

Hafiz Imtiaz

PROFESSOR · MACHINE LEARNING

Department of EEE, Bangladesh University of Engineering and Technology

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Research Interests

Machine learning, decentralized computation, optimization, differential privacy, matrix & tensor factorization, feature learning, source separation, dimension reduction, computer vision, pattern recognition, neuroimaging, signal/image processing.

Experience

Bangladesh University of Engineering and Technology

Dhaka, Bangladesh

PROFESSOR

Jan 2024 – till date

- Research works: i) Decentralized privacy-preserving computations; ii) Privacy-preserving non-negative matrix factorization and matrix completion; iii) Privacy-preserving approximation of functions; iv) Human activity recognition and indoor localization using WiFi CSI data.

Intel Labs

2111 NE 25th Ave, Hillsboro, OR 97124

SECURITY RESEARCH INTERN

May 2019 - Aug 2019

- Evaluation of adversarial attacks on state-of-the-art machine learning algorithms and formulation of defenses against such class of attacks.
- Tools used: **cleverhans**, **TensorFlow**.

Qualcomm Inc.

3165 Kifer Rd, Santa Clara, CA 95051

INTERIM ENGINEERING INTERN

May 2018 - Aug 2018

- Image processing – key point detection, tracking and analyzing from image sequences using **OpenCV**.

Qualcomm Inc.

3165 Kifer Rd, Santa Clara, CA 95051

INTERIM ENGINEERING INTERN

May 2017 - Aug 2017

- Development of Deep Learning algorithms for regression (using **Keras/TensorFlow** on GPUs).

Rutgers University

94 Brett Road, Piscataway, NJ 08854

GRADUATE ASSISTANT

Sep 2015 - Jan 2020

- Development of a protocol for decentralized differentially private computations that can provide utility very close to the pooled-data scenario.
- Development of matrix factorization algorithms for the collaborative neuroimaging data analysis tool **COINSTAC**: PCA, CCA and ICA.
- Development of algorithms for decentralized differentially private orthogonal tensor decomposition, NMF and functional approximation.
- Development of a Python package **dp-stats** that includes commonly used differentially private machine learning and statistical algorithms.
- All codes posted on **GitLab** and **GitHub**.

Rutgers University

94 Brett Road, Piscataway, NJ 08854

TEACHING ASSISTANT

Sep 2014 - Aug 2015

- Course taught: Introduction to Computers for Engineers (14:440:127) – Summer 2015, Spring 2015, Fall 2014.

Bangladesh University of Engineering and Technology

Dhaka, Bangladesh

ASSOCIATE PROFESSOR/ASSISTANT PROFESSOR/LECTURER

Apr 2009 - Jan 2024

- Research works: i) Power quality classification - spectral feature extraction for classification of power quality disturbance; ii) Action recognition - feature extraction from video sequences employing RANSAC, OpticalFlow, etc. Face and palm-print based human identification - feature extraction from spectral and wavelet domains for efficient face/palm-print recognition.

Education

Rutgers University

94 Brett Road, Piscataway, NJ 08854

PH.D. IN ELECTRICAL AND COMPUTER ENGINEERING

2014 - 2020

- Cumulative GPA: 4.00 / 4.00.
- Dissertation title: *Decentralized Differentially Private Algorithms for Matrix and Tensor Factorization*.
- Relevant courses: Digital Signals and Filters, Stochastic Signals and Systems, Convex Optimization, Detection and Estimation Theory, Information Theory and Coding, Biometrics, Image Coding and Processing, Machine Learning (Coursera), Neural Networks and Deep Learning (Coursera), Convolutional Neural Networks (Coursera).

Rutgers University

94 Brett Road, Piscataway, NJ 08854

M.Sc. IN ELECTRICAL AND COMPUTER ENGINEERING

2014 - 2017

- Cumulative GPA: 4.00 / 4.00.
- Topic: *Empirical Comparison of Differentially Private Principal Component Analysis Algorithms*.

Bangladesh University of Engineering and Technology

Dhaka, Bangladesh

M.Sc. IN ELECTRICAL AND ELECTRONIC ENGINEERING

2009 - 2011

- Cumulative GPA: 3.92 / 4.00.
- Thesis title: *A Spectral Domain Dominant Feature Extraction Algorithm for Face and Palm-print Recognition*.
- Relevant courses: Biomedical Signal Processing, Advanced Digital Signal Processing, Broadband Wireless Comm., Digital Speech Processing.

Bangladesh University of Engineering and Technology

Dhaka, Bangladesh

B.Sc. IN ELECTRICAL AND ELECTRONIC ENGINEERING

2004 - 2009

- Cumulative GPA: 3.97 / 4.00.
- Thesis title: *Show-through Cancellation in Duplex Printed Documents*.
- Relevant courses: Digital Communication, Telecommunication Engineering, Microwave Engineering, Digital Signal Processing I & II, Random Signals and Processes, Microprocessor and Interfacing, Control System, Computer Programming (C and C++).

