui Qin *Sept. 2024 - Dec. 2024*

- Re-implemented ToolkenGPT framework, optimizing for computational efficiency and adapting it to smaller models like Llama-3.2 1B.
- Led experimental research on multi-task capabilities, evaluating joint-task performance across different computational tasks.

HealthCare DApp
IIT Kanpur

Course Project: Blockchain Technology and Applications, Prof. Sandeep Shukla *Jan. 2019 - Apr. 2019*

- Decentralized Application (DApp) implemented using Ethereum Blockchain platform to keep patients' and doctors' data at a health center.
- Application allows a patient to maintain their medical data and reports securely using blockchain technology.
- Patients were given full control over their data, and only they had the power to grant access of their data to any doctor.
- Application also supported appointment bookings, where a patient can book an appointment with a doctor one-week in advance.

Multi-user P2P Video Conferencing Web Application
IIT Kanpur

Course Project: Computer Networks, Prof. Dheeraj Sanghi *Aug. 2018 - Nov. 2018*

- Implemented a video conferencing web application capable of handling multi-stream video feeds of many users.
- Application supported peer-to-peer communication and multiple conference rooms, each room capable to run an independent conference.
- Used WebRTC communication technology to enable real-time media communication between peers connected in a conference room.

One-Shot Learning
IIT Kanpur

Course Project: Data Mining, Prof. Arnab Bhattacharya *Aug. 2018 - Nov. 2018*

- One-Shot learning tries to solve the object categorization problem while using one, or only a few, samples of each of the output category/class.
- Studied and implemented the state-of-the-art methods of one shot learning, specifically Siamese networks and Matching Networks.
- Used the Omniglot and MNIST datasets for analyzing the effectiveness of implemented methods.

Neural Network Based Modelling and Control of Quadrotor
IIT Kanpur

Undergraduate Project, Prof. Indranil Saha *Jan. 2018 - Apr. 2018*

- Implemented Neural networks to learn a quadrotor model and its dynamics, and used them to synthesize its controller.
- Simulation environment was set up comprising of Mavros, PX4 and Gazebo which was used to fly a virtual quadrotor and to collect data.
- Collected data for multiple trajectories involving straight lines, sinusoidal, and random trajectories, for training the models.
- Models were tested against circular trajectory which was not part of the training data, and satisfactory results were obtained.

Detecting Semantically Similar Questions on Quora Dataset
IIT Kanpur

Course Project: Natural Language Processing, Prof. Harish Karnick *Jan. 2018 - Apr. 2018*

- Performed literature review on the existing work for detecting semantically equivalent questions from any publicly available corpora.
- Implemented a state-of-the-art work and conducted hyper-parameter tuning for training the model on Quora dataset.
- Implemented another model using Siamese neural network architecture and achieved near state-of-the-art accuracy.
- Proposed and tested few variations of the Siamese network approach while trying to improve the test accuracy.
- Analyzed the effect of including few linguistic constraints in order to improve performance and analyzed the results.

Ada to MIPS Compiler implemented in C++
IIT Kanpur

Course Project: Compiler Design, Prof. Subhajit Roy *Jan. 2018 - Apr. 2018*

- Implemented an Ada to MIPS compiler using C++ as the source language of the compiler.
- Implemented language features include Basic Arithematic operations, Range Operator, Constant Variables, Fixed size Arrays with upto two dimension support, If-Else and If-ElseIf-Else conditionals, Switch cases, Simple for, while, and do-while loops, Procedures(Functions) and Recursions, Packages(Classes) supporting any number of data members as well as objects of other packages, and Package level Methods.
- Basic Integer and Character data types were supported for all implemented features.

Real-time Sentiment Analysis of Video Feed
IIT Kanpur

Course Project: Introduction to Machine Learning, Prof. Purushottam Kar *Aug. 2017 - Nov. 2017*

- Analyzed performance of existing standard CNN networks like LeNet and MobileNet to classify user sentiment from real-time video feed.
- Proposed and implemented a smaller version of AlexNet in order to reduce model complexity.

