Garvit Banga

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Education

New York University, New York City, NY, USA — Fall 2023 – Present
Master of Science in Computer Science — Anticipated Graduation: May 2025
GPA: 3.889/4.0

Indian Institute of Technology (BHU), Varanasi, UP, India — August 2017 – May 2021
Bachelor of Technology
GPA: 8.26/10

Relevant Coursework

Parallel Computing, Natural Language Understanding and Computational Semantics, Computer Vision, Operating Systems, Fundamental Algorithms, Programming Languages, Fuzzy Set Theory.

Research Experience

Summer Research Intern at **UCF** under Dr. Aritra Dutta — Summer 2024

Project: *Communication Compression for Transfer Multimodal Learning*

- Developing bandwidth-aware compression techniques to address data heterogeneity in Federated Learning, accommodating clients with varying data types (Multimodal data) and model architectures.
- Designing methods to effectively compress gradients based on the communication bandwidth of clients, optimizing the time required for sharing gradient bits per data.
- Assigning weightage to clients for aggregation on the server by considering the extent of gradient compression, individual client model performance, and the size of data each client holds.

Independent Study at **NYU** under Dr. Qi Lei — September 2023 – May 2024

Project: *Federated Learning for Domain Adaptation using MGDA*

- Utilized domain-invariant feature extractors and domain-specific classifiers, iteratively optimizing local models and aggregating global models without sharing inter-domain data.
- Implemented multi-source knowledge distillation for dynamic weighting and mitigating contributions from malicious domains/clients for robust domain adaptation across diverse datasets.
- Integrated Multiple Gradient Descent Algorithm (MGDA) in Federated Learning framework, resulting in a robust model that outperforms existing benchmarks on the Digit-Five dataset.

Independent Researcher at **IIT BHU** under Dr. Hari Prabhat Gupta and Dr. Rahul Mishra
January 2021 – August 2023

Projects: *Fed-RAC*, *FL Based Patient Monitoring System* and *Inertial Measurement Units for Handwritten English Alphabets Dataset*

- Developed a Federated Learning and Resource-Aware Clustering Algorithm tailored to address the diverse resource capabilities among participants using Knowledge Distillation technique to encourage the involvement of clients with minimal resources.
- Developed a Federated Learning Algorithm for IoMT, optimizing participant clusters based on data freshness to ensure efficient model deployment while preserving data privacy improving accuracy and efficiency in patient activity monitoring.
- Designed a comprehensive dataset of Inertial Measurement Units for Handwritten English Alphabets, incorporating diverse heterogeneity parameters to support real-world Federated Learning applications.

Grad Course Projects

DS-GA 1012 Natural Language Understanding and Computational Semantics at **NYU** under Dr. Sophie Hao — Spring 2024

Project: *DENIAHL: Data-centric Evaluation of Needle-In-A-Haystack for LLM's*

- Designed the DENIAHL benchmark to assess the impact of data size, patterns, and type on long-context modeling capabilities in language models.

- Conducted comprehensive evaluations of LLaMA-2 7B and GPT-3.5 on the DENIAHL benchmark, identifying key performance trends and analyzing their recall performance against common context-truncated NIAH benchmarks.
- Investigated the influence of data patterns and varying data types on model performance, revealing models' reliance on fine-grained recall versus global pattern recognition, and identifying phenomena such as 'lost-in-the-middle' and 'lost-in-the-end'.

Publications

R. Mishra, H. P. Gupta, **G. Banga** and S. K. Das, *Fed-RAC: Resource-Aware Clustering for Tackling Heterogeneity of Participants in Federated Learning* in IEEE Transactions on Parallel and Distributed Systems(TPDS), 2024, https://doi.org/10.1109/TPDS.2024.3379933

C. Singh, R. Mishra, H. P. Gupta and **G. Banga**, *A Federated Learning-Based Patient Monitoring System in Internet of Medical Things* in IEEE Transactions on Computational Social Systems(TCSS), 2023, https://doi.org/10.1109/TCSS.2022.3228965

Public Dataset

Hari Prabhat Gupta, Tanima Dutta, Rahul Mishra, **Garvit Banga**, Shubham Pandey, Krishna Sharma, Himanshu Sahu, *A Dataset of Inertial Measurement Units for Handwritten English Alphabets: Leveraging Diversity in Indian Context* , IEEE Dataport, 2023, https://dx.doi.org/10.21227/av6q-jj17

Industry Experience

Standard Chartered Bank July 2021 – July 2023

Software Developer

- Contributed to the migration of on-premise banking service architecture to AWS Cloud, ensuring smooth transition and enhanced scalability for core banking operations.
- Utilized Terraform scripting to create and manage AWS infrastructure, including load balancers, target groups, and listeners, to efficiently route HTTPS requests and implement security groups.
- Managed and maintained JBOSS environments for in-house retail banking products E-Branch and eBBS, ensuring high availability and performance on AWS servers.

Other Experience

NYU CSCI-UA 0310 Basic Algorithms, *Tutor/Grader* Summer 2024

NYU CSCI-UA 0480 Parallel Computing , *Tutor/Grader* September 2023 – May 2024

Extra-Curricular

IIT BHU Anveshan *Technical Secretary* August 2020 – May 2021

References

Dr. Qi Lei
Assistant Professor of Computer Science at NYU, **Email:** ql518@nyu.edu.

Dr. Aritra Dutta
Assistant Professor of Computer Science at University of Central Florida, **Email:** Aritra.Dutta@ucf.edu.

Dr. Hari Prabhat Gupta
Associate Professor of Computer Science at IIT BHU, **Email:** hariprabhat.cse@iitbhu.ac.in.

Dr. Rahul Mishra
Assistant Professor of Computer Science at IIT Patna, **Email:** rahul_mishra@iitp.ac.in.