FARIS H. RIZK

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Education

Delta Higher Institute for Engineering and Technology (DHIET)   **Talkha, Dakahlia, Egypt**
B.Eng. in Communications and Electronics   *Sep. 2021 – Jun. 2026 (Expected)*
Focus: *Computer Vision-Language and Biomedical Image Analysis*
Honors: *Dean's Award for Research Excellence (2024, 2025); Departmental Student of the Year (2025)*

Research Experience

State University of New York at Buffalo   **Remote — Buffalo, NY, USA**
Research Intern — *Visual Computing Lab, Supervisor: Prof. Junsong Yuan*   *Oct. 2024 — Present*

- Developed a diffusion autoencoder framework for visual severity grading and lesion detection in MRI scans (datasets: SPIDER, BraTS, and Retina MNIST), leveraging latent-space exploitation and stability-oriented regularization; manuscript in preparation [1].
- Contributed to a Human–Object Interaction (HOI) detection framework (datasets: V-COCO, HICO-DET) by designing model variants and curating a domain-specific basketball HOI dataset. Authored a technical article analyzing the QPIC transformer-based approach (Article).

Carnegie Mellon University (CMU)   **Remote — Pittsburgh, PA, USA**
Research Intern — *Xu Lab, Supervisor: Prof. Min Xu*   *Apr. 2025 — Jul. 2025*

- Conducted supporting work for a foundation model framework for Cryo-electron Tomography (Cryo-ET) subtomogram alignment and protein particle classification under low signal-to-noise conditions, integrating synthetic data generation, equivariant transformers, and noise-resilient contrastive learning (Preprint).

Brownian Labs   **6th of October City, Giza, Egypt**
Research Lead — *Applied Machine Learning Lab, Brownian Labs*   *Sep. 2024 — Present*

- Leading a multidisciplinary team developing an computer vision framework for dermoscopic image analysis, enhancing early skin-cancer detection in underrepresented populations.
- Co-established the Applied Machine Learning Lab at Brownian Labs; helped define the research roadmap and fostered a local research community as part of the Brownian Labs Think Tank.

Delta Higher Institute for Engineering and Technology (DHIET)   **Talkha, Dakahlia, Egypt**
Undergraduate Researcher – *Metaheuristics Optimization for Applied Machine Learning Lab*   *Jan. 2023 – Present*
Supervisors: *Prof. El-Sayed M. El-Kenawy (Senior Member, IEEE; DHIET), Dr. Nima Khodadadi (UC Berkeley),*
Prof. Marwa M. Eid (Senior Member, IEEE; DHIET)

- Developed an Ocotillo Optimization-guided deep learning framework for automated bone marrow cytology image classification, integrating binary and continuous variants of the Ocotillo Optimization Algorithm (bOcOA and OcOA) for feature selection and hyperparameter tuning. Improved CNN-based diagnostic accuracy from 86.29% to 98.24%, with notable gains in sensitivity (+12.32%) and specificity (+11.61%), enhancing reliability in medical image analysis [2].
- Developed the Dynamic Binary Swordfish Movement Optimization Algorithm (DBSMOA)—an adaptive metaheuristic for high-dimensional visual feature selection—integrating dynamic behavioral adaptation and sigmoid-based probabilistic mapping to balance exploration and exploitation. Achieved state-of-the-art performance across 52 benchmark datasets, outperforming twelve leading binary optimizers, including bPSO, bGA, and bGWO [3].
- Designed and implemented a unified optimization framework for plant disease image classification by integrating the Improved iHOW optimization algorithm with the Feature Tokenizer Transformer (FT-Transformer), jointly optimizing features and hyperparameters to achieve 98.35% accuracy and 98.33% F1-score while reducing training time to 12.45s. Memory usage to 256.8MB [4].
- Developed a Puma Optimization-enhanced Restricted Boltzmann Machine (PO-RBM) framework for visual pathogen detection in crop images, integrating copula-based dependency modeling with adaptive hyperparameter tuning to improve training stability and interpretability. Achieved 98.54% accuracy and an F1-score of 98.01%, outperforming PSO-, GWO-, and GA-optimized RBM variants while reducing training time by up to 46% [5].
- Developed a hybrid metaheuristic framework integrating Dipper Throated Optimization (DTO) and Polar Rose Search (PRS) to optimize Radial Basis Function Networks (RBFNs) for irrigation water-quality classification using physicochemical visual data representations. The proposed DTO–PRS model achieved 99.46% accuracy and an F1-score of 99.39%, with statistically significant improvements validated via ANOVA and Wilcoxon tests [6].

