Haoran Xu 徐 浩 然

Research interests: Digital twin; multi-modal data fusion; tunnel surrounding-rock stability; high-precision real-time vision-based geo-hazard monitoring

Email xuhaoran@mail.dlut.edu.cn **Born** Jan 2001 **Expected graduation** 2028

EDUCATION

2022.09 – Present (**2nd-year Ph.D.**)	Dalian University of Technology (985 / Double First-Class)	Geotechnical Engineering	Direct M.Phil.–Ph.D. (Recommended)
2018.09 – 2022.06	Dalian Maritime University (211 / Double First-Class)	Civil Engineering	B.Eng. (Class Rank #1)

RESEARCH GROUP

Affiliated with the **Center for Rock Failure and Instability** at Dalian University of Technology, led by **Prof. Chun-an Tang** (Cheung Kong Distinguished Professor of the Ministry of Education; Recipient of the National Science Fund for Distinguished Young Scholars of China). Advised by **Prof. Shibin Tang** (National Young Top-Notch Talent; Ph.D. supervisor).

HIGHLIGHTS

- First-author SCI papers: 2 CAS Tier-1 Top, 1 CAS Tier-2 Top; cumulative impact factor **21.6**
- Granted invention patents as student first inventor: **5**; published patents: **10+**
- Core technical member on 4 national / provincial research projects, totaling ≈ 3.37 M CNY; **sole technical lead** on 2 industry-sponsored projects
- **Doctoral Excellence Scholarship** (top 3 %, 2025); National Scholarship for Encouragement (3 consecutive years); 2nd-prize Science & Technology Progress Award (technical contributor, 2024); etc.

FUNDED RESEARCH PROJECTS

National-level grants

Failure Evolution Mechanism of Deep Hard Rock and a Spatiotemporal Intelligent Early-Warning Model for Rockburst

NSFC **General Program** **500 k CNY** PI: Prof. Shibin Tang Role: **Core technical contributor**

Role & contribution: Led the technical work on intelligent microseismic-signal processing and rockburst warning modeling. Pioneered the introduction of diffusion models into engineering microseismic denoising to preserve weak precursory signals, and built a deep-learning spatiotemporal early-warning model for rockburst on top of the denoised data; this work has been published in *Adv. Eng. Inform.* (CAS Tier-1 Top, IF 9.9).

Progressive Deterioration Mechanism and Protective-Mining Optimization of Steep High-Cold Open-Pit Mine Slopes in Xinjiang

NSFC **Joint Fund Program** **570 k CNY** PI: Prof. Shibin Tang Role: **Core technical contributor**

Role & contribution: Targeting the difficulty of deploying conventional contact-based monitoring devices in steep, high-cold open-pit environments, developed a non-contact vision-based deformation monitoring solution and built a lightweight edge-side prototype, providing a key observation channel for progressive slope-deterioration warning; the methods are protected by a granted Chinese invention patent.

Major industry-sponsored projects

Digitalization and Intelligent Recognition of Tunnel Engineering-Geological Information under Complex Environments

Sponsor: Guangxi Hydraulic & Electric Survey, Design and Research Institute **2,000 k CNY** Role: **Sole technical lead** 2025.10 – 2027.10

Role & contribution: As the sole technical lead, owned the entire pipeline from requirement analysis to algorithm delivery, independently developing core algorithms including the Digital Tunnel Geometry Model (DTGM), intelligent rock-mass fracture identification, tunnel over/under-excavation recognition, and defect detection; co-authored project technical proposals and stage reports. The work underpins one *IJRMMS* (CAS Tier-1 Top) paper and three granted invention patents.

High-Density Feature-Tracking-Based Real-Time Intelligent Monitoring of Slope Deformation

Sponsor: Guangxi Jiaoke Group **300 k CNY** Role: **Sole technical lead** 2026.01 – 2027.02

Role & contribution: Independently delivered the project end-to-end, from technical roadmap to on-site deployment planning. Targeting the difficulty of large-area, low-cost, automated, real-time deformation detection in cluttered natural scenes, proposed and implemented a high-density pixel-tracking visual solution; the method is protected by a granted Chinese invention patent.

Other classified engineering projects

Grant-application experience

NSFC Young Student Basic Research Program (Doctoral)

Have independently authored all core sections of the proposal — rationale, research content, technical roadmap, feasibility analysis and expected outcomes — and submitted it as the sole applicant, gaining end-to-end experience of an academic-grant application from research-question framing to roadmap design.

