Mahmoud Mohamed Abdelaty

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EDUCATION

Sep 2020 – Jul 2025 **Bachelor of Engineering, Cairo University,**
Systems and Biomedical Engineering Department.
GPA: **3.7**/4
Graduation Project: Multimodal AI-based Autism Spectrum Disorder (ASD) Assessment and Tracking Framework, Developed a system for diagnosis ASD in children, utilizing egocentric vision for eye contact analysis, behavioral analysis for stereotypical behaviors, analyzing graphomotor patterns, and Utilizing (MLLMs) to detect symptoms in audio-visual tasks.

PROFESSIONAL EXPERIENCE

Jan 2025 – present **EzzMedical Industries,** *AI Automation Engineer (Part-time)*
Implemented a BOM Tree to streamline ventilator production and support FDA traceability. Automated inventory database organization to enhance data efficiency.

Jul 2024 – Aug 2024 **EzzMedical Industries,** *Software Analyst Intern*
Analyzed ISO-14971, designed a comprehensive SRS for risk management system, and developed a Risk Management System with integrated AI assistants.

Aug 2024 – Aug 2024 **Siemens Healthineers,** *Service Maintenance Engineer Intern*
Participated in hands-on troubleshooting and calibration of medical laboratory and imaging devices. Attended training on medical devices in the company site

Jun 2021 – Sep 2021 **Misr International Hospital,** *Clinical Engineer*
Performed research to identify risk factors for medical devices. Installed a Nurse Call Systems, improving emergency response times and patient safety.

Jul 2020 – Aug 2020 **Geniprocess International,** *IT & Electrical Engineer*
Contributed to the development and optimization of PCB designs for diverse networking applications.

RESEARCH PROJECTS

Exploring Cognitive Control via fMRI, *BOLD, Preprocessing, Multi-level Statistical Analysis, FSL, fMRI*
- Analyzed fMRI data from the Flanker Dataset to study cognitive control, managing assessment, quality control, preprocessing, and FSL analyses.
- Identified BOLD differences, highlighting the key brain regions & noting absence of a direct task link.

Lung Squamous Cell Carcinoma (LUSC): Differential Gene Expression and Enrichment Study,
Fold Change, Hypothesis Testing, DEGs, GSEA, Volcano Plot
- Analyzed gene expression data in LUSC to identify DEGs and used GSEA to uncover significant pathways, providing insights into potential biomarkers and therapeutic targets for LUSC.

Climate Change Modeling Using via PDEs, *Navier-stokes, Mathematical Modeling, MatLab*
- Developed a mathematical model using PDEs to simulate climate change, focusing on Navier-Stokes equation, Presented @TCCD Research Day.

WORKSHOPS & AWARDS

IoT Development, *Information Technology Institute (ITI)*

Dell Technologies, *Envision the Future Competition*
- Recognized among the **top 20** out of 259 senior projects from 77 universities across 20 countries in MENA & Turkey in **2025**.

ITIDA, *Funded by the ITAC Graduation Projects Support Program*

Dell Technologies, *AI-Empower Egypt*

IEEE EMBS, *Biomedical Engineering Committee*
- Awarded "Best Instructor" in recognition of excellence in teaching and mentorship.

Calibration Engineer, *Medical Equipment Calibration Lab (MECL)*

PROFESSIONAL SKILLS

- AI & Data Science: PyTorch, Tensorflow, Transformers, Keras, Scikit-learn, Hugging Face, Anomaly detection, Automation, Behavior Analysis, OpenCV, DeepFace, Pose-Gaze Estimation, Temporal Modeling, OpenPose, MViT, Mediapipe, NLTK, LoRa, VLMs, RAG, Semantic Segmentation, Explainable AI, Detectron2, YOLOv8, Docker, Flask, SHAP, LIME, BERT, LangChain, 3D Human Pose Estimation, ViTpose++, Grad-CAM.

- Autonomous & Embedded Systems: Drones, IoT, GIS, LiDAR, Radar, ESP32, STM32, Sensor Fusion, PID, VISSIM, PCBs, ROS2, OTA programming, V2X, MPUs, Px4 Autopilot, ITS, MQTT, UAVs control, GPS analysis, QGroundControl, Remote Sensing, SLAM.

- Medical Field: DICOM, fMRI, Rehabilitation, BCI, MR Sequencies, Neuroscience, Bioinformatics, RF coils, Biosensors, Radiomics, Gait Analysis, Robotics, Neurodevelopment disorders, HIS.

