Manzhu Yu

Assistant Professor
Department of Geography, College of Earth and Mineral Sciences   204 Walker Building
Director of Geoinformatics and Earth Observation Laboratory   (814) 867-5881
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The Pennsylvania State University, State College, PA 16801

EDUCATION

Aug 2012 – Dec 2017   Ph.D. in Earth Systems and Geoinformation Science, George Mason University
Aug 2008 – Jun 2012   B.S. in Remote Sensing Science and Technology, Wuhan University

PROFESSIONAL APPOINTMENTS

July 2019 – Present   Assistant Professor, Department of Geography, College of Earth and Mineral Sciences, Pennsylvania State University
Feb 2018 – Jun 2019   Postdoc Research Associate, NSF Spatiotemporal Innovation Center, George Mason University

RESEARCH INTERESTS

Geographic information science, spatiotemporal analysis, natural hazards/extreme weather events, spatial data science and deep learning

GRANTS

2022-2027   E. Willard and Ruby S. Miller Faculty Fellow. Penn State College of Earth and Mineral Sciences. $50,000.
2022-2023   Facilitating environmental investigations employing a single column model. Penn State, Institutes of Energy and the Environment, Co-PI, $30,000.
2022-2023   Integrating low-cost sensors and human mobility into air pollution exposure modeling. IEE-ICDS. 300 hours of RISE development team effort.
2020-2022   The Arctic in Hot Water: Quantifying Maritime Transport under Declining Sea Ice and Increasing Geopolitical Tension. Penn State Center for Security Research and Education (CSRE), Co-PI, $20,000 + one year graduate assistantship
2020-2022   Integrating Internet of Things (IoT) and satellite observation into localized weather forecast for urban heat island and heatwave. Penn State Institutes of Energy and the Environment (IEE), **PI**, $15,000
2020-2021   Utilizing geometric deep learning to predict the rapid intensification of tropical cyclones. Penn State Institute for Computational and Data Sciences (ICDS), **PI**, $10,000
2019-2024   NSF I/UCRC Spatiotemporal Innovation Center, Co-PI, NSF, Funding: 750k 2018-2019. Rapid Tropical Cyclone Feature Detection from High-Resolution Climate Simulation, NASA NCCS, **PI**, Funding: 50k
2017-2018   Big Data Deep Learning Platform for New Information, NASA/NRO, (Co-I), PI: Chaowei Yang, Funding: Phase I $100k, targeting Phase II 450k
2015-2017   Developing an Architecture for Mitigating Near Earth Object's Impact to the Earth Planet, NASA, (Student Co-I), PI: Chaowei Yang, Funding: $200k
2014-2016   DAsHER CD: Developing a Data-Oriented Human-Centric Conceptual Architecture for EarthCube, NSF, (Student Co-I), PI: Chaowei Yang, Funding: $280k

PUBLICATIONS

Peer-reviewed Journal Articles: (student advisee)*

Yu, M., Masrur, A., & Blaszczak-Boxe, C. (2023). Predicting hourly PM2. 5 concentrations in wildfire-prone areas using a SpatioTemporal Transformer model. *Science of The Total Environment*, *860*, 160446.

Lu, M., Wang, M., Zhang, Q., **Yu, M.**, He, C., Zhang, Y., & Li, Y. (2022). A vision transformer for lightning intensity estimation using 3D weather radar. *Science of the total environment*, 158496.

Luo, W., Liu, Z., Zhou, Y., Zhao, Y., Li, Y. E., Masrur, A., & **Yu, M.** (2022). Investigating Linkages Between Spatiotemporal Patterns of the COVID-19 Delta Variant and Public Health Interventions in Southeast Asia: Prospective Space-Time Scan Statistical Analysis Method. *JMIR Public Health and Surveillance*, *8*(8), e35840.

Lu, M., Zhang, Y., Chen, M., **Yu, M.**, & Wang, M. (2022). Monitoring Lightning Location Based on Deep Learning Combined with Multisource Spatial Data. *Remote Sensing*, *14*(9), 2200.

Masrur, A.*, **Yu, M.**, Mitra, P., Peuquet, D., & Taylor, A. (2021). Interpretable machine learning for analysing heterogeneous drivers of geographic events in space-time. *International Journal of Geographical Information Science*, 1-28.

