RIDDHI MANDAL

2019-2025

2014-2019

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EDUCATION

Doctor of Philosophy, Geophysics

University of Toronto

· Recipient of multiple awards, and grants based on academic merit Nominated for OSPP finals at EGU

Master of Science, Geophysics

Indian Institute of Science Education and Research, Kolkata, India

- Conducted research at University of Cambridge
- Recipient of DST INSPIRE Fellowship (Merit-based scholarship)

Bachelor of Science, Earth Science

Indian Institute of Science Education and Research, Kolkata, India

- Recipient of DST INSPIRE Fellowship (Merit-based scholarship)
- Selected for Vijyoshi 2014 (exclusive scientific development camp)

WORK EXPERIENCE

Earth Science Researcher

OutlierAI

- Consulted as a geophysics expert, training AI models to solve complex geophysical problems by integrating domain knowledge into machine learning frameworks by analyzing real-world geophysical challenges in magnetism, seismology and gravity.
- Developed solutions, reviewed Al-generated results, and advised on feature engineering, data processing, and model architecture to improve accuracy and optimized code to accelerate training speed.
- Enhanced AI-driven geophysics applications, boosting model precision and enabling adoption in seismic analysis, resource exploration, finishing the project one month early due to faster model training.

Research Assistant University of Toronto

- Built a numerical model for Boundary Integral Modelling of dynamic rupture propagation using rigorous algorithm design to ensure fast performance in a HPC environment.
- Designed and analysed a 5000 parameter large parameter-space to determine effects of fluids on rupture mechanics.
- Analyzed laboratory rock fracture experiments and modelled them under different scenarios to determine the failure behaviour under different kinds of stresses.
- Performed field-based observations and created an in-depth hydrogeological model of the wastewater injection sites near the 2016 Pawnee Earthquake.
- Executed stress analysis of microseismicity surrounding the event to characterize the fault behaviour and instability caused by the injection operations.
- Developing a deep learning based model to identify precursors to unstable fractures.

Al Data Analyst

DATech

- Reviewed models that were designed for complex problem-solving but needed in-depth performance evaluation to assess accuracy, user experience, and comparison with competitors.
- Analyzed model responses, user scores, and competitor benchmarks to identify strengths, weaknesses, and areas for optimization using data mining, statistical models, and machine learning techniques to evaluate model effectiveness, uncover performance trends, and diagnose pain points.
- Provided data-driven insights that improved AI model performance, enhanced user experience increasing the Net Promoter Score by more than one point. March 2019 – August 2019

Geophysicist – Taiso Alloys

- Conducted geophysical surveys and data analysis, integrating diverse datasets to assess subsurface structures and mineral potential.
- Developed and implemented exploration plans, optimizing survey methodologies for resource identification.
- Interpreted geophysical data using specialized software and advanced modeling techniques, providing actionable insights for exploration teams, collaborating with multidisciplinary teams to refine exploration strategies and improve decisionmaking.

August 2019 - Current

July - December 2024

June 2024 - Current

Masters Research

Indian Institute of Science Education and Research, Kolkata

- Conducted seismic surveys, deployed long-term and short-term seismometers, performing focal mechanism inversions, CFS analysis, receiver function analysis, and rupture propagation modeling.
- Investigated the region's stress regime, fault interactions, and rupture propagation through seismic surveys and numerical modeling.
- Provided critical insights into stress transfer and fault behavior, improving regional seismic hazard assessment and advancing tectonic deformation models.

CAREER RELATED SKILLS

- Geological Software: Oasis Montaj, GMT, ArcGIS, MODFLOW, FEFLOW, ObsPy, InSite, COULOMB, COMSOL Multiphysics, ABAQUS, FLAC3D, SAC, WTC
- **Programming Languages:** Python, R, MATLAB, C++, Fortran, JavaScript, Perl
- **High-Performance Computing (HPC):** Parallel programming and optimization; Experience with MPI, OpenMP & SLURM; Scaling and deploying machine learning models in distributed environments
- Data & Analysis Tools and libraries: Vertex AI, BigQuery, AutoML, Tensorflow, Pandas, SciKitLearn, OpenCV, Excel, Tableau, PowerBI, Seaborn

PUBLICATIONS

- **R. Mandal,** S. Lui, "Fluid Injection and the 2016 Pawnee Earthquake: A Multi-Parameter Analysis of Induced Seismicity", Manuscript in Progress
- **R. Mandal,** S. Lui, "Interdependent effects of injection volume and rate on fault slip behavior: A large-scale numerical study", Scientific Reports
- D. Powali, S. Sharma, R. Mandal, S. Mitra, "A Reappraisal of the 2005 Kashmir (Mw 7.6) Earthquake and its Aftershocks: Seismotectonics of NW Himalaya", Tectonophysics
- S. Dey, D. Powali, J. Chaudhury, M. Ghosh, **R. Mandal**, J. Kanaujia, S. Mitra, "28 August 2018 (Mw 4.5) Bengal Basin earthquake highlights active basement fault beneath the sediments", Current Science, 2019, 116,1633-1636