TECHNICAL PROJECTS

Hermes – Prosthetics Management & Gait Analysis App,
MediaPipe, *LangChain*, *Gemini 2.0 Flash*, *RAG*, *Expo*, *React Native*, *TypeScript*, *FastAPI*, *SQLAlchemy*, *Rehabilitation*
- Developed a mobile gait analysis app using MediaPipe Pose for 3D landmark detection and extracted temporal gait parameters from video input.
- Integrated patient-specific data and utilized **Gemini 2.0 Flash** LLM to generate clinical recommendations, risk assessments, and personalized rehabilitation insights.

VisualMinds – Computer Vision Toolbox, *Image Segmentation*, *Edge Detection*, *Feature Extraction*, *Frequency Filtering*, *Active Contour (Snakes)*, *Hough Transform*, *Histogram Equalization*, *C++/ Qt Development*
- Implemented desktop applications for image processing using C++/Qt, featuring edge detection, key feature extraction, and semantic segmentation techniques.

BCI-EEG Movement Prediction, *Deep Learning*, *ESP32*, *Electron.js*, *Flask*, *EEG-BCI*
- Developed a DL model to predict hand movements from EEG signals, trained on the WAY-EEG-GAL dataset.
- Deployed the model on a Flask server with integrated mobile and desktop applications for real-time EEG visualization and artificial hand control based on predictions.

Real-Time Vision Processing and Face Recognition, *PCA*, *DeepFace*, *Viola-Jones*, *MTCNN*
- Developed a robust computer vision desktop application featuring real-time facial detection, landmark tracking, and recognition. Designed for research and practical applications in video processing and augmented reality (AR).

Audio Fingerprint Recognition, *PyQT*, *DSP*, *Fingerprint*, *SVC*, *ML*
- Utilized PyQt and Digital Signal Processing techniques to implement a desktop application, utilizing voice and word fingerprinting, it employs a Support Vector Classifier (SVC) for precise speaker and word recognition.

DICOM-Visualizer, *VTK*, *DICOM Data Handling*, *Computer Graphics*, *Raycast Rendering*, *Surface Rendering*
- Utilized PyQt6 and VTK for 3D visualization of DICOM data and enables upload dataset and employs Surface Rendering methods.

Autonomous Drone Control, *Unity*, *ESP32*, *A* algorithm*, *MPUs*, *PID*, *Mission Simulation*, *QGroundControl*
- Developed a drone system with ESP32 for real-time control, implemented A* algorithm for pathfinding, and simulated missions in Unity to optimize autonomous navigation and obstacle avoidance.

Ultrasound Beam Simulation, *Matlab MUST*, *Multi-Focus Imaging*, *RMS Pressure*, *Acoustic Field Modeling*
- Simulated focused, diverging, and multi-focus ultrasound fields using MATLAB MUST, applying beam steering and delay-based beamforming to model phased array transducers and enhance diagnostic imaging accuracy.

Fat Separation Viewer, *MRI*, *IR Sequences*, *Dixon*, *T2 Mapping*, *Streamlit*, *Chemical Shift Imaging*, *Multi-Spin Echo*
- Developed a Streamlit application for MRI fat suppression using the Dixon algorithm.

Metal Artifact Reduction, *CLAHE*, *Sinogram*, *Radon Transform*, *SSIM & PSNR*, *Beam Hardening*, *CT Imaging*
- Simulated metal artifacts in CT images using sinogram interpolation techniques to enhance images quality.

Round Robin Arbiter, *Verilog*, *Clocked Sequential Logic*, *Bus Arbitration*, *Hardware Scheduling Algorithms*
- Designed and implemented a Verilog-based Round Robin Arbiter to enable fair and deterministic access control among multiple requesters in shared-resource systems.

EXTRACURRICULAR ACTIVITIES

Jan 2025 – present	**GDSC,** *Machine Learning Instructor and Mentor*
Nov 2023 – present	**IEEE EMBS,** *Biomedical Engineering Committee Head*
Nov 2022 – Jul 2023	**IEEE CUBS,** *Medical Devices and Clinical Engineering Instructor and Mentor*
Sep 2021 – Dec 2022	**BEAT,** *R&D Engineer*, *Embedded Systems Instructor*, *and Event Organizer*