

Muhammad Haekal Muhyidin Al-Araby

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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

(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 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++, 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