Muhammad Haekal Muhyidin Al-Araby

5024221030@student.its.ac.id | muhhae.github.io | muhhae | muhhae

Research Interest

Storage Systems, ***Operating Systems***, ***Computer Network***, ***Databases***, ***Computer Architecture***, and ***Systems*** in general, with experience in efficient and sustainable ***cache management systems*** to enhance performance in modern large-scale systems.

Education

Sepuluh Nopember Institute Of Technology (***its.ac.id***) Aug 2022 – Jan 2026
B.Eng. in Computer Engineering (Expected)

- GPA: **3.71/4.0**
- Major GPA: **3.8/4.0**

Publications

Demystifying and Improving Lazy Promotion in Cache Eviction 2025
*Accepted to **VLDB 2026** - Manuscripts available upon request*

Qinghan Chen, **Muhammad Haekal Muhyidin Al-Araby**, Ziyue Qiu, Zhuofan Chen, Rashmi Vinayak, Juncheng Yang

Research Experience

International Research Collaboration on Cache System utilizing Flash Storage July 2025 - Present
Undergraduate Researcher

- Collaborated with ***Prof. Juncheng Yang*** from ***Harvard University*** researching on how to integrate machine learning into ***Flash Cache*** to reduce unnecessary write without sacrificing miss ratio.
- Designed and implemented ***Hierarchical Cache Simulator*** to simulate Cache Management System consisting of DRAM and Flash Device.
- Benchmarked commonly used algorithms such as: ***CLOCK, LRU, and FIFO***. We discovered that CLOCK would always outperform LRU while having sequential write operation and low write overhead.

International Research Collaboration on the Novel Concept of Lazy Promotion in Cache Eviction Algorithm March 2025 - October 2025
Undergraduate Researcher

- Collaborated with ***Prof. Juncheng Yang*** from ***Harvard University*** to improve ***miss ratio*** and ***efficiency*** in cache utilizing the novel concept of ***Lazy Promotion***.
- Developed experiment and processing pipeline on ***6300+ traces*** from Twitter, TencentPhoto, TencentBlock, CloudPhysics, WikiMedia, Alibaba, and proprietary traces.
- Implemented the concept of ***Lazy Promotion*** into advanced algorithms such as ***ARC*** and ***2Q***. Improved miss ratio by ***1%*** and reduced promotion by ***80%***
- Discovered ***Delayed-CLOCK*** which outperforms both ***LRU*** and ***CLOCK***. Reduced miss ratio by ***20%*** and promotion by ***90%*** compared to LRU.
- Packaged the experiments conducted into ***fully reproducible artifact*** .

UChicago-Indonesia SYstem and AI Research Training Jan 2025 – Jun 2025
Research Trainee

- ***Top 50*** students from Indonesia are selected for this program.
- Covered ***20+*** papers and reproduced key experiments from ***OSDI, SOSP, FAST*** conferences.
- Instructor: ***Prof. Haryadi Gunawi*** from ***University of Chicago***.

Work Experience

Computer Engineering Department & Faculty of Medics, Sepuluh Nopember Institute of Technology Sept 2024 – Jan 2025
Backend Software Engineer

- Designed, implemented, and deployed a system for efficiently storing images of ***cancer cells***. Increased the ***performance*** of medical practitioner by ***25%***

Computer Engineering Department, Sepuluh Nopember Institute of Technology July 2024 – Jan 2025
Backend Software Engineer

- Designed and implemented system for efficiently finding anomalies in database for ***Directorate General of Digital Infrastructure(DGDI)*** under ***Indonesian Ministry of Communication and Digital Affair***, reduced it to ***0***.

Computer Engineering Department, Sepuluh Nopember Institute of Technology Aug 2023 – Jan 2025
Teaching Assistant

- Computer Security : Graded midterm and final exam of ***70+*** students.
- Digital Circuit : Oversaw practicum and assisted ***30+*** students.
- Basic Programming : Oversaw practicum and assisted ***30+*** students.

Projects

Interpreted Programming Language *(source)*

- Implemented core programming language feature such as variable, arithmetic, function, and class.
- Designed and implemented ***custom IDE*** with working syntax highlighting and interactive shell.

Tetromino - Tetromania Castle *(source)*

- Implemented the ***game mechanic and 2D collision detection*** from scratch using C++.

ESP32 PingPong Game *(source)*

- Implemented the ***dot-matrix display rendering*** and a ***buzzer-based music player*** for the game in C++.

Image sharing platform - Lorem Ipsum *(source)*

- Developed web application for sharing random image using Go and HTMX. Includes authentication and light-weight image loader algorithm.

Technical Skill

Languages: C/C++, Python, Javascript, Go, C#, Shell, Lua

Framework: Tensorflow, Keras, React, Echo

Database: PostgreSQL, MongoDB

Tools: Linux, Neovim, Git, GitHub, Docker, libCacheSim, distComp

Misc: Cloudlab, AWS EC2, AWS S3, Arduino, PlatformIO, ESP32

References

Juncheng Yang *juncheng@g.harvard.edu*
Assistant Professor of Computer Science, Harvard University

Haryadi S. Gunawi *haryadi@cs.uchicago.edu*
Professor of Computer Science, University of Chicago

Reza Fuad Rachmadi *fuad@its.ac.id*
Associate Professor of Computer Engineering, Sepuluh Nopember Institute of Technology