Weiqiang Zhu

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Education

Ph.D.	Geophysics, Stanford University	*2016 - 2021*
	Thesis: *Applications of Deep Learning in Seismology*	
	Adviser: *Gregory C. Beroza*	
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 hawai '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., & 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

Observational Seismology	EPS207, UC Berkeley	*Fall 2023*

INVITED TALKS

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

PROFESSIONAL SERVICE

Reviewer for:

Applied Geophysics;	*Bulletin of the Seismological Society of America;*
Computers & Geosciences;	*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;