Riyasat **Ohib**

Ph.D. Candidate | Georgia Tech

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Education

Present – Aug 2021 — **Georgia Institute of Technology, Ph.D. in ECE (Concentration in AI), Atlanta, GA**

- Research in efficient AI, sparsity, pruning and model compression.
- Applications of efficient AI in federated, multi-task and multi-modal learning.
- Supervised by Dr. Vince Calhoun and Dr. Sergey Plis.
- CGPA : 4.0/4.0

Aug 2021 – Aug 2019 — **Georgia Institute of Technology, Master's in ECE Program, Atlanta, GA**

- Research in Sparse Neural Networks and Neural Network Pruning.
- CGPA : 4.0/4.0

Professional Experience

Aug 2022 – May 2022 — **FAIR at Meta AI : Fundamental (previously Facebook) AI Research**
Research Scientist Intern, Menlo Park, CA

- Designed & implemented a git-like library for version control & model compression called weigit.
- Weigit was integrated as part of the open-source facebookresearch/fairscale library.
- Research on extreme sparsity in deep learning models using signal processing based techniques (e.g. FFT and DCT) during training.

Sparse Neural Networks | Model Compression | Model Pruning | Efficient AI | Signal Processing | Research

April 2018 – Oct 2017 — **BAT Bangladesh**
Team Leader, Full Time, Dhaka, Bangladesh

- Acted as one of the 4 Team Leaders in the Manufacturing Department in one of Bangladesh's largest production facilities.
- Learned project management and data analysis in a large-scale multinational corporation by leading a group of over 80 Engineers, Technicians and Staffs.

Project Managemet | Team Leader | Data Driven Decision Making

Research Projects

Present – Aug 2020 — **Sparsity in Deep Learning, Model Compression and Pruning**
GRA, TReNDS - A Joint Georgia Tech, GSU and Emory University Center, Atlanta, GA

- Developed a novel Group Sparse Projection algorithm. Work published in TMLR.
- Sparse training and benchmarked large models on vision datasets including ImageNet.
- Models pruned even in the extreme sparsity range ($> 90\%$) retained close to baseline accuracy.

Model Compression | Sparse Deep Learning | Computer Vision | Neural Network Pruning | PyTorch | NumPy | Distributed Training

Present – January 2023 — **Sparse Communication Efficient Federated Learning**
GRA, TReNDS - A Joint Georgia Tech, GSU and Emory University Center, Atlanta, GA

- Developed a sparse communication efficient method at early stage of Federated training .
- Trained sparse models deployed on actual decentralized framework used by Neuroimaging labs and around 1.7 times wall-time acceleration observed.

Sparse Federated Learning | Model Compression | Sparse Deep Learning | Computer Vision | PyTorch | Differential privacy

Present – May 2021 — **Sparsity in Reinforcement Learning and sparse multi-task Learning in RL**
TReNDS Center, collaboration with MILA, Montreal, CA, Atlanta, GA

- Exploring network pruning for offline and online RL tasks before training. Preliminary work accepted at NeurIPS workshop, full work under review.
- Exploring new paradigms for multitask RL inspired by techniques from sparse deep learning (under review).
- Collaborating with Dr. Doina Precup's group at Montreal Institute for Learning Algorithms (MILA).

Reinforcement Learning | Network Pruning | Sparsity | Python | PyTorch | NumPy

Mar 2016 | **Predicting Location of Audio Recordings**
Sep 2015 | **IEEE Signal Processing Cup : Team and Programming Lead IUT**, Dhaka, BD

- Predicted the location of recording of audio files, exploiting embedded background power signatures from nearby electrical power lines via machine learning techniques.
- Led the Islamic University of Technology (IUT) Signal Processing Cup team to 11th rank worldwide and an Honorable Mention in IEEE Signal Processing Cup, 2016.

Machine Learning | Signal Processing | Fourier Analysis | FFT | Short Time Fourier Transform | Audio Data | Matlab

Technical Strengths

- Deep Learning, Machine Learning, Computer Vision, Optimization.
- Python, C++, Matlab.
- PyTorch, Numpy, Pandas.
- Linux, slurm, cluster computing, bash scripting.