Yang, J., **Yu, M.**, Liu, Q., Li, Y., Duffy, D. Q., & Yang, C. (2022). A high spatiotemporal resolution framework for urban temperature prediction using IoT data. *Computers & Geosciences*, *159*, 104991.

Di, Y., Lu, M., Chen, M., Chen, Z., Ma, Z., & **Yu, M.** (2022). A quantitative method for the similarity assessment of typhoon tracks. *Natural Hazards*, 1-16.

Lu, M., Lao, T., **Yu, M.**, Zhang, Y., Zheng, J., & Li, Y. (2021). PM2. 5 Concentration Forecasting over the Central Area of the Yangtze River Delta Based on Deep Learning Considering the Spatial Diffusion Process. *Remote Sensing*, *13*(23), 4834.

Scheele, C., **Yu, M.** (corresponding author), & Huang Q. (2021). Geographic context-aware text mining: enhance social media message classification for situational awareness by integrating spatial and temporal features, *International Journal of Digital Earth*, DOI: 10.1080/17538947.2021.1968048.

Yu, M., Xu, F., Hu, W., Sun, J. and Cervone, G., 2021. Using Long Short-Term Memory (LSTM) and Internet of Things (IoT) for localized surface temperature forecasting in an urban environment. *IEEE Access*, 9, pp.137406-137418.

Zhan, Z., Zheng, L., Wei, M., **Yu, M.**, & W. Jian. (2021). Aerial Image Color Balancing Based on Rank-Deficient Free Network. *IEEE Access*, doi: 10.1109/ACCESS.2021.3107174.

Lu, M., Zhang, Y., Chen, M., **Yu, M.,** Ma, Z., Zheng, J., & Wang, M. (2021). Lightning Strike Location Identification Based on 3D Weather Radar Data. *Frontiers in Environmental Science*, 329.

Yu, M. & Liu, Q. (2021). Deep learning-based downscaling of tropospheric nitrogen dioxide using ground-level and satellite observations, *Science of the Total Environment*, https://doi.org/10.1016/j.scitotenv.2021.145145

Yu, M., Bambacus, M., Cervone, G., Clarke, K., Duffy, D., Huang, Q., Li, J., Li, W., Li, Z., Liu, Q., & others. (2020). Spatiotemporal event detection: A review. *International Journal of Digital Earth*, 1–27.

Liu, Q., Harris, J. T., Chiu, L. S., Sun, D., Houser, P. R., **Yu, M.**, Duffy, D. Q., Little, M. M., & Yang, C. (2020). Spatiotemporal impacts of COVID-19 on air pollution in California, USA. *Science of The Total Environment*, *750*, 141592.

Yang, C., Sha, D., Liu, Q., Li, Y., Lan, H., … **Yu, M.**, … & others. (2020). Taking the pulse of COVID-19: A spatiotemporal perspective. *International Journal of Digital Earth*, 1–26.

Li, Y., Jiang, Y., Yang, C., **Yu, M.**, Kamal, L., Armstrong, E. M., Huang, T., Moroni, D., & McGibbney, L. J. (2020). Improving search ranking of geospatial data based on deep learning using user behavior data. *Computers & Geosciences*, 104520.

Yu, M. (2020). A Graph-Based Spatiotemporal Data Framework for 4D Natural Phenomena Representation and Quantification–An Example of Dust Events. ISPRS International Journal of Geo-Information, 9(2), 127.

Masrur, A.*, **Yu, M.**, Luo, W., & Dewan, A. (2020). Space-time patterns, change, and propagation of COVID-19 risk relative to the intervention scenarios in Bangladesh. *International Journal of Environmental Research and Public Health*, *17*(16), 5911.

Xu, M., Liu, Q., Sha, D., **Yu, M.**, Duffy, D. Q., Putman, W. M., Carroll, M., Lee, T., & Yang, C. (2020). PreciPatch: A Dictionary-based Precipitation Downscaling Method. *Remote Sensing*, *12*(6), 1030.

Liu, Q., Li, Y., **Yu, M.**, Chiu, L. S., Hao, X., Duffy, D. Q., & Yang, C. (2019). Daytime rainy cloud detection and convective precipitation delineation based on a deep neural Network method using GOES-16 ABI images. *Remote Sensing*, *11*(21), 2555.

