Curriculum Vitae

Patrick (Xinghua) Cheng

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Research Interests

Landscape Ecology, Thermodynamic Entropy, Statistics, Statistical Thermodynamics in Landscape Ecology, Remote Sensing Data Fusion for Phenology Analysis, Machine Learning.

Education

M.S. Geomatics (Distinction) Sept 2018 - Feb 2020
Department of Land Surveying and Geo-Informatics, The Hong Kong Polytechnic Univ, Hong Kong

B.S. Geographical Information Science Sept 2014 - June 2018
Department of Geographical Information Science, Nanjing Normal University, China

Academic Publications

- **Research Articles**
  - **Cheng, X. H**, Li, Z. L., 2021. Predicting the Lossless Compression Ratio of Remote Sensing Images with Configurational Entropy. ***IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing***.14, 11936-11953. Doi: 10.1109/JSTARS.2021.3123650
  - **Cheng, X. H**, Li, Z. L., 2021. Configurational Entropy for Optimizing the Encryption of Digital Elevation Model Based on Chaos System and Linear Prediction. ***Applied Sciences***, 11(5), pp. 2402, Doi: https://doi.org/10.3390/app11052402
  - Li, S. J, Hu, G. H, **Cheng, X. H**, Xiong, L. Y, Tang G. N. Josef S., Integrating topographic knowledge into deep learning for the voids filling of digital elevation models. ***Remote Sensing of Environment***. Doi: https://doi.org/10.1016/j.rse.2021.112818
- **Book Chapter**
  - Hu, D, **Cheng, X. H**, Lü, G. N, Wen, Y. N, Chen, M., 2020. The Chinese Family Tree Geographical information system. In: Ye, X.Y, Lin, H. eds. Spatial Synthesis: Computational Social Science and Humanities. Switzerland: Springer Nature, pp. 13-17, Doi: 10.1007/978-3-030-52734-1_3
- **Conference paper**
  - **Cheng, X. H**, Li Z. L., 2020. How Does Shannon's source coding theorem Fare in prediction of image compression ratio with current algorithms? In ISPRS Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Doi: 10.5194/isprs-archives-XLIII-B3-2020-1313-2020
  - **Cheng, X. H**, Li, Z. L., 2020. Using Boltzmann Entropy to Measure Scrambling Degree of Grayscale Images. In *Proc.* the 2021 IEEE 5th International Conference on Cryptography, Security and Privacy (CSP 2021), Zhuhai, China, pp. 181-185, Doi: 10.1109/CSP51677.2021.9357492
  - Zhou, R. C, Lu, K., Long, Y., Lu, J. Y, **Cheng, X. H**, Hu, D. and Gu, Y.H., 2017. A survey on social image understanding. In *Proc. 2017* IEEE *International Conference on Behavioral, Economic, Socio-cultural Computing (BESC)*, Krakow, Poland, pp. 1-5 Doi*:* 0.1109/BESC.2017.8256394

- **Articles in Review/Preparation**
    - **Cheng, X. H**, Li, Z. L., 2022. Modelling the Energy Flow from Landscape Gradients to Mosaics. (***Submitted to Landscape Ecology, Under Review***) (*Results available upon request*)
    - **Cheng X. H,** Yan, W., 2022. Inferring the Radiometric Quality of MALS via Boltzmann Entropy (*Results available upon request*)
    - **Cheng X.H.** 2022. No-reference Assessment of Disaggregation of Land Surface Temperature **(***Results available upon request***)**

Working Experience

Full-time Research Associate at Department of Land Surveying and Geo-informatics, HK PolyU

Advisor: Chair Prof. Zhi-lin Li

- **Project title: Development of Boltzmann-entropy-based image approaches for remote sensing image analysis** (*supported by a grant from the research grant council of Hong Kong Special Administrative Region*)
    - Responsible for developing novel and powerful methods of calculating Boltzmann entropy
    - **Engineered Boltzmann entropy-based models for predicting lossless image compression ratio**
    - **Investigated the information transmission from multispectral remote sensing images to land cover and land use maps with a statistical thermodynamics-based approach**
    - **Surveyed the statistical thermodynamics in remote sensing image classification**
    - Responsible for the development of statistical thermodynamics-based deep learning approaches for remote sensing image analysis

Advisor: Dr. Yan Wei Yeung

- **Project title: The next-generation global land cover map: a multispectral LiDAR approach** (*supported by a grant from the research grant council of Hong Kong SAR*)
    - **Addressed the issue of measuring radiometric quality of multispectral point clouds with an information-theoretic method**
    - Development of information fusion approaches of multispectral point clouds and remote sensing images for land cover mapping

Research Assistant in "Yangtze River Delta Science Data Center，National Earth System Science Data Sharing Infrastructure" (June 2016 - June 2018)

Advisor: Prof. Nan Jiang and Dr. Di Hu

- **Project title: A Spatial-Temporal Framework Construction and Service of Nanjing over the Past Hundred Years** (*supported by a grant from the Jiangsu provincial bureau of surveying mapping and geoinformation, China*)
    - Participated in the development of web platform of service of Nanjing
    - Analyzed the changes of the Nanjing district over the past century
- **Project title: Spatial-Temporal Modeling and Positioning Approach of Historical Geographic Information** (*supported by a grant from the national science foundation of the People's Republic of China*).
    - Screened data for preliminary studying of spatial-temporal modeling
    - Engineered two approaches for positioning historical geographic information
- **Project title: Multi-granularity Spatial-Temporal Object Expression Model** (Sub-Topics of Pan-spatial Information System and Intelligent Facilities Management, *supported by a grant from the national science foundation of People's Republic of China*)
    - Responsible for district-based spatial-temporal modeling, and for the writing of portions of the manuscript that came out of this project
    - Investigated the data structures for storing spatial-temporal data of the district

