

Muhammad Haekal Muhyidin Al-Araby

✉ haekal.muhamat@gmail.com | 🌐 muhhae.github.io | 📄 muhhae | 🐙 muhhae

Research Interest

Storage Systems, Operating Systems, Databases, Computer Networks, 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

- GPA: 3.74/4.0
- Major GPA: 3.8/4.0

Publications

Demystifying and Improving Lazy Promotion in Cache Eviction

2026

Proceedings of the VLDB Endowment (VLDB) (In Press) 📄

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

Research Experience

International Research Collaboration on Cache System using 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.
- Integrated machine learning into *CLOCK* algorithm as an additional decision-maker, using *ONNX* to ensure a portable pipeline.

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 using the novel concept of *Lazy Promotion*.
- Developed experiment and processing pipeline on **6300+** *traces* from Twitter, TencentPhoto, TencentBlock, CloudPhysics, Wikipedia, 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 Medicine, 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 Affairs**, 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

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

Tetromino - Tetromania Castle

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

ESP32 PingPong Game

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

Image sharing platform - Lorem Ipsum

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

Technical Skills

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

Frameworks: 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