

Meng Lu

PERSONAL DATA

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SUMMARY

My research interests include the theory and application of statistics, machine learning, agent-based modelling, remote sensing, and big computational techniques to the quantification and understanding of the spatiotemporal phenomena of our environment and society. Of particular interest is the modelling of human exposure to environmental pollution and contribute to the understanding of the health impacts of air pollution.

CURRENT POSITION

JUNE. 2021 – Now Junior Professor: **Department of Geography, University of Bayreuth**
Bayreuth, Germany

EXPERIENCE

JULY. 2017 – May. 2021 Postdoctoral researcher:
Department of Physical Geography, Utrecht University
Utrecht, the Netherlands **Global Geo Health Data Center, Utrecht University**

EDUCATION

OCT. 2013 – July. 2017 Ph.D. : **Institute for Geoinformatic, University of Muenster**
Muenster, Germany Promoter: Prof. Dr. Edzer Pebesma
Co-promoter: Associate Prof. Dr. Jan Verbesselt
Thesis title:
“Spatiotemporal Change Modelling from Multidimensional Arrays”
received with *Magna Cum Laude*
Funding:
DAAD (deutscher akademischer austauschdienst) Ph.D. scholarship

AUG. 2011 – May 2013 M.Sc.: **Department of Geography, University at Buffalo, SUNY**
Buffalo, NY, USA Supervisor: Prof. Dr. Chris Renschler
Co-supervisor: Associate Prof. Dr. Thomas Bittner
Thesis title :
“Investigating Consequences of Climate Change -
Temporal and Spatial Changes of Precipitation,
Runoff and Erosion and the Impact on Land Cover”
GPA: 3.82/4.0 (top 5%)

SEP. 2007 – June 2011 B.Eng.: **Institute of Remote Sensing and Information Engineering,**
Wuhan, Hubei, China **Wuhan University**
Supervisor: Prof. Dr. Shunping Ji
Thesis title:
“Transformation Methods and Accuracy Assessment
between Coordinate Systems in RTK Satellite Navigation”

VISITING SCHOLAR

SEP. 2015 – Dec. 2015
Wageningen, Netherlands

**Wageningen University, Laboratory of Geo-information
Geoscience and Remote Sensing**

Supervisor: Associate Prof. Dr. Jan Verbesselt

Subject:

Change detection from multidimensional data

JAN. 2013 – May. 2013
Göttingen, Germany

**University of Göttingen - Georg-August-Universität Göttingen
Department of Bioclimatology**

Supervisor: Prof. Dr. Alexander Knohl

Subject:

climate change, soil modeling, vegetation dynamics, and hydrology

KEY PUBLICATIONS

1. **Lu, M.**, Schmitz, O., de Hoogh, K., Qin, K., Karssenber, D. (2020). Evaluation of different methods and data sources to optimise modelling of NO₂ at a global scale. *Environmental International*, Volume 142, September 2020, 105856.
2. **Lu, M.**, Schmitz, O., Vaartjes, I. & Karssenber, D. (2019). Activity-based air pollution exposure assessment: Differences between homemakers and cycling commuters. *Health and Place*, 60.
3. **Lu, M.**, Soenario, I, Helbich, M., Schmitz, O., Hoek, G., van de Molen, M. & Karssenber, D. (2020). Land use regression models revealing spatiotemporal co-variation in NO₂, NO, and O₃ in the Netherlands. *Atmospheric Environment* 223 (2020): 117238
4. **Lu, M.**, Dai, R., de Boer, C., Schmitz, O., Kooter, I., Cristescu, S., Karssenber, D. (2021). External Validation for Statistical NO₂ Modelling: A Study Case Using a High-end Mobile Sensing Instrumentation. *Atmospheric Pollution Research*, 2021, Volume 12, Issue 11, 101205.
5. **Lu, M.**, Appel, M. & Pebesma, E. (2018). Multidimensional arrays for analysing geoscientific data. *ISPRS International Journal of Geo-Information*, 7 (8).
6. **Lu, M.**, Pebesma, E., Sanchez, A. & Verbesselt, J. (2016). Spatio-temporal change detection from multidimensional arrays: Detecting deforestation from MODIS time series. *ISPRS Journal of Photogrammetry and Remote Sensing*, 117, (pp. 227-236) (10 p.).
7. **Lu, M.**, Hamunyela, E., Verbesselt, J. & Pebesma, E. (2017). Dimension reduction of multi-spectral satellite image time series to improve deforestation monitoring. *Remote Sensing*, 9 (10).
8. Wang, J, Schmitz, O, **Lu, M.** & Karssenber, D (2020). Thermal unmixing based down-scaling for fine resolution diurnal land surface temperature analysis. submitted to *ISPRS Journal of Photogrammetry and Remote Sensing* 161, pp.76-89.
9. Ji, S., Wei, S. & **Lu, M.** (2018). Fully Convolutional Networks for Multisource Building Extraction from an Open Aerial and Satellite Imagery Data Set. *IEEE Transactions on Geoscience and Remote Sensing*, 57 (1).
10. Wei, S., Ji, S., & **Lu, M.** (2020). Toward Automatic Building Footprint Delineation From Aerial Images Using CNN and Regularization. *IEEE Transactions on Geoscience and Remote Sensing*. Volume: 58, Issue 3.

