

# Mohamed El Shorbagy

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## EDUCATION

**Bachelor of Science in Computer & Systems Engineering**  
*Ain Shams University*

2020 - present  
*Cairo, Egypt*

- Senior year 2 (year 5/5) | Anticipated Graduation: Jul 2025
- **CGPA:** 3.62 / 4.0.
- **Relevant Courses:** Compiler Design, Discrete Math, Image Processing, Deep Learning, Operating Systems, Database Systems, Artificial Intelligence, Software Engineering, Distributed Systems, Algorithms.

## TECHNICAL SKILLS

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

## EXPERIENCE

**AI Software Intern**  
*ASMARINE (Autonomous Underwater Vehicles team)*

Oct 2023 - Feb 2024  
*ASU, Cairo, Egypt*

- Implemented state-of-the-art algorithms in Computer Vision and SLAM.
- Explored the feasibility of machine learning-based control in AUVs.
- 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 commands.
- 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*

- Implemented an acoustic wave velocity algorithm within composites.
- Analyzed raw sensor data to localize acoustic sources such as cracks.
- Implemented optimization algorithms (particle swarm, simulated annealing, simplex method).
- Explore the project: [Code](#) / [Report](#)

## PERSONAL PROJECTS

**mesher: 3D Triangular mesh viewer and Inspector**

Sep 2024  
*(under development)*

- Implemented a mesh viewer from scratch with OpenGL API, supporting lighting, model loading, and camera movement.
- Implemented triangle selection algorithm with BVH and Möller–Trumbore algorithm.
- Navigate: [Code](#)

## mark: CLI-based Bookmark manager

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.
- Navigate: [Code](#)

## automata-cli: Automata Renderer and Minimizer

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.
- Explore the project: [Code](#)

## cv.py: YAML to TeX Adapter

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.
- Explore the project: [Code](#)

## Implementation of A\* on Open Street Maps Data

Feb 2023

- Implemented the A\* algorithm with KDTree and KNN to compute the shortest path on OpenStreetMap data.
- Utilized the Haversine heuristic and a randomized median of medians to accelerate KDTree formation.
- Developed the algorithm on top of an extended Kalman filter, running on a bare-metal embedded microcontroller.
- Explore the project: [Code](#)

## HACKATHONS & COMPETITIONS

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### 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 at the NASA Space Apps competition.
- Awarded a prize of 25,000 Egyptian pounds.

### 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 for International Space Station.
- Implemented a sun tracking algorithm for satellite solar panels.
- Awarded 500\$ AWS Credit Points Prize.
- Navigate: [Code](#)

## OPEN-SOURCE CONTRIBUTIONS

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

## AWARDS & HONORS

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### SciPy 2024 Conference

July 2024

*SciPy, NumFocus*

*Tacoma, WA, USA*

- Selected to attend SciPy Conference 2024 with full financial aid.
- Recognized for impact and dedication in advancing open source projects.
- Engaged with leading experts in the field of scientific and high performance computing.

### Top 100 entries & Top 25 Articles

Summer 2022

*Summer of Math Exposition (SoME#2)*

*3Blue1Brown & Leios Labs*

- Participated in a competition aimed at presenting in-depth content in mathematics, computer science, and physics through engaging mediums.
- Secured a spot among the top 100 overall submissions.
- Ranked in the top 25 for non-video submissions (e.g., articles and games).

## ARTICLES

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### The Generalization of Fifteen Puzzle as PQ Puzzle

Jul 2023

- Discussed the generalization and solvability of the fifteen puzzle.
- Implemented a PQ solver using weighted iterative deepening A\*.
- Explore the article: [Article](#) | [Solver Code](#)

### Diffusion Equation: A computational approach

May 2022

- Analyzed the diffusion equation as both a mathematical and computational model.
- Worked on generalizing results to higher dimensions.
- Explore the article: [Article](#)