Redwan Ibne Seraj Khan | Resume

✉ redwan@vt.edu ● Ⓡ Redwan Khan ● ⌂ R-I-S-Khan ● 🔗 redwan-khan

My research interests are in the area of designing scalable systems for running machine learning (ML) workloads. My work spans across several ML domains—Distributed Deep Learning (DDL), Large Language Models(LLM), and Federated Learning(FL). I am a member of *DSSL (Distributed Systems and Storage Lab)*. My ongoing projects aim to address the limitations of existing systems for running ML workloads and leveraging ML to solve systems-related problems related to memory and resource management. Current research directions include: 1) building novel caching policies and hybrid storage systems for improving training performance of large-scale DDL workloads. 2) developing intelligent procedures for efficient scheduling and resource utilization of DDL/LLM job training/inference. 3) constructing novel mechanisms for client scheduling and sampling in privacy-aware high-performing FL workloads.

Education

Virginia Tech   *August 2019 - Present*
Ph.D. in Computer Science   Overall GPA : 3.9/4
Advisor: *Dr. Ali R Butt*

Virginia Tech   *August 2019 - Spring 2022*
M.Sc. in Computer Science   Overall GPA : 3.9/4
Advisor: *Dr. Ali R Butt*

University at Buffalo (SUNY Buffalo)   *August 2016 - June 2019*
B.Sc. in Computer Engineering   Overall GPA : 3.8/4
Certificate in Data-intensive Computing

Awards

◇ **USENIX FAST 2023 Travel Grant** received from Virginia Tech (VT), CS Dept. & USENIX ($2700).
◇ **USENIX OSDI 2022 Travel Grant** received from Virginia Tech (VT), CS Dept. & USENIX ($2200).
◇ **USENIX FAST 2020 Travel Grant** received from Virginia Tech (VT), CS Dept. ($1500).
◇ **Graduate Recruiting Weekend Travel Grant** received from Virginia Tech (VT), CS Dept. ($500) (2019)
◇ **Placed in Dean's List, Graduated with Highest Distinction**, SUNY UB (2019).
◇ **Selected for Advanced Honors Program**, SUNY UB (2017-2019).
◇ **NSF Grant**, Secured funding for working as a Research Assistant ($3500), SUNY UB. (2018)
◇ **UB Hackathon**, Selected as one of the contestants for Project Demo (∼70 projects). (2017)
◇ **UB CSE Ed Week**, Selected as one of the contestants for Project Demo(∼ 800 people participation) (2017)

Publications

[1] **Redwan Ibne Seraj Khan**, Ahmad Hossein Yazdani, Yuqi Fu, AK Paul, Bo Ji, Xun Jian, Yue Cheng, and Ali R Butt. SHADE: Enable Fundamental Cacheability for Distributed Deep Learning Training. In *21th USENIX Conference on File and Storage Technologies (USENIX FAST)*, 2023 [link].

[2] **Redwan Ibne Seraj Khan**, AK Paul, Yue Cheng, and Ali R Butt. A Smart Approach to Client Selection in Federated Settings. In *Submission*, 2023.

[3] **Redwan Ibne Seraj Khan**, Shruti Dongare, Hadeel Albahar, and Ali R Butt. Scheduler for ML and parallel workloads. In *Preparation*, 2023.

[4] Hadeel Albahar, **Redwan Ibne Seraj Khan**, Shruti Dongare, Nannan Zhao, AK Paul, and Ali R Butt. Intelligent Resource Configurer for Transformer-based Model Inference. In *Preparation*, 2023.

[5] Subil Abraham, AK Paul, **Redwan Ibne Seraj Khan**, and Ali R Butt. On the use of containers in high performance computing environments. In *2020 IEEE 13th International Conference on Cloud Computing (CLOUD)*. IEEE, 2020 [link].

Research Experience

○ **Building bridges between ML workloads and System Resources.**   *Fall 2020 - Present*
Ph.D. Thesis Research, Advisor: Dr. Ali R Butt
Current systems often lead to wastage of resources during running DDL/FL/LLM workloads as those have not been designed to be catered to characteristics specific to these workloads. This project aims to design improved systems and algorithms for boosting training/inference performance.

○ **Container Usage Patterns in HPC Scenarios**   *Fall 2019 - Summer 2020*
PhD Research Project, Advisor: Dr. Ali R Butt
Although the usage of containers has peaked in the recent years, its characteristics when used in HPC scenarios had been left unexplored. The goal of this project was to understand those patterns so that bottlenecks could be removed and improved architectures could be designed.

