Shengjie Liu

Curriculum Vitae

University of Southern California
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Education and Academic Training

2021– **University of Southern California**, USA
Ph.D. in Population, Health and Place

2019–2021 **The University of Hong Kong**, Hong Kong
Research Assistant (Full-Time) of Light Pollution
- Supported by Environment and Conservation Fund of the Hong Kong SAR Government

2015–2019 **Sun Yat-Sen University**, China
B.S. in Geographical Information Science (Remote Sensing Track)
- Thesis: Deep learning for land use and land cover classification

Research Interests

Remote Sensing	image processing, hyperspectral, PolSAR, land use mapping
AI4EO	land use mapping, few-shot learning, multitask learning, open-set recognition
Urban Climate	local climate zone, temperature-related mortality/morbidity
Light at Night	nighttime remote sensing, VIIRS, Luojia-1, Jilin-1, International Space Station

Skills

Deep Learning	Pytorch, Keras, TensorFlow
Python	scikit-learn, pandas, geopandas, networkX, matplotlib
Coding	Python, MATLAB, R, Julia, C/C++, IDL, HTML5, LaTeX
Software	QGIS, ArcGIS, GeoDa, OriginLab, Gephi, ENVI, SNAP, eCognition

Journal Publications

7. Christopher C. M. Kyba, Martin Aubé, Salvador Bará, Andrea Bertolo, Constantinos A. Bouroussis, Stefano Cavazzani, Brian R. Espey, Fabio Falchi, Geza Gyuk, Andreas Jechow, Miroslav Kocifaj, Zoltán Kolláth, Héctor Lamphar, Noam Levin, **Shengjie Liu**, Steven D. Miller, Sergio Ortolani, Chun Shing Jason Pun, Salvador José Ribas, Thomas Ruhtz, Alejandro Sánchez de Miguel, Mathias Schneider, Ranjay Man Shrestha, Alexandre Simoneau, Chu Wing So, Tobias Storch, Kai Pong Tong, Milagros Tuñón, Diane Turnshek, Ken Walczak, Jun Wang, Zhuosen Wang, and Jianglong Zhang. Multiple angle observations would benefit visible band remote sensing using night lights. ***Journal of Geophysical Research: Atmospheres***, 127(12):e2021JD036382, 2022

6. **Shengjie Liu**, Zhize Zhou, Huaxiang Ding, Yuanjun Zhong, and Qian Shi. Crop mapping using sentinel full-year dual-polarized SAR data and a CPU-optimized convolutional neural network with two sampling strategies. ***IEEE Journal of***

Selected Topics in Applied Earth Observations and Remote Sensing, 14:7017–7031, 2021

5. **Shengjie Liu**, Qian Shi, and Liangpei Zhang. Few-shot hyperspectral image classification with unknown classes using multitask deep learning. ***IEEE Transactions on Geoscience and Remote Sensing***, 59(6):5085–5102, 2020

4. **Shengjie Liu**, Haowen Luo, and Qian Shi. Active ensemble deep learning for polarimetric synthetic aperture radar image classification. ***IEEE Geoscience and Remote Sensing Letters***, 18(9):1580–1584, 2020

3. **Shengjie Liu** and Qian Shi. Local climate zone mapping as remote sensing scene classification using deep learning: A case study of metropolitan China. ***ISPRS Journal of Photogrammetry and Remote Sensing***, 164:229–242, 2020

2. **Shengjie Liu** and Qian Shi. Multitask deep learning with spectral knowledge for hyperspectral image classification. ***IEEE Geoscience and Remote Sensing Letters***, 17(12):2110–2114, 2020

1. **Shengjie Liu**, Zhixin Qi, Xia Li, and Anthony Gar-On Yeh. Integration of convolutional neural networks and object-based post-classification refinement for land use and land cover mapping with optical and sar data. ***Remote Sensing***, 11(6):690, 2019

Manuscripts under Review

1. **Shengjie Liu**, An-Min Wu, and Hung Chak Ho. Spatial variability of diurnal temperature range and its associations with local climate zone, neighborhood environment and mortality in los angeles. ***Urban Climate***, Revision Submitted, 2023

Conference Proceedings

4. **Shengjie Liu** and Qian Shi. Estimating PM2.5 and PM10 on Zhuhai-1 hyperspectral imagery. In ***IGARSS 2022*** - *2022 IEEE International Geoscience and Remote Sensing Symposium*, pages 5933–5936, 2022

3. **Shengjie Liu**, Chu Wing So, and Chun Shing Jason Pun. Analyzing long-term artificial light at night using VIIRS monthly product with land use data: Preliminary result of Hong Kong. In ***IGARSS 2021*** - *2021 IEEE International Geoscience and Remote Sensing Symposium*, pages 6821–6824, 2021