Yang, C., **Yu, M.**, Li, Y., Hu, F., Jiang, Y., Liu, Q., Sha, D., Xu, M., & Gu, J. (2019). Big Earth data analytics: a survey. *Big Earth Data*. DOI: 10.1080/20964471.2019.1611175.

Ji, Z., Liao, Y., Zheng, L., Wu, L., **Yu, M.** & Feng, Y. (2019). An Assembled Detector Based on Geometrical Constraint for Power Component Recognition. *Sensors*, *19*(16), p.3517.

Shams, I., Li, Y., Yang, J., **Yu, M.**, Yang, C., Bambacus, M., Lewis, R., Nuth, J.A., Oman, L., Leung, R. & Seery, B.D. (2019). Planetary Defense Mitigation Gateway: A One-Stop Gateway for Pertinent PD-Related Contents. *Data*, *4*(2), p.47.

Yang, J., **Yu, M.**, Qin, H., Lu, M., & Yang, C. (2019). A Twitter Data Credibility Framework— Hurricane Harvey as a Use Case. *ISPRS International Journal of Geo-Information*, *8*(3), 111.

Yu, M., Huang, Q., Qin, H., Scheele, C., & Yang, C. (2019). Deep learning for real-time social media text classification for situation awareness–using Hurricanes Sandy, Harvey, and Irma as case studies. *International Journal of Digital Earth*, 1-18.

Zheng, L., Li, Y., Sun, M., Ji, Z., **Yu, M.** & Shu, Q. (2019). Non-Rigid Vehicle-Borne LiDAR- Assisted Aerotriangulation. *Remote Sensing*, *11*(10), p.1188.

Li, Y., Jiang, Y., Gu, J., Lu, M., **Yu, M.**, Armstrong, E. M., ... & Yang, C. (2019). A Cloud- Based Framework for Large-Scale Log Mining through Apache Spark and Elasticsearch. *Applied Sciences*, *9*(6), 1114.

Lu, M., Chen, M., Wang, X., **Yu, M.**, Jiang, Y., & Yang, C. (2018). 3D modelling strategy for weather radar data analysis. *Environmental Earth Sciences*, *77*(24), 804.

Yu, M., Yang, C. and Jin, B., 2018. A framework for natural phenomena movement tracking– Using 4D dust simulation as an example. *Computers & Geosciences*, *121*, pp.53-66.

Zheng, L., Sun, M., Luo, Y., Song, X., Yang, C., Hu, F., & **Yu, M.** (2018). Utilizing MapReduce to Improve Probe-Car Track Data Mining. *ISPRS International Journal of Geo- Information*, *7*(7), 287.

Yu, M., Yang, C., & Li, Y. (2018). Big data in natural disaster management: a review. *Geosciences*, *8*(5), 165.

Yu, M., & Yang, C. (2017). A 3D Multi-Threshold, Region-Growing Algorithm for Identifying Dust Storm Features from Model Simulations. *International Journal of Geographical Information Science*, *31*(5), 939-961.

Li, Y., Yang, R., Yang, C., **Yu, M.**, Hu, F., & Jiang, Y. (2017). Leveraging LSTM for Rapid Intensifications Prediction of Tropical Cyclones. *ISPRS Annals of Photogrammetry, Remote Sensing & Spatial Information Sciences*, 4.

Li, J., Zhang, T., Liu, Q., & **Yu, M.** (2017). Predicting The Visualization Intensity for Interactive Spatio-Temporal Visual Analytics: A Data-Driven View-Dependent Approach. *International Journal of Geographical Information Science*, *31*(1), 168-189.

Yang, C., **Yu, M.**, Hu, F., Jiang, Y., & Li, Y. (2017). Utilizing cloud computing to address big geospatial data challenges. *Computers, Environment and Urban Systems*, *61*, 120-128.

Yu, M., & Yang, C. (2016). Improving the Non-Hydrostatic Numerical Dust Model by Integrating Soil Moisture and Greenness Vegetation Fraction Data with Different Spatiotemporal Resolutions. *PloS one*, *11*(12), e0165616.

Gui, Z., **Yu, M.**, Yang, C., Jiang, Y., Chen, S., Xia, J., ... & Jin, B. (2016). Developing Subdomain Allocation Algorithms Based on Spatial and Communicational Constraints to Accelerate Dust Storm Simulation. *PloS one*, *11*(4), e0152250.

