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EDUCATION

Ph.D. Geophysics, Saint Louis University (2014–2019)
Dissertation*: "Crustal Structure beneath the Wabash Valley Seismic Zone from Dense Seismic Arrays: Implications for Failed Continental Rifts and Intraplate Seismicity"*

M.Sc. Geophysics, Institute for Advanced Studies in Basic Sciences (2009–2012)
Thesis*: "New Insights into the Seismotectonics of Northwest Iran Using the IASBS Temporary Local Seismic Network"*

B.Sc. Geology, University of Tehran (2004–2008)

RESEARCH SUMMARY

My research program integrates observational seismology, computational geophysics, and machine learning (ML) to investigate Earth's structure, earthquake processes, and tectonic deformation from local fault zones to continental-scale lithospheric structure. I develop open-source ML frameworks for automated seismic signal processing, including the **Pick Aggregator**, an ensemble ML workflow for generating high-precision earthquake catalogs that generalize to out-of-distribution seismic datasets. I construct high-resolution seismic velocity models and integrate seismic, geodetic, geological, and anthropogenic datasets to advance understanding of earthquake processes, fault-zone evolution, and seismic hazard. My ongoing work at New Mexico Tech focuses on integrated seismic imaging and ML-based catalog development to characterize natural and induced seismicity and subsurface structure in the Rio Grande Rift and surrounding regions.

Core Research Areas

- **Machine Learning for Seismology:** I developed the Pick Aggregator, an ensemble ML workflow for generating high-precision earthquake catalogs that generalize to out-of-distribution seismic datasets, with ongoing development toward deployment at national-scale seismic networks.
- **Crustal and Upper Mantle Seismic Imaging:** I apply multi-scale imaging of Earth's interior using joint inversion schemes, receiver function analysis, ambient-noise surface-wave dispersion, and seismic tomography to constrain lithospheric structure.

- **Earthquake Source Characterization:** I use high-precision earthquake relocation and moment tensor inversion to investigate rupture processes, fault mechanics, and stress evolution and partitioning.
- **Induced Seismicity and Fault Systems:** I integrate seismic, geodetic, geological, and anthropogenic datasets to quantify the spatiotemporal evolution of induced seismicity, aseismic deformation, fluid-driven processes, and complex fault interactions.
- **Stochastic Ground-Motion Modeling:** I develop source and attenuation models using weak-motion recordings to improve ground-motion prediction and probabilistic seismic hazard assessment.

RESEARCH FUNDING

Total Research Funding: $1M+ (awarded: $349K+; under review: $655K+)

Proposals in Review: $655K+

Principal Investigator: *A Multi-Model Machine Learning Ensemble for Transfer Learning of Seismic Phase Pickers with Out-of-Distribution Data at the New Mexico Tech Seismological Observatory,* $605K, Submitted to **National Science Foundation**, Collaborations in Artificial Intelligence and Geosciences (CAIG), January 2026.

Co-Principal Investigator: *Shallow Subsurface Characterization of the Permian Basin Using Dense Seismic Nodal Arrays,* $50K, Submitted to **New Mexico EPSCoR Seed Grant**, March 2026.

Awarded Grants: $349K+

External Grants

Co-Principal Investigator
Toward understanding physical mechanism of induced seismicity in Texas, Texas Seismological Network, $150K+, Southern Methodist University (2022–2024).

Co-Principal Investigator
Tsunami and landslide hazard studies at U.S. continental margins using ocean bottom seismographs, United States Geological Survey (USGS) Cooperative Funds (*G19AC00406*), $97K+, Saint Louis University (2019–2021).

Internal Grants

Co-Principal Investigator
Precise Earthquake Relocation Along the Cascadia Subduction Zone: Harnessing Machine Learning and Ocean Bottom Seismometers, SMU Dedman College Dean's Research Council Grant Program, $39K+ (2025).

Co-Principal Investigator
Unraveling seismotectonics of subduction zones: Leveraging machine learning analysis of ocean bottom seismometers, SMU Faculty Research Acceleration Grant, O'Donnell Data Science Institute, $63K+ (2024-2025).

RESEARCH PUBLICATIONS

Manuscripts in Review

1. **Aziz Zanjani, A.** and H. R. DeShon. **Pick Aggregator**: A Multi-Model Ensemble of Machine Learning Pickers to Generate an Onshore-Offshore Seismic Catalog for Puerto Rico and the Virgin Islands, *Seismological Research Letters* (2026) (revision submitted).