Selected Publications

* indicates equal contribution. Full list available at: Google Scholar.

[1] **F. H. Rizk**, Nan Xi, Junsong Yuan,
"Latent Space Exploitation in Diffusion Autoencoders for MRI Severity Grading and Detection," manuscript in preparation.

[2] D. S. Khafaga*, E.-S. M. El-Kenawy*, **F. H. Rizk***, M. M. Eid, E. Khodadadi, N. Khodadadi,
"Ocotillo optimization-driven deep learning for bone marrow cytology classification," *PLOS ONE*, vol. 20, no. 8, pp. 1–46 (2025).
DOI.

[3] **F. H. Rizk**, K. Sh. Gaber, M. M. Eid, D. S. Khafaga, A. A. Alhussan, E.-S. M. El-Kenawy,
"Dynamic Swordfish Movement Optimization Algorithm for Feature Selection," under review at *Journal of Big Data* (2025).
Preprint PDF

[4] **F. H. Rizk**, A. A. Alhussan, D. S. Khafaga, M. M. Eid, E.-S. M. El-Kenawy, M. Saber,
"Potato Disease Detection Using Joint Feature and Hyperparameter Optimization of Feature Tokenizer-Transformer with iHow,"
under review at *Potato Research* (2025). Preprint PDF

[5] A. H. Alharbi*, **F. H. Rizk***, K. Sh. Gaber, M. M. Eid, E.-S. M. El-Kenawy, P. K. Dutta, D. S. Khafaga,
"Sustainable phytoprotection: a smart monitoring and recommendation framework using Puma Optimization for potato pathogen detection," *Frontiers in Plant Science*, vol. 16 (2025). DOI.

[6] A. H. Alharbi*, **F. H. Rizk***, K. Sh. Gaber, M. M. Eid, E.-S. M. El-Kenawy, E. Khodadadi, N. Khodadadi,
"Hybrid Deep Learning Optimization for Smart Agriculture: Dipper Throated Optimization and Polar Rose Search Applied to Water Quality Prediction," *PLOS ONE*, vol. 20, no. 7, e0327230 (2025). DOI.

Skills & Courseworks

Programming Languages: Python (Proficient), C/C++, MATLAB.

Machine Learning & Data Science: PyTorch, Hugging Face, TensorFlow, Scikit-learn, NumPy, Pandas, Matplotlib, OpenCV

Tools & Platforms: Jupyter Notebook, Google Colab, Git/GitHub, Linux/Unix, LaTeX.

Languages: Arabic (Native), English (Fluent).

Relevant Coursework: Computer Programming, Signal Analysis, Probability & Statistics, Calculus I & II, Linear Algebra, Discrete Math, Microprocessors & Applications, Project Management, Analysis & Research Skills, Technical Writing, Communication & Presentation Skills.

Independent Study: Principles of Biochemistry, AI for Medicine, Vision-Language Models, Deep Learning for Computer Vision, Machine Learning, Mathematics for Machine Learning & Data Science, Data Structures & Algorithms, OOP, C/C++, Data Analysis, Image Processing, Optimization Algorithms, Writing in the Sciences

Leadership and Extracurricular Activities

Google Developer Student Club (GDSC), DHIET   **Talkha, Dakahlia, Egypt**
Graphic Design Head & Designer (Head cert., Designer cert.)   *Jan. 2023 – Jun. 2024*
- Promoted from Graphic Designer (Jan. 2023 – Oct. 2023) to Graphic Design Head (Oct. 2023 – Jun. 2024); led a 5-member creative team across 6+ events.
- Increased DevFest attendance by 30% and social followers by 25% through targeted multi-channel campaigns and consistent visual branding.

IHOW Organization, DHIET   **Talkha, Dakahlia, Egypt**
Human Resources Member   *Oct. 2022 – Jan. 2023*
- Recruited and onboarded 10+ members; introduced a simple intake + onboarding checklist that streamlined coordination with team leads.
- Organized team-building sessions that improved cross-team communication and project handoffs.

Competitions and Awards

DevFest Mansoura Hackathon   **Mansoura University, Egypt**
2nd place (**25** teams)   *Dec. 2023*
- Built a data-driven platform to match skilled laborers with clients; designed the problem as a ranking/assignment task and implemented ML-based matching.
- Collaborated with design and engineering to improve UX and model outputs; delivered a working demo under event time constraints.