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Guofeng Cao

Curriculum Vitae

Last update: September 2019

Education

- **Ph.D.: Department of Geography** 2011
  University of California, Santa Barbara *Santa Barbara, CA*
  - Specialization: GIScience and Environmental Statistics
  - Dissertation Co-Advisors: Phaedon Kyriakidis and Michael Goodchild
- **M.A.: Department of Statistics and Applied Probability** 2009
  University of California, Santa Barbara *Santa Barbara, CA*
  - Specialization: Applied Statistics
- **M.Sc.: Institute of Geographic Sciences and Natural Resources Research** 2004
  Chinese Academy of Sciences *Beijing, China*
  - Specialization: Cartography and GIS
- **B.Sc.: Department of Earth Sciences** 2001
  Zhejiang University *Hangzhou, China*
- **B.Sc.(Minor): Department of Computer Science** 2001
  Zhejiang University *Hangzhou, China*

Academic Experiences

- **Associate Professor** September 2019-
  Texas Tech University *Lubbock, TX*
  - Department of Geosciences
- **Director** October 2015-
  Texas Tech University *Lubbock, TX*
  - Center for Geospatial Technology
- **Faculty Affiliate** August 2013-
  Texas Tech University *Lubbock, TX*
  - National Wind Institute
- **Assistant Professor** August 2013- August 2019
  Texas Tech University *Lubbock, TX*

- Department of Geosciences

- **Postdoctoral Research Associate** August 2011- August 2013
  University of Illinois *Urbana, IL*
  - CyberInfrastructure and Geospatial Information Laboratory

- **Graduate Research Assistant** 2007 - 2010
  University of California,Santa Barbara *Santa Barbara, CA*
  - Department of Geography and Center for Spatial Studies

- **Graduate Research Assistant** Jun.2008 - Sept.2008
  Los Alamos National Laboratory *Los Alamos, NM*
  - High Energy Physics (T-8) Group

- **Teaching Assistant** 2006 - 2007
  University of California,Santa Barbara *Santa Barbara, CA*
  - Department of Geography

- **Research Scientist** July. 2004 - Sept. 2006
  Institute of Geographic Sciences and Natural Resources Research *Beijing, China*
  - GIS Industrial Development Center of China, Chinese Academy of Sciences

Industrial Experiences

- **Graduate Research Assistant** Jun.2010 - Sept.2010
  TeleNav Inc. *Sunnyvale, CA*
  - Map matching/conflation methods
  - Crowd-source traffic data mining for map updating and traffic modeling

- **Graduate Research Assistant** Jun.2007 - Aug.2007
  ESRI Inc. *Redlands, CA*
  - Geostatistics Group of ESRI

- **Team Leader** Jul. 2001 - Sept. 2006
  SuperMap Software Co., Ltd *Beijing, China*
  - As one of the founding contributors to SuperMap software (the leading GIS platform in China), I led the research and development of a national award winning (of China) 3D GIS and spatial analysis software
  - Main research efforts include high performance spatial analysis, efficient 3D reconstruction and geovisualization, large scale spatial database and spatial statistics

Honors & Awards

- **National Scientific Technology Progress Award of China (second-class)** 2005
  as a member of *SuperMap* *China*

- **Scholarship for Excellent Students** 1998, 1999, 2000
  Zhejiang University *Hangzhou, China*

Grants & Contracts

(∗ indicates the leading principle investigator of the proposal, % indicates the percentage effort in ORS report)

External Applications Funded:

8. DOC NIST: Innovative Measurement and Modeling of Dynamical Social and Health Effects of Windstorms. Amount: **$667,024**. Role: **co-PI: 50%** (with D. Liang*).

7. USGS: Toward Near Real-time Monitoring and Characterization of Land Surface Change for the Conterminous US (2017-2022). Amount: **$1,062,069**. Role: **co-I: 50%** (with Z. Zhu*, Z. Yang from Oregon State).

6. CH Foundation: Mapping Local Community Preparedness to Tornado Hazards in Lubbock, Texas (2018-2019). Amount: **$29,500**. Role: **PI: 80%** (with D. Liang).

5. CH Foundation: Immersive VR Experience for Teaching, Learning, and Researching (2018-2019). Amount: **$17,989**. Role: **co-PI: 30%** (with Litsey R.* and P. Solis).

4. USAID: Mappers Without Borders (2015-2019). Amount: **$999,000**. Role: **co-PI: 17%** (with P. Solis*, K. Mulligan and C. Portillo-Quintero).

3. USDA: Development of Current Hydrologic Data and Analysis of Water Availability in the Ogallala Aquifer over the Next 50 Years (2014-2016). Amount: **$119,895**. Role: **co-PI: 25%** (with K. Mulligan* and L. Barbato).