2. **Shengjie Liu** and Qian Shi. Multi-label local climate zone mapping as scene classification using very high resolution imagery: Preliminary result of Hong Kong. In ***IGARSS 2021*** - *2021 IEEE International Geoscience and Remote Sensing Symposium*, pages 6809–6812, 2021

1. **Shengjie Liu**, Haowen Luo, Ying Tu, Zhi He, and Jun Li. Wide contextual residual network with active learning for remote sensing image classification. In ***IGARSS 2018*** - *2018 IEEE International Geoscience and Remote Sensing Symposium*, pages 7145–7148, 2018

Conference Abstracts

Presenter marked with #

6. **Shengjie Liu**#, Chu-Wing So, Hung Chak Ho, Qian Shi, and Chun Shing Jason Pun. Disproportionate distribution of artificial light at night in Hong Kong: evidence from space with high-resolution nighttime remote sensing. In ***Advanced Urban Remote Sensing Workshop***, Hong Kong, December 2022

5. Chun Shing Jason Pun, Chu Wing So#, **Shengjie Liu**, Lina Canas, Constance E. Walker, and Sze Leung Cheung. Measurement of cloud amplification effect over a wide range of night sky brightness observations with the GaN-MN. In ***LPTMM 2022*** - *Light Pollution Theory Modeling and Measurement*, Santiago de Compostela, Galicia, Spain, June 2022

4. Chun Shing Jason Pun, Chu Wing So, and **Shengjie Liu**#. Analyzing the sources and variations of night lights between 2012 and 2019 in hong kong from VIIRS monthly products. In ***LPTMM 2022*** - *Light Pollution Theory Modeling and Measurement*, Santiago de Compostela, Galicia, Spain, June 2022

3. **Shengjie Liu**#, Chu Wing So, and Chun Shing Jason Pun. The relationship between night sky brightness and remote sensing data: Preliminary result from Luojia-1 and the International Space Station. In ***ALAN 2021*** - *7th International Conference on Artificial Light at Night*, Lleida, Catalonia, Spain, June 2021

2. Chu Wing So#, Nok Yan Janet Chang, **Shengjie Liu**, Lina Canas, Constance E. Walker, Sze Leung Cheung, and Chun Shing Jason Pun. A multinational study of night sky brightness patterns: Preliminary results from the globe at night – sky brightness monitoring network (GaN-MN) of the study of cloud amplification on nsb. In ***ALAN 2021*** - *7th International Conference on Artificial Light at Night*, Lleida, Catalonia, Spain, June 2021

1. Chun Shing Jason Pun#, Chu Wing So, Nok Yan Janet Chang, **Shengjie Liu**, Lina Canas, Constance E. Walker, and Sze Leung Cheung. A multinational study of night sky brightness patterns: Preliminary results from the globe at night – sky brightness monitoring network (GaN-MN). In ***ALAN 2020*** - *6th International Conference on Artificial Light at Night*, Lleida, Catalonia, Spain, June 2020

Awards and Honors

2022 USC Dornsife PhD Academy Scholarship, US$485

2020 Arctic Code Vault Contributor, GitHub

2019 Zhuhai Orbita Hyperspectral Processing Paper Contest, CN¥5,000~US$714

2018 IEEE IGARSS Student Travel Grant, US$1,650

2018 Scholarship of SYSU EMBA Alumni Association, CN¥3,000~US$428

2018 National Undergraduate Innovative Project, CN¥10,000~US$1,428

Guest Lecture

Oct 2022 **Urban Heat Islands with Nighttime and Daytime Landsat Imagery**
University of Southern California, SSCI-382 GIScience Spatial Analytics

Teaching

Spring 2023 **Lab Instructor and Teaching Assistant**
University of Southern California, SSCI-382 GIScience Spatial Analytics

Spring 2023 **Lab Instructor and Teaching Assistant**
University of Southern California, SSCI-220 Spatial Data Collection Using Drones

Fall 2022 **Lab Instructor and Teaching Assistant**
University of Southern California, SSCI-165 Sustainability Science in the City

Journal Reviewer

- IEEE Geoscience and Remote Sensing Letters
- IEEE J. of Selected Topics in Applied Earth Observations and Remote Sensing
- IEEE Transactions on Geoscience and Remote Sensing
- Knowledge-Based Systems
- Pattern Recognition Letters
- Remote Sensing Letters
- Scientific Reports
- Urban Climate

Membership

- American Society for Photogrammetry and Remote Sensing
- IEEE Geoscience and Remote Sensing Society (GRSS)
- IEEE GRSS Image Analysis and Data Fusion (IADF) Technical Committee

Research Experience (Selected)

