

EDUCATION

The American University in Cairo (AUC), Egypt

Expected Graduation: May 2026

Bachelor of Science (B.S.), Mechanical Engineering with a concentration in Industrial and Mechatronics Engineering

GPA: 3.99 / 4.00

University of Colorado Boulder (CU), USA

May 2024

Exchange Semester

WORK EXPERIENCE

Procter & Gamble (P&G), Warehouse Intern, Egypt

January 2026 – Present

- Spearheaded a comprehensive dock restoration project, increasing operational capacity by 71% and enabling 21 additional shipments per day by restoring 5 critical docks.
- Reduced maintenance costs for shipping docks by 83% and lead times by 88% by transitioning from imported OEM parts to 13 local suppliers, effectively ending vendor dependency.
- Generated ~6M EGP in projected savings and a 62% reduction in driver headcount by engineering a plant-wide Equipment Utilization Dashboard (SQL, Databricks, Power BI) that automated data pipelines to optimize fleet requirements based on machine activity.
- Forecasted the annual warehouse budget, accurately projecting operational, maintenance, and repair expenditures to optimize resource allocation and ensure financial readiness.
- Coordinated audit preparations for the P&G IWS Phase Assessment process, by auditing and aligning Daily Management Systems (DMS) to ensure 100% compliance with global operational standards and KPI mapping.
- Optimized the uniform procurement cycle by restructuring purchasing strategies, reducing lead time by one month and ensuring on-time delivery for staff.

The American University in Cairo, Research Assistant, Egypt

September 2025 – Present

- Conducting supply chain research to optimize the connectivity between major Distribution Centers and last-mile warehouses using a hybrid Machine Learning (ML) and Linear Programming (LP) framework for cost savings.

Beko, Warehouse Intern, Egypt

August 2025 – September 2025

- Developed Excel database and Power BI dashboard form to enable tracking of 1000+ reusable plastic boxes.
- Improved supplier accountability & planners' forecasting by tracking boxes transactions.
- Delivered scalable framework ready for SAP integration.

University of Colorado Boulder, Undergrad Research Assistant, USA

June 2024 – August 2024

- Engineered computational models of robotic jellyfish, leveraging the Maxey-Riley equation for simulations.
- Collaborated on research reports and presentations, focusing on bio-inspired underwater jellyfish.

Nexus Analytica, E-Mobility Intern, Egypt

June 2023 – August 2023

- Initiated and constructed a comprehensive database of 650+ electric vehicles from scratch, utilizing Python.
 - Developed a Total Cost of Ownership (TCO) module to compare 650+ EVs and conventional vehicles by means of sensitivity analysis and illustrated the results using Python.
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ACADEMIC PROJECTS

- Engineered a fully automated Storage and Retrieval System (AS/RS) integrating an ESP32 microcontroller, RFID tracking, and a Python/SQL website via low-latency WebSocket, leveraging dual-cycle algorithms to maximize storage density and minimize retrieval time.
- Architected a smart parking prototype utilizing YOLO v11 for real-time License Plate Recognition (OCR) and an MQTT-based ESP32 network, deploying a centralized web portal to monitor occupancy and eliminate manual ticketing workflows.
- Designed a machine learning model using XGBoost to predict performance of premier league players in Fantasy Premier League, with an error of 0.7 points.
- Optimized last-mile delivery routes for Wimpy using Linear Programming and multiple TSP heuristics, achieving a 53 km minimized delivery cycle across 11 nodes.
- Optimized a three-station production system simulation, implementing data-driven strategies in contract management, machine purchasing, lot sizing, inventory control, and scheduling rules, which resulted in improved lead times, reduced job delays, and maximized revenue to have a ROE of 1.5.
- Designed and programmed a PLC-controlled vending machine with real-time inventory tracking, IR sensor feedback, and coin-based purchasing logic using RSLogix 500 and integrated mechanical hardware.

