

WEIQIANG ZHU

✉ zhuwq@berkeley.edu · ☎ (650)-391-6238 · 🔍 Google Scholar · 🌐 Github · 📄 EPS Page

EDUCATION

Ph.D.	Geophysics, Stanford University	2016 - 2021
	Thesis: <i>Applications of Deep Learning in Seismology</i>	
	Adviser: <i>Gregory C. Beroza</i>	
Ph.D. minor	Computer Science, Stanford University	2016 - 2021
M.S.	Geophysics, Peking University	2013 - 2016
B.S.	Geophysics, Peking University	2009 - 2013

APPOINTMENTS

Assistant Professor	University of California, Berkeley	2023 - present
Director's Postdoctoral Fellow	California Institute of Technology	2021 - 2023

AWARDS & HONORS

Director's Postdoctoral Fellowship, Caltech Seismological Laboratory	2021
Exceptional Thesis, Geophysics, Stanford University	2021
Outstanding Student Presentation Award (OSPA), AGU	2021
National Scholarship, Peking University	2015
Outstanding Student Paper Award, Chinese Geophysical Society	2014
National Scholarship, Peking University	2012

PUBLICATIONS

Machine Learning/Deep Learning:

- Li, J., **Zhu, W.**, Biondi, E., & Zhan, Z. (2023). Earthquake focal mechanisms with distributed acoustic sensing. *Nature Communications*, 14(1), 4181.
- Sun, H., Ross, Z. E., **Zhu, W.**, & Azizzadenesheli, K. (2023). Next-generation seismic monitoring with neural operators. *arXiv preprint arXiv:2305.03269*.
- Zhu, W.**, Biondi, E., Li, J., Yin, J., Ross, Z. E., & Zhan, Z. (2023). Seismic arrival-time picking on distributed acoustic sensing data using semi-supervised learning. *arXiv preprint arXiv:2302.08747*.
- Yin, J., **Zhu, W.**, Li, J., Biondi, E., Miao, Y., Spica, Z. J., ... others (2023). Earthquake magnitude with das: A transferable data-based scaling relation. *Geophysical Research Letters*, 50(10), e2023GL103045.
- Ross, Z. E., **Zhu, W.**, & Azizzadenesheli, K. (2023). Neural mixture model association of seismic phases. *arXiv preprint arXiv:2301.02597*.
- Wilding, J. D., **Zhu, W.**, Ross, Z. E., & Jackson, J. M. (2023). The magmatic web beneath hawaii 'i. *Science*, 379(6631), 462–468.
- Zhu, W.**, Hou, A. B., Yang, R., Datta, A., Mousavi, S. M., Ellsworth, W. L., & Beroza, G. C. (2022). Quakeflow: a scalable machine-learning-based earthquake monitoring workflow with cloud computing. *Geophysical Journal International*.
- Zhu, W.**, Tai, K. S., Mousavi, S. M., Bailis, P., & Beroza, G. C. (2022). An end-to-end earthquake detection method for joint phase picking and association using deep learning. *Journal of Geophysical Research: Solid Earth*, 127(3), e2021JB023283. (pdf)