2. **Aziz Zanjani, A.** and R. B. Herrmann. Spatial dependence of high-frequency ground motion along the Chilean subduction zone from weak-motion aftershock records of the M_W 8.8 Maule and M_W 8.2 Iquique earthquakes. Submitted to *AGU: Earth and Space Science* (2026) (revision submitted).

Peer-Reviewed Journal Articles

1. **Aziz Zanjani, A.**, H. R. DeShon, V. Karanam, and A. Savvaidis (2025). Insights into spatiotemporal evolution of induced earthquakes in the Southern Delaware Basin using calibrated relocations from the TexNet catalog (2017-2022). *AGU Earth and Space Science*, 12(6). https://doi.org/10.1029/2024EA004027

2. **Aziz Zanjani, A.**, H. R. DeShon, V. Karanam, and A. Savvaidis (2024). Insights into temporal evolution of induced earthquakes in the Southern Delaware Basin using calibrated relocations from the TXAR catalog (2009-2016). *The Seismic Record*, 4(2), 140–150. https://doi.org/10.1785/0320240011

3. Herrmann, R. B., Ch. J. Ammon, H. M. Benz, **A. Aziz Zanjani**, and J. Boschelli (2021). Short-period surface-wave tomography in the continental United States—A resource for research. *Seismological Research Letters*, 92(6), 3642-3656. https://doi.org/10.1785/0220200462

4. **Aziz Zanjani, A.**, L. Zhu, R. B. Herrmann, Y. Liu, and J. Conder (2019). Crustal structure beneath the Wabash Valley Seismic Zone from joint inversion of receiver functions and surface-wave dispersions and its implications for continental rifts and intraplate seismicity. *Journal of Geophysical Research: Solid Earth*, 124(7), 7028-7039. https://doi.org/10.1029/2018JB016989

5. Ghods, A., E. Shabanian, E. Bergman, M. Faridi, S. Donner, Gh. Mortezanejad, **A. Aziz Zanjani** (2015). The Varzeghan-Ahar, Iran earthquake doublet (Mw 6.4, 6.2): Implications for the geodynamics of northwest Iran. *Geophysical Journal International*, 203(1), 522-540. https://doi.org/10.1093/gji/ggv306

6. **Aziz Zanjani, A.**, A. Ghods, F. Sobouti, E. Bergman, Gh. Mortezanejad, K. Priestly, S. Madanipour, M. Rezaeian (2013). Seismicity in the western coast of the South Caspian Basin and the Talesh Mountains. *Geophysical Journal International*, 195(2), 799-814. https://doi.org/

10.1093/gji/ggt299

7. Mortezanejad, Gh., **A. Aziz Zanjani**, A. Ghods, and F. Sobouti (2013). Insights into the crustal structure and the seismotectonics of the Talesh region using local and teleseismic data. *Scientific Quarterly Journal of Geosciences, Geological Survey of Iran,* 88(2), 38-47 (in Persian).

Open-Source Data Products and Developed Codes

- Pick Aggregator (code): GitHub
- Relocated machine learning based catalog for Puerto Rico and Virgin Islands (mid 2015– mid 2016): Zenodo
- Calibrated Earthquake Relocations from the TexNet Catalog (2017–2022) and Vertical Surface Deformation (2016–2022) (Catalog): Zenodo
- Calibrated Relocations for the TXAR Catalog (2009–2016) (Catalog): Zenodo

RESEARCH EXPERIENCE

Research Scientist, New Mexico Tech Seismological Observatory (Aug. 2025–Present)

- Developing a high-resolution ensemble machine learning catalog for natural and induced seismicity in New Mexico
- Shallow subsurface imaging using ambient noise tomography and dense seismic arrays in southeastern New Mexico to develop a high-resolution shear wave velocity model
- Establishing collaborative research projects through competitive proposals (NSF, New Mexico EPSCoR Seed Grant)

Postdoctoral Researcher, Southern Methodist University (Feb. 2022–Aug. 2025)

- Developed novel *Pick Aggregator* module to build ensemble machine learning catalogs, applied to offshore seismic swarms north of Puerto Rico-Virgin Islands recorded by ocean bottom seismometers and land stations
- Integrated spatiotemporal analysis of induced seismicity in the Delaware Basin, incorporating seismicity patterns from relocated catalog, InSAR surface deformation, and fluid injection-extraction data
- Secured competitive external TexNet funding and internal funding

Postdoctoral Researcher, Saint Louis University (Aug. 2019–June 2021)