SCHOLARLY PUBLICATIONS

2021

1. **Lu, M.**, Dai, R., de Boer, C., Schmitz, O., Kooter, I., Cristescu, S., Karssenber, D. (2021). External Validation for Statistical NO₂ Modelling: A Study Case Using a High-end Mobile

Sensing Instrumentation. *Atmospheric Pollution Research*, 2021, Volume 12, Issue 11, 101205.

2. Ntarladima, A., Karssenber, D., Vaartjes, I., Grobbee, D., Schmitz, O., Lu, M., Boer, J., Koppelman, G., Vonk, J., Vermeulen, R., Hoek, G., Gehring, U. (2021). A comparison of associations with childhood lung function between air pollution exposure assessment methods with and without accounting for time-activity, *Environmental Research*, 2021, Volume 202, 111710, ISSN 0013-9351.
3. Zhang, Z., **Lu, M.**, Ji, S., Yu, H., Nie, C. (2021). Rich CNN Features for Water-Body Segmentation from Very High Resolution Aerial and Satellite Imagery. *Remote Sens.*, 2021, 13 (10), 1912.
4. Geng, X., Ji, S., **Lu, M.**, Zhao, L. (2021). Multi-Scale Attentive Aggregation for LiDAR Point Cloud Segmentation. *Remote Sens.* 2021, 13, 691.
5. Poelman, M, Nicolaou, M., Dijkstra, C., Mackenbach, J., **Lu, M.**, Karssenber, D., Vaartjes, I., Snijder, M., Stronks, K.,. (2021). Does the neighbourhood food environment contribute to ethnic differences in diet quality? Results from the HELIUS study in Amsterdam, the Netherlands. *Public Health Nutrition*. 2021, 24(15), 5101-5112.

