

Mohamed El Shorbagy

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EDUCATION

Bachelor of Science in Computer & Systems Engineering

Ain Shams University

2020 - 2025

Cairo, Egypt

- Senior year 2 (year 5/5) | **GPA:** 3.62 / 4.00 | **Class rank:** 4/160
 - **Relevant Courses:** Compiler Design, Operating Systems, Embedded Systems, Network Security, Discrete Math, Image Processing, Machine Learning, Deep Learning, Database Systems, Artificial Intelligence, Software Engineering, Distributed Systems, Data Structures, Design of Algorithms.
 - **Thesis:** *Dental Crown Generation with Generative AI*, sponsored by [Atomica.ai](#)
- Contributions:
- Developed a geometric kernel in Rust with Python bindings for accelerated mesh operations.
 - Implemented a dental arch (Occlusion) alignment algorithm.

TECHNICAL SKILLS

- **Programming-Languages:** Python, Lua, C++, Rust
- **Graphics:** OpenGL, SDL, ASSIMP
- **Tools & Platforms:** Linux, Bash, CMake, git

EXPERIENCE

Software Engineering Intern

ASMARINE (Autonomous Underwater Vehicles team)

Oct 2023 - Feb 2024

ASU, Cairo, Egypt

- Implemented state-of-the-art algorithms in SLAM & Computational Geometry.
- Optimized code for resource-constrained computers.

Undergraduate Research Assistant

Human Centered Mechatronics Lab

Jun - Sep 2023

ASU Virtual Hospitals, ASU

- Implemented a TCP communication tunnel to retrieve data from various sensors through XML.
- Synchronized motion capture cameras with the metabolic energy consumption system.
- Automated sensor calibration process.

Optimization & Signal Processing Intern

Dynamic Systems & Digitalization cluster - Cardiff University

Aug - Oct 2022

ASU, Cairo

- Utilized the Akaike Information Criterion estimator for precise determination of signal onset time.
- Implemented TDOA algorithm with particle swarm optimization to localize acoustic sources.

PERSONAL PROJECTS

mesher: 3D Triangular mesh viewer in C++, [\[Code\]](#)

Sep 2024

- Implemented a mesh viewer with OpenGL API, supporting lighting, and camera movement.
- Implemented triangle selection algorithm with BVH and Möller-Trumbore algorithm.

mark: CLI-based Bookmark manager, [\[Code\]](#)

Aug 2024

- Developed a CLI tool for global bookmark management built on top of rofi.
- Implemented client-server architecture with async sockets for Rofi communication.
- Created a wrapper around TinyDB with orjson for efficient bookmark storage and querying.
- Added a parser for the Netscape bookmark file format and various export options.

automata-cli: Automata Renderer and Minimizer, [\[Code\]](#)

Nov 2023

- Built a CLI tool to parse and manipulate program-like automata specifications.
- Enabled minimization, format conversion, and custom algorithm manipulation.
- Supported rendering automata into various formats for document embedding.

cv.py: YAML to TeX Adapter, [\[Code\]](#)

Feb 2023

- Created a CLI tool to easily convert YAML files into LaTeX-based CVs.
- Enabled users to focus on content creation while the tool manages the formatting process.
- Supported CV compilation through either a cloud-based LaTeX compiler or local compilation.

Implementation of A* on Open Street Maps Data, [\[Code\]](#)

Feb 2023

- Implemented A* algorithm with KDTree and KNN to compute the shortest path on OSM data.
- Utilized the randomized median of medians algorithm to accelerate KDTree construction.
- Developed the algorithm on top of an extended Kalman filter and embedded microcomputer.

OPEN-SOURCE CONTRIBUTIONS

- [NetworkX](#) a network analysis library and graph theoretic algorithms in Python.
- [SymPy](#) a computer algebra & symbolic computation in Python.

HACKATHONS & COMPETITIONS

NASA Space Apps Cairo

The American University in Cairo

Summer 2023

- Developed a project centered on data sonification, enhancing the perception of space imagery.
- Implemented a melody fitting algorithm: aligning classical music pieces with the input image.
- Received the "Most Innovative Solution" award and **25k EGP** prize.

NASA Space Apps Cairo

The American University in Cairo

Summer 2022

- Developed a web interface for ISS 3D virtual tracking in real-time.
- Implemented orbital propagation algorithm and a sun tracking algorithm for ISS solar panels.
- Awarded 500\$ AWS Credit Points Prize.

AWARDS & HONORS

SciPy 2024 Conference

SciPy, NumFocus

July 2024

Tacoma, WA, USA

- Selected to attend SciPy Conference 2024 with full financial aid.
- Engaged with leading experts in the field of scientific and high performance computing.

Top 100 entries & Top 25 Articles

Summer of Math Exposition (SoME#2)

Summer 2022

3Blue1Brown & Leios Labs

- Secured a spot among the top 100 overall submissions.
- Ranked in the top 25 for non-video submissions (e.g., articles and games).

ARTICLES

The Generalization of Fifteen Puzzle, [\[Article\]](#)[\[Code\]](#)

Jul 2023

- Discussed the generalization and solvability of the fifteen puzzle with group theory.
- Implemented a PQ solver using weighted iterative deepening A*.

Diffusion Equation: A computational approach, [\[Article\]](#)

May 2022

- Analyzed the diffusion equation as both a mathematical and computational model.
- Worked on generalizing results to higher dimensions.