Honors & Awards

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY

2024	Research and Innovation Centre for Science and Engineering (RISE) Internal Research Grant , Bangladesh University of Engineering and Technology	Dhaka, Bangladesh
2023	Ministry of Science and Technology Special Research Grant , Bangladesh Government	Dhaka, Bangladesh
2023	BUET CASR Research Grant , Department of EEE, BUET	Dhaka, Bangladesh
2023	BUET Basic Research Grant , Department of EEE, BUET	Dhaka, Bangladesh
2023	BUET Publication Incentive Award , Department of EEE, BUET	Dhaka, Bangladesh
2022	Second Runner-Up , IEEE Signal Processing Cup 2022	Singapore

RUTGERS UNIVERSITY

2020	ECE Graduate Program Academic Achievement Award , Department of ECE	New Jersey, USA
2019	PhD Research Excellence Award , Department of ECE	New Jersey, USA
2019	PreDoctoral Leadership Development Academy Fellow , Center for Organizational Leadership	New Jersey, USA
2018	Conference Travel Award , School of Graduate Studies	New Jersey, USA
2018	TA/GA Professional Development Fund Award , Rutgers University	New Jersey, USA
2017	TA/GA Professional Development Fund Award , Rutgers University	New Jersey, USA
2016	PhD Research Excellence Award , Department of ECE	New Jersey, USA
2016	Conference Travel Award , National Science Foundation (NSF)	New Jersey, USA
2016	TA/GA Professional Development Fund Award , Rutgers University	New Jersey, USA

Publications (selected)

JOURNALS

- Privacy-Preserving Non-Negative Matrix Factorization for Decentralized-Data Using Correlated Noise**, Hafiz Imtiaz, TUSHER KARMAKAR, AND PROTOYE KUMAR MOHONTA, *Springer Signal, Image and Video Processing*, February 2025
- Privacy-Preserving Human Activity Recognition Using Principal Component-Based Wavelet CNN**, NADIRA PERVIN, TAHSINA FARAH SANAM, AND Hafiz Imtiaz, *Springer Signal, Image and Video Processing*, August 2024
- Machine Learning Modeling for Performance Enhancement of Perovskite Solar Cell with CNT as both Hole Transport Layer and Back Contact**, IHTESHAM IBN MALEK, Hafiz Imtiaz, AND SAMIA SUBRINA, *Elsevier Solar Energy*, August 2024
- Privacy-Preserving Matrix Factorization for Recommendation Systems using Gaussian Mechanism and Functional Mechanism**, SOHAN SALAHUDDIN MUGDHO AND Hafiz Imtiaz, *Springer International Journal of Machine Learning and Cybernetics*, July 2024
- A Robust Neural Network for Privacy-Preserving Heart Rate Estimation in Remote Healthcare Systems**, TASNIM NISHAT ISLAM AND Hafiz Imtiaz, *Elsevier Healthcare Analytics*, June 2024
- Privacy-preserving Non-negative Matrix Factorization with Outliers**, SWAPNIL SAHA AND Hafiz Imtiaz, *ACM Transactions on Knowledge Discovery from Data*, January 2024
- Approximating Functions with Approximate Privacy for Applications in Signal Estimation and Learning**, NAIMA TASNIM, JAFAR MOHAMMADI, ANAND D. SARWATE AND Hafiz Imtiaz, *Entropy Information-Theoretic Privacy in Retrieval, Computing, and Learning*, May 2023
- Human Activity Recognition from Wi-Fi CSI Data Using Principal Component-Based Wavelet CNN**, ISHTIAQUE AHMED SHOWMIK, TAHSINA FARAH SANAM AND Hafiz Imtiaz, *Elsevier Digital Signal Processing*, Apr 2023
- A Correlated Noise-Assisted Decentralized Differentially Private Estimation Protocol, and its Application to fMRI Source Separation**, Hafiz Imtiaz, JAFAR MOHAMMADI, ROGERS SILVA, BRADLEY BAKER, SERGEY M. PLIS, ANAND D. SARWATE AND VINCE CALHOUN, *IEEE Trans. Sig. Proc.*, Nov 2021
- Distributed Differentially Private Computation of Functions with Correlated Noise**, Hafiz Imtiaz, JAFAR MOHAMMADI AND ANAND D. SARWATE, *arXiv-eprint*, Apr 2019
- Distributed Differentially Private Algorithms for Matrix and Tensor Factorization**, Hafiz Imtiaz AND ANAND D. SARWATE, *IEEE Journal of Selected Topics in Signal Processing*, Dec 2018
- Action Recognition Based on Statistical Analysis from Clustered Flow Vectors**, UPAL MAHBUB, Hafiz Imtiaz AND MD. ATIQUUR RAHMAN AHAD, *Springer Signal Image and Video Processing*, Aug 2013
- A Histogram-based Dominant Wavelet Domain Feature Selection Algorithm for Palm-print Recognition**, Hafiz Imtiaz AND SHAIKH ANOWARUL FATTAH, *Elsevier Computers and Electrical Engineering*, Feb 2013
- A Wavelet-domain Local Dominant Feature Selection Scheme for Face Recognition**, Hafiz Imtiaz AND SHAIKH ANOWARUL FATTAH, *ISRN Machine Vision*, Mar 2012

