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

- Constructed an asynchronous federated learning framework (Flotilla) in Python, achieving 92.5% performance retention at scale (1000+ clients) and reducing framework overhead to 1.7% (vs. 55% in SOTA).
- Engineered server/client architectures using MQTT and gRPC to facilitate efficient, non-blocking message passing across 1000+ distinct concurrent endpoints.
- Architected a Redis-based state store with checkpointing, ensuring system resilience against server failures and enabling 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.
- Administered an 80+ node edge cluster (Nvidia Jetsons, Raspberry Pis) to support continuous lab research operations and large-scale scalability studies.
- Collaborated with PhD students under the guidance of Prof. Yogesh Simmhan (IISc) to ensure the overall 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.
- Authored comprehensive system architecture and scalability analysis, accepted for publication in JPDC 2025 and HiPC 2023.

Autonomous drones for path planning

- Formulated workflows for autonomous drones to assist visually impaired individuals (Presented at IROS 2023), applying 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*

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

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.
- Orchestrated weekly 2-hour lab sessions and designed practical assignments to reinforce theoretical concepts. Mentored students through one-on-one office hours, bridging knowledge gaps.

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)