Muhammad Haekal Muhyidin Al-Araby

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Research Interest

Systems, with experiences on efficient **cache management** to enhance performance in 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 [Experiment, Analysis & Benchmark] — 2025
*Submitted to **VLDB 2026** - Manuscripts available upon request*

Qinghan Chen, <u>Muhammad Haekal Muhyidin Al-Araby</u>, 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** admission, to reduce unnecessary **write** without sacrificing **miss ratio**.
- Designed and implemented **Hierarchical Cache Simulator** to simulate **Cache Management System** utilizing **DRAM** and **Flash Device**.
- Experimented on commonly used algorithms such as: **CLOCK, LRU, and FIFO**. We discovered that **CLOCK** would always outperform **LRU** and **FIFO** while having **sequential** operation and low **writes**.

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

- Our app used by **Directorate General of Digital Infrastructure(DGDI)** under **Indonesian Ministry of Communication and Digital Affair**.
- Designed and implemented system for efficiently finding **anomalies** in **DGDI's** database, 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)*

- Ping-Pong Game written in C++ for ESP32 and dot-matrix display.
- Implemented the **dot-matrix display rendering** and a **buzzer-based music player** for the game.

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