Chang Liu

Ph.D. Candidate
School of Civil and Environmental Engineering
University of New South Wales, Sydney (UNSW Sydney)
NSW 2052, Australia
Email: chang.liu17@unsw.edu.au

EDUCATION

Ph.D. **Feb. 2020 – Expected Feb. 2024**
UNSW Sydney, Australia

Dissertation: 'Post-earthquake Multi-level Building Damage Classification: Deep Learning Approaches Based on Satellite Imagery and Lidar Data' (Under review)
Advisors: Prof. Linlin Ge, A/Prof. Samad Sepasgozar, and Dr. Sara Shirowzhan

Ph.D. Visiting Student **June 2023 – Nov. 2023**
Massachusetts Institute of Technology, Cambridge, MA, USA

Advisors: Prof. Carlo Ratti and Dr. Fabio Duarte

M.Phil. in Construction Management **Feb. 2020**
UNSW Sydney, Australia

Thesis topic: 'Implementation of Artificial Intelligence for Detecting Modular Objects in Construction'
Advisors: A/Prof. Samad Sepasgozar and Dr. Sara Shirowzhan

B.E. in Civil Engineering **June 2017**
University of Science and Technology Beijing (USTB), Beijing, China

Thesis topic: '3D Earthquake Disaster Scenario Simulation of Building Groups in Beijing CBD Based on Virtual Reality Technology'
Advisor: Prof. Zhen Xu

PROFESSIONAL APPOINTMENTS

Tutor/Demonstrator, UNSW Sydney **July 2018 – Dec. 2022**

Postgraduate Course： Remote Sensing & Photogrammetry (Term 3, 2022)

- Preparing teaching materials including solutions and slides: ArcMap operation, DInSAR software operation, band composition, bushfire hotspot detection, and flood mapping with SAR intensity information.
- Delivering lectures in weekly in-person and online lab sessions.
- Grading written assignments and final exams.

Undergraduate Course： Principles of Remote Sensing (Term 3, 2022)

- Preparing teaching materials including solutions and slides: ArcMap operation, band bushfire hotspot detection, flood mapping, and Image processing.
- Delivering lectures in weekly in-person and online lab sessions.
- Organizing students for group discussion.
- Grading written assignments and final exams.

Undergraduate Course： Engineering Computation (Term 2, 2021)

- Prepared demonstrated detailed steps of solutions and slides: Linear algebra knowledge, MATLAB operation.
- Delivered lectures in weekly online lab sessions.

Undergraduate Course： Building Structures (Semester 2, 2018)

- Tutor of Q&A class: Students come to ask questions related to assignments.
- Graded written assignments, quizzes, and final exams.

Undergraduate Course： Construction & Property Economics (Semester 2, 2018)

- Prepared teaching slides: Economic principles to the construction and property sectors.
- Delivered lectures in weekly in-person tutorials.

Teaching Assistant, Undergraduate Taste of Research Program, UNSW Sydney, Australia **2021**

- Assisted in interviewing students who apply for this program.
- Assisted supervising undergraduate students to have a basic understanding of research.

Research Assistant, UNSW Sydney **Jul. 2018 – Feb. 2020**

PUBLICATIONS

Selected Journal Articles:

Liu C, Zhang Q*, Ge L, Sepasgozar S, Sheng Z, **2023**. Dielectric Fluctuation and Random Motion over Ground Model (DF-RMoG): An Unsupervised Three-Stage Method of Forest Height Estimation Considering Dielectric Property Changes. *Remote Sensing*, 15(7):1877. DOI: 10.3390/rs15071877

Liu C, Sepasgozar S, Zhang Q, and Ge L*, **2022**. A Novel Attention-Based Deep Learning Method for Post-Disaster Building Damage Classification. *Expert Systems with Applications.* 202, p.117268. DOI: 10.1016/j.eswa.2022.117268

Liu C, Sepasgozar S*, Shirowzhan S, and Mohammadi G, **2021**. Applications of Object Detection in Modular Construction Based on a Comparative Evaluation of Deep Learning Algorithms. *Construction Innovation,* 22(9), pp. 141-159. DOI: 10.1108/CI-02-2020-0017

Liu C, Shirowzhan S, Sepasgozar S*, and Kaboli A, **2019**. Evaluation of Classical Operators and Fuzzy Logic Algorithms for Edge Detection of Panels at Exterior Cladding of Buildings. *Buildings*, 9(2). p.40. DOI: 10.3390/buildings9020040

Wu Y, **Liu C**, Zhang Q* and Ge L*, **2022.** Bibliometric Analysis of Interferometric Synthetic Aperture Radar (InSAR) Application in Land Subsidence from 2000 to 2021. *Journal of Sensors,* 2022. DOI: 10.1155/2022/1027673

Zhang Q, Hensley S, Zhang R*, **Liu C**, and Ge L, **2022**. Improved Model-Based Forest Height Inversion Using Airborne L-Band Repeat-Pass Dual-Baseline Pol-InSAR Data. *Remote Sensing*, 14(20), p.5234. DOI: 10.3390/rs14205234

Zhang Q, Ge L, Hensley S, Metternicht G, **Liu C**, and Zhang R*, **2022**. PolGAN: A Deep-Learning-Based Unsupervised Forest Height Estimation Based on the Synergy of PolInSAR and LiDAR Data. *ISPRS Journal of Photogrammetry and Remote Sensing,* 186, pp.123-139.

