Saikat Mahato

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Personal Summary

Passionate geophysics researcher pursuing a Ph.D. under Prof. Anand Singh at IIT Bombay, specializing in both traditional and AI/ML-driven geophysical inversion and mineral prospectivity mapping. Skilled in geophysical data acquisition, processing, and advanced modeling, with extensive experience in Python, MATLAB, TensorFlow, and PyTorch. Proficient in developing custom 3D synthetic models, deep learning architectures (including Xception-like CNNs).

Education

Indian Institute of Technology Bombay 2021 – 2023
M.Sc. in Applied Geophysics | *GPA: 7.35/10*
Coursework: Global Geophysics | Earthquake and Engineering Seismology | Seismology Lab | Mineralogy & Petrology | Mineralogy & Petrology lab | Computer Programming for Geosciences | Mathematical Physics| Gravity and Magnetic Methods | Electrical Methods | Structural Geology & Stratigraphy | Introduction to Numerical Analysis | Exploration Seismology I | Gravity & Magnetic lab | Structural Geology & Stratigraphy Lab | Geological Field Work | Geophysical Signal Processing | Exploration Seismology II | Electromagnetic Methods | Engineering and Groundwater Geology | Well Logging | Geophysical Inverse Theory

Bankura Christian College, Bankura University 2018 – 2021
B.Sc. in Physics (Honours) | *GPA: 9.45/10*
Honours in Physics with Mathematics and Chemistry as ancillary subjects
GATE 2025: AIR 39

Job Experience

Microseismic Data Analysis & Interpretation *Microseismic Analyst* | 2025 – Present

- Performed microseismic data analysis using **Divine** software, including rigorous quality control of DAS-based microseismic datasets.
- Performed Python-based processing and visualization of microseismic event catalogs and density data.
- Generated map-view and cross-sectional density plots for fracture analysis.
- Integrated well trajectories, stimulation stages, and microseismic event locations to contextualize fracture geometry within the reservoir framework.
- Used **Spotfire** for exploratory analysis and dashboard-based visualization, and **Snowflake** for querying and managing large scale structured datasets.

Research & Projects

High Fidelity Deep Learning-based 3D Magnetic Susceptibility Inversion *Guide: Prof. Anand Singh* [To be Communicated]

- Designed and implemented a custom Xception-inspired CNN for rapid, non-iterative 3D magnetic susceptibility inversion from 2D magnetic anomaly maps.
- Applied to synthetic and real geological datasets, achieving high accuracy and improved depth estimation compared to traditional inversion methods.
- Enhanced anomaly localization, geological boundary delineation, and overall 3D susceptibility reconstruction with inference times reduced to seconds.

Cooperative Inversion of DC Resistivity and Magnetic Data (CIDCMag) *Guide: Prof. Anand Singh* [Under Review]

- Implemented a MATLAB-based 2D cooperative inversion algorithm integrating DC resistivity and magnetic datasets using Guided Fuzzy C-Means (GFCM) clustering with petrophysical constraints.
- Utilized geological unit parameters (mean resistivity/susceptibility and confidence weights) to guide inversion and improve boundary delineation.
- Validated on synthetic datasets, yielding sharper subsurface boundaries, stronger resistivity–susceptibility

correlation, and higher parameter accuracy compared to standalone inversions.

- Applied to Kanpura, Gujarat field data, successfully mapping granite–granulite contact zones with enhanced geological resolution.

Magnetic Inversion and Banded Iron Formation (BIF) Mapping – Karauli, Rajasthan *Guide: Prof. Anand Singh* [To be Communicated]

- Integrated magnetic data inversion with in-situ susceptibility measurements to delineate concealed Banded Iron Formation mineralization.
- Acquired high-resolution magnetic profiles and rock sample data to constrain inversion models.
- Applied constrained Delaunay triangulation for geologically consistent subsurface modeling.
- Enhanced susceptibility models to better correlate magnetic anomalies with BIF-hosted mineralization zones.

Joint Bayesian Inversion of P-wave Polarization and Receiver Function Data *Guide: Prof. Satish Maurya, IIT Bombay* 2023

- Used and modified a Bayesian trans-dimensional McMC framework to jointly invert P-wave polarization and receiver function (RF) data for shallow crustal structure mapping.
- Applied to synthetic models and Barmer Basin (Rajasthan) seismic data, integrating RF's sensitivity to velocity discontinuities with polarization's constraint on absolute V_s.
- Achieved improved layer detection, reduced velocity variance, and higher model convergence compared to individual inversion methods.
- Identified an additional subsurface layer in real data that was missed by individual receiver function or p wave polarization inversion.

Summer Project: Electrical Methods of Prospecting *Guide: Prof. Anand Singh, IIT Bombay* May–Jul 2022

- Acquired self-potential and DC resistivity data in Ambet, Maharashtra for groundwater analysis.
- Performed electrical resistivity tomography and MATLAB-based inversion for subsurface imaging and internal tree structure assessment.
- Developed modeling and inversion algorithms for a lab-scale cross-well resistivity setup.

Earthquake Detection using **STA/LTA** Trigger Algorithm *Mini Project* [2021]

- Used the Short-Term Average/Long-Term Average (STA/LTA) trigger algorithm for seismic event detection to reduce continuous recording data size.
- Applied STA/LTA, trigger, and de-trigger parameters suitable for weak-motion seismology, ensuring sensitivity to P- and S-wave arrivals while minimizing false triggers from noise.
- Incorporated Pre-Event Memory (PEM) and Post-Event Time (PET) to capture full earthquake waveforms.
- Validated the approach using real seismic data from the 25 April 2015 Nepal earthquake and determined event origin time using Wadati diagram analysis.

Geophysical Instrumentation Experience

- Magnetic surveys using VLF and GEM GSM-19T magnetometer with GPS-based acquisition.
- DC resistivity sounding and profiling using SSR MP1, DDR3, and multi-electrode resistivity systems.
- Self-potential (SP) measurements for near-surface geophysical investigations.
- In-situ rock property measurements using KT–10 magnetic susceptibility and conductivity meter.
- Transient Electromagnetic (TEM) surveys using sTEM5 for subsurface imaging to depths of 150–200 m.

Leadership & Extra-Curriculars

- **President** – SPE Student Chapter, IIT Bombay (2024–Present): Leading chapter activities, industry outreach, technical events, and member engagement initiatives.
- **Interview Coordinator**, IIT Bombay: Managed 250+ members and 1700+ interview candidates; organized recruitment tests for 15+ companies.
- **General Secretary**, Student Council of Indian Geophysical Union (IGU), IIT Bombay.

Software & Programming

Python | MATLAB | SEISAN | CorelDRAW | Deep Learning | CNN-based Geophysical Modeling