MUHAMMAD HASAN FAROUK

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Professional Summary

Final-year Computer Science student at Cairo University specializing in **Backend Engineering** and **High-Performance Computing (HPC)**. Hands-on experience rebuilding and optimizing HPC clusters and developing scalable backend systems. Strong foundation in algorithms, performance optimization, and distributed systems, with a focus on building reliable, high-throughput software.

Education

Cairo University Cairo, Egypt
B.Sc. in Computer Science Expected 2026
GPA: 3.27 / 4.0

Technical Skills

- **Languages:** C++, Java, Python, C#, SQL, JavaScript, Bash Scripting
- **Backend & DevOps:** Spring Boot, Django, REST APIs, Docker, Kubernetes, PostgreSQL, SQL Server
- **HPC & Systems:** Parallel Computing, Multithreading, Cluster Administration, Memory Management, Linux System Administration
- **Tools & Concepts:** Git/GitHub, SSH, Linux/Bash, Postman, OOP, SOLID Principles, Data Structures

High-Performance Computing (HPC) Experience

HPC R&D Intern July 2025 – Sept 2025
Faculty of Computers and Artificial Intelligence (FCAI-CU) Cairo, Egypt

- **HiPer-FC Cluster Rebuild:** Co-led the rebuild and optimization of the *HiPer-FC* HPC cluster, restoring operational stability and improving readiness for research workloads.
- **Infrastructure Deployment:** Designed and deployed a secure multi-node lab environment using **SSH**-based access control, enabling reliable remote experimentation.
- **System Optimization:** Analyzed system performance bottlenecks and applied hardware/software tuning to improve efficiency for compute-intensive research tasks.

Web Development Projects

Learning Management System (LMS) • *Spring Boot, PostgreSQL, JWT*

- Designed and implemented a RESTful API for managing online courses, secured with **JWT**-based stateless authentication.
- **Performance:** Designed and implemented an application-level caching strategy using Spring Boot's `@Cacheable`, significantly reducing database load and improving API response latency.
- Integrated asynchronous **SMTP**-based email notifications to improve system responsiveness and user communication.

Restaurant Management System • *C#, Entity Framework Core*

- Built a desktop-based order management solution using Entity Framework Core for ORM and database migrations.
- Designed a clean, layered architecture separating application logic from data access concerns.

Web Book Shop • *Django, HTML/CSS*

- Developed a full MVC-based e-commerce platform with complex relational data models using Django ORM.

Algorithmic Projects

Image Processing Engine • *C++, Manual Memory Management*

- Built a low-level, high-performance image processing engine in **C++** from scratch, avoiding external libraries to minimize runtime overhead.
- Implemented core image transformations (Invert, Blur, Rotate) using raw matrix operations with explicit manual memory management to prevent leaks.

High-Performance Math Kernel • *C++, Matrix Exponentiation*

- Implemented a logarithmic-time **O(log n)** Fibonacci computation using matrix exponentiation, demonstrating algorithmic optimization over naive linear approaches.
- Designed a reusable Matrix abstraction using advanced OOP principles, including encapsulation and operator overloading.

Data Compression Tool • *C++, Huffman Coding, LZ77*

- Implemented lossless compression pipelines using **Huffman Coding** and **LZ77**, focusing on bit-level efficiency and memory-aware data structures.