2. USDA: Development of a GIS Model to Project and Map Future Water Availability (2015-2016). Amount: **$40,679**. Role: **co-PI: 25%** (with K. Mulligan* and L. Barbato).

1. National Institute on Minority Health and Health Disparities Pilot Research Core: Center of Excellence at Meharry (HDRCOE): The role of climate and air pollution for racial disparities in infant mortality (2014-2015). Amount: **$12,729**. Role: **co-PI: 10%** (with L. Gittner* and J. Vanos).

Internal Applications Funded:

3. Texas Tech: Story Maps of Humanitarian Projects around the World (2017-2018). Amount: **$90,000**. Role: **co-PI: 25%** (with P. Solis*, L. Jones, C. Portillo-Quintero, C. Griffith and L. Griffith).

2. Texas Tech National Wind Institute: Toward a Geospatial Cyberinfrastructure for Enhancement of Community Resilience to Tornado Hazards (2014-2015). Amount: **$30,500**. Role: **Sole PI: 100%**.

1. Texas Tech Transdisciplinary Research Academy: A Big Data Approach for Spatial Environmental Epidemiology (2014-2015). Amount: **$4,000**. Role: **PI: 40%** (with J. Vanos and Y. Chen).

Travel and Other Grants:

5. Texas Tech Open Access Publication Initiative: 2018 ($1,000)
4. NSF Travel Grant: Geocomputation 2015
3. NSF Travel Grant: CyberGIS 2012, 2015
2. NSF Travel Grant: ACM GIS 2011
1. Jack Dangermond Travel Grants, UCSB 2007, 2010, 2011

Publications

(∗ indicates corresponding authors, † indicates the advisee authors that I served as the principle advisor)
Citations: 980, H-index: 16 by Google Scholar as of August 30th 2019

In Peer-Reviewed Journals

37. Nguyen, L., Yang, Z., Li, J., **Cao, G.** and Jin, F.: Forecasting people's needs in hurricane events from social network. IEEE Transactions on Big Data. (accepted)
36. Guo, M., Su, J. and **Cao, G.**: Statistical regression analysis of functional and shape data. Journal of Applied Statistics. (accepted)
35. Liu, S., Su, H., **Cao, G.**, Wang, S. and Guan, Q.: An iterative spatio-temporal consistency modification method for urban land cover trajectory analysis. ISPRS Journal of Photogrammetry and Remote Sensing, 154, 202-215.
34. Han, S. Y., Tsou, M. H., Knaap, E., Rey, S., and **Cao, G.** (2019). How Do Cities Flow in an Emergency? Tracing Human Mobility Patterns during a Natural Disaster with Big Data and Geospatial Data Science. Urban Science, 3(2), 51.
33. Liu, Y.†, Zhao, N.†, J. Vanos and **Cao, G.***: Revisiting estimations of $PM_{2.5}$-attributable mortality with advancements in $PM_{2.5}$ mapping and statistical mortality rates: A case study on ischemic heart diseases. Science of the Total Environment, 66, 499-507.
32. Zhao, N.†, Zhang, W., Liu, Y.†, Samson, E., Chen, Y. and **Cao, G.***: Improving nighttime lights imagery with location-based social media data. IEEE Transactions on Geosciences and Remote Sensing.
31. Jamali, M., Nejat, A., Ghosh, S., Jin, F. and **Cao, G.** (2019): Social media data and post-disaster recovery of giant natural disasters. International Journal of Information Management, 44, 25-37.
30. Zhao, N.†, Liu, Y.†, J. Vanos, and **Cao, G.** (2018): Day-of-week and seasonal patterns of $PM_{2.5}$ concentrations over the United States: Time-series analyses using the Prophet procedure. Atmospheric Environment 192, 116-127.

29. Herdt, A., Brown, R., Scott-Fleming, S., **Cao, G.**, MacDonald, M., Henderson, D. and Vanos, J. (2018): Outdoor Thermal Comfort during Anomalous Heat at the 2015 Pan American Soccer Games in Toronto, Canada. Atmosphere, 9(8), 321.

28. Zhao, N.†, **Cao, G.**, W. Zhang and E. L. Samson (2018): Tweets or nighttime lights: comparison for preeminence in estimating socioeconomic factors. ISPRS Journal of Photogrammetry and Remote Sensing, 146, 1-10.

27. Liu, Y.†, **Cao, G.***, Zhao, N.†, Mulligan, K., Ye, X. (2018): Improve ground-level $PM_{2.5}$ concentration mapping using a random forests-based geostatistical approach. Environmental Pollution, 235, 272-282.

    Note: A $PM_{2.5}$ concentration dataset derived in this paper (1km resolution for the United States 2000-2015) is available.

26. Gao, Y., Padmanabhan, A., Wang, S., Yin, J. and **Cao, G.** (2018): Mapping spatiotemporal patterns of events using social media: A case study of influenza trends. International Journal of Geographic Information Science, 32 (3), 425-449.