Zhang Q, Ge L, Zhang R*, Met G, **Liu C**, and Du Z, **2021**. Towards a Deep-Learning-Based Framework of Sentinel-2 Imagery for Automated Active Fire Detection. *Remote Sensing,* 13(23), p.4790. DOI: 10.3390/rs13234790

Selected Conference Articles:

Liu C, Zhang Q, Shirowzhan S, Bai T, Sheng Z, Wu Y, Kuang J, Ge L*, **2023**. The Influence of Changing Features of Point Clouds on the Accuracy of Deep Learning-based Large-scale Outdoor Lidar Semantic Segmentation, in *2023 IEEE International Geoscience and Remote Sensing Symposium (IGARSS)* (Accepted)

Liu C, Ge L*, and Sepasgozar S, **2021**. Post-Disaster Classification of Building Damage Using Transfer Learning, In *2021 IEEE International Geoscience and Remote Sensing Symposium*

(IGARSS), Brussels, Belgium, pp. 2194-2197. DOI: 10.1109/IGARSS47720.2021.9554795

Liu C, Shirowzhan S, and Sepasgozar S*****, **2019**. Developing a Workflow for Cloud-based Inspection of Temporary Structures in Construction. In *Proceedings of the 36th International Symposium on Automation and Robotics in Construction*, Vol. 36, pp. 1319-1326. IAARC Publications. DOI:10.22260/ISARC2019/0177

HONORS AND AWARDS

GeoPitch Young Professional Competition Finalist, IEEE Geoscience and Remote Sensing Society — **July 2023**

Best Ph.D. Poster, 2022 Smart Satellite Cooperative Research Center (SmartSat CRC) Conference, Australia — **Sept. 2022**

Female Ph.D. Personal Development Grant, SmartSat CRC, Australia — **Aug. 2022**

Development and Research Training Grant, UNSW, Australia — **May 2022-May 2023**

SmartSat CRC Full Scholarship, SmartSat CRC, Australia — **2020 - 2023**

Tuition Fee Scholarship, UNSW, Australia — **2020 - 2023**

Summer School Outstanding Participant, Wuhan University, China — **2020**

- Awarded as one of the six "outstanding participants" in the Machine Learning course of 2020 International GeoInformatics Online Summer School sponsored by Wuhan University, China.

Outstanding Graduate Class of 2017, USTB, Beijing, China — **2017**

People Academic Scholarship, USTB, Beijing, China — **2013 - 2016**

Second Place Award, National Undergraduate Entrepreneurship Competition, Beijing Division, Beijing Municipal Education, China — **2016**

GRANT WRITING EXPERIENCE

Building Damage Estimation After Natural Disaster Using Multi-source Data Based on Artificial Intelligence, UNSW Sydney (Funded: AUD$105,000) — **2020 - 2023**

- SmartSat CRC Grant: Independent Project for Ph.D. thesis
- Role: Led proposal writing and budgeting
- Project Lead: Chang Liu

Quantifying the Past and Current Major Australian Floods with SAR and Other Satellites, UNSW Sydney, NSW Department of Planning and Environment, Geoplex (Funded: AUD$297,000) — **2022**

- Role: Assisted PI with technical details and background information
- PI: Prof. Linlin Ge

All-weather, Near Real-time Monitoring of Bushfire with Satellites SAR, UNSW Sydney & Nova Systems (Funded: AUD$97,000) — **2021**

- Role: Assisted PI with literature review and technical details
- PI: Prof. Linlin Ge

Business Plan of Weichen Microbioecologics (Funded: ¥6,000) — **2016**

- Grant of National Undergraduate Innovation and Entrepreneurship Competition, Beijing Division
- Role: Led proposal writing and budgeting
- Project leaders: Chang Liu and Yukang Zhang

RESEARCH PROGRAM EXPERIENCE

Flood/Fire Tracking using GIS and Remote Sensing Technologies, **July 2020 -June 2021**
UNSW Sydney & Beijing PIESAT Information Technology Co Ltd

- Played a dual academic and communication role.
- Built flood/burnt area map using ArcMap and ENVI.
- Implemented InSAR and related technical algorithms.
- Flood/fire tracking with Sentinel 1 and 2 images.