- Zhu, W.**, McBrearty, I. W., Mousavi, S. M., Ellsworth, W. L., & Beroza, G. C. (2022). Earthquake phase association using a bayesian gaussian mixture model. *Journal of Geophysical Research: Solid Earth*, 127(5), e2021JB023249. (pdf, code)
- Wang, K., Ellsworth, W., Beroza, G. C., **Zhu, W.**, & Rubinstein, J. L. (2022). Develnet: Earthquake detection on develocorder films with deep learning: Application to the rangely earthquake control experiment. *Seismological Society of America*, 93(5), 2515–2528.
- Retailleau, L., Saurel, J.-M., Laporte, M., Lavayssière, A., Ferrazzini, V., **Zhu, W.**, ... others (2022). Automatic detection for a comprehensive view of mayotte seismicity. *Comptes Rendus. Géoscience*, 354(S2), 153–170.
- Yang, L., Liu, X., **Zhu, W.**, Zhao, L., & Beroza, G. C. (2022). Toward improved urban earthquake monitoring through deep-learning-based noise suppression. *Science advances*, 8(15), eabl3564.
- Datta, A., Wu, D. J., **Zhu, W.**, Cai, M., & Ellsworth, W. L. (2022). Deepshake: Shaking intensity prediction using deep spatiotemporal rnns for earthquake early warning. *Seismological Society of America*, 93(3), 1636–1649.
- Zhang, M., Liu, M., Feng, T., Wang, R., & **Zhu, W.** (2022). Loc-flow: An end-to-end machine learning-based high-precision earthquake location workflow. *Seismological Research Letters*.
- Retailleau, L., Saurel, J.-M., **Zhu, W.**, Satriano, C., Beroza, G. C., Issartel, S., ... others (2022). A wrapper to use a machine-learning-based algorithm for earthquake monitoring. *Seismological Research Letters*, 93(3), 1673–1682.
- Tan, Y. J., Waldhauser, F., Ellsworth, W. L., Zhang, M., **Zhu, W.**, Michele, M., ... Segou, M. (2021). Machine-learning-based high-resolution earthquake catalog reveals how complex fault structures were activated during the 2016–2017 central italy sequence. *The Seismic Record*, 1(1), 11–19. (pdf)
- Zhu, W.**, Mousavi, S. M., & Beroza, G. C. (2020). Seismic signal augmentation to improve generalization of deep neural networks. *Advances in Geophysics*, 61, 151–177. (pdf)
- Mousavi, S. M., Ellsworth, W. L., **Zhu, W.**, Chuang, L. Y., & Beroza, G. C. (2020). Earthquake transformer—an attentive deep-learning model for simultaneous earthquake detection and phase picking. *Nature communications*, 11(1), 3952. (pdf, code)
- Chai, C., Maceira, M., Santos-Villalobos, H. J., Venkatakrishnan, S. V., Schoenball, M., **Zhu, W.**, ... Team, E. C. (2020). Using a deep neural network and transfer learning to bridge scales for seismic phase picking. *Geophysical Research Letters*, 47(16), e2020GL088651. (pdf)
- Liu, M., Zhang, M., **Zhu, W.**, Ellsworth, W. L., & Li, H. (2020). Rapid characterization of the july 2019 ridgecrest, california, earthquake sequence from raw seismic data using machine-learning phase picker. *Geophysical Research Letters*, 47(4), e2019GL086189. (pdf)
- Park, Y., Mousavi, S. M., **Zhu, W.**, Ellsworth, W. L., & Beroza, G. C. (2020). Machine-learning-based analysis of the guy-greenbrier, arkansas earthquakes: A tale of two sequences. *Geophysical Research Letters*, 47(6), e2020GL087032. (pdf)
- Zheng, J., Shen, S., Jiang, T., & **Zhu, W.** (2020). Deep neural networks design and analysis for automatic phase pickers from three-component microseismic recordings. *Geophysical Journal International*, 220(1), 323–334.
- Zhu, W.**, Mousavi, S. M., & Beroza, G. C. (2019). Seismic signal denoising and decomposition using deep neural networks. *IEEE Transactions on Geoscience and Remote Sensing*, 57(11), 9476–9488. (pdf, code)
- Zhu, W.**, & Beroza, G. C. (2018). Phasenet: a deep-neural-network-based seismic arrival-time picking method. *Geophysical Journal International*, 216(1), 261–273. (pdf, code)
- Mousavi, S. M., Sheng, Y., **Zhu, W.**, & Beroza, G. C. (2019). Stanford earthquake dataset (stead): A global data set of seismic signals for ai. *IEEE Access*, 7, 179464–179476. (pdf)
- Mousavi, S. M., **Zhu, W.**, Ellsworth, W., & Beroza, G. (2019). Unsupervised clustering of seismic signals using deep convolutional autoencoders. *IEEE Geoscience and Remote Sensing Letters*, 16(11), 1693–1697. (pdf)

Mousavi, S. M., **Zhu, W.**, Sheng, Y., & Beroza, G. C. (2019). Cred: A deep residual network of convolutional and recurrent units for earthquake signal detection. *Scientific reports*, 9(1), 10267. (pdf)