Zheng, L., **Yu, M.**, Song, M., Stefanidis, A., Ji, Z., & Yang, C. (2016). Registration of Long- Strip Terrestrial Laser Scanning Point Clouds Using RANSAC and Closed Constraint Adjustment. *Remote Sensing*, *8*(4), 278.

Luo, Y., Song, X., Zheng, L., Yang, C., **Yu, M.**, & Sun, M. (2015) Probe Vehicle Track- Matching Algorithm Based on Spatial Semantic Features. *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences*. DOI: 10.5194/isprsannals-II-4-W2-19-2015.

Li, Z., Yang, C., Jin, B., **Yu, M.**, Liu, K., Sun, M., & Zhan, M. (2015). Enabling Big Geoscience Data Analytics with a Cloud-Based, MapReduce-Enabled and Service-Oriented Workflow Framework. *PLoS ONE, 10*(3), e0116781.

Xia, J., Yang, C., Liu, K., Li, Z., Sun, M., & **Yu, M.** (2015). Forming a Global Monitoring Mechanism and a

Spatiotemporal Performance Model for Geospatial Services. *International Journal of Geographical Information Science*, *29*(3), pp.375-396.

Xu, C., Qin, H., & **Yu, M.** (2015). Visualizing Spatiotemporal Trajectories of Mobile Social Media Users using Space–Time Cube. *Cartography and Geographic Information Science*, *42*(sup1), 75-83.

Gui, Z., Yang, C., Xia, J., Huang, Q., Liu, K., Li, Z., **Yu, M.**, Sun, M., Zhou, N., & Jin, B. (2014). A Service Brokering and Recommendation Mechanism for Better Selecting Cloud Services. *PLoS ONE, 9*(8), e105297.

Textbook:

Yang, C., **Yu, M.**, Sun, M., Huang, Q., Liu, K.,… & Hu, F. (2017) Introduction to GIS Programming Fundamentals using Python and ArcGIS. CRC Press.

Peer-reviewed Book Chapters:

Yu, M., Shen, T., & Cervone, G. (2022). A comparative study of deep learning-based time-series forecasting techniques for fine-scale urban extreme heat prediction using Internet of Things observations. In *Nanotechnology-Based Smart Remote Sensing Networks for Disaster Prevention* (pp. 253-271). Elsevier.

Liu, Q., Gu, J., Yang, J., Li, Y., Sha, D., Xu, M., Shams, I., **Yu, M.**, & Yang, C. (2021) Cloud, Edge, and Mobile Computing for Smart Cities. In: Shi W., Goodchild M.F., Batty M., Kwan MP., Zhang A. (eds) Urban Informatics. The Urban Book Series. Springer, Singapore. https://doi.org/10.1007/978-981-15-8983-6_41

Li, Y., **Yu, M.**, Xu, M., Yang, J., Sha, D., Liu, Q., & Yang, C. (2020). Big Data and Cloud Computing. *Manual of Digital Earth*, 325.

Yu, M., & Sun, M. (2017). Geospatial Data Discovery, Management, and Analysis at National Aeronautics and Space Administration (NASA). *Federal Data Science: Transforming Government and Agricultural Policy Using Artificial Intelligence*, 177.

Yang, C., Sun, M., Liu, K., Huang, Q., Li, Z., Gui, Z., **Yu M.**,... & Lostritto, P. (2015). Contemporary computing technologies for processing big spatiotemporal data. In *Space- Time Integration in Geography and GIScience* (pp. 327-351). Springer Netherlands.

Huang, Q., Li, Z., Xia, J., Jiang, Y., Xu, C., Liu, K., **Yu M.**,... & Yang, C. (2013). Accelerating Geocomputation with Cloud Computing. In *Modern Accelerator Technologies for Geographic Information Science* (pp. 41-51). Springer US.

Huang, Q., Xia J., **Yu M.**, Benedict K., & Bambacus M. (2013). Cloud-Enabling Dust Storm Forecasting. In *Spatial Cloud Computing: A Practical Approach*, edited by Chaowei Yang, Qunying Huang, Zhenlong Li, Chen Xu, Kai Liu (pp.163-178). CRC Press.

