Shupeng Chai

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Education

PhD candidate in Geotechnical Engineering 05/2023 – Present

- The Hong Kong Polytechnic University (Hong Kong SAR, China)
- Research topic: Effects of fault roughness on rupture dynamics and stick-slip behavior.

M.A.Sc in Mineral Engineering (Research-based) 08/2018 – 04/2020

- Polytechnique Montréal, University of Montreal (Canada) • GPA: 3.91/4.0
- Thesis: Analytical and numerical studies on the stresses in backfilled stopes and the stability of side-exposed backfill in inclined stopes (Link).

B.Eng. in Civil Engineering 09/2014 – 06/2018

- Wuhan University (China) • GPA: 87.1/100 (Top 10%, 13/168)
- Thesis: Numerical analyses on the horizontal directional drilling under a railway (Outstanding Bachelor's Thesis).

Employment

Teaching Assistant, The Hong Kong Polytechnic University 09/2024 – Present

- 2025-2026 Semester 1, **CSE 579 Advanced rock engineering:** tutorial session
- 2024-2025 Semester 1, **CSE40411 Rock engineering:** tutorial session, laboratory session, field trip, consultation
- **Supervision of final year project**

Lecturer, Zhengzhou University of Science and Technology 02/2021 – 04/2023

- **Teaching**: Soil Mechanics, Subgrade and Pavement Engineering, Road Engineering
- **Research**: Slope stability analyses

Intern, Three Gorges Geotechnical Consultants Co., Ltd (Wuhan) 01/2018 – 03/2018

Research Experience

Effects of fault roughness on rupture dynamics and stick-slip behavior 01/2024 – Present

- Visualize the contact evolution during shear sliding by acoustic emissions and surface scanning.
- Relate the dilatancy behavior to temporal and spatial distributions of micro-seismicity.
- Stress heterogeneity caused staged friction/stress drop during the slip phases of stick-slip cycles.

Stress heterogeneity on faults in ten laboratory shear configurations 05/2023 – 12/2024

- Review various laboratory shear tests and highlight the significance of stress heterogeneity.
- Evaluate the stress heterogeneity and related shear behavior using numerical simulations.

Maximum height estimation and stability analyses of slopes with a weak layer 02/2021 – 12/2022

- Estimate the maximum height of slopes with a weak layer with FLAC3D.
- Propose an improved analytical solution for two-wedge slope stability analyses by incorporating the effect of nonvertical wedge interface and soil shear mobilization.

Stress and stability analysis of mine backfill 01/2019 – 03/2020

- Analyze stress distribution in mine backfill using numerical simulations and propose an analytical solution considering kink effects due to the interaction between the rock walls and backfill.
- Develop an analytical solution to estimate the minimum required strength of side-exposed mine backfill in inclined stopes and verify it with numerical simulations in FLAC^{3D}.

Selected Publications

(To be) Submitted

- **Chai S**, Su B, Zou Y, Zhao Q. Fault roughness and contact evolution control the dilatancy and compaction during shear sliding.
- **Chai S**, Zou Y, Wu H, Akbariforouz M, Su B, Grasselli G, Elsworth D, Hatzor Y H, Zhao Q. Stress heterogeneity across faults during laboratory earthquakes.

- **Chai S**, Zou Y, Wu H, Akbariforouz M, Su B, Grasselli G, Elsworth D, Hatzor Y H, Zhao Q. Stress heterogeneity across rock discontinuities: new insights from numerical simulations.

Peer-reviewed (selected, see full list**)**

- **Chai S**, Zheng J*, and Li L (2023). Kink effect on the stress distribution in 2D backfilled stopes. *Geotechnical and Geological Engineering*. (Link)
- **Chai S*** (2023). Two-wedge slope stability analysis considering a nonvertical wedge interface. *Bulletin of Engineering Geology and the Environment*. 82:89. (Link)
- **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)

Selected Conference Presentations

- **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).
- Chai S, Zou Y, Chen G, Zhao Q (2024). Possible moonquakes and tectonic activities inferred from crater landslides. **Poster** presentation at *AGU24*. (Link)
- 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**)
- 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).

Skills

Experimental skills	Shear tests, acoustic emissions, optical fiber, micro-CT scan, etc.
Computer skills:	FLAC(3D), PFC(3D), Matlab, GeoStudio, RocScience, Abaqus, ANSYS
Languages:	English (Proficient), French (Beginner), Mandarin Chinese (Native)

Honors & Awards

- **Best Student Award** at 2024 International Geomechanics Conference 11/2024
- Second Prize in the Student Contest at 2024 International Geomechanics Conference 11/2024
- 2024 International Geomechanics Conference Student Sponsorship 10/2024
- **Best Poster Award** in 2023 ARMA East Asia Geomechanics Workshop 08/2023
- RBC Royal Bank Excellence Scholarship (University of Montreal) 02/2020
- Marianne-Mareschal Excellence Scholarship (University of Montreal) 02/2020
- Quebec Government Exemption Scholarship Program (University of Montreal) 11/2019
- National Encouragement Scholarship (Wuhan University) 10/2017
- Third prize in 11th National Structure Design Competition 10/2017
- First prize in 10th National Engineering Drawing and BIM Innovation Competition 07/2017
- Scholarship for Excellence of Wuhan University (Twice) 10/2015 & 10/2016
- Excellent Volunteer, Advanced Individual (Wuhan University) 12/2014
- Outstanding Student Cadre of Wuhan University 09/2016