ABDULKHALEK AL-FAKIH

Research Assistant | Master's Student in AI and Data Science

+82-10-6442-4005 | abdulkhalekalfakih@gmail.com | GitHub | South Korea, Seoul

Summary

Biomedical Systems and Engineering graduate from Cairo University (GPA 3.69/4.0, Class of 2023) and Master's graduate in Artificial Intelligence and Data Science from Sejong University (GPA 4.29/4.5). Former Research Assistant with a strong background in medical imaging, artificial intelligence, and data science. Experienced in deep learning, medical image segmentation, and developing innovative AI-driven solutions for healthcare applications.

Education

System and Biomedical Engineering, Cairo University — Sep 2018 – Jul 2023

Artificial Intelligence and Data Science, Sejong University — Mar 2024 – Feb 2026

Selected Projects

- Graduation Project: Brain Tumor Segmentation and MRI Synthesis
  - Analyzed the BRATS (Brain Tumor Segmentation) dataset for medical image processing.
  - Evaluated MRI artifacts impacting image quality, including ringing, motion, susceptibility, low contrast, and low resolution.
  - Categorized artifact severity levels (0-3) to assess impact on diagnostic reliability.
  - Developed a deep learning model to segment brain tumors even with missing MRI sequences by synthesizing FLAIR images using an enhanced GAN with Squeeze-and-Excitation modules.
  - Utilized tools and frameworks: TensorFlow, Python, and AI-based methods.
  - Project titled "FLAIR MRI sequence synthesis using squeeze attention generative model for reliable brain tumor segmentation " published in 2024.
- Pulse Sequence Designer for MR Sequences
  - Prep Pulses: INV, T2prep, Tagging. Acquisition Sequences: spoiled GRE, balanced SSFP, SE, TSE. Features: Pulse sequence diagram, logical parameters, inversion delay, T2prep duration, tag lines orientation/angle, tag width. Simulation: Digital phantom, dual viewports, k-space, reconstructed image. Tools: Python, QT.
- Sequence Analysis
  - comparative study related to SARS-Cov-2 (COVID-19) and its variant Omicron, construct a consensus sequence, multiple sequence alignment, phylogenetic tree, UGENE/MEGA software, compare,
- Cephalometric analysis
  - Developed a CNN-based model for analyzing cephalometric x-ray images using DenseNet and EfficientNet architectures.
  - Implemented the model in TensorFlow and integrated with a PyQt5 GUI for visualization and user interaction.
- Image Processing
  - Developed an image processing tool featuring image filtering, histogram analysis, histogram equalization, and frequency magnitude computations.
  - Integrated Computer Vision techniques with a QT GUI interface for user interaction.
  - Implemented the project using Python, utilizing libraries for advanced image manipulation and display, and a view project on GitHub.

- Digital Filter Design
  - Filter, Load Signal and Filter it, Website, HTML, CSS, JAVASCRIPT.
- Real Time Monitor
  - Signal Viewer, Real Time Filter, control signal, spectrogram, PDF, python, QT, GitHub.
- Signal Equalizer
  - Open music file, play/pause, control volume, spectrogram, histogram, GUI, python, QT, GitHub.
- Hospital Website
  - Cardiology Department, Sing in/up as Admin/User, statistical analysis, HTML, CSS, JS, SQL, Python Flask Web Microframework.

Online Courses

- Object-Oriented Programming (Data Camp)
- Machine and deep learning (Coursera)
- Challenger Data Analysis (Udacity)

Skill

Software

- Technical development (Python).
- Desktop development (Java, C++, C).
- Machine and deep learning (PyTorch, TensorFlow)
- Database development (SQL).
- Web development (HTML, CSS, JavaScript).

Hardware

- Proteus, Arduino Uno, Stm32F401.

Graphics Editors

- Adobe Photoshop, Adobe Illustrator.

Publications

Journal Papers:

- **A. Al-Fakih**, A. Mohammed, A. Shazly, K. Ryu, M.A. Almasni, Learning robust brain tumor segmentation under label corruption and data scarcity, Engineering Applications of Artificial Intelligence Journal. Volume 162, Part A, 15 December 2025, 112322, https://doi.org/10.1016/j.engappai.2025.112322 (Top 2.5% Journal).