- Developed calibrated earthquake locations and focal mechanisms for Puerto Rico Subduction Zone using ocean bottom and land seismometers
- Secured USGS Cooperative Funds for seismic hazard studies in Puerto Rico

Graduate Research Assistant, Saint Louis University (Aug. 2014–Aug. 2019)

- Developed high-resolution 2-D velocity model of the Wabash Valley Seismic Zone using joint inversion of receiver functions and surface wave dispersion (NSF project)
- Developed 3-D ambient noise tomography models of the Illinois Basin
- Developed source-attenuation models using stochastic modeling of ground motion in the Chilean Subduction Zone

Graduate Research Fellow, Institute for Advanced Studies in Basic Sciences (Aug. 2009–Mar. 2013)

- Investigated seismotectonics of the Talesh Fold-and-Thrust Belt, western coast of South Caspian Basin by developing a local high-resolution earthquake catalog
- Relocated aftershocks of two major mainshocks in northwest Iran

TEACHING EXPERIENCE

Instructor of Record

Adjunct Lecturer, Southern Methodist University

- Earth Systems (Canvas-based, undergraduate, 72 students, Fall 2023)

Developed inclusive, active-learning curriculum incorporating real-world applications and case studies, designed hands-on exercises with students presentations on anthropogenic impacts in Earth Systems.

Lecturer, University of Zanjan, Iran

- Introduction to Geophysics (undergraduate, 28 students, Fall 2012)

Teaching Assistant, Saint Louis University

- Sustainable Energy (undergraduate, Fall 2017 & 2018)
- Is Earth Unique? (undergraduate, Spring 2016)
- Earth's Dynamic Environment (undergraduate, Fall 2015 & 2016)

Professional Teaching Development

- **Certificate in University Teaching Skills**, Reinert Center for Transformative Teaching and Learning, Saint Louis University, 15 credits through workshops, online courses, and preparing a teaching portfolio, 2019.
- Canvas Onsite Training, Reinert Center for Transformative Teaching and Learning, Saint Louis University, 2021.
- Comprehensive Canvas Training Series, Southern Methodist University, 2023.

Courses Prepared to Teach

- Upper-level/Graduate: Earthquake Seismology, Applied Geophysics, Machine Learning in Earth Sciences, Induced Seismicity, Advanced Signal Processing, Inverse Theory, Earthquakes and Volcanoes, Geophysical Field Methods, Computational Methods in Geoscience, Earth Processes,

Theoretical Seismology, Observational Seismology, Environmental Seismology, Earthquake and Fault Mechanics
- Introductory: Introduction to Geophysics, Earth Systems, Natural Hazards, Environmental Geology, Plate Tectonics, Structural Geology, Seismotectonics, Historical Geology

MENTORING & STUDENT SUPERVISION

2026 EarthScope Consortium RESESS Program Summer Intern Mentor
- Nathan Wolski (Geology major from The University of Illinois in Champaign-Urbana): Ambient noise tomography for developing shear wave velocity models, seismic data processing on Linux

2024-2025 Graduate Student Co-mentor
- Omid Asgarvand (PhD candidate, Southern Methodist University): Machine learning for developing seismic catalogs

Asgarvand, O., H. R. DeShon, and **A. Aziz Zanjani** (2026). Machine learning-based high-resolution earthquake catalog for the Middle America Trench using ocean bottom and land seismometers, *SSA Annual Meeting*, Pasadena, CA, poster.

2022 Undergraduate IRIS Summer Intern Co-mentor
- Chris Justiniano: Seismic data processing on Linux, Machine learning for developing seismic catalogs

Justiniano Ch., **A. Aziz Zanjani**, and H. R. DeShon (2022). A deep learning approach for induced seismicity in Azle-Reno, North Texas, *AGU Fall Meeting*, Chicago, IL, poster.

INVITED TALKS

- *From drilling to ground shaking: Tracing the effects of oil and gas production on seismicity in the Permian Basin*, New Mexico Tech, Department of Earth and Environmental Science (October 2025)
- *Spatial and temporal evolution of induced seismicity in the Delaware Basin*, UT San Antonio, Department of Earth and Planetary Sciences (October 2023)
- *Spatial and temporal evolution of induced seismicity in the Delaware Basin*, UT Dallas, Department of Sustainable Earth Systems Sciences (September 2023)
- Industry-focused presentations at TexNet & CISR Annual Review Meetings:

1. *Insights into spatiotemporal evolution of induced seismicity in the Delaware Basin near Pecos, Texas, spanning 2009-2017*, TexNet & CISR 2023 Annual Review Meeting, Bureau of Economic Geology, University of Texas, Dec. 6, 2023.

