Omnia Mohamed Abdel Raouf Mohamed

Nationality: Egyptian | **Phone number:** (+20) 1116832712 (Mobile) | **Email address:** omnia.raouf.01@gmail.com | **Git Hub:** https://github.com/OmniaRaouf101 | **LinkedIn:** https://www.linkedin.com/in/omnia-abdel-raouf-8a4223292/

EDUCATION

10/2019 – 06/2024

Faculty of Women for Arts, Science and Education | Ain Shams University (ASU)

- B.Sc. in Science and Education | **Physics** (Graduated in Summer 2024).
- Graduated at the top **2%** of my class, with a Cumulative Grade of **'Very Good'**.
- Carried out research in the fields of **Quantum Computing** and **High Energy Physics**.
- **Main Courses**: Quantum Mechanics, Special Relativity, Statistical Mechanics, Electrodynamics, Solid State Physics, Nuclear Physics, Laser Physics, Plasma Physics, Physical Optics, Electronic Circuits, Atomic Physics and Spectroscopy, Computational Physics, Mathematical Physics, Classical Mechanics, Linear Algebra, Calculus, Differential Equations, Applied Mathematics.

Bachelor's Thesis- Dark Matter Searches. | Supervisor: Dr. Maha Reda Ahmed (ASU)

- **Conducted** an in-depth analysis of dark matter detection methods, examining both direct detection approaches and indirect detection techniques.
- Explored the innovative integration of **quantum computing (QC) and convolutional neural networks (CNN)** to enhance detection accuracy and efficiency, proposing novel frameworks for data analysis and **signal processing** in dark matter research.
- Received a grade of **A+**.

- **References**: Dr. Niseem Magdy Abdelrahman (*Research Associate at Stony Brook University*), Dr. Hebatallah Ali (*Postdoctoral Scientist at Forschungszentrum Jülich* and Fritz Haber Institute of the Max Planck Society).

RESEARCH EXPERIENCE

11/2024 – 12/2024

Joint Institute for Nuclear Research (JINR) | Dubna, Moscow Region, Russia

RESEARCH INTERN | SUPERVISOR: DR. OLEG SAMOYLOV

- Implemented **convolutional neural networks** to detect slow magnetic monopoles in NOvA detector data, achieving **88.25%** test accuracy in classification tasks.
- Reproduced and validated **linear regression** results for monopole trajectories with consistent R^2 values across Python and Standard methods.
- Generated efficiency plots and evaluated IoU scores for segmentation models, identifying challenges in overlay image detection [Project Report].

06/2024 – 08/2024

QIntern 2024

QUANTUM COMPUTING AND ROBOTICS INTEGRATION | MENTOR: AMANY SALAMA

- **Explored** integrating quantum gates for controlling robotic movements, enhancing precision and coordination in tasks.
- Developed theoretical models for **swarm robotics** using **quantum computing**, though the project did not continue.

02/03/2024 – 05/03/2024

9th EGYPlasma School

PARTICIPANT WITH SCHOLARSHIP

- Engaged in intensive lectures, computational tutorials, and problem-solving sessions focused on **plasma physics** and its applications.
- **Led** a team of 6 participants during the problem-solving competition and achieved **the first rank**.

07/2023 – 09/2023

Helmholtz-Zentrum Dresden Rossendorf Summer Student Program (HZDR) | Dresden.

INTERN

- **Admitted** as one of 29 students among more than 1500 applicants **(1.9% acceptance rate)** (Unfortunately, was unable to attend).
- **Supervisor:** Dr. Thomas Kluge | Scientist at Helmholtz Center Dresden-Rossendorf - Laser Particle Acceleration Division.

15/08/2022 – 19/08/2022

1st High Energy Physics Simulation Course | Assiut university

INTERN

- **Designed** and simulated calorimeter detectors.
- Worked on Hands-on project to design and simulate a calorimeter using **ROOT**.
- Wrote (from scratch) a simulation of a **particle detector**.

