

# Mohamed El Shorbagy

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## EDUCATION

<b>Bachelor of Science in Computer Engineering</b> <i>Ain Shams University</i>	2020 - present <i>Cairo, Egypt</i>
<ul style="list-style-type: none"><li>• Senior year 2 (year 5/5)   Anticipated Graduation: Jul 2025</li><li>• <b>CGPA:</b> 3.62 / 4.0.</li><li>• <b>Relevant Courses:</b> Compiler Design, Discrete Math, Image Processing, Deep Learning, Operating Systems, Database Systems, Artificial Intelligence, Software Engineering, Distributed Systems, Algorithms.</li></ul>	
<b>STEM High School Certificate</b> <i>Dakahlia STEM School</i>	Class 2020 <i>Gamasa, Egypt</i>
<ul style="list-style-type: none"><li>• <b>CGPA:</b> 4.0 / 4.0 (1<sup>st</sup> Rank)</li></ul>	

## TECHNICAL SKILLS

- <b>Programming-Languages (high proficiency):</b>	Python,	Lua	
- <b>Programming Languages (some proficiency):</b>	C/C++,	Java	Rust
- <b>Scientific Computing:</b>	Octave,	NumPy,	SciPy, Matplotlib
- <b>System and Scripting:</b>	Linux,	Bash	
- <b>Databases &amp; Data stores :</b>	MySQL,	TinyDB,	Pandas

## EXPERIENCE

<b>AI Software Intern</b> <i>ASMARINE (Autonomous Underwater Vehicles team)</i>	Oct 2023 - Present <i>ASU, Cairo, Egypt</i>
<ul style="list-style-type: none"><li>• Implemented state-of-the-art algorithms in Computer Vision and SLAM.</li><li>• Explored the feasibility of machine learning-based control in AUVs.</li><li>• Optimized code for resource-constrained computers.</li></ul>	
<b>Undergraduate Research Assistant</b> <i>Human Centered Mechatronics Lab</i>	Jun - Sep 2023 <i>ASU Virtual Hospitals, ASU</i>
<ul style="list-style-type: none"><li>• Implemented a TCP communication tunnel to retrieve data from various sensors through XML commands.</li><li>• Synchronized motion capture cameras with the metabolic energy consumption system.</li><li>• Automated sensor calibration process.</li></ul>	
<b>Optimization &amp; Signal Processing Intern</b> <i>Center for Sound, Vibration &amp; Smart Structures</i>	Aug - Oct 2022 <i>ASU, Cairo</i>
<ul style="list-style-type: none"><li>• Implemented an acoustic wave velocity algorithm within composites.</li><li>• Analyzed raw sensor data to localize acoustic sources such as cracks.</li><li>• Implemented optimization algorithms (particle swarm, simulated annealing, simplex method).</li><li>• Navigate: <a href="#">Code</a> / <a href="#">Report</a></li></ul>	

## TRAVEL GRANTS

<b>SciPy 2024 Conference</b> <i>SciPy, NumFocus</i>	July 2024 <i>Tacoma, WA, USA</i>
<ul style="list-style-type: none"><li>• Fully funded Trip.</li><li>• Pushing the open-source ecosystem forward.</li></ul>	

## Visiting Student

Cardiff University, School of Engineering

Mar 2023

Wales, UK

- Fully funded program (UK-HE Climate Research Grant).
- Cultural and educational exchange.
- Conducted Fourier analysis and signal processing on composite structures.

## 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 dedicated solver using weighted iterative deepening A\*.
- Navigate: [Article](#) | [Solver Code](#)

### Diffusion Equation: A computational approach

May 2022

- Discussed diffusion equation as a mathematical, and computational model trying to generalize the results to higher dimensions
- Navigate: [Article](#)

## PERSONAL PROJECTS

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### automata-cli

Nov 2023

- A command-line interface program to parse program-like automata specifications.
- The stored automata structure can be minimized, converted to other forms, or manipulated with user-specified algorithms.
- Supports rendering automata to various formats for document embedding.
- Navigate: [Code](#)

### cv.py

Feb 2023

- A CLI abstraction of the LaTeX-based CV building process using YAML to TeX conversion.
- Compilation is done with a LaTeX cloud compiler or locally if applicable. • Navigate: [Code](#)

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

Feb 2023

- An implementation of the A\* algorithm with KDTree and KNN algorithms to compute the shortest path on open street maps data based on the haversine heuristic and randomized median of medians algorithm to speed up KDTree formation.
- This algorithm is developed on top of an extended Kalman filter that runs on a bare-metal embedded microcontroller with a GPS & IMU.
- Navigate: [Code](#)

## AWARDS & HONORS

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### Most Innovative Solution with 25k Egyptian Pound Prize

Summer 2023

NASA Space Apps Cairo

The American University in Cairo

My team and I were fortunate to receive the "Most Innovative Solution" award along with a prize of 25,000 Egyptian pounds at the NASA Space Apps competition. This competition featured approximately 150 teams from various disciplines. Our project focused on the unique concept of data sonification, with a particular emphasis on enhancing the perception of space imagery.

### Top 100 entries & Top 25 Articles

Summer 2022

Summer of Math Exposition (SoME#2)

3Blue1Brown & Leios Labs

- Secured one of the top 100 submissions overall.
- Secured one of the top 25 non-video submissions (e.g. articles and games).
- The competition focused on effectively presenting in-depth content in mathematics, computer science, and physics through engaging mediums.
- Navigate: [Article](#)

## 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.

## HACKATHONS & COMPETITIONS

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### NASA Space Apps Cairo

*The American University in Cairo*

Summer 2023

- Developed a web application that transforms various types of space images, into audible sound and harmonious music.
- Implemented a melody fitting algorithm: aligning classical music pieces with the input image.
- Implemented a panoramic projection algorithm.

### 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](#)

### NASA Space Apps Cairo

*Virtual*

Summer 2021

- Created a web interface for simulating distant rotating Jupiter asteroids.
- Implemented a real-time light curves computation algorithm
- Constructed a simplified 3D solar system scene with Blender's Python API to simulate approximate conditions an asteroid encounters in reality.
- Navigate: [Code](#)