

Anindya Bijoy Das

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- Summary**
- Won **Karas Award** for outstanding dissertation in Iowa State University in 2022
 - 2024 **Postdoctoral Mentor Award Nominee** for The Graduate School, Purdue University
 - Highly experienced in coding, speci cally in **Python** and **MATLAB** and their toolboxes
 - Got best paper awards; also got research and teaching excellence awards in Iowa State University
 - Highly experienced in carrying out large-scale simulations in **AWS** using **MPI** toolbox
 - Research experience in federated Learning, distributed computations, signal processing etc.
 - Research interest: Cloud & Edge Computing, AI/ML applications, Data Analytics, Signal Processing
- Education**
- PhD** in Electrical Engineering in Iowa State University **May 2022**
- Major Professor: Dr. Aditya Ramamoorthy
 - Specialization: Signal Processing, **Minor: Mathematics**
- M.Engg.** from Electrical and Computer Engineering in Iowa State University **May 2018**
- B.Sc.** in EEE, in Bangladesh University of Engineering & Technology (BUET) **Jul 2014**
- Grant Writing Experiences**
- **A Grant of \$73,000:** awarded by Autonomous and Connected Systems of Purdue Engineering Initiatives to conduct research on AI tensor computations in edge network.
 - Assisted to write **NSF** proposals during the PhD study (CCF- 1910840 and CCF-2115200)
 - Assisted in proposal writing and presentation during the postdoctoral tenure: this includes proposals in

A. N. Arun, **A. B. Das**, C. G. Brinton, D. J. Love and J. V. Krogmeier "Do Small Cells Make Sense for Simple Low Cost LPWANs?", **IEEE Wireless Communications Letters**, 2024.

A. B. Das, A. Ramamoorthy, D. J. Love and C. G. Brinton, "Distributed Matrix Computations with Low-weight Encodings", **IEEE Journal on Selected Areas in Information Theory**, 2023.

M. S. Oh, **A. B. Das**, S. Hosseinalipour, T. Kim, D. J. Love and C. G. Brinton, "A Decentralized Pilot Assignment Algorithm for Scalable O-RAN Cell-Free Massive MIMO", **IEEE Journal on Selected Areas in Communications**, 2023.

A. B. Das and A. Ramamoorthy, "A Unified Treatment of Partial Stragglers and Sparse Matrices in Coded Matrix Computation", **IEEE Journal on Selected Areas in Information Theory**, 2022.

A. B. Das and A. Ramamoorthy, "Coded sparse matrix computation schemes that leverage partial stragglers," **IEEE Transaction on Information Theory**, 2022.

A. B. Das, A. Ramamoorthy and N. Vaswani, "Efficient and Robust Distributed Matrix Computations via Convolutional Coding," **IEEE Transaction on Information Theory**, 2021.

A. Ramamoorthy, **A. B. Das** and L. Tang, "Straggler-Resistant Distributed Matrix Computation via Coding Theory: Removing a Bottleneck in Large-Scale Data Processing", **IEEE Sig. Proc. Mag.**, 2020.

M. M. Rahman, M. I. H. Bhuiyan and **A. B. Das**, "Classification of focal and non-focal EEG signals in VMD-DWT domain using ensemble stacking", **Biomed. Sig. Proc. and Control**, Elsevier, 2019.

A. B. Das and M. I. H. Bhuiyan, "Discrimination and classification of focal and non-focal EEG signals using entropy-based features in the EMD-DWT domain", **Biomed. Sig. Proc. and Control**, 2016.

A. B. Das, M. I. H. Bhuiyan and S. M. S. Alam, "Classification of EEG signals using normal inverse Gaussian parameters in the DT-CWT domain for seizure detection", **Sig., Img. and Vid. Proc.**, 2016.

Manuscripts Under Review

J. Kim, T. Kim, **A. B. Das**, S. Hosseinalipour, D. J. Love and C. G. Brinton, "Coding for Gaussian Two-Way Channels: Linear and Learning-Based Approaches", under review.

