Anindya Bijoy Das

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Summary

- Won **Karas Award** for outstanding dissertation in Iowa State University in 2022
- Working on Federated Learning to reduce communication delay and privacy leakage
- Highly experienced in coding, specifically in **Python** and **MATLAB**
- Carried out large-scale simulations in **AWS** using **MPI** toolbox
- Got best paper awards; research and teaching excellence awards

Education

PhD in **EE**, Iowa State University, USA **May 2022**
Specialization: Signal Processing, **Minor: Mathematics**

M. Engg. EE, Iowa State University **May 2018**

B.Sc. in EEE, Bangladesh Univ. of Eng. & Tech. **Jul 2014**

Technical Skills

Programming Languages: Python, C, 8086 Assembly
Numerical Analysis & Signal Processing: MATLAB
Deep Learning Toolbox: TensorFlow, Torch, Keras
Parallel Computation: AWS, MPI, Cuda, Cudnn

Professional Experiences

Postdoctoral Researcher, Purdue University **May 2022-Present**
Research on federated learning, edge computation, deep reinforcement learning.

Research Assistant, Iowa State University **May 2019-May 2022**
Research on straggler mitigation in distributed computations and simulations in AWS

Teaching Assistant, Iowa State University **Aug 2016-May 2019**
Conducted Lab Courses: Introduction to Circuits and Instruments and Motors.

Lecturer, Presidency University, Bangladesh **Feb 2015-Jul 2016**
Courses: Numerical Methods, Digital Signal Processing, Programming Language etc.

Research Experiences

Improving communication delay and privacy in Federated Learning

- Developed an algorithm for linearized federated learning in a D2D setting
- Utilized the heterogeneity of the clients to enhance the job completion speed
- Reduced overall delay and privacy leakage by limited data transmission

Optimal Graph Discovery in D2D-Enabled Federated Learning

- Finding an optimal graph to minimize data exchange among the clients
- Addressing constraints based on power consumption, privacy and stragglers

Enhancing the numerical stability and speed of distributed computation

- The **recovery error has been reduced** by 2 orders of magnitude than others
- One of the **fastest decoding** schemes: no need of division and multiplication
- Worker node computation can be at least 2× **faster** for sparse matrices

Classification of EEG data for detection of epilepsy and epileptogenic zone

- Utilized different classifiers: SVM, kNN etc. to classify practical EEG datasets
- The overall accuracy has been improved significantly (by around 6%)

Graduate Courses

Deep Machine Learning	Data Analytics	Probability & Statistics
Non-linear Programming	Abstract Algebra	Linear Algebra
Statistical Machine Learning	Convex Optimization	Digital Signal Processing

Relevant Projects

Image recognition from CIFAR-10 dataset using deep residual learning
- Implemented convolutional neural network in TensorFlow (TF) using GPU

Prediction of a time series sequence using recurrent neural network
- Implemented TF-based RNN for the prediction of multidimensional data

Generative adversarial networks (GAN) in image super-resolution
- Implemented deep convolutional GANs to upscale images by $4\times$ factor

Classification of '20 Newsgroups' dataset using Bayes classifier
- Implemented multinomial naive Bayes model and MLE to show their difference.

Application of decision tree for 'Breast Cancer Wisc. (Original)' dataset
- Utilized scikit-learn toolbox to implement decision tree with k-fold cross-validation

Application of optimization algorithms for X-ray CT images
- Developed a regularized MM algorithm to recover images from sparse sampling

Designing the university course registration system
- Implemented all the primary concepts of programming languages in C

Awards

Karas Award, for outstanding dissertation, 2022, Iowa State University
Research Excellence Award, fall-2021, dept. of ECpE, Iowa State University
Teaching Excellence Award, fall-2020, dept. of ECpE, Iowa State University
1st Position, best paper award, IEEE conference iCEEiCT, 2015
2nd Position, best paper award, IEEE conference EICT, 2013
National Champion, higher secondary, Bangladesh math olympiad, 2008

Selected Journals

A. B. Das, et. al., "Distributed Matrix Computations with Low-weight Encodings", under review in **IEEE Jour. on Sel. Areas in Info. Th.**.

M. S. Oh, **A. B. Das**, et. al., "A Decentralized Pilot Assignment Methodology for Scalable O-RAN Cell-Free Massive MIMO", under review in **IEEE Jour. on Sel. Areas in Comm.**.

A. B. Das, et. al., "A Unified Treatment of Partial Stragglers and Sparse Matrices in Coded Matrix Computation", **IEEE Jour. on Sel. Areas in Info. Th.**, 2022.

A. B. Das, et. al.,"Coded sparse matrix computation schemes that leverage partial stragglers," in **IEEE Trans. on Info. Th.**, 2022.

A. B. Das, et. al., "Efficient and Robust Distributed Matrix Computations via Convolutional Coding", in **IEEE Trans. on Info. Th.**, 2021

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

Selected Conference Papers

A. B. Das, et. al., "Coded Matrix Computations for D2D-Enabled Linearized Federated Learning", **ICASSP**, 2023

S. Wagle, A. B. Das, et. al., "A Reinforcement Learning-Based Approach to Graph Discovery in D2D-Enabled Federated Learning", under review in **GLOBECOM**.

A. B. Das, et. al., "An Integrated Method to Deal with Partial Stragglers and Sparse Matrices in Distributed Computations", **ISIT**, 2022

A. B. Das, et. al., "C^3LES: Codes for Coded Computation that Leverage Stragglers", **ITW**, 2018

Reviewer Experiences

IEEE Transactions: TCOM, TPDS, TPAMI, TNSRE etc.

Others: ICASSP, PLOS ONE, IEEE Access, BSPC, IET Image Processing etc.