Mohammad Taufik

Computational geoscientist
with expertise in scientific machine learning

hatsyim@gmail.com
+1 (346) 317-6642
https://hatsyim.github.io/

Education

- **King Abdullah University of Science and Technology** — Thuwal, KSA
  PhD in Machine Learning in Geosciences; GPA: 3.89 — *August 2020 - Present*
- **King Abdullah University of Science and Technology** — Thuwal, KSA
  MSc in Machine Learning in Geosciences; GPA: 3.86 — *December 2021*
- **Bandung Institute of Technology** — Bandung, INA
  BSc in Geophysics; GPA: 3.78 — *June 2019*

Journal Articles

1. **M.H. Taufik** and T. Alkhalifah. High-Fidelity Velocity Model Building through Reconstruction-Guided Diffusion Model. *In preparation*. IEEE Transactions on Geoscience and Remote Sensing, 2025.
2. **M.H. Taufik** and T. Alkhalifah. Full Waveform Inversion using Velocity-encoded Physics-Informed Neural Networks. *Submitted*. Earth and Space Science, 2024.
3. **M.H. Taufik** and T. Alkhalifah. Wavenumber-aware Diffusion Sampling to Regularize Multi-parameter Elastic Full Waveform Inversion. *Published*. Geophysical Journal International, 2024.
4. **M.H. Taufik**, X. Huang, and T. Alkhalifah. Multiple Wavefield Solutions in Physics-Informed Neural Networks using Latent Representation. *Published*. IEEE Geoscience and Remote Sensing Letter, 2024.
5. **M.H. Taufik**, T. Alkhalifah, and U.B. Waheed. Stable Neural Network-based Traveltime Tomography using Hard-constrained Measurements. *Published*. Geophysics, 2024.
6. **M.H. Taufik**, and T. Alkhalifah. LatentPINNs: Generative Physics-Informed Neural Networks via Latent Representation Learning. *Under review*. Artificial Intelligence in Geoscience, 2024.
7. **M.H. Taufik**, F. Wang, and T. Alkhalifah. Learned Regularizations for Multi-parameter Elastic Full Waveform Inversion using Diffusion Models. *Published*. JGR Machine Learning and Computation, 2024.
8. **M.H. Taufik**, U.B. Waheed, and T. Alkhalifah. A Neural Network Based Global Traveltime Function (GlobeNN). *Published*. Nature Scientific Report, 2023.
9. **M.H. Taufik**, U.B. Waheed, and T. Alkhalifah. Upwind, No More: Flexible Traveltime Solutions Using PINNs. *Published*. IEEE Transactions on Geoscience and Remote Sensing, 2022.

Experience

- **Occidental Petroleum Corporation** — Houston, USA
  Subsurface Innovation Lab Intern — *December 2024 - February 2025*
  - **Uncertainty Quantification in Inverse Problems**: Develop an AWS-based solution to quantify the risk of misplacing borehole locations using seismic data.
  - **Diffusion Models**: Accelerating the solutions of non-linear inverse problems in AWS using conditional diffusion models.
- **KAUST** — Thuwal, KSA
  MS/PhD Fellow — *August 2020 - Present*
  - **Physics-Informed Neural PDE Solvers**: Develop a deep learning-based neural partial differential equation (PDE) solvers.
  - **Diffusion Regularization for Inverse Problems**: Pioneer the use of a diffusion model to regularize multi-parameter non-linear inverse problems.

