Sultan Mahmud Sajal

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Research Interests

My research focuses on **workload analysis** and **performance evaluation** of **Cloud Computing Systems**. I am especially interested in faithfully scaling, analysing and synthesizing cloud workloads to facilitate realistic experimentation in both academia and industry. Much of my research has explored how different characteristics of the workload affect the performance of the system under different conditions and how we can modify the workload to our need while preserving important characteristics.

Education

Expected 2023 — **Ph.D. in Computer Science and Engineering, The Pennsylvania State University**
Advisors: *Dr. Timothy Zhu* and *Dr. Bhuvan Urgaonkar*
Selected Courses: Operating Systems Design, Performance Evaluation, Topics in Cloud Computing, Data Mining, Algorithm Design and Analysis, Computer Networks, Programming Language, Natural Language Processing, Database Systems

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: *Dr. Rifat Shahriyar*
Selected Courses: Artificial Intelligence, Machine Learning, Operating System, Computer Networks, Database.

Publications

1. **Sajal, Sultan Mahmud*** and Hasan*, Rubaba, Zhu, T., Urgaonkar, B., & Sen, S. (2021). **TraceSplitter: a new paradigm for downscaling traces** [*Equal Contribution]. *Proceedings of the Sixteenth European Conference on Computer Systems,* ***(EuroSys '21)***, 606–619.

2. **Sajal, Sultan Mahmud**, Mehrab, Z., Zaman, I., Uddin, M., & Rahman, A. (2017). **Poster Abstract: Handwriting Recognition Using Accelerometer**. *International Conference on Networking Systems and Security ,* ***(NSysS)***.

Research Experience

2020 - Ongoing — **Upscale Workloads from Cloud Infrastructure and Large Datacenters**
- Mentors: *Dr. Timothy Zhu* and *Dr. Bhuvan Urgaonkar* (The Pennsylvania State University), *Dr. Siddhartha Sen* (Microsoft Research)
- Upscale real workload for enabling faithful systems experimentation under varying loads
- Exploring novel approaches to faithfully increase the load of cloud workloads
- Performance evaluation using 3-tier web server system consisting of Mediawiki web server, Memcached and MySQL database

May, 2022 - Aug, 2022 — **Capacity Reservation in Cloud System**
- Mentors: *Dr. Luke Marshall, Dr. Beibin Li* and *Dr. Ishai Menache* (Cloud Operations Research (CORE) - MSR)
- Develop capacity reservation techniques for Azure which maximizes sellable capacity while minimizing SLA violation risk
- Extend existing simulator to analyze different capacity reservation techniques for comparison

Research Experience (continued)

May,2021 - August,2021 — **Development of Flight Simulator for Spark Jobs**
- Mentors: *Dr. Abhishek Roy* and *Dr. Joyce Cahoon* (Gray Systems Lab (GSL), Microsoft)
- Create realistic benchmark for Spark Workloads from query traces
- Generate synthetic representative datasets for the benchmark

2018 - 2020 — **Downscale Workloads from Cloud Infrastructure and Large Datacenters**
- Mentors: *Dr. Timothy Zhu* and *Dr. Bhuvan Urgaonkar* (The Pennsylvania State University), *Dr. Siddhartha Sen* (Microsoft Research)
- Downscale cloud workload while preserving important characteristics to facilitate realistic systems research and industry prototyping
- Proposed novel techniques for realistically downscaling workloads that preserve important characteristics such as arrival process and performance
- For performance evaluation, implemented a 3- tier web server system consisting of Elgg web server, Memcached and MySQL database using Docker containers on Linux
- For real world case study, implemented autoscaler on Wikimedia application with MySQL database
- Used statistical methods (e.g. energy distance) for data analysis

2016-2017 — **An Empirical Study on The Growth of New Languages and Their users in Stack Overflow**
- Mentor: *Dr. Rifat Shahriyar* (Bangladesh University of Engineering and Technology)
- Studied the growth patterns of new language resources and Users in Stack Overflow
- Analyzed the Stack Overflow data using Java and MySQL on Linux

Revealing Correlations Over Gene Expressions in Hypoxia-Induced Human Heart Cells
- Mentors: *Dr. A.B.M. Alim Al Islam* (Bangladesh University of Engineering and Technology), *Dr. Rameen Shakur* (University of Cambridge)
- Explored the dependency of genetics on Hypoxia
- Developed analysis framework using MATLAB and Weka

Professional Experience

May, 2022 - August,2022 — **Research Intern** at Cloud Operations Research (CORE), Microsoft Research.

May, 2021 - August,2021 — **Research Intern** at Gray Systems Lab (GSL), Microsoft.

August, 2018 - Present — **Graduate Research Assistant** and **Graduate Teaching Assistant** at The Pennsylvania State University.

October, 2017 - July, 2018 — **Junior Software Engineer** at Reve Systems.

Awards

2021 — Registration Grant, Sigmetrics 2021

2020 — Student Grant, USENIX Symposium on Operating Systems Design and Implementation (OSDI)

2019, 2018 — Student Travel Grant, ACM Symposium on Cloud Computing (SoCC)

2018 — Technical Scholarship, Bangladesh University of Engineering and Technology

Awards (continued)

2012 Higher Secondary Certificate Scholarship, Dhaka Education Board, Bangladesh
2009 Junior Scholarship, Dhaka Education Board, Bangladesh

Skills

Programming Languages	Java, Python, C++, Scala, C, R, Scheme, Assembly (Intel 8086)
Analysis Tools	MATLAB, Weka
Databases	Oracle, MySQL, SQLite
Frameworks	Apache Spark, Android, Spring-Boot, JPA, JSP, Scikit-Learn, Bootstrap
Technologies	AWS Services and SDK, Azure Services and CLI, Docker, Git

References

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Dr. Siddhartha Sen
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