B. Lee, **A. B. Das**, D. J. Love, C. G. Brinton and J. V. Krogmeier, "Constant Modulus Waveform Design with Interference Exploitation for DFRC Systems: A Block-Level Approach", under review.

S. Wagle, **A. B. Das**, D. Love and C. Brinton, "Multi-Agent Reinforcement Learning for Graph Discovery in D2D-Enabled Federated Learning", under review.

Selected Conference Papers

S. K. Sakib and **A. B. Das**, "Challenging Fairness: A Comprehensive Exploration of Bias in LLM-Based Recommendations", **IEEE Intl. Conf. on Big Data (BigData)**, 2024.

S. K. Sakib and **A. B. Das**, "Explainable Vertical Federated Learning for Healthcare: Ensuring Privacy and Optimal Accuracy", **IEEE (BigData) Workshop: Big Data and AI for Healthcare**, 2024.

S. Lee, **A. B. Das**, S. Wagle and C. Brinton, "A Reinforcement Learning-Based Approach to Graph Discovery in D2D-Enabled Federated Learning", **IEEE Intl. Conf. Commun. (ICC)**, 2024.

S. Wagle, **A. B. Das**, D. Love and C. Brinton, "A Reinforcement Learning-Based Approach to Graph Discovery in D2D-Enabled Federated Learning", **IEEE Glob. Comm. Conf. (GLOBECOM)**, 2023.

A. B. Das and A. Ramamoorthy, D. Love and C. Brinton, "Preserving Sparsity and Privacy in Straggler-Resilient Distributed Matrix Computations", **Ann. Allerton Conf. on Comm., Control & Comput.** 2023.

A. B. Das and A. Ramamoorthy, D. Love and C. Brinton, "Distributed Matrix Computations with Low-weight Encodings", **IEEE Intl. Symp. on Info. Theory (ISIT)**, 2023.

A. B. Das and A. Ramamoorthy, D. Love and C. Brinton, "Coded Matrix Computations for D2D-Enabled Linearized Federated Learning", **IEEE Intl. Conf. Acoustics, Speech, & Sig. Proc. (ICASSP)**, 2023.

A. B. Das and A. Ramamoorthy, "An Integrated Method to Deal with Partial Stragglers and Sparse Matrices in Distributed Computations", accepted in **IEEE Intl. Symp. on Info. Theory (ISIT)**, 2022.

- A. B. Das** and A. Ramamoorthy, "A Unified Treatment of Partial Stragglers and Sparse Matrices in Coded Matrix Computation", IEEE Info. Theory Workshop (**ITW**), 2021.
- A. B. Das** and A. Ramamoorthy, "Coded sparse matrix computation schemes that leverage partial stragglers", IEEE Intl. Symp. on Info. Theory (**ISIT**), 2021.
- A. B. Das**, A. Ramamoorthy and N. Vaswani, "Efficient and Robust Distributed Matrix Computations via Convolutional Coding", IEEE Intl. Symp. on Info. Theory (**ISIT**), 2021.
- A. B. Das** and A. Ramamoorthy, "Distributed Matrix-Vector Multiplication: A Convolutional Coding Approach", IEEE Intl. Symp. on Info. Theory (**ISIT**), 2019.
- A. B. Das**, A. Ramamoorthy and L. Tang, " C^3LES : Codes for Coded Computation that Leverage Stragglers", IEEE Info. Theory Workshop (**ITW**), 2018.
- A. B. Das** and M. I. H. Bhuiyan, "Discrimination of Focal and Non-focal EEG Signals using Entropy-based Features in EEMD and CEEMDAN Domains", IEEE Conf. Elec. Comp. Engr. (**ICECE**), 2016.
- M. I. H. Bhuiyan and **A. B. Das**, "A subband correlation-based method for the automatic detection of epilepsy and seizure in the DT-CWT domain", IEEE Conf. on Biomed. Eng. and Sci. (**IECBES**), 2014.
- A. B. Das** and M. I. H. Bhuiyan, "Bessel k-form parameters in the dual tree complex wavelet transform domain for the detection of epilepsy and seizure", (**ICECE**), 2014
- A. B. Das**, M. I. H. Bhuiyan and S M S. Alam, "A Statistical Method for Automatic Detection of Seizure and Epilepsy in the Dual Tree Complex Wavelet Transform Domain", (**ICIEV**), 2014

Research Experiences

Backdoor Attacks on Vertical Federated Learning (VFL)

- Developed a novel backdoor attack on VFL which does not rely on server gradient information
- Considered collusion among multiple adversaries for sample selection and trigger embedding
- Conducted convergence analysis that reveals the impact of backdoor perturbations on VFL.

