

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 <i>Proceedings of the VLDB Endowment (VLDB)</i> (In Press) 	2026
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 using Flash Storage Undergraduate Researcher	July 2025 - Present
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- 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 Undergraduate Researcher	March 2025 - October 2025
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- 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 Research Trainee	Jan 2025 – Jun 2025
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- 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