- Modeled and simulated the dynamic response of a plate heat exchanger using MATLAB and Simulink, implementing a PID controller that reduced settling time by 6.3% and achieved <1.1% steady-state error.
 - Developed a rover equipped with advanced sensors and Arduino to navigate rugged terrains and collect critical data for emergency applications.
 - Designed and fabricated a biomimetic mechanism simulating flapping bird using SolidWorks, with a focus on motion analysis, and prototyping.
 - Led development of a MATLAB tool to analyze shockwave behavior in CD ducts, integrating GUI design, computational models, and dynamic visualizations of fluid properties.
 - Designed and engineered a drill-powered tricycle, leading the CAD development and integration for the Endurance Challenge, resulting in successful performance over a 1,100 ft racecourse.
 - Hands-on experience in metalworking through fabrication of a two-shaft speed reducer using lathe and milling machines.
 - Pioneering the design of an optimized engine crankshaft with a lattice structure to reduce weight by 70%. Static structural, thermal, and vibration analyses were performed using Ansys software to ensure performance.
 - Performed stress analysis of Boeing 737 wing using SolidWorks & MATLAB, identifying critical load points.
 - Conducted large-scale NLP analysis on 1,800+ Egyptian songs using machine-learning sentiment classification, offensive-language detection, and popularity modeling, revealing long-term changes in lyrical tone.
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COMPETITIONS

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| P&G Peakathon , 2 nd Place, Egypt | November 2025 |
| <ul style="list-style-type: none"> • Created a targeted marketing campaign and execution plan after identifying why manual users don't upgrade, using mentor insights to shape actions projected to boost electric toothbrush adoption. | |
| Amazon Transcend Challenge , 2 nd Place, Egypt | February 2025 |
| <ul style="list-style-type: none"> • Designed an optimized warehouse cart system that reduced idle time by 83%, enhancing material handling efficiency through smart mechanical design and workflow analysis. | |
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SKILLS

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| <ul style="list-style-type: none"> • Highly collaborative team player with strong interpersonal skills. • Proficient in Microsoft Office Suite (Word, Excel, PowerPoint, Outlook) and Microsoft Project. | <ul style="list-style-type: none"> • Basic understanding of data visualization and analysis using Power BI. • Proficient in using engineering and design software: SolidWorks, Ansys, and MATLAB. |
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LEADERSHIP EXPERIENCE

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| AUC Innovators' Society , <i>President</i> , Egypt | August 2025 – Present |
| <ul style="list-style-type: none"> • Founded AUC's first Electric Racing Team designing and manufacturing an EV for Formula Student UK 2026 • Formulated new platform to promote undergraduate research within the student body | |
| AUC Student Union , <i>Community Engagement Chairperson</i> , Egypt | August 2024 – June 2025 |
| <ul style="list-style-type: none"> • Managed a diverse team of 10+ General Managers and 75+ members to strategize, plan and execute initiatives to engage unreached segments within the AUC Student Body. • Distributed 1,200+ Ramadan packs to university workers to strengthen community engagement, resulting in a record 40% increase in campaign participation. • Established first-ever partnership with Al Masry Foundation to streamline donation collection, ensuring 100% secure and transparent fundraising for the Ramadan campaign. • Directed Sustainability & Wellness initiatives to promote mindfulness and eco-friendly habits, engaging 200+ students across 5+ events. • Organized Athletes Symposium to celebrate national and university sports champions, boosting athlete visibility and drawing 300+ attendees. • Hosted World Athletes Forum with 60+ panels featuring athletes, coaches, and experts, attracting 1,000+ participants and media coverage. • Managed accessibility logistics for SU's largest concerts (Polaroid & Cassette), ensuring inclusive access for 100+ people with disabilities. | |
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PUBLICATIONS

- Abdelrafe, Omar (2025) "Evolution of Lyrics of Egyptian Songs in the 20th Century," *The Undergraduate Research Journal*: Vol. 10, Article 10. Available at: <https://fount.aucegypt.edu/urje/vol10/iss1/10>