2. *Calibrated locations for induced earthquakes in the Delaware Basin*, Texas, spanning 2009-2017, TexNet & CISR 2022 Annual Review Meeting, Bureau of Economic Geology, University of Texas, Dec. 7, 2022.

SELECTED CONFERENCE PRESENTATIONS & ABSTRACTS

Aziz Zanjani, A. and Heather R. DeShon (2026). Pick Aggregator: A Multi-Model Ensemble of Machine Learning Pickers to Detect Offshore Seismic Swarms North of Puerto Rico and the Virgin Islands, *SSA 2026 Annual Meeting*, Pasadena, CA, oral.

Aziz Zanjani, A. and U. Basu (2026). A Comprehensive Machine Learning-Based Catalog for Effective Monitoring of Induced Seismicity in Southeastern New Mexico, *SSA 2026 Annual Meeting*, Pasadena, CA, oral.

Aziz Zanjani, A. and U. Basu (2026). Constraining Seismic Velocity Structure in Southeastern New Mexico Using Ambient Noise Tomography: Implications for Induced Seismicity Depth Determination, *SSA 2026 Annual Meeting*, Pasadena, CA, poster.

Aziz Zanjani, A., U. Basu, and A. Record (2025). Benchmarking Machine Learning Pickers and Pre-trained Models for Induced Seismicity in Southeastern New Mexico. *ESSA 2025 Annual Meeting*, Saint Louis, MO, poster.

Aziz Zanjani, A. and H. R. DeShon (2025). Seismic Catalog Development North of Puerto Rico and the Virgin Islands Using Machine Learning and Ocean Bottom Seismometers. *ESSA 2025 Annual Meeting*, Saint Louis, MO, oral.

Aziz Zanjani, A. and H. R. DeShon (2025). Seismotectonics of the Puerto Rico Subduction Zone: Leveraging Machine Learning Analysis of Ocean Bottom Seismometers. *SSA 2025 Annual Meeting*, Baltimore, MD, oral.

Aziz Zanjani, A., H. R. DeShon, A. Savvaidis (2024). Spatiotemporal Evolution of Induced Earthquakes in the Southern Delaware Basin, Reeves-Pecos, West Texas. *SSA Annual Meeting*, Anchorage, AK, oral.

Aziz Zanjani, A., H. R. DeShon, F. Aziz Zanjani, L. Binetti, A. Savvaidis (2023). Insights into spatiotemporal evolution of induced seismicity in the Delaware Basin near Pecos, Texas, *AGU Fall Meeting*, San Francisco, CA, oral.

Aziz Zanjani, A., L. Binetti, and H. R. DeShon (2023). Bridging the data gap and relocation errors for improved spatiotemporal evaluation of induced seismicity in the Delaware Basin. *SSA Annual Meeting*, Puerto Rico, oral.

Aziz Zanjani, A. and H. R. DeShon (2023). Spatial and temporal characteristics of induced earthquakes in the Delaware Basin near Pecos, Texas, *ESSA Annual Meeting*, Dallas, TX, oral.

Aziz Zanjani, A., L. Binetti, and H. R. DeShon (2022). Calibrated locations for induced earthquakes in the Delaware Basin, Texas, spanning 2009-2017, *AGU Fall Meeting*, Chicago, IL, poster.

Aziz Zanjani, A., U. S. Ten Brink, R. B. Herrmann and C. H. Flores (2020). P-wave tomography and seismotectonics of the Puerto Rico subduction zone. *AGU Fall Meeting*, online, poster.

Aziz Zanjani, A., R. B. Herrmann (2019). Spatial characteristics of high frequency ground motion along the Chilean Subduction Zone. *SSA Annual Meeting*, Seattle, WA, poster.

Aziz Zanjani, A., L. Zhu, R. B. Herrmann, Y. Liu, and J. Conder (2017). Crustal structure beneath the Wabash Valley Seismic Zone and implications for the intracontinental seismicity. *AGU Fall Meeting*, New Orleans, LA, poster.

