

EDUCATION

University of California San Diego | *MS Computer Science*

Sep 2025 – July 2027

Relevant Coursework: Graduate Operating Systems, Recommender Systems, Software Engineering

Ganpat University, India | *B. Tech. Computer Engineering, GPA - 3.96/4.00*

Aug 2018 – July 2022

Relevant Coursework: Operating Systems, Cloud Computing

Achievement: Academic scholarship recipient for securing **2nd** rank out of 60+ students.

WORK EXPERIENCE

Indian Institute of Science (IISc)

Research Associate

Jan 2023–Apr 2024 (Full-time); June 2024–Nov 2024 (Remote)

Federated Learning framework

- Developed an asynchronous **federated learning framework** (Flotilla) in Python, retaining **92.5%** performance at scale (1000+ clients) and reducing framework overhead to **1.7%** (an improvement from 55% in the state-of-the-art).
- Designed and implemented **server/client** communication using MQTT and gRPC, allowing for non-blocking, efficient message passing across **1000+** distinct concurrent endpoints.
- Built a **resilient**, Redis-based state store with **checkpointing** to guarantee system reliability against server failures, achieving session recovery in under **820ms**.
- Integrated **client selection** and **aggregation strategies** from current research, providing flexibility in choice to optimize performance, accuracy, and turnaround times for federated learning in the Flotilla framework.
- Managed and maintained an **80+** node **edge cluster** (Nvidia Jetsons, Raspberry Pis) to support continuous lab research and validate large-scale scalability studies.

Remote Contributions

- Orchestrated the **containerized** deployment of Flotilla across a distributed cluster of **1000+** concurrent clients, utilizing custom **Docker** images to validate system scalability.
- Wrote in-depth system architecture and scalability analysis, accepted for publication in **JPDC 2025** and **HiPC 2023**.

Autonomous drones for path planning

- Developed workflows for autonomous drones to assist visually impaired individuals (Presented at **IROS 2023**), utilizing CNNs (YOLO) and depth estimation models to achieve real-time obstacle avoidance and path planning.

STL - Sterlite Tech

Software Engineering Intern

Jan 2022 – Aug 2022

- Refactored existing **Docker** images, reducing image size by **35%** and accelerating the CI/CD pipeline build times by **50%**.
- Integrated a Liquibase module to track MongoDB schema changes, improving version control reliability.

TEACHING EXPERIENCE

Indian Institute of Science

Teaching Assistant, Data Engineering at Scale

Aug 2023 — Dec 2023

- Teaching assistant alongside Prof. Yogesh Simmhan for the graduate-level Data Engineering at Scale class about distributed computing paradigms including HDFS, MapReduce, and Apache Spark.
- Designed and graded assignments in Apache Spark; conducted weekly 2-hour lab sessions.

PUBLICATIONS

scholar.google.com

Flotilla: A Scalable, Modular and Resilient Federated Learning Framework for Heterogeneous Resources

Journal of Parallel and Distributed Computing (JPDC 2025)

Roopkatha B., Prince Modi, Jinal Vyas, Abhijit S. Chundru, Tejas C., Harsha Varun Marisetty, Manik Gupta, and Yogesh Simmhan

POSTERS PRESENTED

Toward a Modular Federated Learning Framework on Edge Devices

The 30th IEEE International Conference on High Performance Computing, Data, and Analytics (HiPC 2023)

Roopkatha B., Prince Modi, Harsha Varun Marisetty, Manik Gupta and Yogesh Simmhan

Towards Collision Avoidance for UAVs to Guide the Visually Impaired

Late-Breaking Results Abstracts. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2023)

Suman Raj, Swapnil Padhi, Ruchi Bhoot, Prince Modi and Yogesh Simmhan

PROJECTS

github.com/prince-modi

Git Clone Personal Project | Python, CLI, SHA-1, Zlib

April 2024

- Reverse-engineered Git's content-addressable file system, implementing the .git directory structure, SHA-1 hashing logic, and Zlib compression to manage blob, tree, and commit objects.
- Developed core plumbing commands (hash-object, write-tree) and porcelain commands (commit, log) to achieve full interoperability with standard Git repositories.

BitTorrent Client Optional Coursework Project | Python, AsyncIO

December 2021

- Implemented a peer-to-peer file sharing program utilizing Python's AsyncIO library and the BitTorrent protocol to discover and establish connections with peers to exchange pieces of data between each other.
- Built an event loop to handle semantics regarding the protocol, which includes managing connections to peers and managing the exchange of pieces of data.
- Developed a Bencode Parser to encode and decode the ".torrent" files and the messages required by the BitTorrent protocol.

Key-Value Store Personal Project | Python, Sockets

December 2020

- Engineered an asynchronous key-value database server using sockets with a custom communication protocol inspired by Redis to handle client-server exchanges.
- Handles commands like GET, SET, DELETE, FLUSH, MSET, and MGET for several data-types, from binary to hashmaps.

GIST Coursework Project | Python, NLTK

April 2020

- Utilized the YouTube API to extract the auto-generated captions of a video and summarize the main ideas. Used Python's NLTK library, cosine similarity of words, and a small BART (bidirectional encoder) model to generate shorter text.
- Incorporated advanced functionality, such as storing the previously generated summaries using SQLite database as a cache, and created a functional user-interface with Python's Tkinter library.

PROFESSIONAL AND ACADEMIC DEVELOPMENT

- 6.824: *Distributed Computer Systems* by Robert Morris, MIT OpenCourseWare

August 2021

- *Algorithms: Design and Analysis I and II* by Tim Roughgarden, Stanford University, edX

June 2021

- *The Bits and Bytes of Computer Networking* by Google, Coursera

January 2021

VOLUNTEERING

Indian Institute of Science, Bengaluru, India | Senior Student Volunteer

May 2023

- Co-organized the 23rd IEEE/ACM CCGrid conference with a footfall of 300+ participants, coordinated 3 poster presentation sessions over 5 days; assisted keynote speakers and senior faculty.

IISc Open Day 2023 | Student Volunteer

March 2023

- Coordinated the presentation sessions for the DREAM: Lab projects.

TECHNICAL SKILLS

Languages: Python (proficient), C, Go, Java, Bash/Shell

Systems & Cloud: Linux/Unix, Docker, CI/CD, AWS (EC2), Cloudflare Tunnels

Distributed Protocols: gRPC, Protocol Buffers, MQTT, REST APIs

Data & Tools: Redis, PostgreSQL, MongoDB, Git, PyTorch, Neovim