Teaching Experience

Teaching Assistant Sept 2020- Dec 2021

- Course Name: LSGI3242A Digital Terrain Modelling (Sept 2020-Dec 2020)
  - Instructor: Dr. Yan Wai Yeung
  - Responsibility**:** Lab Teaching, Assignments Marking
- Course Name: LSGI3244A_535_20202_A Spatial Data Analysis and Mining (Jan 2021- May 2021)
  - Instructor: Dr. Xiao-lin ZHU
  - Responsibility: Lab Teaching, Assignments Marking

Society Membership

- North American Regional Association of the International Association for Landscape Ecology (IALE-NA) Student Membership.
- International Society for Photogrammetry and Remote Sensing (ISPRS)
- AAG (American Association of Geographers) Graduate Student Membership.
- Institute of Electrical and Electronics Engineers (IEEE) Geoscience and Remote Sensing Student Membership.

Oral Presentation

Cheng, X. H, Li, Z. L "Effects of Upscaling Functions on Calculating Thermodynamic Entropy of Numerical Raster Data: A Case Study on Aggregation". In *T-08: Modeling*, *North American Regional Association of the International Association for Landscape Ecology (IALE-NA) Annual Meeting*, Neveda, USA, April 8-16, 2021. (Online).

Cheng, X. H, Li, Z. L. "Boltzmann-entropy-based Optimization of Encryption and Decryption of DEM with Logistic Map". In *Special Symposia-07: Entropy for landscape ecology: models, computation, and applications, North American Regional Association of the International Association for Landscape Ecology (IALE-NA) Annual Meeting*, Toronto, Canada, May 10-14, 2020. (Online).

Cheng, X. H, Li, Z. L. "Using Boltzmann Entropy to Measure Scrambling Degree of Grayscale Images". In 2021 *IEEE 5th International Conference on Cryptography, Security and Privacy (CSP 2021)*, Zhuhai, China, January 8-10, 2021.

Cheng, X. H, Li, Z. L. "Measung the Srambling Degree of Remote Sensing Imgaes: A Perspective from The Second Law of Thermodynamics". *In 2020 International Graduate Workshop on Geoinformatics*, Wuhan, China, December 16-18, 2020.

Cheng, X. H, Li, Z. L. "How Does Shannon's source coding theorem Fare in prediction of image compression ratio with current algorithms?" *XXIVI International Society for Photogrammetry and Remote Sensing (ISPRS) Congress 2020*, Nice, France, June 14-20, 2020.

Cheng, X. H, Hu, D, He, H. Y, Wang, Q. R. "Publicly-oriented Historical Geographical Information System of Three Kingdoms". *Digital Humanities: Academic Frontiers and Explorations in the Big Data Era" Symposium*, Nanjing, People's Republic of China, July 1-3, 2017.

Academic Conference Experience

- IALE-NA Annual Meeting, [Online] (2020 Toronto, Canada)
- XXIV ISPRS Congress 2022, [Online] (2022 Nice, France)
- ISPRS Geospatial Week (2017 Wuhan, China)

Honor & Awards

- LSGI Scholarship for Outstanding Academic Performance, The Hong Kong Polytechnic University (2018-2019).

- Outstanding Undergraduate Thesis of Nanjing Normal University, Sept 2018.
- Third-class Scholarship for Excellent Student, Nanjing Normal University, 2015
- Award of Pacemaker to Merit Student, Nanjing Normal University, December 2015.
- Third-class Scholarship for Excellent Student, Nanjing Normal University, 2016
- Second-class Scholarship for Excellent Student, Nanjing Normal University, 2017.
- Third-class Scholarship for Excellent Student, Nanjing Normal University, 2018
- Second Prize in the 5th National GIS Skills Competition (Qingdao, China), November 2016.
- Second Prize in the Mapping Group of Nanjing Normal University Campus Invitational Tournament of the 14th National University GIS Competition, Sept 2016.

Professional Skills

- Programming Languages: Python, R, C, Matlab, C#, C++, Java, HTML5, JavaScript
- Deep Learning Frameworks: Tensorflow, PyTorch.
- Operating System: Windows families, MacOS, Linux families.
- Databases: Oracle, Mysql, SQLite, PostgreSQL, SqlServer, ESRI Geodatabase.
- Software and Tools: DJ UAV (Unmanned Aerial Vehicle), Android Studio, MATLAB, Visual Studio, Eclipse, IntelliJ, ArcGIS, ENVI, Level, Total Station, GPS, Theodolite.

References

Dr. Zhilin Li (M.S. and RA Supervisor at HKPU)
Full Professor
Faculty of Geosciences and Environmental Engineering
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Curriculum Vitae (polyu.edu.hk), Li Zhilin - Google Scholar

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https://geot.bnu.edu.cn/Public/htm/news/5/427.html, Jianbo Gao -Google Scholar