Hongyu Xiao

Ph.D. | Oklahoma Geological Survey | the University of Oklahoma | Email: Hongyu.Xiao-1@ou.edu

Education

Ph.D. in Geophysics/Geology, University of Illinois Urbana-Champaign, 2023 Advisor: Dr. Xiaodong Song

M.S in Geophysics/Physics, University of Chicago, 2016 Advisor: Dr. Douglas MacAyeal

B.E.S in Geological Engineering, China University of Petroleum, Beijing, 2014,

Honor Program, Top Graduate

Relevant Experience

Research Associate, University of Oklahoma, Oklahoma Geological Survey **April 2024-now.**

- Designed machine learning algorithms for effective seismicity monitoring and event cataloging.
- Improved seismic event detection accuracy using transfer learning techniques.
- Integrated ML models with nodal acquisition systems using Python and PyTorch.
- Designed ML algorithms to edge computing devices
- Presented findings to stakeholders for informed decision-making.

Research Assistant, University of Illinois Urbana-Champaign, Geology Department **August 2017-August 2022**

- Applied a revised receiver function analysis in central and north midcontinent of U.S. and constructed high-resolution Moho depth maps.
- Built a high-resolution joint inversion seismic tomography model of the midcontinent of the United States with revised receiver functions and ambient noise surface wave data.

Graduate Student Intern, the Illinois Geological Survey

May 2022- August 2022/ August 2023-December 2023

- Conducted a comprehensive hedonic analysis on real estate properties and geothermal heat pump installations and conducted statewide surface geological mapping with diverse datasets.
- Conducted diverse geophysical surveys such as seismic streamers, electrical conductivity surveys, and Horizontal-to-Vertical Spectral Ratio (HVSR)
- Developed a Raspberry Shake based HVSR tool for horizontal-to-vertical spectral ratio (HVSR) and depth-to-bedrock analysis in Illinois.

Research Assistant, University of Chicago, Department of the Geophysical Sciences **Sept 2015-Sept 2016**

- Built a 3-layer neural network model of early earthquake warning system based on historical seismicity records.
- Managed large datasets of historical seismic records for supervised training and performed data cleaning, preprocessing, and feature design.

Programming Skills

Python/SAC/CShell/AWK/Perl/Matlab/C/Fortran

ArcGIS mapping/Generic mapping tools /PyTorch / Electrical Conductivity Survey /HVSR /Shallow Seismic Survey / Geophysical Inversion

SKILLS

- Knowledge of seismic wave propagation, regional structural tectonics, and parallel computing on HPC
- Demonstrated Linux computer scripting and programming skills with various languages.
- Excellent communication skills and teamwork skills

Publications

- Xiao, Hongyu, et al. "Moho depth (crustal thickness) variations under the northeastern midcontinent of North America, based on H-κ– c receiver-function analysis." Earth and Planetary Science Letters 658 (2025): 119289.

- Xiao, Hongyu, et al. "Crustal Thickness Variations in the Central Midcontinent, USA, and Their Tectonic Implications: New Constraints Obtained Using the H-κ-c Method." *Geophysical Research Letters* 49.17 (2022): e2022GL099257.

- (Submitted) Xiao et al., "Transfer Learning and Benchmarking for Induced Seismic Events Detection: Insight from Oklahoma"

- (In prep) Xiao, Hongyu, et al. " Performance of Automated Deep-Learning Seismic Event Detectors on Nodal Array Data"

- (In prep) Xiao, Hongyu, et al. " Joint Inversion of Surface Wave Dispersions and Receiver Functions in The Central Midcontinent of The United States: Implications for the Central Midcontinent of the USA "

- (In prep) Xiao, Hongyu, et al. " Crustal Thickness Variations Across North American Cratonic Basins: New Constraints from the Williston, Illinois, and Michigan Basins Using Receiver-Function Analysis. "

- (In prep) Balakian, Riley & Xiao, Hongyu " Horizontal to Vertical Spectral Ratio (HVSR) Analysis with SPRITE: An Open-Source Python-Based Software for Accurate Bedrock Interpretation "

Conference Presentations

- Topic: Machine Learning for Effective Microseismicity Monitoring
  Hongyu Xiao, Jacob Walter, Paul Ogwari, Andrew Thiel, Nicholas Gregg, Brandon Mace, Isaac Woelfel
  ES-SSA Annual Meeting in St. Louis, Missouri, USA – 2025

- Topic: Unveiling Shear Velocity Anomalies in the Central Midcontinent of the United States through High-Resolution Joint Inversion
  Hongyu Xiao, Stephen Marshak, Xiaodong Song
  ES-SSA Annual Meeting in St. Louis, Missouri, USA – 2025

- Topic: High-Fidelity Seismicity Dataset and Machine Learning Fine-Tuning Framework for Induced Seismicity Monitoring in Oklahoma
- **Hongyu Xiao,** Jacob Walter, Paul Ogwari, Andrew Thiel, Nicholas Gregg, Brandon Mace, Isaac Woelfel
  AAPG MCS Annual Meeting in Oklahoma City, OK, USA – 2025

- (**Invited Talk**) Topic: What Lies Beneath: Moho Depth and Crustal Structures in the Central Midcontinent, USA
  Hongyu Xiao, Stephen Marshak, Xiaodong Song
  John D. Pigott Colloquium, Department of Geoscience, University of Oklahoma, 2025

- Topic: Benchmarking Transfer Learning for Enhanced Detection and Monitoring of Induced Earthquakes from Regional and Microseismic Arrays
  Hongyu Xiao, Jacob Walter, Paul Ogwari
  AGU Annual Meeting in Washington. DC, USA – 2024

- (**Invited Talk**) Topic: Continental-Interior Deformation Deeper Down: Hints of Crustal Buckling and Trans-Crustal Shear Zones in the Cratonic Platform, Midcontinent USA
  Stephen Marshak**, Hongyu Xiao,** Benjamin Murphy**,** Michael DeLucia**,** Xiaodong Song
  GSA Annual Meeting in Pittsburgh, Pennsylvania, USA – 2023

- Topic: SPRIT HVSR: An Open-Source Software Package in Python for Processing, Analyzing, and Visualizing Ambient Seismic Vibrations
  Riley Balikian, **Hongyu Xiao,** Alexandra Sanchez
  GSA Annual Meeting in Pittsburgh, Pennsylvania, USA - 2023

- Topic: The Varying Crustal Thickness Underneath the Cratonic Basins in the Midcontinent of USA and its Implications: New Insights Using the H-κ-c Method
  H Xiao, MS DeLucia, X Song, S Marshak
  AGU Fall Meeting 2022

- Topic: Surface Wave Tomography from Ambient Noise in Central U.S. and its Implications for Illinois Basin and New Madrid Seismic Zone
  H Xiao, X Song, S Marshak
  GSA Annual Meeting in Indianapolis, Indiana, USA - 2018

Honors and Awards

Teachers Ranked as Excellent by Their Students, 2022
Teachers Ranked as Excellent by Their Students, 2021
Jackson Graduate Research Awards, 2020
Teachers Ranked as Excellent by Their Students, 2019