

## EDUCATION

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**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

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### 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

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### 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

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[scholar.google.com](https://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

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### 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

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[github.com/prince-modi](https://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

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- 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

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### 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

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**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