# Jeffrey Akuoko

**M16 8PH, Manchester |jk.akuoko@gmail.com|+447548874474|**

## SUMMARY

Experienced engineer and educator with expertise in Oil and Gas Engineering, Chemical Engineering, and Geomatic Engineering. Skilled in teaching, research, and industry work, with proficiency in software, laboratory techniques, and programming. Demonstrated leadership through innovative projects and achievements. Strong communicator and problem solver committed to advancing engineering knowledge.

## RESEARCH INTERESTS

- Aqueous geochemistry (with a focus on water-rock reactions, and interactions for hydrogen production)
- Application of Artificial Intelligence techniques to geoscientific problems
- Fluid flow in porous media
- Coupled processes of hydrogen production and $CO_2$ storage
- Pore-scale imaging and modelling

## EXPERIENCE

**University of Manchester** *Graduate Teaching Assistant, England*| **09, 2023 - Present**

- Assist professors in the delivery of modules in Oil and Gas processing to students studying for their MSc in Oil and Gas Engineering and Advanced Chemical Engineering
- Provide feedback to students on assessments and individual projects.
- Lead and guide students during practical laboratory and tutorial sessions.

**University of Mines and Technology** *Teaching & Research Assistant, Ghana*| **08, 2020 – 08, 2021.**

- Assisted with the data collection process and the development of a CNN model used in detecting deteriorating mine sites in Tarkwa, Ghana.
- Developed a Land Use Landcover map using the maximum likelihood technique in ArcGIS, and a CNN model in YOLO used for comparative and predictive analysis.
  Developed YOLO model gave 90% prediction accuracy on test data for predicting built-up areas
- Tutored and mentored final-year graduate students on final-year projects covering dimensionality reduction, deep learning, and Natural Language Processing concepts.
- Designed short courses for students on literature review which also included teaching topics related to data analysis, deep learning, neural network model development and optimisation techniques.
- Provided one one-on-one session to 10 students, explaining concepts in Oil and Gas formation, trapping, and production.
- General student improvement in thesis preparation and presentation as a result of consistent tutoring on concepts relating to research skills and delivery.

**Goldfields Ghana Limited** *Data Analyst/ Mine Surveyor, Intern, Ghana*| **09, 2018 - 12, 2018.**

- Accurately updated pit designs using AutoCAD software
- Used various survey instruments to carry out thorough inspections and for mine
- assessments
- Conducted comprehensive field surveys, logging, and processing mine data to aid
- planning operations
- Processed and used satellite imagery for stockpile analysis and computations.
- Developed a neural network model for predicting water levels and played a key role in its initial deployment stages using SwiftUI.
- Developed models for computing stockpiles from drone images using YOLO and OpenCV
- Regularly updated database of collected drone images for subsequent model retraining and testing.

**Grain Solutions** *Computer Vision Engineer, Ghana*| **01, 2020 - 08, 2021.**

- Applied data pre-processing, and feature engineering techniques and developed models to extract insights from large datasets.
- Developed computer vision models for cocoa health detection and tested them with collected drone images taken from 250 farm sites across Ghana.

  Model accuracy on unseen data was 80% on the first test and improved to 92% after increasing the training dataset and retraining.
- Developed predictive models to forecast key business metrics and improve decision-making processes using PyTorch.

  The developed model (a hybrid PCA-Wavelet Neural Network) gave reliable results and increased farmers' profits by up to 5% as the model helped regulate fertiliser purchases.
- Adopted transfer learning techniques for modelling and prediction on limited datasets using previously trained and tested models
- Created data visualizations to communicate insights to stakeholders using MatplotLib and Seaborn.

## EDUCATION

**University of Manchester** | PhD Chemical Engineering **Manchester, 09, 2023 – Present.**
**Thesis:** Multiscale characterisation of ultramafic rocks for hydrogen exploration with integration of AI techniques.

**University of Aberdeen** | MSc Oil and Gas Engineering **Scotland, 09, 2021 – 12, 2022.**
**Dissertation:** Application of deep learning methods in modelling and predicting incipient conditions of hydrate formation in Gas transmission pipelines.

(The project involved a comparative analysis of Feed Forward Particle Swarm Optimization, Back Propagation Neural Network, Group Method of Data Handling and Radial Basis Function Neural Network, and a conventional method of Van der Waal and Platteuw model, with the hybridized model, PSO -FFBPNN giving the best performance)

**University of Mines and Technology**| BSc Geomatic Engineering **Ghana, 09, 2016 - 07, 2020.**
**Project:** A hybrid intelligent model of dimensionality reduction techniques and Artificial Neural Networks for predicting noise levels in the Tarkwa Municipality.

## SKILLS

**Hard Skills**
**Software:** Phreeqc, OpenFOAM, Numerical methods for solving fluid flow problems (FVM, FDM, FEM, Physics Informed Neural Networks), ArcGIS, AutoCAD

**Hard Skills**
**Geospatial Software:** ArcGIS, AutoCAD
**Programming Languages:** Python, SwiftUI, MATLAB
**Tools and frameworks**; Sklearn, Pytorch, CreateML, CoreML, ONNX, OpenCV, YOLO, DeepXDE for Physics Informed Neural Networks, Docker, Git
**Data Manipulation & Analysis**: SQL, Data Visualization (Matplotlib, Seaborn)
**Software Engineering**: Agile Methodologies

**Soft Skills**

- Excellent research, problem-solving, and communication skills.
- Strong time management and organizational skills.

**Laboratory Analytical Techniques:**

- **X-ray Diffraction (XRD):** Proficient in analysing the mineralogical composition and crystal structure of samples obtained from water-ultramafic rock interaction experiments.
- **Electron Microprobe Analysis (EMPA):** Experienced in determining the chemical composition of micro-scale features in ultramafic rock samples.
- **Gas Chromatography with Thermal Conductivity Detector (GC-TCD) and Flame Ionization Detector (GC-FID):** Skilled in analysing gas phases generated during water-ultramafic rock interactions to identify and quantify organic compounds and gases.
- **Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES):** Proficient in elemental analysis of aqueous solutions and dissolved phases resulting from HP-HT experiments.
- **Thermogravimetric Analysis (TGA):** Experienced in studying thermal decomposition and mass changes in ultramafic rock samples under HP-HT conditions.
- **X-ray Computed Tomography (X-ray CT):** Proficient in visualizing and analysing the internal structure and pore space of ultramafic rock samples subjected to water-rock interactions and HP-HT conditions.

## PERSONAL PROJECTS / ACHIEVEMENTS

**SECQAI AI Competition** **1st Runner up**

- Developed a crop prediction model using Spiking Neural Networks

Reservoir pressure simulation using Physics Informed Neural Networks and OpenFOAM

A Neural Network Approach to Estimating Natural Hydrogen from Geochemical Reactions (Prepared Manuscript)

## AWARDS

- Ghana Government Scholarship for MSc Oil and Gas Engineering, University of Aberdeen
- Ghana Government Scholarship for PhD Chemical Engineering, University of Manchester

## PROFESSIONAL MEMBERSHIP

Society of Petroleum Engineers
Associate Member, Institute of Chemical Engineers.
European Association of Geoscientists and Engineers.

**Appendix**: Developed codes for my works can be accessed using the link: https://github.com/J-Akuoko/My_codes