Abdelrahman Diaa

GeoAI & Spatial Machine Learning Engineer | Remote Sensing Researcher

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Summary

GeoAI & Spatial Machine Learning Engineer and Global Award-Winning Researcher (**3rd Place Worldwide at UNEP & Tongji University GESC 2026**; **2nd Place Winner in Egypt's National Smart Green Projects 2026**). International Exchange Scholar at **Philipps-Universität Marburg, Germany** (ranked in the **Top 5 students** in Remote Sensing & Machine Learning). Proven track record of architecting national-scale spatio-temporal deep learning foundation models (**631,053 pixels,** $R^2 = 0.8733$), contributing production code to global open-source spatial engines (**OpenStreetMap Nominatim**), and building end-to-end Google Earth Engine & Python ETL pipelines.

Education

Philipps-Universität Marburg — Marburg, Germany
International Exchange Scholar — Department of Geography (MO:VE Scholarship Program) — *Apr. 2026 – Present*

- **Academic Distinction:** Ranked among the **Top 5 Students** in the research seminar *"Remote Sensing: Linking LiDAR and Satellite Data with Machine Learning"* (instructed by Dr. Temesgen Abera).
- **Research Seminars & Coursework:** Environmental Informatics (*Umweltinformatik*) & Upscaling Biodiversity, Advanced Species Distribution Modeling, Data Analysis (*Datenanalyse*) & Base R Computing, Advanced Empirical Research Methods.

Cairo University — Giza, Egypt
*Bachelor of Arts in Geography — Major in **Geomatics, GIS & Remote Sensing*** — *Sep. 2023 – Present*

- **Relevant Coursework:** Spatial Analysis, Satellite Remote Sensing, Photogrammetry, Surveying Mathematics, Spatial Databases.

Research & Working Papers

DroughtWatch AI V4 Titan: A Pan-Egypt Spatio-Temporal Deep-GeoAI Foundation Model | *Lead Author* — 2026

- Engineered a **997,906-parameter** hybrid neural architecture (**Conv1D Residual Head + 3-Stage Stacked Bi-LSTM + 8-Head Transformer Attention**) trained on **8.32M sequences** across **631,053 active cropland pixels** (25 years of MODIS, CHIRPS, and NASA GLDAS).
- Formulated a strictly monotonic multi-quantile projection head ($P_{10} \leq P_{50} \leq P_{90}$) via non-negative Softplus offsets (**0.000000% crossing violations**) and asymmetric drought-penalized pinball loss ($\alpha = 2.0$), achieving **National** $R^2 = 0.8733$ **(MAE** $= 0.0463$**)**.
- Eliminated out-of-distribution regional collapse across 4 Agro-Ecological Zones (**Nile Delta** $R^2 = 0.8547$, **Upper Egypt** $R^2 = 0.8715$) with an ultra-low inference latency of **0.0084 ms on GPU / 0.66 ms on CPU** (1,507 parcels/sec throughput).

Experience

VEXL (Spatial AI & Remote Sensing Intelligence) — Giza, Egypt
Founder & Lead GeoAI Architect — *Jan. 2026 – Present*

- Architected **VEXL AgroScore & DroughtWatch AI**, integrating quarter-century Google Earth Engine data cubes with 3×3 spatial lag matrices and automated parametric risk underwriting.
- Designed production-grade spatial ETL pipelines and FastAPI microservices with strict schema validation, 24-month temporal buffer zones (zero data leakage), and sub-millisecond inference serving.

OpenStreetMap (Nominatim Geocoding Engine) — Remote / Global
Open Source Contributor | *Merged PR #4047* — *Mar. 2026*

- Diagnosed and resolved a silent `UnicodeDecodeError` in `tiger_data.py` by enforcing explicit UTF-8 encoding on `io.TextIOWrapper`, preventing data extraction failures on Windows environments defaulting to `CP1252`.
- Eliminated fragile CI/CD workarounds (`PYTHONUTF8=1`) in GitHub Actions, establishing native cross-platform pipeline stability.

Selected Spatial & Data Engineering Projects

NYC Restaurant Geospatial Intelligence | *Python, SQL, GeoPandas, REST API* — Mar. 2026

- Built an automated ETL pipeline ingesting **85,000+ raw records** and **50,000+ geospatial points** into a structured SQLite database; optimized spatial aggregations in **GeoPandas** to uncover a **32.8%** violation spike in high-risk zones.

3D Hydrological Modeling & Spatial Geodatabase Automation | *ArcGIS Pro, Python (ArcPy)* — Mar. 2026

- Engineered an automated **ArcPy** hydrological pipeline converting low-resolution DEMs into high-precision 3D flow networks and a schema-validated Master Geodatabase with zero-error handover.

Honors, Awards & Leadership

- **3rd Place Worldwide (Top 0.5%)** — *UNEP & Tongji University Global Environmental Solutions Challenge (GESC 2026)*, Shanghai, China (competed against 574 teams from 58 nations) [Jun. 2026].
- **2nd Place Winner (Startups Category)** — *Egypt National Initiative for Smart Green Projects 2026* (Fayoum Governorate; selected among top regional innovations out of 164 projects under Presidential auspices) [Oct. 2026].
- **Grand Finalist** — *Cairo University AI Nexus 2026 Hackathon* (AI for Business Track, Creativa Innovation Hub) [Oct. 2026].
- **National Finswimming Athlete** — Ranked **23rd Nationally** in the Egyptian Republic Championship across 8 years of competition.

Technical Skills & Languages

GeoAI & Remote Sensing: Google Earth Engine (GEE), MODIS/Sentinel-2/Landsat/GLDAS Fusion, LiDAR, Species Distribution Modeling (SDM), ArcGIS Pro, QGIS, ArcPy, PostGIS, DuckDB Spatial
Machine Learning & Data Science: PyTorch, TensorFlow/Keras, Spatio-Temporal Deep Learning (Bi-LSTM, Transformers, Conv1D), Quantile Regression, XGBoost, Random Forest, Spatial KNN, SHAP Explainability
Programming & Engineering: Python (GeoPandas, Rasterio, Pandas, NumPy), R (Base R & Spatial Packages), SQL, TypeScript/React, FastAPI, Git/GitHub, Linux
Languages: Arabic (Native), English (Advanced Academic & Technical Proficiency — EF SET Certified), German (Beginner)

Certifications

DeepLearning.AI Data Analytics | *DeepLearning.AI* *Mar. 2026*
IBM Data Analyst Specialization | *IBM* *Dec. 2025*
Quantium Data Analytics | *Forage* *Mar. 2026*
SQL for Data Science | *UC Davis* *May 2025*
GIS Specialization | *UC Davis* *Dec. 2024*
Data Visualization with Tableau | *UC Davis* *Sep. 2024*