Shengjie (Shawn) Liu

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EDUCATION

2015 – 2019	**Sun Yat-Sen University**, Guangzhou, China
	B.S. in Geographic Information Science (GPA: 3.9/4.0)
	Thesis: Deep learning for land use and land cover classification

WORK EXPERIENCE

Oct 2019 – Present   **The University of Hong Kong**, Pokfulam, Hong Kong
Research Assistant**,** Department of Physics
- Investigated artificial light at night and light pollution in Hong Kong using satellite and night sky brightness data
- Satellite data including VIIRS Annual/Monthly Composite, Black Marble VNP46A1/A2, Luojia-1, Jilin-1, and ISS

Jul – Aug 2019   **OneSpace Technology Co., Ltd.**, Chongqing, China
Remote Sensing Engineer, Department of Spatial Information
- Applied satellite data for crop mapping, and water and air quality assessment (e.g., chlorophyll a, PM2.5)
- Reduced the need for human annotation and was the key to a three million crop mapping project in Chongqing

Oct 2017 – Apr 2019   **Guangdong Key Lab. of Urbanization and Geo-simulation**, Guangzhou
Undergraduate Research Assistant (Part-time)
- Developed machine learning methods for remote sensing image classification
- Methods: convolutional neural network, multitask learning, active learning, object-based image analysis
- Applications: land use and crop mapping, local climate zone, hyperspectral and PolSAR image classification

Jul 2017 – Dec 2018   **School of Geography and Planning**, Sun Yat-Sen University, Guangzhou
Assistant Lab Manager (Part-time), GIS Lab
- Maintained 82 computers and 2 multimedia systems for classes

Jun – Aug 2016   **Center of Social Survey**, Sun Yat-Sen University, Guangzhou
Interviewer (Internship), China Labor-force Dynamic Survey (Zhuhai Team)
- Conducted face-to-face interviews about job and migration history with 70 families in two communities

JOURNAL PUBLICATIONS

Liu, S., Shi, Q., and Zhang, L., 2020. Few-shot Hyperspectral Image Classification with Unknown Classes Using Multitask Deep Learning. *IEEE Transactions on Geoscience and Remote Sensing*, Early Access, 2020. doi:10.1109/TGRS.2020.3018879

Liu, S., Luo, H., and Shi, Q., 2020. Active Ensemble Deep Learning for Polarimetric Synthetic Aperture Radar Image Classification. *IEEE Geoscience and Remote Sensing Letters*, Early Access, 2020. doi:10.1109/LGRS.2020.3005076

Liu, S., and Shi, Q., 2020. 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. doi:10.1016/j.isprsjprs.2020.04.008

Liu, S., and Shi, Q., 2020. Multitask Deep Learning with Spectral Knowledge for Hyperspectral Image Classification. *IEEE Geoscience and Remote Sensing Letters*, Early Access, 2020. doi:10.1109/LGRS.2019.2962768

Liu, S., Qi, Z., Li, X., and Yeh, A.G.O., 2019. 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), p.690. doi:10.3390/rs11060690

PEER-REVIEWED CONFERENCE PROCEEDINGS

Liu, S., Luo, H., Tu, Y., He, Z., and Li, J., 2018. Wide Contextual Residual Network with Active Learning for Remote Sensing Image Classification. In *IEEE International Geoscience and Remote Sensing Symposium,* July 2018, pp. 7145-7148. doi:10.1109/IGARSS.2018.8517855

CONFERENCE ABSTRACTS AND PRESENTATIONS

Shengjie Liu, 2020. Deep learning for remote sensing image classification: Scene classification of local climate zone and fine-grained classification with unknown classes. In *3rd Urban Remote Sensing Symposium*, November 2020, Shanghai, China.

Chun Shing Jason PUN, Chu Wing SO, Nok Yan Janet CHANG, **Shengjie LIU**, Lina CANAS, Constance E. WALKER, and Sze Leung CHEUNG, 2020. A Multinational Study of Night Sky Brightness patterns: preliminary results from the Globe at Night – Sky Brightness Monitoring Network (GaN-MN). In *6th International Conference on Artificial Light at Night (ALAN)*, June 2020, Lleida, Catalonia, Spain.

WORKING PAPERS

Shengjie Liu, Chu Wing So, Nok Yan Janet Chang, Chun Shing Jason Pun et al. Understanding remotely sensed nighttime lights with field measurements and land use data: A case study of Hong Kong. (manuscript available on request)

Shengjie Liu, Qian Shi. Multi-label local climate zone mapping as scene classification using very high resolution imagery: Preliminary result of Hong Kong. Preprint submitted to IGARSS 2021.

Shengjie Liu, Chu Wing So, Chun Shing Jason Pun et al. High inequality of artificial light due to commercial and sports lighting in Hong Kong. (manuscript available on request)

HONORS AND AWARDS

2020	Arctic Code Vault Contributor, GitHub
Nov 2019	Second Price (5 000 CNY), The 1st Orbita Hyperspectral Satellite Data Processing Paper Contest
	- Estimating PM2.5 and PM10 directly from TOA reflectance using hyperspectral data and multitask learning
Dec 2018	Scholarship of the EMBA Alumni Association for Real Estate of Sun Yat-Sen University
Dec 2018	The First Prize of Excellent Undergraduate Scholarship, Sun Yat-Sen University

PROFESSIONAL ACTIVITIES AND SERVICES

2020 –	Reviewer for *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (2), Pattern Recognition Letters, Urban Climate, Remote Sensing Letters.*
2018 –	Member, IEEE Geoscience and Remote Sensing Society

