

# Garvit Banga

Personal Website

Jersey City, NJ, USA

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Education

**New York University**, New York City, NY, USA  
Master of Science in Computer Science  
GPA: 3.889/4.0

Fall 2023 – Present  
Anticipated Graduation: May 2025

**Indian Institute of Technology (BHU)**, Varanasi, UP, India  
Bachelor of Technology  
GPA: 8.26/10

August 2017 – May 2021

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: *Optimizing Federated Learning with Bandwidth-Aware Gradient Compression for Multi-modal Clients*

- 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	<p>R. Mishra, H. P. Gupta, <b>G. Banga</b> and S. K. Das, <i>Fed-RAC: Resource-Aware Clustering for Tackling Heterogeneity of Participants in Federated Learning</i> in IEEE Transactions on Parallel and Distributed Systems(TPDS), 2024, <a href="https://doi.org/10.1109/TPDS.2024.3379933">https://doi.org/10.1109/TPDS.2024.3379933</a></p> <p>C. Singh, R. Mishra, H. P. Gupta and <b>G. Banga</b>, <i>A Federated Learning-Based Patient Monitoring System in Internet of Medical Things</i> in IEEE Transactions on Computational Social Systems(TCSS), 2023, <a href="https://doi.org/10.1109/TCSS.2022.3228965">https://doi.org/10.1109/TCSS.2022.3228965</a></p>	
Public Dataset	<p>Hari Prabhat Gupta, Tanimu Dutta, Rahul Mishra, <b>Garvit Banga</b>, Shubham Pandey, Krishna Sharma, Himanshu Sahu, <i>A Dataset of Inertial Measurement Units for Handwritten English Alphabets: Leveraging Diversity in Indian Context</i> , IEEE Dataport, 2023, <a href="https://dx.doi.org/10.21227/av6q-jj17">https://dx.doi.org/10.21227/av6q-jj17</a></p>	
Industry Experience	<p><b>Standard Chartered Bank</b></p> <p>Software Developer</p> <ul style="list-style-type: none"> <li>• Contributed to the migration of on-premise banking service architecture to AWS Cloud, ensuring smooth transition and enhanced scalability for core banking operations.</li> <li>• 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.</li> <li>• Managed and maintained JBOSS environments for in-house retail banking products E-Branch and eBBS, ensuring high availability and performance on AWS servers.</li> </ul>	July 2021 – July 2023
Other Experience	<p>NYU CSCI-UA 0310 Basic Algorithms, <i>Tutor/Grader</i></p> <p>NYU CSCI-UA 0480 Parallel Computing , <i>Tutor/Grader</i></p>	<p>Summer 2024</p> <p>September 2023 – May 2024</p>
Extra-Curricular	IIT BHU Anveshan <i>Technical Secretary</i>	August 2020 – May 2021
References	<p><b>Dr. Qi Lei</b> Assistant Professor of Computer Science at NYU, <b>Email:</b> ql518@nyu.edu.</p> <p><b>Dr. Aritra Dutta</b> Assistant Professor of Computer Science at University of Central Florida, <b>Email:</b> Aritra.Dutta@ucf.edu.</p> <p><b>Dr. Hari Prabhat Gupta</b> Associate Professor of Computer Science at IIT BHU, <b>Email:</b> hariprabhat.cse@iitbhu.ac.in.</p> <p><b>Dr. Rahul Mishra</b> Assistant Professor of Computer Science at IIT Patna, <b>Email:</b> rahul_mishra@iitp.ac.in.</p>	