2020

6. **Lu, M.**, Schmitz, O., de Hoogh, K., Qin, K., Karssenber, D. (2020). Evaluation of different methods and data sources to optimise modelling of NO₂ at a global scale. *Environmental International*, Volume 142, 105856.
7. Loozen, Y, Rebel, K., de Jong, S., **Lu, M.**, Ollinger, S., Wassen, M., Karssenber, D. (2020). Mapping canopy nitrogen in European forests using remote sensing and environmental variables with the random forest method. *Remote sensing of Environment*. Volume 247, 2020, 111933, ISSN 0034-4257
8. Ji, S., Dai, P, **Lu, M.**, Zhang, Z. (2020). Simultaneous Cloud Detection and Removal From Bitemporal Remote Sensing Images Using Cascade Convolutional Neural Networks. *IEEE Transactions on Geoscience and Remote Sensing* PP(99):1-17
9. van Rongen, S., Poelman, M., Thornton, L., Abbott, G., **Lu, M.**, Kamphuis, C., Verkooijen, K., & de Vet, E. (2020). Neighbourhood fast food exposure and consumption: the mediating role of neighbourhood social norm. *International Journal of Behavioral Nutrition and Physical Activity*, Volume, 17, Number, 61.
10. Wei, S., Ji, S., & **Lu, M.** (2020). Toward Automatic Building Footprint Delineation From Aerial Images Using CNN and Regularization. *IEEE Transactions on Geoscience and Remote Sensing*. Volume: 58, Issue 3.
11. Li, X., Luo M., Ji, S., Li, Z., **Lu, M.** (2020). Evaluating generative adversarial networks based image-level domain transfer for multi-source remote sensing image segmentation and object detection. *International Journal of Remote Sensing*, Volume 41, 2020, Issue 19.
12. Ji, S., Qin, Z., Shan, J. & **Lu, M.** (2020). Panoramic SLAM from a multiple fisheye camera rig. *ISPRS Journal of Photogrammetry and Remote Sensing*, 159, (pp. 169-183).
13. Ji, S., Zhang, Z., Zhang, C., Wei, S., **Lu, M.** & Duan, Y. (2020). Learning discriminative spatiotemporal features for precise crop classification from multi-temporal satellite images. *International Journal of Remote Sensing*, 41 (8), (pp. 3162-3174).
14. **Lu, M.**, Soenario, I, Helbich, M., Schmitz, O., Hoek, G., van de Molen, M. & Karssenber, D. (2020). Land use regression models revealing spatiotemporal co-variation in NO₂, NO, and O₃ in the Netherlands. *Atmospheric Environment* 223 (2020): 117238

15. Wang, Y., Ji, S., **Lu, M.** & Zhang, Y. (2020). Attention boosted bilinear pooling for remote sensing image retrieval. *International Journal of Remote Sensing*, 41 (7), (pp. 2704-2724) (21 p.).
16. Wang, J., Schmitz, O, **Lu, M.** & Karssenber, D (2020). Thermal unmixing based down-scaling for fine resolution diurnal land surface temperature analysis. submitted to *ISPRS Journal of Photogrammetry and Remote Sensing* 161, pp.76-89.

2019

17. Ji, S., Shen, Y., **Lu, M.** & Zhang, Y. (2019). Building instance change detection from large-scale aerial images using convolutional neural networks and simulated samples. *Remote Sensing*, 11 (11).
18. Ji, S., Liu, J. & **Lu, M.** (2019). CNN-based dense image matching for aerial remote sensing images. *Photogrammetric Engineering and Remote Sensing*, 85 (6), (pp. 415-424).
19. Ji, S., Wei, S. & **Lu, M.** (2019). A scale robust convolutional neural network for automatic building extraction from aerial and satellite imagery. *International Journal of Remote Sensing*, 40 (9), (pp. 3308-3322) (15 p.).
20. **Lu, M.**, Schmitz, O., Vaartjes, I. & Karssenber, D. (2019). Activity-based air pollution exposure assessment: Differences between homemakers and cycling commuters. *Health and Place*, 60.
21. Zhang, C., Wei, S., Ji, S. & **Lu, M.** (2019). Detecting large-scale urban land cover changes from very high resolution remote sensing images using CNN-based classification. *ISPRS International Journal of Geo-Information*, 8 (4).
22. Zhu, R., Yu, D., Ji, S. & **Lu, M.** (2019). Matching RGB and Infrared Remote Sensing Images with Densely-Connected Convolutional Neural Networks. *Remote Sensing*, 11 (23), (pp. 2836) (1 p.).

2018

23. Ji, S., Yu, D., Hong, Y. & **Lu, M.** (2018). Template Matching for Wide-Baseline Panoramic Images from a Vehicle-Borne Multi-Camera Rig. *ISPRS International Journal of Geo-Information*, 7 (7), (pp. 236) (1 p.).
24. **Lu, M.**, Appel, M. & Pebesma, E. (2018). Multidimensional arrays for analysing geoscientific data. *ISPRS International Journal of Geo-Information*, 7 (8).
25. Ji, S., Wei, S. & **Lu, M.** (2018). Fully Convolutional Networks for Multisource Building Extraction from an Open Aerial and Satellite Imagery Data Set. *IEEE Transactions on Geoscience and Remote Sensing*, 57 (1).
26. Qin, K., Zou, J., Guo, J., **Lu, M.**, Bilal, M., Zhang, K., Ma, F. & Zhang, Y. (2018). Estimating PM 1 concentrations from MODIS over Yangtze River Delta of China during 2014–2017. *Atmospheric Environment*, 195, (pp. 149-158).

