Blacksburg, VA, 24061

# Sindhuja Madabushi

https://sindhujamadabushi.github.io

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## EDUCATION

- **Ph.D. in Computer Science at Virginia Tech** (2023-Present)
  *Coursework*: Security Risks of Generative AI; Scientific Knowledge-Guided Machine Learning; Network Security; Optimization for Machine Learning; Deep Learning.
- **M.Sc. in Data and Knowledge Engineering at Otto-von-Guericke Universität Magdeburg** (2016-2019)
  *Selected Coursework*: Data Mining; Frequent Pattern Mining; Recommender Systems; Bayesian Networks; Advanced Databases; Distributed Data Management; Machine Learning; Information Retrieval.
- **B.Tech. in Computer Science and Engineering at GITAM University, India** (2009-2013)
  *Selected Coursework*: Probability & Stats; Data Mining; Artificial Intelligence; Data Structures & Algorithms; Discrete Math; Databases; C, C++, Java & Unix Programming; Computer Architecture; Operating Systems.

## PUBLICATIONS

- **Sindhuja Madabushi** and Parameswaran Ramanathan, "Two-Cloud Private Read Alignment to a Public Reference Genome," **accepted to *Privacy Enhancing Technologies Symposium* (PETS) 2023.**
- **Sindhuja Madabushi**, "Graph Sketches and Embeddings: A Study of their Applications in Graph Databases," *Master's Thesis*, Faculty of Computer Science, Otto-von-Guericke-Universität Magdeburg, 2019.
- **Sindhuja Madabushi**, "Novel Network System with Miscellaneous Features," *Bachelor's Thesis*, Department of Computer Science and Engineering, GITAM University, 2013.

## RESEARCH PROJECTS

- **P2VFL: Performance and Privacy-enhanced Incentive Mechanism for Vertical Federated Learning** (present)
  - Designed a *privacy-preserving incentive mechanism* for Vertical Federated Learning (VFL)
  - Worked with split neural networks to compute contributions and rewards in VFL
  - Experienced with data privacy techniques such as differential privacy and homomorphic encryption
- **Two-Cloud Private Read Alignment to a Public Reference Genome** (2020-2022)
  - Designed a *scalable cloud-based algorithm for private alignment* of DNA sequence data.
  - Worked with the whole human genome and high volumes of Next Generation Sequencing (NGS) data.
  - Evaluated scalability and accuracy using RNA-Seq, ChIP-Seq, SAMtools, and SimLord.
- **Graph Sketches and Embeddings: A Study of their Applications in Graph Databases** (M.Sc. Thesis)
  - Performed a comprehensive study on graph sparsification and graph representation learning methods.
  - Evaluated effect of graph sparsification on graph properties of social network data such as page rank, community detection, and betweenness centrality.
  - Examined effect of graph embedding methods such as *DeepWalk, Node2Vec, and GNNs* on node similarity.
  - Created stored procedures for different graph queries in the Neo4j graph database to evaluate results.
- **Evaluation of High-Performance Application-level Caching of Generic Graph Structured Data** (2018)
  - Implemented several hashing techniques and graph algorithms in Java.
  - Evaluated the effects of these hashing techniques on graph properties using SNAP datasets.
- **Supporting Non-Relational Models with Flexible Schema Storage** (2017)
  - Created mappings between NoSQL and relational data stores to tile-based architectures.
  - Evaluated get and count queries for these mappings.
- **Novel Network System with Miscellaneous Features** (Bachelor's Thesis)
  - Designed a two-step authentication protocol to securely store files on a network disk using Rijndeal cypher.
  - Developed a web application to demonstrate my approach.

## WORK EXPERIENCE

- **Research Associate at University of Wisconsin-Madison** (2020-2022)
  - Designed a *scalable cloud-based algorithm for private alignment* of DNA sequence data.
  - Worked with the whole human genome and high volumes of Next Generation Sequencing (NGS) data.
  - Evaluated scalability and accuracy using RNA-Seq, ChIP-Seq, SAMtools, and SimLord.
- **Student Research Intern at PisaSales CRM** (2017-2018)
  - Performed a detailed evaluation study of existing visualization libraries and pitched to senior management a library to integrate with the existing software system.
  - Implemented visualization elements such as heat maps, chord diagrams, Venn diagrams, and hive plots.
  - Designed and integrated a *flexible visualization widget* for customer sales data onto a graphical dashboard.
- **Software Engineer 1 at Innominds Software** (2015-2016)
  - Created *versatile UI elements* such as chatbots, visualizations, and navigation menus for BenchmarkONE's Customer Relationship Management and Sales Automation toolkit.
- **Systems Engineer at Tata Consultancy Services** (2013-2015)
  - Developed a communication portal using C# and Microsoft SQL for Microsoft India's weekly newsletters.
  - Migrated the portal to the cloud based on the client's specifications.
  - Responsible for client communication and maintaining content on the cloud.

## TECHNICAL SKILLS

- **Languages:** Python; C#; Java; SQL; JavaScript; LaTeX
- **Libraries:** PyTorch; TensorFlow; Scikit-learn; NumPy; Matplotlib; Pandas
- **Environments & IDEs:** Linux; Git; Google Cloud Platform; MPI; Cluster Computing; Jupyter Notebook
- **Databases:** Neo4j; MongoDB; Cassandra; Redis; MySQL
- **Frontend and Visualization:** SharePoint; HTML5; CSS3; Bootstrap; d3.js; Dimple.js; Gephi

## AWARDS AND SERVICE

- **CAPWIC Conference Travel Award** (2024). Received travel award to attend and give a talk at ACM Capital Region Celebration of Women in Computing held in April 2024.
- **ACSAC Conferenceship Travel Award** (2023). Received confereceship award to attend Annual Computer Security Applications Conference held in December 2023.
- **Volunteer at STEM Santa Fe** (2022). Led the team that mentored $\sim$ 100 school girls for the "Pathways for Girls conference" held in Santa Fe, NM in November 2022.
- **Master's Mentor at Otto-von-Guericke Universität** (2017-2018). Organized social events for 100 incoming Master's students. Mentored international students on adapting to changes in cultural environments.
- **Organizer at Magdeburg Indians** (2017-2018). Organized a Summer Fest for about 1000 participants. Led the cultural team that organized several other annual cultural events.
- **Awards and Other Achievements** (*2004-2013*). Top 10 ranks in the Indian Math Talent Search Exam; Degree in South Indian classical music; Several prizes in the performing arts.

## TALKS AND GUEST LECTURES

- **Privacy Preserving and Feature Importance Based Incentive Mechanism in Vertical Federated Learning** (2024). ACM The Capital Region Celebration of Women in Computing Conference (CAPWIC) 2024
- **Exploring NoSQL Databases: Challenges and Opportunities** (2023). Guest Lecture for CS4604, CS5614: Introduction to Database Management Systems, Fall'23, Spring'24 Virginia Tech

## ACADEMIC PEER REVIEWS

- **IEEE Transactions on Network and Service Management** (2024).