CONFERENCES

- A Robust Image Watermarking Approach for Application in AI Generated Images**, TARVIR ANJUM ADITTO, MD. RAKIB SHAHARIAR, Hafiz Imtiaz, *International Conference on Electrical and Computer Engineering (ICECE) 2024*, December 2024
- Empirical Analysis of The Privacy-Utility Trade-off of Classification Algorithms Under Differential Privacy**, NUR MOHAMMAD SARWAR BARI, Hafiz Imtiaz, *International Conference on Computer and Information Technology (ICCIT) 2023*, December 2023
- DCT-Based Feature Extraction For Human Activity Recognition using WiFi Channel State Information Data**, ISHTIAQUE AHMED SHOWMIK, TAHSINA FARAH SANAM, Hafiz Imtiaz, *IEEE Region 10 Conference (TENCON) 2023*, October 2023
- Cyber Threat Detection Using Machine Learning Algorithms on Heterogeneous MiniVHS-22 Dataset**, I. F. RAHMAN, R. Z. TANNA, U. HABIBA, R. SHAIKH, Z. RAHMAN, AND Hafiz Imtiaz, *IEEE International Conference on Computer and Information Technology (ICCIT)*, December 2022
- Correlation-Assisted Distributed Differentially Private Estimation**, Hafiz Imtiaz, JAFAR MOHAMMADI AND ANAND D. SARWATE, *NeurIPS 2019 Workshop on Privacy in Machine Learning*, December 2019
- Distributed Differentially Private Canonical Correlation Analysis**, Hafiz Imtiaz AND ANAND D. SARWATE, *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2019)*, May 2019
- Improved Algorithms for Differentially Private Orthogonal Tensor Decomposition**, Hafiz Imtiaz AND ANAND D. SARWATE, *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2018)*, Apr 2018
- Differentially Private Distributed Principal Component Analysis**, Hafiz Imtiaz AND ANAND D. SARWATE, *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2018)*, Apr 2018
- Differentially Private Canonical Correlation Analysis**, Hafiz Imtiaz AND ANAND D. SARWATE, *IEEE Global Conference on Signal and Information Processing (GlobalSIP 2017)*, Oct 2017
- Privacy-preserving Source Separation for Distributed Data using Independent Component Analysis**, Hafiz Imtiaz, ROGERS SILVA, BRADLEY BAKER, SERGEY M. PLIS, ANAND D. SARWATE AND VINCE CALHOUN, *Annual Conference on Information Sciences and Systems (CISS 2016)*, Mar 2016

Presentations

3-Minute-Thesis Competition

DIFFERENTIALLY PRIVATE MATRIX AND TENSOR FACTORIZATION WITH APPLICATION IN NEUROIMAGING

Montreal, Quebec, Canada

Nov 2017

ECE Research Day, Rutgers University

DIFFERENTIALLY PRIVATE CORRELATION HEATMAP FROM MULTI-MODAL LOCATION DATASETS

New Jersey, USA

Nov 2017

Rutgers Day, Rutgers University

LEARNING LATENT FEATURES IN IMAGES WITH APPLICATIONS TO BRAIN IMAGING

New Jersey, USA

Apr 2017

ECE Research Day, Rutgers University

DP-STATS: A PYTHON LIBRARY FOR DIFFERENTIALLY-PRIVATE STATISTICS AND MACHINE LEARNING ALGORITHMS

New Jersey, USA

Feb 2016

ECE Research Day, Rutgers University

DIFFERENTIALLY-PRIVATE PRINCIPAL COMPONENT ANALYSIS FOR DIMENSIONALITY REDUCTION AND ITS APPLICATION IN FMRI

New Jersey, USA

Feb 2016

Tutorial Talk, International Conference on Informatics, Electronics and Vision (ICIEV)

FACE AND ACTION RECOGNITION: FUNDAMENTAL TECHNIQUES AND CHALLENGES

Dhaka, Bangladesh

May 2014

Tutorial Talk, International Conference on Electrical Engineering and Information Communication Technology (ICEEICT)

BIOMETRIC SECURITY: RECOGNITION TECHNIQUES AND CHALLENGES

Dhaka, Bangladesh

Apr 2014

EEE Undergraduate Project Workshop (EUProW)

FACE RECOGNITION USING DISCRETE COSINE TRANSFORMS

Dhaka, Bangladesh

Oct 2009

Skills

Programming languages	Expert: Python, MATLAB; Basic: Java, C, SLURM, 8086 Assembly.
Deep learning software	TensorFlow, Keras, Pytorch
Computer vision software	OpenCV.
Machine learning	Matrix factorization, regression, support vector machine, clustering, gradient descent, Scikit-Learn, cvx.
Simulation software	Expert: OrCAD PSpice; Basic: Microwind and DSCH.
Office software	Expert: Microsoft Office, \LaTeX , \TeX .
Drawing and imaging software	Adobe Photoshop, Adobe Illustrator, AutoCAD, SolidWorks, and Microsoft Visio.
Operating systems	Mac OSX, Windows, Linux (Ubuntu and openSUSE).
Misc.	Practical experience about computer hardware, troubleshooting, networking; system implementation using ATmega16 microcontroller; basic Android app development.