Haiyang Liao

M.S. in NJU, applying for Ph.D.

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Education

- **M.S. in Geological Engineering** Sept. 2022 - June 2025 (expected)
  Nanjing University, Nanjing, China
  - Thesis (in preparation): *Urban karst collapse monitoring technology based on fiber-optic distributed acoustic sensing (DAS)*
  - Advisor: Professor, Dan Zhang
- **B.S. in Geology** Sept. 2018 - June 2022
  Anhui University, Hefei, China
  - Thesis: *Application of Ground Penetrating Radar (GPR) in surface collapse detection of solid waste deposits in landfill*
  - Advisor: Associate Professor, Qifeng Yin

Research

Interests

- **DAS seismology, Interdisciplinary seismology applications**
  - I aspire to continue studying and researching algorithms and programs in seismology, including applications of DAS in various settings such as groundwater monitoring, ocean bottom imaging and glacier monitoring.

Projects

- **"Distributed acoustic sensing and characterization of Urban Ground Collapse development process"**, *National natural science foundation of China (No. 42077233)* Jan. 2021 - Dec. 2024
  - **Principal Investigator**. Major research focus during my master's studies, involving participation in experiments and research using DAS seismology.
- **"Research on key technologies for engineering geological exploration, environmental safety and structural waterproofing of Nanjing Shangyuanmen railway cross-river tunnel"**, *Jiangsu province transportation science and technology and achievement transformation project (No. 2023G08)* June 2023 - Aug. 2024
  - **Principal Investigator**. Served as the student leader, responsible for designing the experimental plan, coordinating with multiple parties, implementing the field tests, processing data, and co-authoring the final report.

Experience

- **Shallow subsurface void detection** May. 2024 - now
  - Deployed fiber optic cables near campus wells to validate cavity detection with DAS. - Studied lateral detection ranges with DAS using the three-station interferometry method to address uneven noise.
- **Optical fiber cable coupling methods study** May. 2024 - now
  - Installed fiber optic cables in campus with different coupling methods to compare imaging effects from active and passive sources.
- **Software development for surface wave imaging** Apr. 2024 - Aug. 2024
  - Developed preprocessing and postprocessing software for monitoring ground collapses using surface waves and ambient seismic fields.
- **Karst fracture zone detection in Mufu Mountain, Nanjing** Jan. 2024 - Aug. 2024
  - Laid fiber optic cables on roads near Mufu Mountain, applying the frequency-Bessel method to detect fractured karst zones in dolomite.
- **Numerical simulation for subsurface cavity detection** Jan. 2023 - Oct. 2023
  - Used specfem3d/2d for simulations of shallow cavities to analyze DAS imaging responses.

Publications

* indicates the corresponding author

Journal Articles

- **Haiyang Liao**, Dan Zhang*, Kai Lin, and Haoyu Wang. "Urban shallow subsurface void detection using fiber-optic distributed acoustic sensing" in preparation.
- **Haiyang Liao**, Dan Zhang*, Zhengyu Qian, Hasanjan Yimit, and Qi Luo. "Characterization of shallow karst zones using distributed acoustic sensing and ambient noise tomography: a case study in Mufu Mountain, China" *Engineering Geology*, submitted.
- **Haiyang Liao**, Dan Zhang*, Fei Cheng, Zhuoqun Xu, Xiang Zhang, Zhiwei Ai, and Kai Lin. "Application of fiber-optic distributed acoustic sensing technology in the detection of urban hidden karst" *Tunnel Construction* (in Chinese), submitted.
- Kai Lin, Dan Zhang*, Lianghong Shi, **Haiyang Liao**, Gang Fu, Yihuan Zhu and Xiaoqing Liu. "Mechanical response characteristics study of surrounding gravel and cobble stratum overlying the tunnel based on coupled discrete-continuous simulation" pending submission.
- Zhengyu Qian, Dan Zhang*, **Haiyang Liao**, and Haoyu Wang. "Can the seismic wave attenuation characteristics of various soils be identified using distributed acoustic sensing?" *Journal of Applied Geophysics* 221 (2024): 105281.
- Qi Luo, Dan Zhang*, Hasanjan Yimit, Jingwen Su, Haoyu Wang, and **Haiyang Liao**. "Effects of Cable Sheath on Deformation Coordination between the Sensing Fiber and Sand." *Geotechnical Testing Journal* 47, no. 5 (2024).
- Hasanjan Yimit, Dan Zhang*, Qi Luo, Xulong Gong, Haoyu Wang, and **Haiyang Liao**. "Investigation of deformation coordination between optical fibre and borehole sand backfill." *Proceedings of the Institution of Civil Engineers-Geotechnical Engineering* (2023): 1-12.

Patents

- **Haiyang Liao**, Dan Zhang, Bin Shi, and Haoyu Wang. "A Multi-parameter Monitoring Device for Karst Development Drilling Holes" *CN Utility Model*, 2024, current status: pending submission.
- **Haiyang Liao**, Dan Zhang, Zhengyu Qian, Hasanjan Yimit, and Qi Luo. "Distributed fiber optic sensing surface wave imaging system" *CN Computer Software Copyright*, 2024, 2024SR1195965. *pdf*
- Dan Zhang, Hasanjan Yimit, Qi Luo, **Haiyang Liao** and Haoyu Wang. "A land-water integrated microdisturbance sensing optical cable" *CN Invention Patent*, 20240429, current status: accepting (202410530041) *pdf*

Honors and Awards

- Outstanding Member of the Communist Youth League, Nanjing University 2024
- ACEI Star (Institute of Earth Environment Computational Engineering, Nanjing University) 2023
- Outstanding Volunteer at the National Annual Conference on Engineering Geology 2023
- Outstanding Member of the Communist Youth League, Anhui University 2021

Others

Activities

- 09/2024 The 12th China Optic Fiber Sensing Conference, Chongqing, China.
- 08/2024 The 10th Summer School on Algorithms and Programs in Seismology, Online Learning.
- 08/2023 The 9th Summer School on Algorithms and Programs in Seismology, Hohhot, China.
- 04/2023 National Annual Conference on Engineering Geology, Nanjing, China.

Skills

- Languages: Chinese (Native), English (TOEFL: preparing).
- Programming Languages: Python, Matlab, Shell.
- Technical Softwares: MASW, CC-FJpy, evodcinv, specfem3d/2d, GMT.
- Document / Presentation: LaTeX, Markdown, HTML, Office, Adobe.