# Faris H. Rizk

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## Education

**Delta Higher Institute for Engineering and Technology (DHIET)** **Mansoura, Dakahlia, Egypt**
*B.Eng. in Communications and Electronics* *Sep. 2021 – Jun. 2026 (Expected)*
***Focus**: Machine Learning for Vision; Reliable/Interpretable AI*
***Honors**: Dean's Award for Research Excellence (2024, 2025); Departmental Student of the Year (2025)*

## Selected Publications

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

[1] **F. H. Rizk**, Nan Xi, Junsong Yuan,
"Latent Visual Diffusion Reasoning for Explainable Pathology Grading," Submitted to MIDL 2026. OpenReview.

[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," *Journal of Big Data*, accepted (in production) (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.

[7] A. H. Alharbi, E.-S. M. El-Kenawy, **F. H. Rizk**, K. Sh. Gaber, D. S. Khafaga, M. M. Eid, "Optimized Machine Learning for Building Energy Prediction: Feature Selection and Hyperparameter Tuning Using the Al-Biruni Earth Radius (BER) Search Optimization Algorithm," *Energy Reports*, vol. 14, pp. 5505–5538 (2025). DOI .

## 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-based visual reasoning framework (LVDR) that addresses the opacity of conventional pathology-grading models by explicitly modeling how diagnostic evidence is integrated across volumetric scans. The method treats the earliest slice of a scan as a noisy initialization and progressively denoises subsequent slices to construct an interpretable latent reasoning trajectory. This design enables step-wise visualization of the model's decision process, aligning computational predictions with clinical reasoning practices. Through comprehensive evaluation on three pathology-grading benchmarks, the approach demonstrated state-of-the-art performance while substantially improving transparency, offering clinicians clearer insight into the intermediate steps leading to final grading outcomes. [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*

- Co-established & co-led research in 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)** **Mansoura, 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 bone marrow cytology classification, integrating bOcOA/OcOA for feature selection and hyperparameter tuning; improved CNN accuracy 86.29%→98.24% with sensitivity +12.32% and specificity +11.61% [2].
- Developed DBSMOA—an adaptive metaheuristic for high-dimensional visual feature selection—using dynamic behavioral adaptation and sigmoid probabilistic mapping to balance exploration/exploitation; achieved SOTA on 52 benchmarks, outperforming 12 binary optimizers (bPSO, bGA, bGWO) [3].
- Developed a unified plant-disease classification framework integrating Improved iHOW with FT-Transformer, jointly optimizing features and hyperparameters; achieved 98.35% accuracy and 98.33% F1 while reducing training time to 12.45s and memory to 256.8MB [4].
- Developed a Puma Optimization–enhanced RBM (PO-RBM) for crop pathogen detection, integrating copula-based dependency modeling and adaptive hyperparameter tuning to improve stability and interpretability; achieved 98.54% accuracy and 98.01% F1, outperforming PSO/GWO/GA baselines and cutting training time up to 46% [5].
- Developed a hybrid DTO–PRS framework to optimize RBFNs for irrigation water-quality classification using physicochemical visual representations; achieved 99.46% accuracy and 99.39% F1 with improvements validated via ANOVA and Wilcoxon tests [6].
- Contributed to a Site EUI prediction pipeline coupling bBER feature selection with metaheuristic search (GWO/PSO/WAO) and BER-guided Random Forest tuning; improved baseline RF RMSE 0.1096 ($R^2 = 0.8258$)→0.000983 ($R^2 = 0.9843$) while reducing complexity and improving efficiency [7].

## 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**: Statistics & Probability Theory, Mathematics (I–V), Computer Programming, Computer Organization & Architecture, Computer Networks, Signal Analysis, Digital Signal Processing, Modeling & Simulation of Engineering Systems, Automatic Control, Microprocessors & Applications, Microcontrollers & Applications

**Independent Study**: 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** — **Mansoura, 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** — **Mansoura, 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.