PRINCE MODI

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EDUCATION

University of California San Diego | *Master of Science in Computer Science* *Sep 2025 – July 2027*

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

Graduate student at UCSD, with a focus on Distributed Systems specialization.

Ganpat University, India | *Bachelor of Technology in Computer Engineering, GPA - 3.96/4.00* *Aug 2018 – July 2022*

Relevant Coursework: Operating Systems, Computer Networks, Big Data Analytics, Cloud Computing

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

WORK EXPERIENCE

Indian Institute of Science (IISc), Bengaluru

Project Associate (Distributed Systems) *Jan 2023–Apr 2024 (Full-time); June 2024–Nov 2024 (Remote Contributions)*

Developing a 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 highly **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.
- Collaborated with PhD researchers under Prof. Yogesh Simmhan (IISc) on the scalability, modularity, reliability, and operability of the Flotilla framework.

Remote Contributions ("PUBLICATIONS" section, point 1)

- Orchestrated the containerized deployment of Flotilla across a distributed cluster of **1000+** concurrent clients, utilizing custom **Docker** images to validate system scalability.
- Wrote comprehensive 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.

Sterlite Technologies Limited, Ahmedabad

Software Engineering Intern (Intellza) *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, Bengaluru

Teaching Assistant, Data Engineering at Scale *Aug 2023 — Dec 2023*

- Instructed a graduate-level cohort of **40+** students in Data Engineering at Scale, delivering technical lectures on distributed computing paradigms including HDFS, MapReduce, and Apache Spark.
- Conducted and managed weekly 2-hour lab sessions and practical assignments to strengthen understanding of theoretical concepts; offered individualized mentorship during office hours to address student knowledge deficiencies.

PUBLICATIONS scholar.google.com

- Roopkatha Banerjee, **Prince Modi**, Jinal Vyas, Abhijit Sri Chundru, Tejas Chandrashekhar, Harsha Varun Marisetty, Manik Gupta and Yogesh Simmhan. Flotilla: A Scalable, Modular and Resilient Federated Learning Framework for Heterogeneous Resources. Journal of Parallel and Distributed Computing (**JPDC**, rated CORE A*****) doi.org/10.1016/j.jpdc.2025.105103

POSTERS PRESENTED

- Roopkatha Banerjee, **Prince Modi**, Harsha Varun Marisetty, Manik Gupta and Yogesh Simmhan. Towards a Modular Federated Learning Framework on Edge Devices. 30th IEEE International Conference on High Performance Computing, Data, and Analytics (**HiPC**), 2023
- Suman Raj, Swapnil Padhi, Ruchi Bhoot, **Prince Modi** 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

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, 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*

Core team member, 23rd IEEE/ACM CCGrid   *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 special guests such as 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

OTHERS

- **Interests:** Hiking/Trekking (led treks as a volunteer on three occasions), River Rafting; Reading (Currently reading: The Memory of Light, WoT Book 14); Tennis, Pickleball; Formula 1; Home Lab - PiHole (DHCP, DNS), PFSense (Router)