Humanoid Robotics Project *IIT Kanpur*

Core Member, Robotics Club *Oct. 2015 - Apr. 2017*

- Implemented various algorithms such as Line Following, Object Detection and Object Tracking using OpenCV C++.
- Implemented the Speech Recognition, Chat-bot and the core system modules for the project HURO in the SnT Summer Camp 2016.
- Actively worked with team on Computer Vision problem statements required for participation in the competition HuroCup Fira, a robotic game and robotics benchmark problem for humanoid robots.
- Implemented Histogram Backprojection algorithm using OpenCV for improving object detection module of the robot.

N-Body Simulation in CUDA *IIT Kanpur*

Project under ACA (Association of Computer Activities) *Jan. 2016 - Apr. 2016*

- Implemented a simulation of dynamical system consisting of a large number of particles, moving under the influence of gravity
- Used the C++ CUDA APIs for parallel implementation of the simulation on a Nvidia GPU
- Implemented the visual realization of the simulation using the OpenCV library in C++

Relevant Coursework

Graduate

Artificial Intelligence	CSE250A: Principles of AI: Probabilistic Reasoning and Learning
	CSE 291A: Large Model Reasoning
ML System	CSE 234: Data Systems for Machine Learning *(ongoing)*
Theory	CSE 202: Algorithm Design and Analysis *(ongoing)*

Online Courses

Machine Learning	Generative AI with Large Language Models - DeepLearning.AI, Coursera
	Reinforcement Learning Specialization - University of Alberta, Coursera (4 Courses)
	Generative Adversarial Networks (GANs) Specialization - DeepLearning.AI, Coursera (3 Courses)
	Machine Learning Engineering for Production (MLOps) Specialization - DeepLearning.AI, Coursera (4 Courses)
	Convolutional Neural Networks - DeepLearning.AI, Coursera
	Sequence Models - DeepLearning.AI, Coursera
	Hyperparameter Tuning, Regularization and Optimization - DeepLearning.AI, Coursera
Robotics	Robotics Specialization - University of Pennsylvania, Coursera (6 Courses)

Undergraduate

Machine Learning	Introduction to Machine Learning, Natural Language Processing, Data Mining, Computational Cognitive Science
Computer Science	Operating Systems, Computer Networks, Parallel Computing, Data Structure & Algorithm, Advanced Algorithms, Compiler Design, Computer Systems Security, Introduction to Software Engineering, Blockchain Technology
Others	Introduction to Electronics, Introduction to Electrical Engineering, Neurobiology

Awards and Achievements

2024	**Samsung Excellence Award**, Recognized as **Star of the Quarter** for excellent contributions in projects	*SRI-B*
2023	**Key Talent Recognition Program**, Recognized for exemplary teamwork and significant contributions to projects and organizational goals	*SRI-B*
2022	**SPOT Award**, Recognized for excellent contributions in the project	*SRI-B*
2021	**SPOT Award**, Recognized for swift implementation and completion of project	*SRI-B*
2020	**Clean Code Culture Award**, Recognized for rigorous adoption of clean code and SOLID principles in project	*SRI-B*
2020	**Samsung Citizenship Award**, Recognized for excellent contributions and commitment to project	*SRI-B*
2018	**Academic Excellence Award**, 2017-18 Academic Year, Dept. of Computer Science and Engineering	*IIT Kanpur*

Positions of Responsibility

2025	**Teaching Assistant**, For *DSC 240: Introduction to Machine Learning*, by Prof. Yu-Xiang Wang	*UCSD*
2024	**Project Lead**, Supervised and contributed to four different on-device personalization solutions	*SRI-B*
2023	**Project Lead**, Pioneered and supervised the development of the in-house Android profiling tool	*SRI-B*
2022	**Project Mentor**, Worked with and mentored two Interns in two different projects	*SRI-B*
2019	**Project Mentor**, Project under Association of Computer Activities (ACA)	*IIT Kanpur*
2018	**Teaching Assistant**, For *ESO 207A: Data Structures and Algorithms*, by Prof. Sumit Ganguly	*IIT Kanpur*
2017-18	**Event Manager**, Robogames Techkriti'18	*IIT Kanpur*
2016-17	**Student Guide**, Counselling Service	*IIT Kanpur*
2016-17	**Secretary**, Robotics Club	*IIT Kanpur*