○ **Autotuning a High Performance Datatype Engine**   *Summer 2021*
Intern, Mathematics and Computer Science(MCS) at Argonne National Lab,
Advisor: Dr. Yanfei Guo and Dr. Shintaro Iwasaki
Examined current performance with different datatypes in Yaksa Pack/Unpack Library of MPICH, developed scripts to implement optimizations in performance, created benchmarks for providing insights into performance optimization scenarios, and designed

an auto-tuner to explore a search space for optimizations.

○ **Approaches for Improving Graph Coloring in Large Networks** *Fall 2018 - Spring 2019*
Undergraduate Thesis, Advisor: Dr. Erdem Sariyuce
Explored on improving graph coloring in massive graph networks and identified methods for analysing large and distributed stock market datasets.

○ **Power Performance Trade-offs for Mobile Devices in Next Gen. WiFi** *Spring 2018*
UG Research Project, Advisor: Dr. Dimitrios Koutsonikolas
Devised algorithms for understanding power consumption by mobile devices using different cores and packet transfer rates.

Selected Projects

○ **SHADE - A caching system for DL workloads** [link] *Fall 2022*
Introduced functionalities to increase read hit ratio of a small cache, and thereby leading to faster accuracy convergenceand higher throughput. Developed high-level APIs for training on a wide variety of models and datasets. Developed using *Python, Redis, and Shell*.

○ **Trending News Detector** [link] *Spring 2018*
Determined co-occurrence of important words in Twitter and News Data using Hadoop MapReduce.
Made a web application to demonstrate the most trending words both in the social media and news.
Developed using *Hadoop, R, Java, HTML, CSS, and Javascript.*

○ **My Way Weather** [link] *Fall 2018*
Integrated different APIs together to form an application which shows the weather along the route of a traveller.
Developed using *Python, Django, Javascript, HTML, and CSS.*

○ **Publisher-Subcriber Distributed System** [link] *Fall 2018*
Implemented a Pub/Sub System for disseminating events to multiple recipients through an intermediary.
Developed using *Docker and Python.*

Computing and Programming Skills

Programming Languages:	Python, C/C++, Java, Javascript, Android, R, Matlab, Assembly(ARM8), Bash
Web Development Languages/Frameworks:	HTML, CSS, React, Angular.js, Node.js, Bootstrap, Django, MongoDB, LaTeX
Software/Technologies:	Spark, Hadoop, Containers, Heroku, Android Studio, Arduino, Raspberry Pi, PyTorch, Tensorflow, Keras, Redis, MySQL, Cloud Computing, Serverless Systems

Teaching Experience

◇ **CS2506 - Computer Organization II** *Fall 2019 - Present*
Teaching Assistant, Virginia Tech
Intermediate course in Computing for CS majors.
Responsibilities: Teaching, Creating Course content, Setting lab servers, TA coordination
Instructor: William McQuain. Course enrollment: ∼350 students.

◇ **CS321 - Real Time Embedded Systems** *Fall 2018*
Teaching Assistant, University at Buffalo
Advanced course in computing for CS majors.
Responsibilities: Taking office/recitation sessions, Creating course content, Grading, Exam proctoring
Instructor: Matt Stock. Course enrollment: ∼200 students.

◇ **CS487/587 - Data Intensive Computing** *Spring 2019*
Teaching Assistant, University at Buffalo
Advanced course in computing for CS majors and graduate students.
Responsibilities: Taking office/recitation sessions, Grading, Exam proctoring
Instructor: Bina Ramamurthy. Course enrollment: ∼200 students

Talks & Professional Service

◇ **Technical Talk at ByteDance** *April, 2023*
Title: Navigating the Tricky Path to Optimal Performance - Coordinating System Resources with ML App Needs

◇ **Technical Talk at IBM** *April, 2023*
Title: Insights into Managing Machine Learning Applications Using Optimal System Resources

◇ **Conference Proceedings Sub-Reviewer** *Present*
IPDPS (19' - 22'), HPDC (20' - 22'), BigData (19',22'), ICDCS 22', ICPP 22', CLOUD 23', SC'23

◇ **Server Administrator at DSSL Lab** *Present*
Administrative duties, including tracking space usage, providing access to members, buying lab resources *etc.*

◇ **VT Graduate Recruiting Weekend Ambassador** *Spring 2020, 2023*
Answered questions related to the CS Department, graduate studies, accommodation, etc.
to the prospective graduate students. (∼ 100 people participation)