Selected from 22 total conference presentations, complete presentation list is available upon request

MEDIA & PUBLIC ENGAGEMENT

- ***Dallas Morning News***: "Is it natural or fracking? SMU study reveals cause of past Texas earthquakes" (August 2024)
- ***SMU News, Research***: "Study revisits Texas seismic activity occurring before 2017, confirming connection to wastewater injection" (August 2024)

PROFESSIONAL SERVICE

Leadership & Organization

Scientific Session Organizer and Chair

- SSA 2026: "From Drilling to Ground Shaking: Mechanisms, Monitoring, and Mitigation of Induced Earthquakes," Pasadena, CA
- SSA 2024: "Induced Earthquakes: Source Characteristics, Mechanisms, Stress Field Modeling, and Hazards," Anchorage, Alaska
- AGU 2023: "De-Risking Induced and Triggered Earthquake: Advances in Theory, Monitoring, and Forecast Modeling," San Francisco, CA
- Co-Chair, Eastern Section of SSA Annual Meeting, SMU, Dallas (2023)

Peer Review & Evaluation

Journal Peer Reviewer

- Seismological Society of America, The Seismic Record (2026)
- American Geophysical Union, Earth and Space Science (2025)
- American Geophysical Union, Earth Surface (2025)
- Seismological Society of America, Bulletin of the Seismological Society of America (BSSA) (2021)

Outstanding Student Presentation Award (OSPA) Judge

- AGU Fall Meeting (2023)
- SSA Annual Meetings (2023, 2024, 2025, 2026)
- ESSA Annual Meeting (2023, 2025)

K-12 Outreach

- STEM Earthquake Research Workshop facilitator for middle school students (Medlin Middle School, May 2022)
- Tech Trek, New Mexico Bureau of Geology and Mineral Resources, 2026

FIELDWORK EXPERIENCE

- Node design, field logistics (truck driving), deployment, and data processing for ambient noise tomography in southeastern New Mexico (Carlsbad), at New Mexico Bureau of Geology and Mineral Resources (2026).
- Teaching near-surface geophysics workshop (GPR, GPS, ERT, and seismic refraction), EarthScope Consortium, Colorado School of Mines (2026).
- Active seismic refraction survey, Southern Methodist University (2023).
- Deployment of broadband seismometers for the Wabash Valley project, Saint Louis University (2015).
- Geophysical field campaigns for geodetic, gravity, and geoelectrical data acquisition, processing, and modeling, Institute for Advanced Studies in Basic Sciences (2010).
- Structural and geological mapping of Qom Formation, University of Tehran (2007).

TECHNICAL EXPERTISE

Programming & High-Performance Computing (HPC): Python, MATLAB, Fortran, Bash scripting, HPC cluster management (SLURM, SBATCH, parallel processing), cloud computing

Seismological Analysis Software: Massive Parallel Analysis System for Seismologists (MsPASS), Computer Programs in Seismology (CPS), SAC/GSAC, ObsPy, SEISAN, XCORLOC, NonLinLoc, CAP, HypoDD, HypoInverse, GrowClust, tomoDD, VELEST, SMSIM

Machine Learning: EQTransformer, PhaseNet, SeisBench, GaMMA, PyOcta

Data Processing & Visualization: GMT, Python (Matplotlib, Seaborn), QGIS, Google Earth, LaTeX

Professional Certifications:

- EarthScope Consortium Certificate for Using MsPASS for Data Processing on HPC and Cloud Systems (2025)
- NVIDIA DLI Certificate: Fundamentals of Deep Learning (2023)
- Publons Academy Peer Reviewer Certificate, endorsed by a qualified supervisor, an online peer review course corresponding to 15 hours, two paper reviews (2021)

Professional Memberships

- American Geophysical Union (AGU)
- Seismological Society of America (SSA)

FELLOWSHIPS & AWARDS

- Postdoctoral Fellowship, Texas Seismological Network, 2022, 2023, 2024
- Postdoctoral Fellowship, USGS Cooperative Funds, 2019
- Seismological Society of America Travel Award, 2026
- Best Presentation Award among postdoctoral scholars, Research and Innovation Week, Moody School of Graduate and Advanced Studies, Southern Methodist University (2023)

REFERENCES

Prof. Heather R. DeShon
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Roy M. Huffington Department of Earth Sciences, Southern Methodist University
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Relationship: Postdoctoral Research Supervisor

Prof. Robert B. Herrmann
Otto Nuttli Professor of Geophysics
Department of Earth and Atmospheric Sciences, Saint Louis University
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Relationship: Postdoctoral Research Supervisor and Doctoral Research Co-advisor

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Relationship: Doctoral Research Advisor

Additional references available upon request