2017

27. **Lu, M.**, Hamunyela, E., Verbesselt, J. & Pebesma, E. (2017). Dimension reduction of multi-spectral satellite image time series to improve deforestation monitoring. *Remote Sensing*, 9 (10).

2016

28. **Lu, M.**, Pebesma, E., Sanchez, A. & Verbesselt, J. (2016). Spatio-temporal change detection from multidimensional arrays: Detecting deforestation from MODIS time series. *ISPRS*

Journal of Photogrammetry and Remote Sensing, 117, (pp. 227-236) (10 p.).

2015

29. Peng, J., Liu, Q., Wang, L., Liu, Q., Fan, W., **Lu, M.** & Wen, J. (2015). Characterizing the pixel footprint of satellite albedo products derived from MODIS reflectance in the Heihe River Basin, China. *Remote Sensing*, 7 (6), (pp. 6886-6907) (22 p.).

preprint

- **Lu, M.** and C. Renschler. Rainfall and Rainfall Erosivity Time Series Analysis of a Small Semi-arid Watershed of the American Southwest. EarthArXiv. Retrieved from earth-arxiv.org/nk75z.

FULL PAPER OR EXTENDED ABSTRACT IN CONFERENCE PROCEEDINGS

- **Lu, M.**, Groeneveld, L., Karssenberg, D., Ji, S., Jentick, R., Paree, E., Addink, E., GEOMORPHOLOGICAL MAPPING OF INTERTIDAL AREAS. In ISPRS International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences. 2021. (**refereed**)
(Awarded by *Remote Sensing* journal travel grant)
- **Lu, M.**, Modeling spatio-temporal change from large-scale high-dimensional array data. In Extended Abstract Proceedings of the GIScience 2014, page354, 2014. (**refereed**)
- **Lu, M.** and Hamunyela, E., On-line change monitoring with transformed multi-spectral time series, a study case in tropical forest. In ISPRS Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 2016. (**refereed**)
- Hu, M., **Lu, M.**, Ji, S. Cascaded deep neural networks for predicting biases between building polygons in vector maps and new remote sensing images. In IGARSS, WE2.MM-3.4.

JOURNAL SUBMISSIONS UNDER REVIEW

- **Meng Lu**, Paula Moraga, Joaquin Cavieres. A comparison of INLA and machine learning-based methods in NO₂ modelling: prediction accuracy, uncertainty quantification, and model interpretability. Submitted to Geo-graphical Analysis.
- Ji, S., Hu, M., **Lu, M.**, Cascaded Deep Neural networks for predicting biases between building polygons in vector maps and new remote sensing images. Submitted to IEEE Geoscience and Remote Sensing Letters.
- Youchen Shen, Jessica Ruijsch, **Meng Lu**, Edwin Sutanudjaja, Derek Karssenberg Error-correction of streamflow predictions from a global hydrological model using random forests. submitted to computer and Geoscience.
- Anna-Maria Ntarladima, Derek Karssenberg, Maartje Poelman, Diederick Grobbee, **Meng Lu**, Oliver Schmitz, Maciej Strak, Nicole Janssen, Gerard Hoek, Ilonca Vaartjes. Associations between fast-food environment and diabetes prevalence: a cross-sectional study in the Netherlands. Submitted to Lancet Planetary Health.

SELECTED CONFERENCE ABSTRACTS AND PRESENTATIONS

- **Meng Lu**, Oliver Schmitz, Kees de Hoogh, Perry Hystad, Luke Knibbs, Qin Kai, and Derek Karssenberg Global, high-resolution statistical modelling of NO₂. In EGU General Assembly Conference Abstracts, 2021.
- Oliver Schmitz, **Meng Lu**, Kees de Hoogh, Nicole Probst-Hensch, Ayoung Jeong, Benjamin Flückiger, Danielle Vienneau², Gerard Hoek, Kalliopi Kyriakou, Roel C. H. Vermeulen, and Derek Karssenberg. Nationwide estimation of personal exposure to air

pollution using activity-based field-agent modelling. In EGU General Assembly Conference Abstracts, 2021.