Yu, M., Fu P., Zhou N., & Xia J. (2013). ArcGIS in the cloud. In *Spatial Cloud Computing: A Practical Approach*, edited by Chaowei Yang, Qunying Huang, Zhenlong Li, Chen Xu, Kai Liu. (pp.109-122). CRC Press.

Peer-reviewed Conference Articles:

Yu, M., Bessac, J., Xu, L., Gangopadhyay, A., Shi, Y., & Wang, J. (2020, December). Image Segmentation for Dust Detection Using Semi-supervised Machine Learning. In 2020 IEEE International Conference on Big Data (Big Data) (pp. 1745-1754). IEEE.

Heuwinkel, J.R., Rice, M.T., **Yu, M.**, Curtin, K.M. & Jacobson, R.D. (2019, July). Mobility routing optimization for physical accessibility and thermoregulation. In *Proceedings of the ICA* (Vol. 2).

Bambacus, M., Yang, C. P., Leung, R. Y., Barbee, B., Nuth, J. A., Seery, B., ... & Xu, M. (2017). A Planetary Defense Gateway for Smart Discovery of relevant Information for Decision Support.

Yang, C. P., **Yu, M.**, Xu, M., Jiang, Y., Qin, H., Li, Y., ... & Seery, B. (2017, March). An architecture for mitigating near earth object's impact to the earth. In *Aerospace Conference, 2017 IEEE* (pp. 1-13). IEEE.

Seery, B., Bambacus, M., Yang, C., Bertini, N., **Yu, M.**, Piccione, M., … & Li, Y. (2016). An Architecture for Mitigating Near Earth Object's Impact to the Earth Planet. In *2017 IEEE Aerospace Conference*,

Mar 4 - 11, 2017, Montana, USA.

Yu, M., Yang, C., Li, Z., Liu, K., & Chen, S. (2015). Enabling the Acceleration of Dust Simulation using Job Scheduling Methods in a Cloud Environment. In *GeoComputation 2015*, May 20 – 23, 2015, Texas, USA.

Yu, M., Yang, C., Huang, Q., Gui, Z., & Xia, J. (2013). Utilizing high spatiotemporal resolution soil moisture for dust storm modeling. In *Agro-Geoinformatics 2013 Second International Conference*. pp. 176-181. IEEE, 2013.

Invited Talks:

Spatiotemporal Methodologies, Computing and Applications in the Big Data and Deep Learning Era. Harvard University, Cambridge, MA. Apr 20, 2018.

Spatiotemporal Methodologies and Analytics in 4D Extreme Weather Detection – using Dust Storm Events as an Example. University of Maryland - Baltimore County, Baltimore, MA. May 21, 2018.

TEACHING EXPERIENCE

Department of Geography, Pennsylvania State University

GEOG260: Introduction to Geographic Information Systems (Fall 2021)
GEOG463: Geospatial Information Management (Fall 2021, Spring 2021, Fall 2019)
GEOG363: Geographic Information Systems (Spring 2022, Spring 2021, Spring 2020)
GEOG485: GIS Programming and Software Development (Spring 2022)
GEOG560: GIScience Seminar: Spatiotemporal Studies in GIScience (Fall 2020)

Department of Geography and Geoinformation Science, George Mason University

Introduction to GIS Programming and Algorithms (Fall 2018, Fall 2017, Fall 2016, Fall 2015)
Spatial Data Structure (Spring 2018, Spring 2017)
Introduction to GIS (Fall 2015)

PROFESSIONAL SERVICES

Present — Review Editor for Nature Scientific Reports, International Journal of Digital Earth, Frontiers in Big Data, Atmosphere
Penn State Representative, University Consortium for Geographic Information Science (UCGIS)
2020-2022 — Program Committee, DeepSpatial2020 (1st ACM SIGKDD Workshop on Deep Learning for Spatiotemporal Data, Applications, and Systems)
2016-2019 — Member, Organizing committee, AAG Spatiotemporal Symposium
2016-2017 — Student member, BOD, AAG Cyberinfrastructure Specialty Group
2015-2016 — Organizing committee, International Workshop of Cloud Computing and Big Data
2013-2015 — Vice President, George Mason University Charter, International Society for Photogrammetry and Remote Sensing