07/2022 – 08/2022

Qiskit Global Summer School

INTERN

- Explored **Quantum Machine Learning**, **Quantum Kernels**, **Quantum Error Correction**, **Quantum Annealing**, **Variational Algorithms, Quantum Cryptography and Distributed Quantum Computing.**
- Implemented **Quantum Neural Network** and Classical Convolutional Neural Network with **TensorFlow**-Quantum and **Cirq** for a Classification task.

06/2022 – 07/2022

Peaceful Uses of Atomic and Nuclear Energy Summer Program, Egyptian Atomic Energy Authority, EAEA

TRAINEE

- Attended training courses in **EAEA** to build a firm understanding of the different applications of atomic and nuclear energy in science and industry.
- Visited the central lab of the facility, including the **cyclotron**, and monitored the radiation detectors and other operations to ensure compliance with activity safety levels in accordance with IAEA safety protocols.

PROJECTS

ASL Alphabet Learning Application

- Developed a user-friendly Windows application using Qt in **C++** for learning the ASL Alphabet.
- Integrated **OpenCV** for real-time **computer vision**, allowing the application to interpret users' sign language gestures accurately.
- Utilized **TensorFlow** models in **Python** to improve the precision of sign recognition.

Deep Q Snake PyTorch

- Implemented a **Deep Q-Network (DQN)** using **PyTorch** for training an **AI** agent to master the snake game.
- Developed a custom snake game environment using **Pygame**.
- Applied **MLOps** practices, incorporating custom plotting functions for real-time training visualization.

Quantum Computer Simulator

- A fully-functional **GPU-accelerated quantum statevector simulator** implemented in Python.

Machine Learning

- Worked with ILSVRC **pre-trained neural models** to study how the utilized feature descriptors were relevant in the task of emotion classification.
- Worked on exploring **data imputation** techniques for handling NA values and cosine similarities of variables to make predictions.

Numerical Analysis

- **Self-Implemented** the most common built-in functions that are used to numerically solve the typical linear and non-linear mathematical equations.

Linear and Non-linear Programming

- Worked on Interior point methods and **greedy algorithms** for solving network- flow problems with linear programming formulation.

CONFERENCES AND WORKSHOPS

05/09/2022 – 07/09/2022
Sustainable HEP | CERN

- The workshop aimed to discuss the transition to a sustainable future in the fields of **high-energy physics (HEP)**, cosmology and astro-particle physics (APP).

11/07/2022 – 13/07/2022
Geometry and Machine Learning workshop | Heidelberg

- Contributed to the workshop's objective of applying Geometry to Machine Learning problems, emphasizing the prevailing trend of **Geometric Deep Learning** architectures, tools, and publications.

11/07/2022 – 15/07/2022
Mathematical Methods for Quantum Hardware Workshop - IMSI

- The workshop aimed to improve numerical methods to reliably simulate complicated **quantum systems,** and to identify the underlying challenges, and develop novel mathematical tools to solve these open questions.

VOLUNTEERING

11/2024 – CURRENT Remote
MIT iQuHACK 2025

VOLUNTEER
- Selected to assist participants in the hackathon by providing guidance and ensuring a smooth and engaging experience.
- Worked to facilitate involvement and encourage wider participation in quantum computing, fostering collaboration and innovation.

02/2019 – 11/2021 Cairo | Egypt
Resala Charity Organization

VOLUNTEER TUTOR
- Provided instruction in Physics and Mathematics to underprivileged students aged 11-17, who lacked access to formal schooling, aiming to equip them with foundational knowledge for a better future.

SKILLS

Programming Skills

- **Programming:** Python, SQL, Go, JavaScript, Rust, C/C++, Elixir, Mathematica, MATLAB
- **Quantum Programming:** Qiskit, PennyLane, QuTiP, Pulser
- **Technologies and Frameworks:** Git, Docker, Linux, ROOT, Kubernetes, Arduino, Flask, Node.js, Raspberry Pi, SVN, Jenkins, ROS.
- **Machine Learning:** PyTorch, Tensorflow, scikit-learn, OpenCV
- **Software:** VizGlow, MadGraph, Zemax, JetBrains products, Vim, Phabricator
- **Database Technologies:** MySQL, Oracle, PostgreSQL, MongoDB

LANGUAGE SKILLS

Arabic (Native) | English (Fluent)