- **Lu, M.**, Schmitz, O., Soenario, I., Helbich, M., Vaartjes, I., & Karssenber. D., Assessment of air pollution exposures across a population: differences between home-based workers and bike commuters. In EGU General Assembly Conference Abstracts, 2018.
- **Lu, M.** and Pebesma, E., Spatio-temporal change modeling with array data. In EGU General Assembly Conference Abstracts, volume 17, page 5014, 2015.
- **Lu, M.** and Pebesma, E., Modeling change from large-scale high-dimensional spatio-temporal array data. In EGU General Assembly Conference Abstracts, volume 16, page 7670, 2014
- **Lu, M.**, Renschler, C., and Nearing, M., Climate change and its impact on precipitation, runoff, and erosion in a small semi-arid watershed of the American Southwest. In EGU General Assembly Conference Abstracts, volume 16, 2014.
- Schmitz, O., de Jong, K., de Bakker, M., **Lu, M.**, and Karssenber, D., Integration of field-based and agent-based modelling paradigms into the PCRaster environmental modelling platform. In EGU General Assembly Conference Abstracts, 2018.
- Loozen, Y., Karssenber, D., de Jong, S., **Lu, M.**, Olin, S., Wassen, M., Wårlind, D., Zaehle, S., and Rebel, K., Canopy N across European forests: comparing spatial patterns of canopy N retrieved from remote sensing, environmental variables and global vegetation models. In EGU General Assembly Conference Abstracts, 2020.

TEACHING AND ORGANIZING EXPERIENCE

- 2020 OpenGeoHub summer school (formerly Geostat), "Statistical methods in global air pollution modelling". Wageningen, the Netherlands. *Lecturer*
Course material 2020
- 2019 OpenGeohub summer school, "Global air pollution mapping". Muenster, Germany. *Lecturer*
Course material 2019
- 2019 Data Science & Complexity Centre Central Topic, "Statistical learning in global air pollution mapping", Utrecht, the Netherlands. *Lecturer*
- 2019 Statistics and Data Analysis in Physical Geography, Utrecht University, Utrecht, Netherlands. *Lecturer for labs*
- 2018-2019 Land Surface Process Modelling, Utrecht University, Utrecht, Netherlands. *Lecturer for labs, guest lectures*
- 2017 Workshop, Scalable multidimensional array analysis. EGU General Assembly 2017, Vienna, Austria. *Lecturer*
- 2017 Reference System, Department of Geoinformatics, University of Muenster, Germany. *Lecturer for labs, teaching assistant*
- 2014 Workshop, gamification, institute of geoinformatics, University of Muenster. *Organiser*

SOFTWARE DEVELOPMENT

I commit to open-source software development, below are some of my Github repositories, written as R packages.

1. Air pollution modelling: APMtools <https://github.com/mengluchu/APMtools>

2. spatiotemporal change detection and big spatiotemporal data analysis: scalable-spatial-temporal-BFAST, <https://github.com/ifgi/scalable-spatial-temporal-BFAST>,
3. Integration of multidimensional information to improve change detection: multibandsBFAST, <https://github.com/ifgi/multibandsBFAST>,
4. Manipulating multidimensional arrays: rearrange, <https://github.com/ifgi/rearrange>.

SUPERVISED MASTER THESIS (SELECTED)

- Spatial variance in air pollution and its (socioeconomic-) explanatory variables in The Netherlands and Germany. Foeke Boersma
- 2019 Improving land-use regression models for air pollution mapping by assimilating satellite and in-situ observations. Youchen Shen
- 2019 High-resolution personal exposure assessment for air pollution and greenness using a data poor space-time approach. Lars Groeneveld
- 2018-2019 Mapping Individual Air Pollution Exposure with Sparse Data: A Novice Spatial-temporal Aggregation Method of NO₂ Exposure. Ruoying Dai
- 2018 Deforestation detection using Sentinel-2 imagery. Study case: West New Britain, Papua New Guinea. Joel Koupermann
- 2017-2018 Mapping Plasmodium Falciparum exposure between 2000 and 2015. Chris Kerklaan

