Mahmoud Yasser Abdallah Elsharkawy

Research Assistant | Teaching Assistant | Computational Biologist

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Education

CAIRO UNIVERSITY Giza, EGYPT

Bachelor of Science in Biotechnology and Biomolecular Chemistry

Graduated: June 2023 Grade: 93.53% |GPA: 4.36/5.0 (A+) | Honors: Salutatorian (2nd in class)

- **Presidential Honor:** Recognized by Egyptian **President Abdel Fattah El Sisi** for being an outstanding student for four consecutive years and among the top bachelor students in Egypt.
- **Graduation Project:** Impact of Circulating microRNA as Molecular Marker for Triple-Negative Breast Cancer Combined with Systematic In-Silico Approach Grade: 97%.

Internship

ICGEB–IBG (Izmir, Türkiye) — Short-Term Research Internship: Genome Editing & ART

Sep 15–19, 2025 • Fully funded (ICGEB scholarship) **• Travel covered** (ASRT grant)

- **CRISPR execution & validation:** guide design/optimization, in-silico off-target profiling, delivery by embryo **microinjection/electroporation**, and PCR-based genotyping with allele verification.
- **Model systems:** zebrafish and mouse embryos; **successful zebrafish microinjection** (top 3 in cohort).
- **Mouse reproductive work:** zygote electroporation; assisted **embryo transfer to pseudopregnant females**; observed vasectomy for colony management.
- **ART workflows:** IVF I–III; **~75% two-cell embryos** during training; cryopreservation of sperm and embryos to support edited line establishment.
- **Competitively funded:** selected **1 of 5** trainees for full ICGEB support; received **ASRT** travel grant.

Experience

National Research Center, Giza, Egypt

intern – Molecular Biology & Bioinformatics · *Dec 2024 – Present*

- Manage >30 human cancer cell lines, including sourcing, culturing, passaging, and cryopreservation.
- Conduct advanced in-vitro assays: MTT cytotoxicity, wound healing, anti-inflammatory assays, and **3D** spheroid formation.
- Apply molecular biology techniques, including RNA extraction, qPCR, and protein analysis (SDS-PAGE, Western blot).
- Assist in in-vivo experiments supporting oncology and diabetic mouse models.
- Leverage AI tools and automation to streamline experimental design and data processing.
- Collaborate on interdisciplinary drug repurposing and cancer research projects, integrating biological data with computational pipelines.
- Contributed to four projects: two manuscripts in final revision and two in early experimental stages.

CAIRO UNIVERSITY Giza, Egypt

Teaching Assistant September 2024 – present

- Supervised and mentored **17 undergraduate bioinformatics projects**, guiding students through project design, data analysis, and presentation.
- Taught practical sessions covering:
  - **R and Python programming** for biological data processing and visualization
  - **Statistical analysis** for experimental data interpretation and hypothesis testing
  - **Transcriptomic analysis**: microarray and RNA-seq pipelines
  - **Molecular modeling**: docking (ADFR) and molecular dynamics (GROMACS)
- Assisted six lab groups in molecular biology techniques:
  - Recombinant protein production in *E. coli*, protein extraction, and chromatographic purification
  - Performed and instructed on Bradford assay and Western blotting
  - Maintained lab equipment, prepared materials, and supported students in experimental troubleshooting and systematic data reporting.

EGYCYTE RESEARCH TEAM Giza, EGYPT

Team leader March 2022– April 2023

- Orchestrated 22 brainstorming sessions and weekly meetings; spearheaded innovation in synthetic biology:" *A Novel Approach to* ***Engineering a New Translation Machinery to incorporate d-amino acids into Peptide Sequence***"
- **Contributed** to the innovative protein and RNA design pipeline and comprehensively analyzed tRNA sequences from 5 databases using Python and bash scripts
- Applied mathematical modeling to create a novel tRNA using R and Python from 150 natural tRNAs.

