

# Muhammad Haekal Muhyidin Al-Araby

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## Research Interest

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**Storage Systems, Operating Systems**, and **Systems** in general, with experience in efficient **cache management systems** to enhance performance in large-scale systems.

## Education

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**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

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**Demystifying and Improving Lazy Promotion in Cache Eviction** 2025  
*In submission to VLDB 2026 - Manuscripts available upon request*  
Qinghan Chen, Muhammad Haekal Muhyidin Al-Araby, Ziyue Qiu, Zhuofan Chen, Rashmi Vinayak, Juncheng Yang

## Research Experience

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**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

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**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

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### 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

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**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

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**Juncheng Yang**

Assistant Professor of Computer Science, Harvard University

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**Haryadi S. Gunawi**

Professor of Computer Science, University of Chicago

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**Reza Fuad Rachmadi**

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