Research related to Urban Climate

2022 **Associations between temperatures and emergency department visits at 135 zip-codes in New York City**

- Applied the *distributed lag nonlinear model* on associations between station air temperature and emergency department visits in New York City (135 zip codes, daily data)
- Explored the impacts on age groups (0-4, 5-17, 18-64, 65+) and identified older adults as the vulnerable population
- Added Covid-19 mobility index in the model for adjusting the special Covid-19 period
- Explored the modification effects of Landsat NDVI (protective factor), median household income (protective factor), and land surface temperature data (mixed result) within the 135 zip-code areas of New York City
- Wrote a report (available on request)

2022 **Diurnal temperature range, local climate zones, and all-cause mortality in Los Angeles**

- Identified associations between local climate zones and diurnal temperature range (DTR)
- Estimated the DTR exposure from nighttime and daytime Landsat imagery
- Analyzed exposure to DTR by age, ethnicity, and income
- Found that young-age, ethnic minorities, and low-income populations were exposed to larger DTR
- High mortality risks were associated with larger DTR exposure (RR=1.047, 95% credibility interval 1.013-1.082) after controlling for socioeconomic status and other factors
- Wrote a paper (under review)

2022 **Fine-scale mapping of PM1, PM2.5 and PM10 using Landsat imagery and PurpleAir data in Los Angeles**

- Collected PurplrAir PMx data in Los Angeles (N=537-715 stations) in 25 dates from 16,738 PurpleAir stations in the world
- Developed a convolutional neural network for estimating PMx exposures (input: Landsat imagery; output: PM1, PM2.5, PM10)
- Achieved R^2=0.69-0.77 on three PMx exposures based on leave-out data validation
- Wrote a report (available on request)

2019 **Estimating PM2.5 and PM10 directly from TOA reflectance using Zhuhai-1 hyperspectral data**

- Developed a Python script to covert raw Zhuhai-1 hyperspectral data to Top-of-Atmosphere reflectance
- Developed a multitask artificial network to simultaneously predict PM2.5 and PM10 concentration
- Won the Zhuhai Orbita Hyperspectral Processing Paper Contest
- Project page: http://sjliu.me/Estimation-of-PM2.5-PM10-from-Satellite-Imagery

Research related to Artificial Light At Night (ALAN)

2021 **Capturing the Impacts of Earth Hour 2021**

- Analyzed images and videos
  - Wrote a Python script to automatically download CCTV images from weather and traffic cameras
  - Wrote a Python script to align videos onboard tramway collected from two nights
  - Identified lights-out buildings from images before, during and after Earth Hour
- Analyzed night sky brightness (NSB) from sky quality meter data
  - Subtracted the cloud amplification effect in NSB by developing a regression on NSB against all-sky camera imagery
- Materials available on request. Tramway videos: `https://youtu.be/B6hXvqMPvyE`

2018 **Using DMSP/OLS nighttime light data to capture the collapse and rise of post-Soviet States**

- Won the National Undergraduate Innovative Project in China
- Developed an ENVI/IDL plugin for calibrating DMSP/OLS imagery
- Developed an preliminary objective detection algorithm using the TensorFlow Object Detection API on Sentinel-1 PolSAR imagery to detect open-pit mines

Research related to Deep Learning, Computer Vision and Image Processing

2022 **Predicting brain ages from MRI imagery**

- Pre-processed brain images using the standard pipeline with FSL 5.10 on Linux
- Developed CNNs to predict brain ages on the IXI dataset (R^2=0.85)

2018 **Cost-effective remote sensing image classification with active learning using convolutional neural network**

- Developed a CPU-runnable convolutional neural network for remote sensing image classification using TensorFlow with Keras backend
- Developed an ensemble-based active learning with the CPU-runnable network to reduce the need of training samples
- Published in IGARSS 2018: `https://doi.org/10.1109/IGARSS.2018.8517855`

Research related to Road Network and Graph Theory

2018 **Urban structure discovery in the Pearl River Delta**

- Discovered urban structure in the Pearl River Delta using mobile GPS data with complex network analysis and community detection (Gephi, NetworkX, Fast-unfolding algorithm)
- Explored the distribution of diseases with online medical records using complex network analysis and clustering analysis
- Identified urban functional zones in Guangzhou and Foshan

2017 **Community detection with OpenStreetMap road network and graph theory**

- Developed a C++ program to calculate the shortest path using Dijkstra algorithm without external libraries (linked list implementation)
- Developed a label propagation algorithm with real distance constraint for community detection in Guangzhou, China
- Evaluated the performance of community detection by calculating modularity
- Visualized the detected road network community in ArcGIS
- Wrote a report: `https://sjliu.me/paper/communityDetection.pdf` (in Chinese)