- **A. Al-Fakih**, A. Shazly, A. Mohammed, M. Elbushnaq, K. Ryu, Y.H. Gu, M.A. Almasni, M.M. Makary, *FLAIR MRI sequence synthesis using squeeze attention generative model for reliable brain tumor segmentation*, Alexandria Engineering Journal. 99 (2024) 108–123, https://doi.org/10.1016/j.aej.2024.05.008 (Top 10% Journal).

- A. Mohammed, **A. Al-Fakih**, A. Shazly, K. Ryu, M.A. Almasni, Regional-aware clinically guided multi-decoder pathway towards reliable brain glioma segmentation, Computer Biology and Medicine journal, Volume 201, 15 January 2026, 111387, https://doi.org/10.1016/j.compbiomed.2025.111387 (Top 6% Journal).

- A. Elzayat, N. Hanafy, M. Magdy, **A. Al-Fakih**, Y.H. Gu, M.A. Al-Masni, M.M. Makary, MTSS-KDNet Distilling Population-Specific Expertise for Generalizable Brain Tumor Segmentation Across Diverse Cohorts, Scientific Reports journal, Undergoing Review (Accepted).

- **A. Al-Fakih**, A.M. Rezk, A. Shazly, M.A. Al-Masni, "Architectural Evolution of GANs for Medical Image Enhancement and Super-Resolution: A Review, Computer Methods and Programs in Biomedicine journal, Undergoing Review (Top 14% Journal).

- A. Shazly, D. Kim, A.M. Rezk, **A. Al-Fakih**, D.H. Kim, T.S. Kim, K. Ryu, M.A. Al-Masni, Self-Supervised Registration by Generation for Precise CT Alignment from Misaligned CBCT-CT Pairs, Neurocomputing Journal, Undergoing Review (Top 18% Journal).

Conferences (Main Papers):

- **A. Al-Fakih**, A. Mohammed, A. Shazly, K. Ryu, M.A. Almasni, Overcoming data scarcity: Brain tumor segmentation in pediatric and African populations, 3rd Workshop in Data Engineering in Medical Imaging (DEMI), MICCAI-2025 Workshop·27th September, 2025 (Published).

- A. Shazly, D. Kim, A.M. Rezk, **A. Al-Fakih**, M.A. Almasni, A Comparative Evaluation of Convolutional, Transformer, and Diffusion-Based Architectures for 3D Medical Image Segmentation, 9th International Artificial Intelligence and Data Processing Symposium (IDAP'25), Malatya, Türkiye & Seoul, Republic of Korea, Sept. 6–7, 2025 (Published).

- **A. Al-Fakih**, A. Mohammed, A. Shazly, K. Ryu, M.A. Almasni, Two-Stage meta-reweighting with Dynamic Retrieval for Segmentation with Limited Data, 29th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI 2026), 4–8 October 2026 , Abu Dhabi (Under Review).

- **A. Al-Fakih,** D.-H. Kim, K. Ryu, M.A. Almasni, Coarse-to-Fine Meta-Reweighting with Dynamic Retrieval for Adult-to-Pediatric Domain Adaptation in Tumor Segmentation, MICCAI 2026, Abu Dhabi, 4–8 October 2026 (Submitted).

- **A. Al-Fakih,** D.-H. Kim, M.A. Almasni, GFP-Suppress: Generalization-Oriented False-Positive Suppression for Mammography Mass Detection, MICCAI 2026, Abu Dhabi, 4–8 October 2026 (Submitted).

- M. Jegiraj, **A. Al-Fakih**, D.-H. Kim, M.A. Almasni, MammoAgent: Sequential Multi-Agent with Spatial-Frequency Encoding for Generalizable Mammographic Mass Analysis, MICCAI 2026, Abu Dhabi, 4–8 October 2026 (Submitted).

Conferences (Abstracts Papers):

- **A. Al-Fakih**, K. Ryu, M.A. Almasni, Coarse-to-Fine Meta-Reweighting with Dynamic Retrieval for Pediatric Brain Tumor Segmentation. Will present at the 2026 ISMRM & ISMRT Annual Meeting & Exhibition, Cape Town, South Africa, 9–14 May. 2026.

