# Muhammad Haekal Muhyidin Al-Araby

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## Research Interest

***Storage Systems***, ***Operating Systems***, and ***Systems*** in general, with experience in efficient ***cache management systems*** 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, **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*** 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*

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*Associate Professor of Computer Engineering, Sepuluh Nopember Institute of Technology*