Amir Mardan

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Research Interest

- Full waveform inversion
- Decision making under uncertainty
- Geophysical monitoring
- Reservoir characterization
- Numerical modeling
- Machine learning

Education

INRS (Québec, Canada) *Sep./2018 - Dec./2022*
Ph.D. Geoscience

Amirkabir University of Technology (Tehran, Iran) *Sep./2014 - Sep./2016*
M.Sc. Petroleum engineering (Exploration seismology)

Science and Research Branch of Islamic Azad University (Tehran, Iran)
B.Sc. Petroleum engineering (Exploration) *Sep./2009 - Sep./2013*

Research Experience

Processing and inversion of near-surface seismic data using deep learning
Industrial postdoctoral fellowship (Polytechnique Montréal, Géostack) *Jan./2023 - present*
Supervisor*: Dr. Gabriel Fabien-Ouellet*
Co-supervisor*: Dr. Bernard Giroux*
Industrial supervisor*: Dr. Martin Blouin*

Monitoring CO_2 saturation using time-lapse seismic FWI
INRS-ETE *Sep./2018 - Dec./2022*
Supervisor*: Dr. Bernard Giroux*
Co-supervisor*: Dr. Gabriel Fabien-Ouellet*

Application of pattern recognition in detecting buried channels in seismic data
Amirkabir University of Technology *July/2015 - Sep./2016*
Supervisor*: Dr. Abdolrahim Javaherian*

Porosity measurement using well logging
Science and Research Branch of Islamic Azad University of Tehran *July/2012 - July/2013*
Supervisor*: Dr. Kamyar Ahmadi*

Teaching Experience

Guest lecturer
Polytechnique Montréal *Oct./2023*
Montréal, QC, Canada

Teacher assistant
Polytechnique Montréal *Sep./2023 - present*
Montréal, QC, Canada

Lecturer
Azad University *Sep./2016 - Jan./2018*
Tehran, Tehran, Iran

Professional Experience

Mitacs Elevate Postdoctoral Researcher
Polytechnique Montréal - Géostack — *Jan./2023 - present*
QC, Canada

Geophysical Technician
Géostack (part-time collaboration) — *Nov./2021 - Dec./2022*
Québec, QC, Canada

Technical Skills

Programming language: Python, C++, HTML, JavaScript, MATLAB
Machine-learning: Pandas, PyTorch, TensorFlow, Scikit-learn
Version control: Git, GitHub
Software: Petrel, OpendTect, HampsonRussell, VISTA

Open source contributions

- PyFWI
  PyFWI is a Python package I developed for seismic full-waveform inversion (FWI) and reservoir monitoring (TL-FWI). This package is developed using OpenCL to perform the computations on GPU.
- PINN-FWI
  PINN-FWI is an open-source tool that I have developed to perform full-waveform inversion (FWI) by taking advantage of artificial intelligence (AI). This software allows researchers to employ physics-informed neural network (PINN) for modeling the subsurface.
- first_break_picking
  first_break_picking is a Python package developed with the support of Geostack for picking first break in seismic data. With some modifications, this package has been also used for dispersion curve picking of surface waves and also late arrivals in GPR data.

Publications

- **Mardan, A.**, B. Giroux, G. Fabien-Ouellet, and M. R. Saberi, 2023, Monitoring fluid saturation in reservoirs using time-lapse full-waveform inversion, Geophysical Prospecting, doi:10.1111/1365-2478.13363.
- **Mardan, A.**, B. Giroux, and G. Fabien-Ouellet, 2023, PyFWI: A Python package for full-waveform inversion and reservoir monitoring, SoftwareX, doi:10.1016/j.softx.2023.101384.
- **Mardan, A.**, B. Giroux, and G. Fabien-Ouellet, 2023, Weighted-average time-lapse seismic full-waveform inversion, Geophysics, doi:10.1190/geo2022-0090.1.
- **Mardan, A.**, B. Giroux, G. Fabien-Ouellet, and M. R. Saberi, 2022, Direct monitoring of fluid saturation using time-lapse full-waveform inversion, 2^{nd} International Meeting for Applied Geoscience & Energy (IMAGE), Houston, Texas, doi:10.1190/image2022-3746685.1.
- **Mardan, A.**, B. Giroux, and G. Fabien-Ouellet, 2022, Effects of nonrepeatability on time-lapse full-waveform inversion, 83rd EAGE Conference and Exhibition 2022, Madrid, doi:10.3997/2214-4609.202211009.
- **Mardan, A.**, B. Giroux, and G. Fabien-Ouellet, 2022, Time-lapse full-waveform inversion for monitoring the fluid saturation, 83rd EAGE Conference and Exhibition 2022, Madrid, doi:10.3997/2214-4609.202210635.
- **Mardan, A.**, B. Giroux, and G. Fabien-Ouellet, 2022, Time-lapse seismic full-waveform inversion using improved cascaded method, 2nd EAGE Conference On Seismic Inversion, Porto, doi:10.3997/2214-4609.202229003.
- **Mardan, A.**, A. Javaherian, and M. Mirzakhanian, 2018, Channel detection using unsupervised learning techniques, 80th EAGE Conference and Exhibition 2018, Copenhagen, doi:10.3997/2214-4609.201800924.
- **Mardan, A.**, A. Javaherian, and M. Mirzakhanian, 2017, Channel characterization using support vector machine, 79th EAGE Conference and Exhibition 2017, Paris, doi:10.3997/2214-4609.201701665.

- **Mardan, A.**, A. Javaherian, and M. Mirzakhanian, 2016, Channel detection using unsupervised learning algorithms, The 17$^{\text{th}}$ Iranian Geophysical Conference, Tehran.
- **Mardan, A.**, A. Javaherian, and M. Mirzakhanian, 2015, A comparison of unsupervised learning techniques for channel detection in 3D seismic data acquired over the Strait of Hormuz, Journal of Research on Applied Geophysics, **1**, 2, 90-102, doi:10.22044/JRAG.2015.649

Awards

Research scholar position at Stanford University	*2023*
Mitacs Elevate postdoctoral fellowship, CAD$160,000.00	*2023*
High-rank presentation at 83rd EAGE Conference and Exhibition	*2022*
SEG/Landmark Scholarship for USD$9,465.9	*2022*
SEG Foundation Scholarship for USD$534.1	*2022*
IEAGHG International CCS Summer School	*2020*
Ranked 4$^{\text{th}}$ in MSc Entrance Exam of Petroleum Exploration Engineering in Iran	*2014*

Other scientific activities

Journal reviewer

- Geophysics *2024 -*
- Computers and Geosciences *2023 -*
- Geophysical Journal International *2023 -*
- Geophysical Prospecting *2023 -*

EAGE, extended abstract reviewer	*2017 -*
Member, EAGE	*2016 -*
Member, SEG	*2014 -*