Sindhuja Madabushi

Ph.D. Virginia Tech, Blacksburg, USA

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SKILLS

Programming & Databases: Python, C#, Java, SQL, JavaScript, Neo4j, MySQL
ML & Data: PyTorch, TensorFlow, NumPy, Pandas, Matplotlib, Librosa, DiffPrivLib, PyTorch Geometric, NetworkX
Tools: Linux, Git, MPI, HPC Slurm, Jupyter
Cloud & MLOps Tools: AWS, GCP, containerization (Docker, Kubernetes)
Web & Visualization: HTML5/CSS3, Bootstrap, d3.js, SharePoint

RESEARCH EXPERIENCE

Graduate Research Assistant
Virginia Tech Aug 2023 - Present

ML Systems: Developed a scalable distributed ML framework (VFL) with differential privacy, built for seamless integration into real-world multi-organization settings; achieved **25% higher participation** incentives, faster training cycles, and lower compute costs while maintaining high model model accuracy.

Adversarial AI: Reproduced and extended Label Inference Attack (Fu et al.) with malicious optimizer and model-completion phase, **matching reported accuracy within ±5%**. Implemented Feature Inference, Backdoor Attacks with tunable severity and client configurations across datasets.

Audio ML, XAI & Diffusion: Built an end-to-end audio classification pipeline (resampling → mel-spectrogram → CNN) for early disease detection. Utilized audio diffusion models for explanation-aligned synthesis and reduced **labeling noise by ~30% via targeted review of high-error samples.**

AI Fairness: Benchmarked privacy–fairness trade-offs in FL under IID/non-IID settings and implemented loss disparity monitoring with targeted adjustments, **improving worst-client accuracy by ~25% while guiding equitable AI systems.**

Research Associate
University of Wisconsin-Madison Department of Electrical & Computer Engineering Jan 2020 - Dec 2022

Engineered a scalable two-cloud algorithm for privacy-preserving DNA read alignment, capable of processing the entire human genome and massive volumes of next-generation sequencing data. **Delivered 100 % privacy with zero loss in accuracy**, achieving alignment for a single chromosome in just minutes.

EDUCATION

PhD Candidate
Computer Science
Virginia Tech (Since 2023)

Master of Science
Data and Knowledge Engineering
OVGU Magdeburg (2016 - 2019)

Bachelor of Technology
Computer Science
GITAM University (2009 - 2013)

INDUSTRY EXPERIENCE

Student Research Intern
PiSA sales GmbH
2017 - 2018

Software Engineer 1
Innominds Software
2015 - 2016

Systems Engineer
Tata Consultancy Services
2013 - 2015

SELECTED PUBLICATIONS

OPUS-VFL: Incentivizing Optimal Privacy-Utility Tradeoffs in Vertical Federated Learning
Sindhuja Madabushi, Ahmad Faraz Khan, Haider Ali, Jin-Hee Cho (ArXiv 2025)

Empirical Analysis of Privacy-Fairness-Accuracy Trade-offs in Federated Learning: A Step Towards Responsible AI
Dawood Wasif, Dian Chen, **Sindhuja Madabushi**, Nithin Alluru, Terrence J Moore, Jin-Hee Cho (AIES 2025)

Two-Cloud Private Read Alignment to a Public Reference Genome
Sindhuja Madabushi, Parameswaran Ramanathan (PETS 2023)

AWARDS AND SERVICE

Best Poster Award: Commonwealth Cyber Initiative Southwest Virginia Student Researcher Showcase, 2025
Recognized for excellence in presenting original research in privacy-preserving federated learning.

Elected Secretary: Computer Science Graduate Council, Virginia Tech, 2025–2026
Chosen by peers to represent the graduate student body, coordinate departmental initiatives, and advocate for student interests.

Volunteer, C-Tech^2 Program: Virginia Tech, Summer 2025
Delivered STEM outreach workshops for high school students, introducing optimization concepts and problem-solving activities.

Peer Reviews: IEEE Transactions on Network and Service Management 2024, Transactions on Services Computing 2024, 2025.

Travel Awards: ACM Capital Region Celebration of Women in Computing (CAPWIC) 2024 & 2025; Conferenceship Travel Award, Annual Computer Security Applications Conference (ACSAC) 2023.

Volunteer, STEM Santa Fe: Nonprofit organization that delivers STEM programs, mentoring, and resources
Led a mentoring team for ~100 school students, inspiring participants to explore STEM careers.

Master's Mentor: Otto-von-Guericke University, 2017–2018
Organized orientation events and provided mentorship to over 100 incoming international graduate students.

Organizer: Magdeburg Indians, 2017–2018
Directed the cultural team for community events, including a summer festival with ~1,000 attendees.