Improving communication delay and privacy in Federated Learning

- Developed algorithms for linearized federated learning in a **D2D setting** for data offloading
- Utilized the **heterogeneity** of the clients and exploited the stragglers to enhance the overall speed
- Reduced communication delay and **privacy**

- Utilized SVM and kNN classifiers to classify EEG datasets with at least 4% higher accuracy
- Worked on practical datasets: CHB-MIT datasets, Bern-Barcelona dataset, Bonn EEG dataset etc.

Teaching Experiences

- **Assistant Professor**, ECE, The University of Akron
Conducted Course: Digital Communication, ELEN: 441/541 for senior level undergrad and masters students in Fall-2024. Teaching duties also include preparing and grading assignments and exams.
- **Teaching Assistant**, ECE, Iowa State University
Conducted Laboratory Courses: Introduction to Circuits and Instruments and Introduction to AC Circuits and Motors. Duties also include preparing exam rubrics, grading the exams, office hours etc.
- **Lecturer**, ECE, Presidency University, Bangladesh
Conducted Courses: Numerical Methods, Digital Signal Processing (theory and laboratory), Electronics, Engineering Electromagnetics, Programming Language (C), Properties of Materials. Duties also include preparing the corresponding course outlines, preparing exam questions etc.
- **Volunteer Tutor**, CyMath
Served as a tutor for 3rd and 4th grade kids in the program **Cymath-kids**

Awards

- Karas Award**, 2022, Iowa State University
For the Outstanding Dissertation in Mathematical and Physical Sciences and Engineering
- Research Excellence Award**, Fall-2021
Department of Electrical and Computer Engineering, Iowa State University
- Teaching Excellence Award**, Fall-2020
Department of Electrical and Computer Engineering, Iowa State University
- National Science Foundation (NSF) Travel Grant**
For travelling to Paris, France for International Symposium on Information Theory (ISIT), 2019
- 1st Position, Best Paper Award**
IEEE Intl. Conf. on Electrical Engineering and Info. and Comm. Tech. (ICEEICT), 2015
- 2nd Position, Best Paper Award**
IEEE Intl. Conf. on Electrical Info. and Comm. Tech. (EICT), 2013
- National Champion**, in the higher secondary category
Bangladesh Mathematical Olympiad, 2008

Technical Skills

- Programming Languages:** C, Python, 8086 Assembly Language
- Numerical Analysis and Signal Processing:** MATLAB
- Deep Learning Toolbox:** TensorFlow, Torch, Keras
- Parallel Computation:** AWS, MPI, Cuda, Cudnn
- Document Preparation & Illustration:** LATEX, MS Office
- Circuit Design tools:** Proteus, PSPICE, Orcad, Simulink

Graduate Courses

- | | | |
|---------------------------------|------------------------|---------------------|
| Deep Machine Learning | Data Analytics | Abstract Algebra |
| Statistical Machine Learning | Linear Algebra | Convex Optimization |
| Detection and Estimation Theory | Non-linear Programming | Real Analysis |

Students Guided

- **Myeung Suk Oh**, a PhD student
First, we developed a low-complexity pilot assignment scheme which can be incorporated in O-RAN cell free massive MIMO architecture. Second, we have developed positioning neural network (PNN) for complexity reduction in ML-based wireless positioning. Both of these papers are accepted in IEEE Journal on Selected Areas in Communications (**JSAC, Impact Factor: 16.4**).

- **Satyavrat Wagle**, a PhD student.

We developed a decentralized RL methodology for D2D graph discovery that promotes communication