Simulation & Inversion:

Xu, K., **Zhu, W.**, & Darve, E. (2022). Learning generative neural networks with physics knowledge. *Research in the Mathematical Sciences*, 9(2), 33. (pdf)

Zhu, W., Xu, K., Darve, E., & Beroza, G. C. (2021). A general approach to seismic inversion with automatic differentiation. *Computers & Geosciences*, 151, 104751. (pdf, code)

Zhu, W., Xu, K., Darve, E., Biondi, B., & Beroza, G. C. (2022). Integrating deep neural networks with full-waveform inversion: Reparameterization, regularization, and uncertainty quantification. *Geophysics*, 87(1), R93–R109. (pdf, code)

Ma, B., **Zhu, W.**, & Huang, Q. (2021). Imaging shallow fault structures by three-dimensional reverse time migration of ground penetration radar data. *Journal of Applied Geophysics*, 190, 104342.

Zhu, W., Allison, K. L., Dunham, E. M., & Yang, Y. (2020). Fault valving and pore pressure evolution in simulations of earthquake sequences and aseismic slip. *Nature communications*, 11(1), 4833. (pdf, code)

Zhu, W., Huang, Q., Liu, L., & Ma, B. (2020). Three-dimensional reverse time migration of ground-penetrating radar signals. *Pure and Applied Geophysics*, 177, 853–865.

Xu, K., **Zhu, W.**, & Darve, E. (2020). Distributed machine learning for computational engineering using mpi. *arXiv preprint arXiv:2011.01349*.

ZHU, W.-Q., & HUANG, Q.-H. (2016). Attenuation compensated reverse time migration method of ground penetrating radar signals. *Chinese Journal of Geophysics*, 59(10), 3909–3916.

Zhu*, W., Huang, Q., & Liu, L. (2015). Application of reverse time migration on gpr data for detecting internal structures in a sand dune. In *Seg technical program expanded abstracts 2015* (pp. 2269–2274). Society of Exploration Geophysicists.

TEACHING EXPERIENCE

<i>Observational Seismology</i>	EPS207, UC Berkeley	<i>Fall 2023</i>
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INVITED TALKS

Workshop: Distributed Fiber-Optic Sensing: Advances in Applications and ML-based Techniques, IMAGE2023	<i>Sep 2023</i>
Online Workshop: Machine Learning & Artificial Intelligence, SZ4D	<i>Aug 2023</i>
The 4th Artificial Intelligence Seismology Conference, China	<i>Jul, 2023</i>
Earthquake Science Center Seminars, USGS	<i>Jun, 2023</i>
IGPP Seminar Series, UCSD	<i>May, 2023</i>
Earth & Environmental Sciences Seminars, MSU	<i>Apr, 2023</i>
Plenary Talk, Computational Science (CS), SCEC	<i>Sep, 2022</i>
Fall Meeting: Geomechanics and Mitigation of Geohazards, Caltech	<i>Sep 2022</i>
Department Seminar of Geophysics, Peking University	<i>Oct 2021</i>
The 37th General Assembly, European Seismological Commission (ESC)	<i>Sep 2021</i>
Earth System Science (ESSC) Seminars, CUHK	<i>Aug 2021</i>
Seismological Methods and Programs Online Course, USTC	<i>Aug 2021</i>

PROFESSIONAL SERVICE

Reviewer for:

Applied Geophysics;
Computers & Geosciences;

Bulletin of the Seismological Society of America;
Earthquake Science;

Earth Science Review;
Frontiers;
Geophysical Journal International;
Geophysical Research Letters;
Geoscience Letters;
IEEE Computational Intelligence Society;
IEEE Geoscience and Remote Sensing Society Letters;
Journal of Geophysical Research: Solid Earth;
Scientific Reports;

Earth, Planets and Space;
Geochemistry, Geophysics, Geosystems;
Geophysical Prospecting;
Geophysics;
IET Signal Processing;
IEEE Internet of Things Journal;
IEEE Transactions on Geoscience and Remote Sensing;
Neural Information Processing Systems - AI4Science;
Seismological Research Letters;