Performed protein-protein docking using Autodock Vina and protein-RNA using Haddock

Publications

1- Published an abstract in the Tumori journal, Impact of Circulating Mir-373, 27a and 181 As Molecular Markers For Early Detection Of Breast Cancer: Combined with In Silico Analysis. View publication

2- Authored a **review article** in the Journal of Tropical Insect Science, Nanotechnology in pest management: advantages, applications, and challenges. View publication

Conference Presentations

Presented a **poster** presentation at the 15th Breast Gynecological & Immunooncology International Cancer Conference (BGICC) on 19-20 January 2023.

Grants & Scholarships

- ***ASRT "Step by Step" (Growth) Master's Scholarship, 2025*** — ***EGP 250,000***. *Awarded by Egypt's Academy of Scientific Research & Technology.*
- **ICGEB Training Scholarship (2025)** — Full tuition/onsite costs for Genome Editing & ART internship.
- **ASRT Travel Grant (2025)** — Round-trip airfare support.
- ***ASRT Research Grant — EGP 75,000*** *(miRNA diagnostics in TNBC; in-silico & in-vivo)*

Professional Training

1- Compute Ontario Summer School – Biomedical Text Mining
Covered NER, text classification, and information retrieval using BioBERT and SemRep for biomedical knowledge extraction and graph construction.

2- **Neuromatch Academy (NMA) — Computational Neuroscience & AI Summer School** | Global Cohort
Jul 10–28, 2023 Fully funded
Project-based training with international team; capstone on fMRI motor-activation prediction (GLM-ML vs seed-based correlation)

3- City of Scientific Research and Technological Applications (SRTA-City) June 15-29, 2021

- Gained theoretical knowledge of various protein isolation techniques, including chromatography, electrophoresis, and mass spectrometry.
- Observed demonstrations of experiments to identify and analyze proteins; collaborated with fellow participants to discuss and troubleshoot experimental protocols.

4- ***Molecular docking and pharmacogenomics approach for identification of a novel anticancer target and its validation in the in-vitro cancer cell line culture.***
Embryology, cell culture, GMO Labs, Research Park, Cairo University.

5- ***Application of Bioinformatics in Environmental Sciences***.
The training workshop is at the Entomology Department, Faculty of Science, Cairo University.

Projects

1- IC50 Literature Mining Pipeline (R, Python, Gemini, PubTator) — 2025
Designed resilient R prefilter (tidyverse/httr) using **PubTator v3** search highlights and a robust **IC50** regex with unit validation; **normalized chemical tokens** (@CHEMICAL_*) and **cell-line RRIDs/synonyms**.
Implemented Python batch runner (pandas/argparse, **google-genai**) with **URL Context, exponential** backoff+jitter for 5xx/empty responses, JSON salvage+schema validation, dedupe/merge and full coverage reporting.

2- **Comparing Predicted Motor Activation Using Generalized Linear Model-ML Against Seed-Based Correlation Analysis.**
Completed an intensive, project-based program with a ***global cohort****, collaborating across time zones on real neuroscience datasets.*
Applied ***Python****,* ***NumPy/pandas****,* ***scikit-learn****, and* ***PyTorch*** *to modeling pipelines; practiced* ***experimental design, cross-validation, and model evaluation****.*
Capstone*: built a reproducible pipeline to* ***predict motor activation from fMRI****, benchmarking* ***GLM-ML*** *against* ***seed-based correlation****; presented results and defended methodology in a live Q&A*

3- **Identified a New Biomarker Using the Wrapper Methods**.
Utilized a machine learning algorithm to identify a new biomarker.

4- A Novel Approach to Engineering a New Translation Machinery to Incorporate d-Amino Acids into Peptide Sequences
Contributed to the innovative protein and RNA design pipeline and comprehensively analyzed tRNA sequences from 5 databases using R scripts
Engineered a novel tRNA incorporating unnatural amino acids into protein sequences by applying mathematical modeling to predict the best T-arm
2D and 3D structure prediction, and then MD simulation was applied to test the hypothesized tRNA.
Designed a suitable ribosome by introducing previously published mutations and tested the whole system by M.D. stimulation and HPLC.
Protein-protein docking was performed using Autodock Vina, and protein-RNA docking was performed using Haddock.