SELECTED PUBLICATIONS

*Underlined = author of this CV; * corresponding author.*

[1] **Xu, H.**, Tang, S.*, & Mao, Y. (2026). A dual-condition diffusion-based microseismic signals denoiser for real-world engineering noise. *Advanced Engineering Informatics*, 71, 104374. (***IF 9.9, CAS Tier-1 Top***)

[2] **Xu, H.**, & Tang, S.* (2025). Digital tunnel geometry model (DTGM): A multimodal data-fusion framework for rock-mass feature quantification. *International Journal of Rock Mechanics and Mining Sciences*, 194, 106212. (***IF 7.5, CAS Tier-1 Top***)

[3] **Xu, H.**, Tang, S.*, Wang, J., Dong, B., Wang, X., Zhao, K., … & Geng, J. (2024). Rock fracture identification algorithm based on the confidence score and non-maximum suppression. *Bulletin of Engineering Geology and the Environment*, 83(6), 213. (***IF 4.2, CAS Tier-2 Top***)

[4] Tang, S. B., Liu, Y. H., **Xu, H. R.**, & Chen, X. M. (2023). Review for the microseismic source location in surrounding rock of deep-buried tunnels. *Journal of Central South University*, 30(12), 4182–4196. (***IF 4.4, JCR Q1***)

GRANTED INVENTION PATENTS

Patents listed below are all those for which I served as the **student first inventor** *(with my supervisor as the nominal first inventor, per institutional convention).*

[1] Tang, S.*, & **Xu, H.** Vehicle-mounted and mobile-platform multi-modal geo-hazard sensing, alarming and avoidance method and system. Dalian University of Technology, **CN121148105A**. 2025-11-18.

[2] Tang, S.*, & **Xu, H.** A lightweight rock–soil deformation and motion monitoring system and method. Dalian University of Technology, **CN121140636A**. 2025-11-18.

[3] Tang, S.*, & **Xu, H.** A high-density pixel-tracking-based real-time monitoring method and system for rock–soil deformation. Dalian University of Technology, **CN121140665A**. 2025-11-18.

[4] Tang, S.*, **Xu, H.**, Chen, P., Gan, B., & Li, Y. A laser-point-cloud-based identification and volume-calculation method for tunnel over-/under-excavation. Dalian University of Technology, **CN119784814A**. 2024-12-18.

[5] Tang, S.*, **Xu, H.**, Wang, J., Chen, X., Zheng, J., & Hou, C. A method for rock-mass fracture identification. Dalian University of Technology / Nanfen Open-Pit Mine of Bensteel Group / China Railway 24th Bureau Group Fujian Railway Construction Co. Ltd., **CN116883373A**. 2023-10-13.

10+ additional published invention patents.

ACADEMIC SERVICE

Peer review — *Automation in Construction*, *Advanced Engineering Informatics*, *International Journal of Rock Mechanics and Mining Sciences*, *Rock Mechanics and Rock Engineering*, etc.

Conferences — Multiple **oral presentations** at conferences in rock mechanics, underground engineering and intelligent monitoring.

HONORS & AWARDS

National

- **Doctoral Excellence Scholarship**, top 3 %, 10,000 CNY · 2025
- **National Scholarship for Encouragement**, top 3 %, 5,000 CNY, three consecutive years
- China General Chamber of Commerce (with national-award nomination eligibility) — **Second Prize**, Science & Technology Progress Award, technical contributor · 2024
- Excellence Award, Zhou Pei-yuan National College Mechanics Competition

Provincial

- Outstanding Graduate, Dalian Municipality
- Second Prize, Dalian Mathematics Competition
- Provincial Grade-B, National College Innovation & Entrepreneurship Program — *Visualization of Bridge Health Monitoring Data in BIM* (Team Leader)

University

- Second Prize (university), National College Computer Design Competition
- Outstanding Bachelor's Thesis, Dalian Maritime University
- Outstanding Postgraduate, Dalian University of Technology (multiple times)
- Single-event competition scholarships (multiple)
- Outstanding Student Cadre & Youth-League Cadre, etc.

LEADERSHIP & SERVICE

Current — **Secretary**, Doctoral Student Party Branch of the Research Institute, Faculty of Infrastructure Engineering, Dalian University of Technology

2018 – 2022 — Student cadre and Youth-League officer, Dalian Maritime University

TECHNICAL SKILLS

AI / Algorithms — Diffusion models, machine learning, point-cloud processing, signal processing, multi-modal data fusion, object detection

Programming — Python, C++

Systems / HPC — Linux, GPU/CPU parallel computing, Git, Docker

Numerical simulation — ANSYS, ABAQUS, FLAC, RFPA

Languages — English: CET-6 (577). Mandarin Chinese: native.