Sultan Mahmud Sajal

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Education

2018 - Ongoing	**Ph.D. in Computer Science and Engineering** **The Pennsylvania State University** **Thesis topic:** Improving the Fidelity of Trace-Driven Experiments in Cloud Computing Systems **Advisors:** *Timothy Zhu* and *Bhuvan Urgaonkar*
2013 - 2017	**B.Sc. in Computer Science and Engineering** **Bangladesh University of Engineering and Technology** **Thesis topic:** An Empirical Study on the Growth of New Languages and Their Users in Stack Overflow **Advisor:** *Rifat Shahriyar*

Professional Experience

May, 2022 - August, 2022	**Research Intern** at Cloud Operations Research (CORE), Microsoft Research. - *Mentors:* Luke Marshall, Beibin Li, and Ishai Menache.
May, 2021 - August, 2021	**Research Intern** at Gray Systems Lab (GSL), Microsoft. - *Mentors:* Abhishek Roy and Joyce Cahoon.
August, 2018 - Present	**Graduate Research Assistant** and **Graduate Teaching Assistant** at The Pennsylvania State University. - *Advisors:* Timothy Zhu, Bhuvan Urgaonkar. - *Collaborator:* Siddhartha Sen (*Microsoft Research*).
October, 2017 - July, 2018	**Junior Software Engineer** at Reve Systems. - *Manager:* Golam Md Muktadir.

Skills

Programming Languages	Java, Python, C++, Scala, C, R
Databases	MySQL, PostgreSQL
Technologies	AWS Services and SDK, Azure Services and CLI, Apache Spark, Kubernetes, Docker, Git, Nginx, Varnish Http Cache, Memcached
Scripting	Bash, HTML, CSS, LaTeX
Specialized Skills	Distributed Systems, Microservice, Analysis and Testing of Systems, Performance Evaluation

Recent Projects

Facilitate Isolated Experimentation for Reproducible Results in Cloud Systems [2023 - Ongoing]
- Motivate the need for isolated experimentation for realistic and reproducible experiments through realistic experiments
- Using synthetic and real-world applications with *Kubernetes* as orchestration service

Efficient and Scalable Cloud Admission Control in Azure [May, 2022 - Dec, 2022]
- Developed novel admissions control techniques to guarantee SLAs for both allocated and reserved resources while maximizing resource efficiency.
- Extended existing simulator (written in *C++*) and generated synthetic capacity reservation requests using *Python3* to complement real-world trace, stored in *PostgreSQL*

Recent Projects (continued)

Upscale Workloads to Evaluate Cloud Systems at High Load [2020 - 2023]
- Developed novel upscaling techniques for real workloads to enable faithful systems experimentation under varying loads.
- Deployed a stateful replicated *DeathStarBench Social Network benchmark*, using *Varnish Http Cache* as front-end reverse proxy cache and *Nginx* as load balancer, and deployed in *Azure*
- Deployed a stateless 16-node distributed Mediawiki application using *MySQL, Memcached*, and *Nginx* load balancer, and deployed in *Azure*

Development of Flight Simulator for Spark Jobs [May, 2021 - Aug, 2021]
- Analyzed anonymized *Azure HDInsight* telemetry data to generate synthetic database and queries to facilitate realistic performance experiments using synthetic data
- Developed in *Apache Spark* using *Scala*

Improvements of the Python based PickleDB [2021]
- Investigated effects of different design choices: (1) presence of cache, (2) cache size, (3) write-through vs write-back, and (4) choice of Join algorithms
- Performed evaluation using IMDB dataset

Downscale Workloads from Cloud System for Realistic Experimentation and Prototyping [2018 - 2020]
- Developed novel techniques to downscale cloud workloads while preserving important characteristics such as arrival process and performance to facilitate realistic systems research and industry prototyping.
- Deployed two different application systems: (1) distributed *Elgg* and (2) *MediaWiki* with autoscaling
- Both uses *MySQL* database and *Nginx* load balancer and are deployed as *Docker* containers in *AWS*

Evaluation of Different Clustering Methods [2019]
- Studied the performance of *K-means clustering, Gaussian Mixture Model, PCA, tree-structured classifier, a boosting method and SVM* on real-world dataset using *R*

Development and Evaluation of Replicated Linearizable Key-Value Storage [2018]
- Evaluated performance of two variants of key-value storage providing linearizability: (1) *blocking protocol* and (2) A *non-blocking ABD algorithm-based protocol*, implemented in *C++*

Implementation and Evaluation of LSM Tree [2018]
- Evaluated performance of a *2-level Log-Structured Merge Tree-based key-value storage*, implemented in *C++*

Discrete Event Simulator [2018]
- Implemented a discrete event simulator consisting of task dispatching, queueing networks, and task scheduler using *C++*

Implementation and Evaluation of Key-Value Storage [2018]
- Implemented and compared different types of IO for key-value storage implemented with *C++*
- The evaluated approaches are: (1) multi-threaded blocking IO, (2) single event-driven thread non-blocking IO with – (2a) polling-based event notification, and (2b) signaling-based event notification

Publications

[1] **Sajal, Sultan Mahmud**, T. Zhu, B. Urgaonkar, and S. Sen, *"TraceUpscaler: Upscaling Traces to Evaluate Systems at High Load,"* in 19th European Conference on Computer Systems, *(Eurosys '24)*, 2024, (Accepted to Appear).

[2] **Sajal, Sultan Mahmud**, L. Marshall, B. Li, *et al.*, *"Kerveros: Efficient and Scalable Cloud Admission Control,"* in 17th USENIX Symposium on Operating Systems Design and Implementation, *(OSDI '23)*, 2023.

[3] **Sajal, Sultan Mahmud*** and Hasan*, Rubaba, T. Zhu, B. Urgaonkar, and S. Sen, *"TraceSplitter: A New Paradigm for Downscaling Traces,"* in Proceedings of the Sixteenth European Conference on Computer Systems, *(EuroSys '21)*, *Equal Contribution, 2021.