5- **Computational and Experimental Pipeline for Circulating miRNA Biomarkers in Triple-Negative Breast Cancer**
Graduation Research Project, Cairo University (2023–2024)
under the supervision of Prof Menha Swellem

Part 1 – Bioinformatics & Systems Biology

Normalized and analyzed three public miRNA microarray datasets using R (limma, eBayes, dplyr) to identify differentially expressed miRNAs in TNBC.

Constructed a protein–protein interaction (PPI) network, identified hub genes, and performed pathway and gene enrichment analysis.

Published results as an abstract in *Tumori Journal*; awarded university funding for publication.

Part 2 – Predictive Modeling & Wet-Lab Validation

Dry Lab:

Developed a novel two-gene prediction model to infer miRNA differential expression from DEG profiles, integrating transcription factor networks and miRNA-target gene relationships.

Integrated a machine learning model into the pipeline for enhanced prediction accuracy.

Wet Lab:

Extracted RNA from 27+ patient serum samples; quantified using NanoDrop and synthesized cDNA. And performed qPCR validation to confirm computational predictions.

Accomplishments & Medals

Gold Medal: *Awarded the gold medal in the oral presentation category among six tracks at the 16th edition of the Undergraduate Research Forum (UGRF).*

Silver Medal: *Represented Cairo University in the Science Operation Leaders in Egypt (SOLE) competition and won the silver medal in the case study track.*

public Service

Volunteered as a judge in the Canada-wide virtual CyberSTEAM Challenge *on February 25-26, 2023, a prestigious competition for grades 6-12 that fosters innovation in STEM and science.*

Represented the Biotechnology and Biomolecular Chemistry department at EDUGATE-EG, *a leading educational platform, to guide high school students in choosing a suitable department and answer their questions*

Skills

Dry Lab Skills (Computational Biology and Bioinformatics)

- Programming Languages: R, Python, Bash scripting, MATLAB.
- Statistical Analysis and Data Visualization: Excel, SPSS, limma, eBayes, dplyr, and machine learning models (wrapper methods, GLM).
- Omics Data Analysis: Microarray, RNA-seq normalization, differential expression analysis, and pathway and gene enrichment studies.
- Molecular Modeling and Protein Engineering: Molecular dynamics simulations (GROMACS), protein-protein docking (AutoDock Vina, HADDOCK), protein structure prediction (AlphaFold, ColabFold).
- fMRI Data Analysis: Motor activation prediction using GLM-ML models.
- High-Performance Computing (HPC): Working in Linux-based HPC environments for large-scale data processing.

Wet Lab Skills (Molecular Biology and Cell Culture)

- Cell Culture Techniques: Mammalian cell culture maintenance, callus and suspension culture, protoplast culture, and preservation of cell lines in liquid nitrogen.
- Molecular Biology Techniques: DNA, RNA, and protein extraction; cDNA synthesis; PCR, real-time PCR, RFLP, SSCP, and spectrophotometry (Nanodrop).
- Protein Analysis and Purification: SDS-PAGE, PAGE, Western blotting, Bradford assay, chromatography purification techniques (affinity and liquid extraction).
- Microbiology Techniques: Isolation of microorganisms (air, water, soil samples), antibiotic sensitivity assays (MIC, MBC), biochemical identification tests, enzyme immobilization.
- Cancer Research Techniques: MTT assay, trypan blue exclusion assay, flow cytometry for cell viability and apoptosis studies.
- Experimental Sourcing: Procuring and preparing cell culture media, reagents, and experimental setups for laboratory protocols.

Technical and Computational Skills

- Operating Systems: Windows and Linux proficiency.
- Research Documentation: Experimental data analysis, laboratory report writing, and manuscript preparation.