- **Cloud4C** Jakarta, INA
  Machine Learning Engineer Intern *June 2022 - August 2022*
  - **Computer Vision**: Built and deployed a machine learning model to detect safety equipments given a set of images on Amazon AWS.
  - **Natural Language Processing**: Built web application based on Flask for a web summarizer given a text, website link, or PDF file as input.
  - **Cloud Architecture**: Deployed machine learning model on Amazon AWS and orchestrate the data IO between S3, user's mobile phone, and local machine for a recommendation system application.
- **Pertamina Hulu Kalimantan Timur** Balikpapan, INA
  Geophysicist *June 2019 - May 2020*
  - **Interpretation**: Involved in the regional joint study along the Makassar Strait.
  - **Geophysics**: Generating well-seismic tie process, seismic data quality assessment, depth-time conversion process.
  - **Geology**: Generating three-dimensional (3D) velocity model to build 3D pore pressure cube.
  - **Reservoir**: Initiated rock physical data visualization for sand-shale distribution analysis.
- **Bandung Institute of Technology** Bandung, INA
  Research Assistant *Auguts 2017 - June 2019*
  - **Seismic Processing**: Constructing a guideline in seismic data processing and basic signal processing. Mentoring and grading the learning process of the course.
  - **Seismology**: Constructing a guideline in basic seismology course. Supervising basic seismological routine processing like earthquake relocation and arrival time picking.
  - **Seismic Refraction**: Constructing a guideline in exploration seismic refraction course. Supervising routine seismic refraction processing routine.
  - **Geophysical Instrumentation**: Supervising basic electrical engineering behind potential methods in geophysics, electrostatic, and electrodynamic in geophysics. Mentoring and grading the learning process of the course.
  - **Computational Geophysics**: Constructing a guideline in basic numerical methods in geophysical prospecting methods. Supervising basic numerical methods for simple gravimetry method.
  - **Electrical Analysis**: Constructing a guideline in basic electrical engineering and signal processing in geophysics. Supervising basic electrical engineering behind potential methods in geophysics, electrostatic, and electrodynamic in geophysics.
- **PetroChina** Jakarta, INA
  Geophysicist Intern *June 2018 - August 2018*
  - **Quantitative Seismic Interpretation**: Analyzing elastic properties of reservoir rocks through rock physics analysis.
  - **Rock Physics**: Generating well-seismic tie process and enhancing rock properties distribution map through multi-attribute analysis.

Projects

- **Physics-informed Neural Networks (PINNs)**: Solving a parametric PDE for 2D to 3D Earth's velocity model for regional to global Earth scale.
- **Mass Spectometry**: Data visualization web application based on plotly with data processing in R.
- **Wireline Transformers**: Wireline logs prediction using a Transformers-based machine learning model.
- **Multi-parameter Land Data Elastic Full-waveform Inversion using Deep Learning Regularization**: Introduce novel regularization scheme using deep generative (diffusion) models to invert for V_p, V_s, ρ simultaneously from single-component geophones.

Invited Talks

1. **Student Presenter**. EAGE Annual Meeting. Oslo, NOR. June 2024.
2. **Guest Lecture**. Bandung Institute of Technology. Bandung, INA. December 2023.
3. **Student Presenter**. AGU Annual Meeting. New Orleans, USA. December 2023.
4. **Student Presenter**. EAGE Annual Meeting. Vienna, AUT. June 2023.

5. **Student Presenter**. SEG Annual Meeting. Houston, USA. September 2022.
6. **Student Presenter**. EAGE Annual Meeting. Madrid, ESP. June 2022.
7. **Student Presenter**. AGU Annual Meeting. New Orleans, USA. December 2021.
8. **Student Presenter**. EAGE Annual Meeting. Amsterdam, NED. October 2021.
9. **Student Presenter**. PA Annual Convention and Exhibition. Jakarta, INA. September 2019.

Honors, Awards, and Fellowships

- **NVIDIA-EAGE HPC Hackathon Winner** *2024*
  European Association of Geoscientists and Engineers
- **Best Teamwork in the EVOLVE Program** *2022*
  Society of Exploration Geophysicists
- **Middle East Super Bowl Champion** *2021*
  Society of Exploration Geophysicists
- **KAUST Fellow** *2020 - Present*
  King Abdullah University of Science and Technology
- **Dean's Honor List** *2015 - 2019*
  Bandung Institute of Technology
- **Best Geosciences Student Presenter** *2019*
  Indonesian Petroleum Associations
- **Best Thesis Presentation** *2019*
  Bandung Institute of Technology
- **Best Student Paper Presenter** *2018*
  Trisakti University

Programming Skills

- **Languages**: Matlab, Python, R, Bash, LaTeX, C++
- **DevOps**: AWS, Docker, Kubernetes, GCP
- **Machine Learning**: TensorFlow, Keras, PyTorch, Scikit-learn, SciANN
- **Data Visualization**: D3.js, Plotly, Carto
- **Front-end**: Hugo, CSS, HTML5
- **Databases**: SAS, PostgreSQL, SQLite, MySQL, MongoDB, BigQuery, Apache Spark