Shengjie Liu

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EDUCATION

B.S. Geographic Information Science, Sun Yat-Sen University, China, 2019

PROFESSIONAL EXPERIENCE

Oct 2019 – The University of Hong Kong
Research Assistant, Department of Physics

Jul–Aug 2019 OneSpace Technology Co., Ltd.
Remote Sensing Engineer, Department of Spatial Information

RESEARCH INTERESTS

Remote Sensing Image Analysis: object-based image analysis (OBIA), land use and land cover, mapping, hyperspectral, PolSAR, data fusion, and Google Earth Engine

Machine Learning in Earth Observation: convolutional neural network, random forest, ensemble learning, multitask learning, active learning, few-shot learning, and open-set recognition

Urban Science: spatial analysis, local climate zone, urban heat, air quality estimation, light pollution, artificial light at night (ALAN), healthy cities, inequality, road network, and complex network

PUBLICATIONS

Journal Articles

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

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

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

2019 **Liu, S.**, and Shi, Q. "Multitask Deep Learning With Spectral Knowledge for Hyperspectral Image Classification." *IEEE Geoscience and Remote Sensing Letters*, Early Access. doi:10.1109/LGRS.2019.2962768

2019 **Liu, S.**, Qi, Z., Li, X., and Yeh, A.G.O. "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

Conference Proceedings

2021 **Liu, S.**, So, C.W., and Pun, C.S.J. "Analyzing Long-Term Artificial Light at Night Using VIIRS Monthly Product with Land Use Data: Preliminary Result of Hong Kong." Accepted to *2021 IEEE International Geoscience and Remote Sensing Symposium*. Preprint at sjliu.me/preprint

2021 **Liu, S.**, and Shi, Q. "Multi-Label Local Climate Zone Mapping as Scene Classification Using Very High Resolution Imagery: Preliminary Result of Hong Kong." Accepted to *2021 IEEE International Geoscience and Remote Sensing Symposium*. Preprint at sjliu.me/preprint

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

Conference Abstracts

2021 **Liu, S.**, So, C.W., Chang, N.Y.J., and Pun, C.S.J. "The relationship between night sky brightness and remote sensing data: Preliminary result from Luojia-1 and the International Space Station." Accepted to *7th International Conference on Artificial Light at Night (ALAN)*.

2020 **Liu, S.**, and Shi, Q. "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.

2020 Pun, C.S.J., So, C.W., Chang, N.Y.J., **Liu, S.**, Canas, L., Walker, C.E., and Cheung, S.L. "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.

Manuscripts In Review & Working Papers

2021 **Liu, S.**, Zhou, Z. et al. "Crop Mapping Using Sentinel Full-Year PolSAR Data and a CPU-Optimized Convolutional Neural Network With Two Sampling Strategies." Submitted to *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, Major Revision.

2021 **Liu, S.**, So, C.W., Chang, N.Y.J., and Pun, C.S.J. "Understanding remotely sensed nighttime lights with field measurements and land use data: A case study of Hong Kong." (manuscript available on request)

2021 **Liu, S.**, So, C.W., Ho, D.H.C., Shi, Q., and Pun, C.S.J. "High inequality of artificial light due to commercial and sports lighting in Hong Kong."

2021 **Liu, S.**, So, C.W., and Pun, C.S.J. "Analyzing the Sources and Variations of Satellite-Observed Night Lights Between 2012 and 2020 in Hong Kong."

HONORS AND AWARDS

2020 Arctic Code Vault Contributor, GitHub

2019 The 1st Orbita Hyperspectral Satellite Data Processing Paper Contest, Second Prize (5,000 CNY)

2018 Scholarship of the EMBA Alumni Association for Real Estate of Sun Yat-Sen University

2018 The First Prize of Excellent Undergraduate Scholarship, Sun Yat-Sen University

FUNDED PROJECTS

As principal investigator

2018 National Undergraduate Innovative Project: Using DMSP/OLS night lights to capture the collapse and rise of post-Soviet states (No. 201810558050, 10,000 CNY)

Participated in

2020– Panoramic Photography Survey on the Usage of External Lighting (Knowledge Exchange Grants of the University of Hong Kong, KE-IP-2020/21-78, PI: Dr Chun Shing Jason Pun)

2019– Effects of external lighting on the environment (Environment and Conservation Fund (Hong Kong), No. 2018-125, PI: Dr Chun Shing Jason Pun)

2019– Land use classification based on deep fusion of remote sensing imagery and social sensing data (National Natural Science Foundation of China, No. 61976234, PI: Dr Qian Shi)

2019 A multi-city dark sky advocacy campaign (Knowledge Exchange Grants of the University of Hong Kong, KE-IP-2019/20-54, PI: Dr Chun Shing Jason Pun)

2018 Scene-target-pixel transfer learning for remote sensing image classification (National Natural Science Foundation of China, No. 61601522, PI: Dr Qian Shi)

SERVICE

Professional Activities

Member (2021–), IEEE GRSS Image Analysis and Data Fusion (IADF) Technical Committee

Member (2018–), IEEE Geoscience and Remote Sensing Society (GRSS)

Academic Journal Peer Review

Urban Climate (2)

Knowledge-Based Systems

Pattern Recognition Letters

IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (2)

Remote Sensing Letters (3)

Scientific Reports

TECHNICAL SKILLS

Data Analysis and Machine Learning

Deep learning (TensorFlow, Keras, and Pytorch) and convolutional neural network, machine learning (support vector machine, random forest, and AdaBoost), data mining, network analysis, Python (including numpy, scipy, pandas, matplotlib, networkx, and scikit-learn), and MATLAB.

Geospatial Methods and Software

Spatial analysis, GeoDa, QGIS, eCognition, ENVI, ArcGIS, GDAL, and Google Earth Engine.

SELECTED PROJECTS WITH ONLINE MEDIA MATERIALS

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; revealed the U- and inverted U-shaped relationship between nightlight (x-axis) and Flickr photo density (y-axis); Flickr density map (change "Hong-Kong" to "Toronto"): https://sjliu.me/Flickr/Hong-Kong

2019 Local climate zone mapping in metropolitan China
Developed a neural network named LCZNet to classify satellite scene images to local climate zones; generated local climate zone maps in fifteen major cities in China; project page: https://sjliu.me/lcz

2019 Estimating PM2.5 and PM10 concentrations directly from TOA reflectance using Zhuhai-1 hyperspectral data using multitask deep learning
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/

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. Report and visualization in Chinese: sjliu.me/paper/communityDetection.pdf

Updated March 2021