

# Shupeng Chai

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## Research interests

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Earthquake Mechanics; Seismology; Rock Physics

- Role of fault roughness and contact evolution
- Laboratory shear tests and numerical simulations

## Education

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- 2023–Present    **PhD** in Geotechnical Engineering    HK **Hong Kong Polytechnic University**
- Thesis: Governing role of fault-geometry-dependent stress heterogeneity in laboratory earthquakes
  - Chief supervisor: Professor Qi Zhao
- 2025–2026    **Visiting PhD** student    SG **Nanyang Technological University**
- Project: Simulating the effects of asperity contacts on laboratory earthquakes with PyQuake3D
  - Supervisor: Professor Luca Dal Zilio
- 2018–2020    **MASc** in Mineral Engineering    CA **University of Montreal (Polytechnique Montréal)**
- Thesis: Analytical and numerical studies on the stresses in backfilled stopes and the stability of side-exposed backfill in inclined stopes ([link](#)).
- 2014–2018    **BEng** in Civil Engineering    CN **Wuhan University**
- Thesis: Numerical analyses on the horizontal directional drilling under a railway (Outstanding Thesis).

## Professional Experience

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- 2023–2025    Teaching Assistant    **Hong Kong Polytechnic University**
- 2025-2026 Semester 1, CSE 579 Advanced rock engineering: tutorial
  - 2024-2025 Semester 1, CSE40411 Rock engineering: tutorial, laboratory, field trip, consultation
  - Supervision of final year project
- 2021–2023    Lecturer    **Zhengzhou University of Science and Technology**
- Teaching: Soil Mechanics, Subgrade and Pavement Engineering, Road Engineering
  - Research: Slope stability analyses
- 2018    Road Design Intern    **Three Gorges Geotechnical Consultants Co., Ltd (Wuhan)**

## Publications

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### ***(To be) submitted***

- [1] **Chai S**, Su B, Zou Y, Dal Zilio L, Hatzor Y H, Zhao Q (2026). Fault roughness and contact evolution control the dilatancy and compaction during shear sliding. *Submitted to Geophysical Research Letters*.
- [2] **Chai S**, Dal Zilio L, Hatzor Y H, Xia K, Zhao Q (2026). Staged coseismic behavior controlled by roughness-induced stress heterogeneity. *To be submitted to Geophysical Research Letters*.
- [3] **Chai S**, Zhao Q (2026). Interplay between fault geometric roughness and mechanical properties in governing sliding instability. *To be submitted to Earth and Planetary Science Letters*.
- [4] **Chai S**, Zou Y, Wu H, Akbariforouz M, Su B, Grasselli G, Elsworth D, Hatzor Y H, Zhao Q (2026). Unveiling stress heterogeneity in seismic slip: A review of fault shear experiments. *To be submitted to RMRE*.

### ***Peer-reviewed (selected, see full publication list via Google Scholar)***

- [5] **Chai S**, Zou Y, Wu H, Akbariforouz M, Su B, Grasselli G, Elsworth D, Hatzor YH, Zhao Q\* (2026). Influence of stress heterogeneity on shear behavior of rock discontinuities in laboratory experiments: New insights from numerical simulations. *International Journal of Rock Mechanics and Mining Sciences* 197:106358. ([link](#))

- [6] **Chai S**, Zheng J\*, and Li L (2023). Kink effect on the stress distribution in 2D backfilled stopes. *Geotechnical and Geological Engineering*. ([link](#))
- [7] **Chai S\*** (2023). Two-wedge slope stability analysis considering a nonvertical wedge interface. *Bulletin of Engineering Geology and the Environment*. 82:89. ([link](#))
- [8] **Chai S\***, Fan L and Liang H (2022). Required jacking force for deviation rectification of inclined structures supported with rigid piles. *Frontiers in Earth Science*. 10:998798. ([link](#))
- [9] **Chai S\*** (2022). Maximum height estimation for mine waste dumps. *Journal of the Southern African Institute of Mining and Metallurgy*. 122(10):579-586. ([link](#))

### Selected Conference Presentations

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- [1] **Chai S**, Su B, Zou Y, Zhao Q (2025). Dilation or compaction? Laboratory insights into the role of fault roughness. **Oral** presentation at *EGU General Assembly 2025*. ([link](#)).
- [2] **Chai S**, Zou Y, Chen G, Zhao Q (2024). Possible moonquakes and tectonic activities inferred from crater landslides. **Poster** presentation at *AGU24*. ([link](#))
- [3] **Chai S**, and Zhao Q. (2024). New insights into stress conditions on rock discontinuities in laboratory shear tests. **Oral** presentation at *International Geomechanics Conference 2024*. Kuala Lumpur, Malaysia. (Won **Best Student Award**, [link](#))
- [4] **Chai S**, and Zhao Q. (2024). New insights for stress conditions of laboratory shear tests. **Poster** presentation at *ARMA 58th. US Rock Mechanics/Geomechanics Symposium*. ([link](#))

### Awards & Honors

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| 2025 | PolyU Research Student Attachment Program (Scholarship) for a 6-month exchange at NTU       |
| 2024 | <b>Best Student Award</b> at 2024 International Geomechanics Conference                     |
| 2024 | Second Prize in the Student Contest at 2024 International Geomechanics Conference           |
| 2024 | 2024 International Geomechanics Conference Student Sponsorship                              |
| 2023 | <b>Best Poster Award</b> in 2023 ARMA East Asia Geomechanics Workshop                       |
| 2020 | RBC Royal Bank Excellence Scholarship (University of Montreal)                              |
| 2020 | Marianne-Mareschal Excellence Scholarship (University of Montreal)                          |
| 2019 | Quebec Government Exemption Scholarship Program (University of Montreal)                    |
| 2017 | National Encouragement Scholarship (Wuhan University)                                       |
| 2017 | Third prize in 11 <sup>th</sup> National Structure Design Competition                       |
| 2017 | First prize in 10 <sup>th</sup> National Engineering Drawing and BIM Innovation Competition |
| 2016 | Scholarship for Excellence of Wuhan University (Twice)                                      |
| 2016 | Outstanding Student Cadre of Wuhan University   |
| 2014 | Excellent Volunteer, Advanced Individual (Wuhan University)                                 |

### Skills

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| <b>Experimental skills</b>  | Laboratory shear tests, Acoustic emissions, Micro-CT scan, etc.    |
| <b>Computational skills</b> | FLAC(3D), PFC(3D), MATLAB, Python                                  |
| <b>Languages</b>            | English (Proficient), French (Beginner), Mandarin Chinese (Native) |