- **A. Al-Fakih**, A. Mohammed, A. Shazly, K. Ryu, M.A. Almasni, Two-Stage Meta-Learning Framework with Gradient-Based Case Retrieval for Low-Data Pediatric Brain Tumor Segmentation. MRI & 30th Annual Scientific Meeting of KSMRM (ICMRI 2025), South Korea, 31 Oct–1 Nov. 2025 (Best Digital Poster).

- A. Elzayat, N. Hanafy, M. Magdy, **A. Al-Fakih**, Y.H. Gu, M.A. Al-Masni, M.M. Makary, MTSS-KDNet: Multi-Teacher Single-Student Knowledge Distillation Network for Generalizable Brain Tumor Segmentation Across Diverse Cohorts. MRI & 30th Annual Scientific Meeting of KSMRM (ICMRI 2025), South Korea, 31 Oct–1 Nov. 2025 (Oral Presentation)

- **A. Al-Fakih**, A. Mohammed, A. Shazly, K. Ryu, M.A. Almasni, Meta-learning for robust medical image segmentation: a gradient-similarity reweighting approach to mitigate noisy labels, Will presente at the 2025 ISMRM & ISMRT Annual Meeting & Exhibition, Hawaii, USA, 10–15 May. 2025.

- A. Mohammed, **A. Al-Fakih**, A. Shazly, K. Ryu, M.A. Almasni, Regional-aware clinically guided multi-decoder pathway towards reliable brain glioma segmentation, Will present at the 2025 ISMRM & ISMRT Annual Meeting & Exhibition, Hawaii, USA, 10–15 May. 2025.

- **A. Al-Fakih**, A. Mohammed, A. Shazly, K. Ryu, M.A. Almasni, Enhancing medical imaging with meta-learning: a novel reweighting approach to mitigate noisy labels via gradient similarity, Presented at the 12th International Congress. MRI & 29th Annual Scientific Meeting of KSMRM (ICMRI 2024), South Korea, 8–9 Nov. 2024 (Best Oral).

- A. Mohammed, **A. Al-Fakih**, A. Shazly, K. Ryu, M.A. Almasni, Regional-based multi-decoder network with clinical guidance for accurate brain tumor segmentation, Presented at the 12th International Congress. MRI & 29th Annual Scientific Meeting of KSMRM (ICMRI 2024), South Korea, 8–9 Nov. 2024 (Best Digital Poster).

- A. Shazly, A. Mohammed, **A. Al-Fakih**, D. Kim, K. Ryu, M.A. Almasni, Deformation-aware cross-attention transformer for efficient aligned CT generation from misaligned inputs, Presented at the 12th International Congress. MRI & 29th Annual Scientific Meeting of KSMRM (ICMRI 2024), South Korea, 8–9 Nov. 2024.

- **A. Al-Fakih**, Synthesizing missing MRI sequences towards reliable semantic segmentation of brain tumors, Presented at the 2024 ISMRM & ISMRT Annual Meeting & Exhibition, Singapore, 4–9 May 2024.

Academic Service & Leadership

- **Workshop Organization:** Co-organized and managed international joint research workshops between South Korea and Turkey (2024, 2025), focused on *"Explainable AI for Lumbar Spinal Stenosis."*
- **Technical Program Committee:** Member, Technical Program Committee (TPC), 3rd Workshop on Data Engineering in Medical Imaging (DEMI), MICCAI 2025 (27 September 2025).

Awards & Honors

- **Yemeni Ministry of Higher Education** – Fully Funded Undergraduate Scholarship, Awarded for Bachelor's studies at Cairo University.
- **Sejong University Presidential Scholarship**, Full tuition waiver awarded (March 2024 – Feb 2026).

- **Sejong University, Research Assistant**, MITILab, Fully Funded Master's Award (March 2024 – Feb 2026).

References

Dr. Mohammed A. Al-masni
Assistant Professor
Department of Artificial Intelligence Data Science
Sejong University, Seoul, South Korea
Email: m.almasani@yonsei.ac.kr
Relation: Master's Thesis Supervisor

Dr. Meena M. Makary
Assistant Professor
Massachusetts General Hospital (MGH)
Harvard Medical School
Email: mmakary@mgh.harvard.edu
Relation: Bachelor's Project Supervisor