Relevant Coursework

Statistical Machine Learning | Convex Optimization | Linear Algebra | Advanced DSP | Fourier Analysis | Advanced Programming Techniques | Real Analysis | Information processing in Neural Systems

Projects

WeiGit : A git-like neural network model-weight tracking library — 2022

github.com/facebookresearch/fairscale

- Designed & implemented a git-like model weight tracking library for tracking the changes of model weights during training.
- Provides a git like cli and api for easy integration to training scripts.
- Implemented compression for weigit leveraging FFT and data deduplication.

Software Engineering | Open Source Contribution | SW Design | library implementation | Compression

Drone Simulation using OpenGL and OpenMPI — 2019

github.com/riohib/UAV-Simulation-OpenGL-OpenMPI

- A C++ implementation of flight simulation for a pack of drones following physics mechanics equations.
- Flight path was not explicitly programmed, but was constrained and used laws of physics for navigation.
- Graphics was rendered using OpenGL on C++.
- Each drone physics was handled by a separate compute node and all drones were coordinated among nodes using OpenMPI.

C++ | OpenGL | OpenMPI | Physics Simulation | Graphics

ENF Data Acquisition and Analysis : — 2016

github.com/riohib/IEEE-SP-Cup-2016

- Collected 10 hours of Electric Network Frequency (ENF) data from the Bangladesh Power Grid.
- Analyzed data using Fourier Analysis and classified with Support Vector Machines.

Machine Learning | Fourier Analysis | Support Vector Machines | Matlab

Publications and Pre-prints

2023 **Riyasat Ohib**, Bishal Thapaliya, Jingyu Liu, Vince Calhoun and Sergey Plis. *Efficient decentralized Federated learning*. [under review]

2023 Samin Yeasar, **Riyasat Ohib**, Sergey Plis and Doina Precup. *Multitask Sparse Reinforcement Learning*. [under review]

2023 **Riyasat Ohib**, Bishal Thapaliya, Jingyu Liu, Vince Calhoun and Sergey Plis. *Decentralized Sparse Federated Learning for Efficient Training on Distributed NeuroImaging Data*. **Neurips Medical Imaging Workshop, 2023**

2023 **Riyasat Ohib**, Bishal Thapaliya, Pratyush Reddy, Jingyu Liu, Vince Calhoun and Sergey Plis. *SalientGrads : Sparse Models for Communication Efficient and data aware Distributed Federated Training.* **ICLR Sparsity in Neural Networks workshop (SNN), 2023.** *webpage* .

2022 **Riyasat Ohib**, Nicolas Gillis, Niccolo Dalmasso, Vamsi Potluru and Sergey Plis. *Explicit Group Sparse Projection with applications to Deep Learning and NMF*. **Transactions on Machine Learning Research (TMLR), 2022.** webpage

2021 Samin Yeasar, **Riyasat Ohib**, Sergey Plis and Doina Precup. *Single-Shot Pruning for Offline Reinforcement Learning*. **NeurIPS Offline Reinforcement Learning workshop, 2021**. paper webpage

2021 **Riyasat Ohib**, Nicolas Gillis, Sameena Shah, Vamsi Potluru, Sergey Plis. *Grouped Sparse Projection for Deep Learning.* **ICLR Hardware Aware Efficient Training workshop, 2021**. paper webpage

2018 **Riyasat Ohib**, Samin Arnob, Muhtady Muhaisin, Riazul Arefin, Taslim Reza and MR. Amin. *ENF Based Machine Learning Classification for origin of Media Signals : Novel Features from Fourier Transform Profile.* **Accepted at ICEECS 2018** presented on Nov 13-14, 2018.

2017 Samin Yeasar, **Riyasat Ohib**, and Muhtady Muhaisin. *Power file extraction process from Bangladesh grid and exploring ENF based classification accuracy using machine learning.* **IEEE R10HTC Conference, 2017**. paper

2016 **Riyasat Ohib**, Samin Yeasar Arnob, Md Sayem Ali, Rakibul Hasan Sagor, and Md Ruhul Amin. *Metal nanoparticle enhanced light absorption in Ga-As thin-film solar cell.* **IEEE Asia-Pacific Conference on Applied Electromagnetics**, pages 89–93, 2016. paper