Smart Parking in Australia, *UNSW, Sydney, Australia* **Feb. 2020 - Apr. 2021**

- Installed Solar wireless cameras, set up network and built SQL database.
- Programmed parking space and license plate detection codes.

Joint Development of Intelligent Space Technology, **June 2020 - Apr. 2021**
NSW Sydney & HuiTian JiuZhou Pty Ltd

- Wrote docker image files for installing the designed software.
- Wrote Python codes for processing InSAR results.

BIM-based Maintenance Platform of Zhongguancun Medical Device Park, *USTB, Beijing, China* **Dec. 2014 - Mar. 2016**

- Applied Revit to check the pipeline layouts.

PRESENTATIONS

Talks:

AI-Based Classification of Post-Disaster Building Damage with Remote Sensing Data, GeoPitch Competition, IEEE Geoscience and Remote Sensing Society, Pasadena, USA **2023**

Implementation of Artificial Intelligence for Detecting Modular Objects in Construction Risk Management, Risk Management Course, UNSW Sydney, Australia **2020 & 2021**

Conference Presentations:

The influence of changing features on the accuracy of deep learning-based large-scale outdoor lidar semantic segmentation, IEEE International Geoscience and Remote Sensing Symposium (IGARSS), Pasadena, USA **2023**

Building damage estimation after natural disaster using multi satellite source data based on machine learning, SmartSat CRC Conference, Sydney, Australia **2022**

Post-Disaster Classification of Building Damage Using Transfer Learning, IEEE International Geoscience and Remote Sensing Symposium (IGARSS) (online) **2021**

Analysis of Five Edge Detection Algorithms for Panel Defect Detection, 1st International Conference on 3D Construction Printing (online) **2018**

LEADERSHIP AND SERVICE

Board Member, Young & Emerging Professionals Committee, Geospatial Council of Australia **May 2023 – present**

Vice-President, Civil and Environmental Engineering Research **June 2022 – Sept. 2023**

Student Association, UNSW Sydney

Group leader, Professional Development Program, UNSW Sydney **2022**

Volunteer, Higher Degree Research Student Welcome Event, UNSW Sydney **2022**

Conference volunteer, SSSI NSW Regional Conference, Australia **2022**

Conference Volunteer, SIGGRAPH Asia Conference **Nov. 2019**

Women in Engineering Ambassador, Build EXPO 2019, Australia **Mar. 2019**

Head of Organization Department, Student Union of Department of Civil and Resources Engineering, USTB, Beijing, China **Aug. 2014 – Sept. 2015**

PROFESSIONAL AFFILIATIONS

Journal Reviewer, IEEE Transactions on Geoscience and Remote Sensing **2022 - present**

Journal Reviewer, Journal of Architectural Engineering **2021 - present**

Conference Reviewer, 6th International Conference on Computer Science and Application Engineering (CSAE) **2022**

Student Member, Institute of Electrical and Electronics Engineers (IEEE) **2021 - present**

Member, Surveying & Spatial Sciences Young Professional Mentoring Program **2022**

INDUSTRY EXPERIENCE

Internship, China Construction Eighth Engineering Division Co., Ltd, Shanghai, China **July 2016**

- Responsible for budget analysis and contract accumulation.

Internship, Anshan Winner Hongxin Real Estate Company, China **July 2015 - Sept. 2015**

- Checked drawings, maintaining files, and CAD mapping

SKILLS AND COMPETENCES

Language Proficiency: English, Mandarin Chinese (Native)

Programming/OS: Python, MATLAB, Docker, Linux Ubuntu, LaTeX

Software/Tools: ENVI, ArcGIS, Google Earth Pro, Nvivo, Gephi

- National Computer Rank Examination Certificate Grade 2 (China)

Hardware: LiDAR Drone, Raspberry Pi

REFERENCES

Linlin Ge, Ph.D.

Professor

School of Civil and Environmental Engineering
University of New South Wales, Sydney
Room CE414, Civil Engineering Building (H20)
Library Walk, UNSW, Kensington
NSW 2052, Australia
(+61) 426287219
l.ge@unsw.edu.au

Sara Shirowzhan, Ph.D.

Senior Lecturer

School of Built Environment
University of New South Wales, Sydney
Anita B building (H13) prev. Red Centre
Room 2018
University Mall, UNSW, Kensington
NSW 2052, Australia
(+61) 470330559
s.shirowzhan@unsw.edu.au

Zheyuan Du, Ph.D.

EL1 Computational Geologist & UNSW Postdoc Research Fellow

Minerals, Energy and Groundwater Division
Geoscience Australia
GPO Box 378
Canberra ACT, Australia
(+61) 470663241
zheyuan.du@ga.gov.au