SKILLS

Coding languages: Python, C/C++, MATLAB, HTML5, LaTeX
Coding in Python: TensorFlow, Keras, PyTorch, NetworkX, Matplotlib
Academic software: GeoDa, ArcGIS, QGIS, ENVI, eCognition, Gephi, OriginLab
General software: VideoPad Video Editor, Adobe Illustrator

I have participated deeply in the following funded projects of my advisors or collaborators

Effects of external lighting on the environment
- Environment and Conservation Fund (Hong Kong) 2018-125, PI: Dr Chun Shing Jason Pun
Land use classification based on deep fusion of remote sensing imagery and social sensing data
- NSFC 61976234, PI: Dr Qian Shi
Scene-target-pixel transfer learning for remote sensing image classification
- NSFC 61601522, PI: Dr Qian Shi

Below are projects/subprojects that I was the main investigator (did the research)

2020 **High inequality of artificial light due to commercial and sports lighting in Hong Kong**
- Commercial and sports lighting contributed 41% and 17% of the total light emission in downtown Hong Kong
- Sports lighting had a Gini coefficient 0.25 higher than that of streetlights, while street lighting was evenly distributed across districts
- Buildings were bluer than streets: Ratios of light emission are 42:41 for blue lights and 37:47 for red lights
- Manuscript entitled *High inequality of artificial light due to commercial and sports lighting in Hong Kong*

2020 **Analyzing the relationship of up-to-down and down-to-up nighttime lights**
- Found a linear relationship between up-to-down night sky brightness and down-to-up nighttime lights
- Correlation varies depending on the spaceborne data: R=0.73 for Luojia-1 nighttime images; R between 0.81 and 0.99 for images captured at the International Space Station (ISS)
- Switching off unnecessary external lights at midnight significantly reduced downtown lights by two orders of magnitude as observed in the ISS images
- Manuscript entitled *Understanding remotely sensed nighttime lights with field measurements and land use data: A case study of Hong Kong*

2020 **U- and inverted U-shaped relationship between Flickr photo density and nightlight**
- Found that People prefer to take photos in bright urban centers and dark green parks
- Found a U- and inverted U-shaped relationship between nightlight (x-axis) and Flickr photo density (y-axis)
- Submitted to the Deep City Symposium Latsis EPFL 2020–21
- Flickr density map (change "Hong-Kong" to "Singapore" or "Toronto"): https://sjliu.me/Flickr/Hong-Kong/

2020 **Hyperspectral crop mapping with unknown classes** (open-set recognition)
- Empowered deep learning models with the ability to say "I don't know"
- Developed a multitask deep learning method (classification and reconstruction) to compare the reconstructed and original spectral profiles and reject the unknown classes
- Published in *IEEE TGRS* entitled *Few-shot Hyperspectral Image Classification with Unknown Classes Using Multitask Deep Learning*

2019 **Local climate zone mapping in metropolitan China**
- Developed an artificial network named LCZNet to classify satellite scene images to local climate zones
- Generated local climate zone maps in fifteen major cities in China
- Published in *ISPRS Journal P&RS* entitled *Local Climate Zone Mapping as Remote Sensing Scene Classification Using Deep Learning: A Case Study of Metropolitan China*
- Project page: https://sjliu.me/lcz

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 2nd Price of the 1st Orbita Hyperspectral Satellite Data Processing Paper Contest
- Project page: https://sjliu.me/Estimation-of-PM2.5-PM10-from-Satellite-Imagery

2019 **Crop mapping in Chongqing, China**
- Developed advanced neural networks for crop mapping using Sentinel-2 and Gaofen satellite imagery
- Key to win a three-year three million project entitled *Digital Map of Agricultural Industry in Yubei District, Chongqing* supported by the Chongqing Agriculture and Rural Committee
- News: https://web.archive.org/web/20200923163536/http://www.onespacechina.com/news20191130/

2018 **Using DMSP/OLS nighttime light data to capture the collapse and rise of post-Soviet states**
- Funded by the National Undergraduate Innovative Project (No. 201810558050, 10 000 CNY)
- Found that most light-decreased areas are related to mining industries based on spatial analysis
- Identified the sources of decreased night lights in fifteen post-Soviet countries by classifying high-resolution Google satellite images and locating their latitude and longitude in DMSP/OLS data

2018 **Active deep learning for remote sensing image classification** (Class: Hyperspectral Analysis)
- Developed a light-weight convolutional network that can run on CPU for image classification
- Integrated the light-weight network with active learning to reduce the need of training samples
- Published in *IGARSS 2018* entitled *Wide Contextual Residual Network with Active Learning for Remote Sensing Image Classification*

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 online medical records using complex network and clustering analysis
- Identified urban functional zones in Guangzhou and Foshan

2017 **Fusion of Sentinel optical and PolSAR data for land use and land cover mapping** (Class Project)
- Proposed an object-based refinement method to reduce the salt-and-pepper phenomenon and increase accuracy
- Evaluated the fusion of Sentinel Optical and PolSAR data using SVM, random forest, and neural network
- Published in *Remote Sensing* entitled *Integration of Convolutional Neural Networks and Object-Based Post-Classification Refinement for Land Use and Land Cover Mapping with Optical and SAR Data*

2017 **Community detection with open street map road network and graph theory** (Class Project)
- Developed a C++ program to calculate the shortest path using Dijkstra algorithm (linked list implementation)
- Developed a label propagation algorithm with real distance constraint for community detection
- Evaluated the performance of community detection by calculating modularity
- Visualized the detected road network community in ArcGIS

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