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

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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 Uni ed 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, \E cient 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, \Classi cation 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 classi cation 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, \Classi cation 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 Uni ed 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, \E cient 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 onvergence 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 o oading
- Utilized the heterogeneity of the clients and exploited the stragglers to enhance the overall speed
- Reduced communication delay and privacy

- Utilized SVM and kNN classi ers 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, o ce 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 3*rd* and 4*th* 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 O ce
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