PRINCE MODI

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EDUCATION

University of California, San Diego | *MS Computer Science, GPA - 3.80/4.00* *Sep 2025 – June 2027*
Relevant Coursework: Graduate Operating Systems, LLM System Optimization

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), Bangalore
Project Associate (Distributed Systems) *Jan 2023–Apr 2024 (Full-time); Apr 2024–Nov 2024 (Voluntary Researcher)*
Developing a federated learning framework

- Developed a **distributed machine learning framework** (Flotilla) in Python, achieving **92.5%** performance retention while scaling to **1000+** clients, and outperforming state-of-the-art systems by reducing overhead to just **1.7%** (vs. 55%).
- Implemented a **multi-threaded server/client** architecture using MQTT and gRPC for efficient message passing across **1000+** concurrent endpoints.
- Built a highly resilient, **Redis** based state store with **checkpointing**, for resilience against server failures and enabling session recovery in under **820ms**.
- Integrated **federated learning strategies** from state-of-the-art research papers, to improve training times.
- Deployed custom **Docker** images for Flotilla on **1000+** clients, enabling large-scale **scalability** studies.
- Wrote in-depth **system architecture** and scalability analysis, published in **JPDC** 2025 and **HiPC** 2023.

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

Towards 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

System Performance Characterization | *C, Linux (Armbian)* *December 2025*

- Developed a suite of micro-benchmarks to evaluate the Rockchip RK3588S SoC, utilizing **ARMv8** cycle counters to measure CPU scheduling and OS primitive latencies with nanosecond precision.

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.

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