SCHOLARSHIPS

- DAAD (deutscher akademischer austauschdienst) <https://www.daad.de/en/> (Ph.D. scholarship, 52,200 Euros)
- Scholarship for MSCJ-LIFE Spring School, 2017 <https://www.geographie.uni-jena.de/en/Chairs/GIScience.html> (travelling grant)
- Scholarship for GEOSTAT Summer school, 2014 <https://www.uni-muenster.de/Geoinformatics/en/> (travelling grant)
- Remote Sensing journal travel grant, 2021 <https://www.mdpi.com/journal/remotesensing/awards>

RECENT RESEARCH PROJECTS

- "Global Geo Health Data Centre" (Utrecht University, 2017-2021): My major contributions are in spatiotemporal air pollution prediction and exposure assessment, as well as the understanding of the health effects of air pollution exposure. I also contributed to thermal image downscaling, foliage N prediction, malaria mapping, and food environment mapping.
- "Mobi-Air" (Health Effects Institute, from 2020): I am responsible for the development of agent-based models for air pollution exposure assessment and support the subsequent health studies in Switzerland and the Netherlands.
- "Meten en Detecteren" (Dutch Science Foundation, 2019-2021): the project aims to develop and apply novel sensors. I designed a study that applies novel mobile sensor techniques to critically study the application of machine learning techniques in air pollution mapping.
- "Beyond Maps" (Utrecht University, 2020-2021): Course design for the Applied Data Science M.Sc. program.

JOURNAL REVIEWS (SELECTED)

- IEEE Transactions on Cybernetics

- IEEE transactions on Geoscience and Remote Sensing
- ISPRS Journal of Photogrammetry and Remote Sensing
- IEEE Geoscience and remote sensing letters
- Remote Sensing
- Remote Sensing Letters
- Computer & Geosciences
- ISPRS International Journal of Geo-information
- International Journal of Environmental Research and Public Health
- Environmental Modeling & Assessment

LANGUAGES

MANDARIN: Native
ENGLISH: Proficient
GERMAN: Intermediate (B2)
DUTCH: Advanced beginner (A2-B1)

APPENDIX 1

Jounal manuscript to be submitted

- **Meng Lu** and Chris Renschler, Rainfall and Rainfall Erosivity Time Series Analysis of a Small Semi-arid Watershed of the American Southwest. EarthArXiv. Retrieved from eartharxiv.org/nk75z.
- **Meng Lu**, José L. Aznarte, Spatio-temporal prediction of Nitrogen dioxide with MACC model output using geostatistical and statistical learning methods. (to be submitted to atmospheric environment)

APPENDIX 2: INTERNSHIPS

Nov. 2012 – Dec. 2012 Buffalo, NY, USA	LESAM lab, Department of Geography University at Buffalo Project: Hurricane Sandy Hazard Assessment Supervisor: Chris Renschler Accomplishment: Map of the Hurricane Sandy hazard Funding: FEMA (Federal Emergency Management Agency)
JUNE 2012 – Nov. 2012 Front Royal, VA, USA	Smithsonian Conservation Biology Institute Project: Spatial Patterns in Relative Primary Productivity and Gazelle (<i>Procapra Gutturosa</i>) Migration in the Eastern Steppes of Mongolia Supervisor: Dr. Justin Calabrese Accomplishment: climatological data collection and processing.
DEC. 2011 – Jan. 2012 Front Royal, VA, USA	Smithsonian Conservation Biology Institute Project: PnET-II (Physical Ecological Model) Model Conversion Supervisor: Dr. Jonathan R Thompson Accomplishment: Converted the PnET-II (in Matlab) to R.
JUNE 2010 – Dec. 2010 Wuhan, Hubei, China	Wuhan University, GIS/ RS Lab Project: Development of Image Processing Software Supervisor: Prof. Shunping Ji Project: Imagery processing software development. Main Contribution: Design of Satellite image processing algorithm.

APPENDIX 3: OUTSIDE ACADEMIA

I am a strong amateur Go (the board game which the AI "AlphaGo" plays) player (5 Dan). I enjoyed playing casually, teaching, and participating in national and international tournaments. The highlight might be that I won respectively the 5th and 6th female prize at the Ing international university Go tournament in 2008 and 2009.