Haarika Manda

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Research Interests

My research sits at the intersection of networking and machine learning, focusing on building data-driven methods to model, measure, and optimize network performance in real-world settings. By leveraging large-scale network telemetry, I develop ML-based frameworks that enhance the reliability and Quality of Experience (QoE) of networked systems while prioritizing robustness, interpretability, and efficiency.

Technical Skills

Machine Learning: Foundation Models, Time-Series models, Transformers
Programming: Python, C/C++, Perl, Golang, PyTorch, TensorFlow
Big Data: MySQL, PySpark
Other: Docker, Linux, Git, Matlab, Databases, SLURM, HPC Cluster/Distributed ML training

Education

University of California, Santa Barbara — Santa Barbara, California
PhD in Computer Science (Co-advised by Arpit Gupta and Elizabeth Belding) — Sept 2023–March 2028
- GPA: 4.0/4.0; Developed ML-driven system using 1.8 million+ real-world network measurements to model broadband performance and save data. Also achieved >90% data savings for expensive speedtest measurements

Birla Institute of Technology and Science, Pilani — India
Bachelor of Engineering in Electronics and Communication Engineering — Aug 2019–May 2023
- Minor in Robotics

Professional Experience

University of California, Santa Barbara — Santa Barbara, California
Systems and ML Researcher (Graduate Student - PhD) — Sept 2023-Present
- Designed TurboTest [1] (in collaboration with Google), a time-series ML model, trained on **80M+ TCP traffic patterns** for early termination of internet speed tests, achieving **2–4× data savings** over prior heuristics and more than **95% savings** in high-throughput conditions (Publication: USENIX NSDI)
- Co-developed the Broadband Plan Querying Tool (BQT) [2], a scalable docker pipeline for collecting **537k broadband samples** at scale, implemented using a containerized Selenium-based scraping system.
- Architected Pramana orchestration, a local-to-AWS network-experiment backend for automating provisioning, packet capture, queue-log collection and job orchestration; supported 600K+ PCAPs / 60+ TB and 3,000+ experiments/hour.
- Analyzed collected ISP broadband data offerings (AT&T, Frontier Fiber etc) and showcase previously unknown broadband downgrade of **55% serviceability** for select US ISPs. Work has been published in ACM's SIGCOMM Conference.
- Currently developing network foundation model that leverages residential network telemetry to enable bottleneck link detection and performance diagnosis at scale.

Cisco Systems — Bangalore, India
Software Engineering Intern at Security Group — Aug 2022-Dec 2022
- Optimized enterprise intrusion detection workflows and production Snort configurations. Led a redesign that reduced sandbox memory footprint.
- Improved firewall threat detection system by enhancing performance and **reducing deployment time** by 5 s .

Idaho National Laboratory — Idaho Falls, Idaho
Researcher Intern (Machine Learning) — June 2024-Sept 2024
- Designed and implemented a ML-based defect segmentation system for large scientific datasets, arising from sensitive government research workflows. Achieved up to an **18× improvement** in performance over existing baselines and resulted in a manuscript accepted for journal publication [3].

Dimaag-AI — Bangalore, India
Software Developer Intern of AI/ML team — May 2022-July 2022
- Computer Vision & Defect Detection: Non-destructive fruit Quality Analysis using statistical ML models and instance segmentation of fruits using Mask-RCNN.

Selected Publications & Preprints

PRISM: A Deployment-Ready Framework for Network Foundation Models 2026–Present
(Under submission)
- Built a stress-testing suite across **bandwidth, RTT, and cross-traffic** using **600K+ samples**; fixed model-configuration faults, improving detection accuracy by up to **3**× without retraining.

Pramana: Experiment Orchestration Backend *(ACM HotNets 2026)* Nov 2026
- Architected a **local-to-AWS backend** for **million-scale PCAP/telemetry collection**, natural-language experiment automation, and embedding extraction; supported **2.6**× **more experiment scenarios** than the strongest standalone baseline.

netFound: Network Foundation Model *(Under review)* May 2026
- Helped develop a **hierarchical foundation model** that learns representations at **packet, burst, and flow** granularity from raw network traces.

TurboTest: Early Termination of Internet Speed Tests *(USENIX NSDI 2026)* May 2026
- Built a two-stage transformer using **80M+ TCP samples across 46+ countries**, with a memory-efficient **PyArrow** pipeline on Berkeley Lab's GPU cluster.
- Saved **94.2% of data across 1M+ M-Lab tests**, achieving **1.8–4.4**× **greater savings** than prior heuristics and < 5 **ms Redis-backed inference**; led four undergraduate students.
- **Invited Poster:** 5th Google Networking Research Summit, Student Poster Sessions (2025). Also presented at the Google India Networking Research Summit (2026) and Microsoft Research India (January 2026).

BQT: The Connect America Fund Project *(ACM SIGCOMM 2024)* Aug 2024
- Co-developed a **Docker/Selenium pipeline** collecting **1M+ ISP offerings across 15+ states**; improved reported-data accuracy by **67%**. Findings were cited in a **U.S. Supreme Court amicus brief**; managed four students.
- **Recognition:** 2025 IETF/IRTF Applied Networking Research Prize (ANRP); presented at IETF 123, Madrid, Spain (2025).

- J. Daneshamooz, **H. Manda**, M. Moghimi, S. Beltiukov, W. Willinger, and A. Gupta, "Rethinking Network Foundation Models: From Bigger Models to Better Data," *Network Traffic Classification—Reloaded (NTC-R), co-located with ACM CoNEXT*, accepted; forthcoming December 2026.
- **H. Manda**, L. Zhao, R. Reddy Kancharla, X. Xiao, C. Purushotham, Y. Tang, P. Xu, T. Yao, and F. Xu, "Bridging Multimodal Microscopy for Advanced Characterization on Nuclear Fuel Using Machine Learning," *Frontiers in Mechanical Engineering*, October 2025.
- **H. Manda**, V. Srinivasavaradhan, L. Koduru, K. Zhang, X. Zhou, U. Paul, E. Belding, A. Gupta, and T. N. Narechania, "Measuring Broadband Policy Success," *Harvard Law Review Blog*, July 16, 2024.

Honors and Awards

- National Science Foundation (NSF) Graduate Research Fellowship (Awarded: April 4th, 2024)
- IETF/IRTF-Applied Networking Research Prize (ANRP) 2025 (Awarded: Aug 2025, Presented at IETF 123)
- Outstanding Publication of the Year - UCSB Department of Computer Science (Awarded: June 2025)

Projects

- Spatio-Temporal Graph Modeling for Subnet Traffic Forecasting Jan 2025–March 2025
  Trained a spatio-temporal transformer to predict inter-subnet traffic patterns from college network telemetry. Achieved **1000**× **lower MSE** compared to statistical forecasting methods (ARIMA).
- Microservice Fingerprinting from Network Packet Traces Sept 2023–Dec 2023
  Fine-tuned a hierarchical IP-level model to fingerprint microservices. Using packet traces generated by virtual machines and Docker containers, achieved **84.2% classification accuracy**.

Selected Classes Taken

- ML For Networked Systems, Trustworthy ML in Security, Special Topics in Large Language Models and Conversational AI, Advanced Topics in Security, Machine Learning, Runtime Systems

Teaching Experience

- Teaching Assistant for Advanced Topics in Internet Computing (Spring 2024)