25. Liu, Y.†, Zhao, N.†, Vanos, J. and **Cao, G.** (2017): Visualizing changes in nationally averaged $PM_{2.5}$ concentrations by an alluvial diagram. Environment and Planning A: Economy and Space (*Featured graphics*), 50 (2), 259-261.

24. Hardin, A., Liu, Y.†, **Cao, G.** and Vanos, J. (2017): Urban heat island intensity and spatial variability by synoptic weather type in the northeast US. Urban Climate, 24, 747-762.

23. Zhao, N.† and **Cao, G.*** (2017): Quantifying and visualizing language diversity of Hong Kong using Twitter. Environment and Planning A: Economy and Space (*Featured graphics*), 49 (12), 2698-2701.

22. Mehdipoor, H., Vanos, J., Zurita-Milla, R. and **Cao, G.** (2017): Short communication: Emerging technologies for biometeorology. International Journal of Biometeorology, 61 (1), 81-88.

21. Fisher-Phelps, M., **Cao, G.**, Wilson, R. and Kingston, T. (2017): Protecting bias: Across time and ecology, open-source bat locality data are heavily biased by distance to protected area. Ecological Informatics, 40, 22-34.

20. Zhao, N.†, Hsu, F., **Cao, G** and Samson, E. (2017): Improving accuracy of economic estimations with VIIRS DNB image products. International Journal of Remote Sensing, 38 (21), 5899-5918.

19. Zhao, N.†, Liu, Y.†, **Cao, G.**, Samson, E., Zhang, J. (2017): Forecasting China's GDP at the pixel level using nighttime light time series images. GIScience & Remote Sensing, 54(3), 407-425.

18. Zhao, N.†, **Cao, G.***, Vanos, J., Vecellio, D. (2017): Effects of synoptic weather on influenza infection incidence: A retrospective study using influenza surveillance data and spatial synoptic classification. International Journal of Biometeorology, 62 (1), 69-84.

Note: An influenza dataset for major cities of the United States derived in this paper (a combination of Google Flu Trends and CDC reports) is available.

17. Liu, Y.†, Zhao, N.†, Vanos, J., and **Cao, G** (2017): Effects of synoptic weather on ground-level PM2.5 concentrations in the United States. Atmospheric Environment (148) 297-305.

16. Liu, Y.†, Delahunty, T., Zhao, N †. and **Cao, G.** (2016): These lit areas are undeveloped: China's urban extents and urban development patterns from thresholded nighttime light imagery. International Journal of Applied Earth Observation and Geoinformation, 50(8), 39-50.

15. Luo, F.†, **Cao, G.***, Mulligan, K. and Li, X. (2016): Explore spatiotemporal and demographic characteristics of human mobility via Twitter: A case study of Chicago. *Applied Geography*, 70 (5), 11-25.

    Note: This article is the most cited article in *Applied Geography* since 2016. Accessed: 06/31/2019

14. **Cao, G.**, Wang, S., Hwang, M., Padmanabhan, A., Zhang, Z. and Soltani, K. (2015): A general framework for scalable spatio-temporal analysis of location-based social media data, *Computers, Environment and Urban System*, 51(5), 70-82.

    Note: This article is one of the top 25 most cited articles in *Computers, Environment and Urban System* since 2015. Accessed: 08/31/2018

13. Padmanabhan, A., Wang, S., **Cao, G.**, Hwang, H., Zhao, Y., Zhang Z. and Gao Y. (2014): FluMapper: an interactive CyberGIS environment for massive location-based social media data analysis, *Concurrency and Computation: Practice and Experience*, 26(13) 2253-2265.

12. **Cao, G.**, Yoo, E.H., Wang, S. (2014): A statistical framework of data fusion for spatial prediction of categorical variables. *Stochastic Environmental Research and Risk Assessment*, 28 1785-1799.

    Note: A Matlab toolbox associated with this paper is available.

11. Leetaru, K., Wang, S., **Cao, G.**, Padmananabhan, A., Shook, E. (2013): Mapping the global Twitter heartbeat: the geography of Twitter. *First Monday*.

10. Yoo, E.H., Hoagland, B.W., **Cao, G.** and Fagin, T.D. (2013): Spatial distribution of trees and landscapes of the past: a mixed spatially correlated multinomial logit model approach for the analysis of the Public Land Survey data. *Geographical Analysis*, 45(4), pp.419-440.

9. Luo, F., Zhong, E., **Cao, G.**, Tellez, R.D. and Gao, P. (2013): VGIS-AntiJitter: an effective framework of solving jitter problems in virtual geographic information systems *International Journal of Digital Earth*, 6(1), pp.28-50.

8. **Cao, G.**, Kyriakidis, P.C., and Goodchild, M.F. (2012): Response to 'Comments on 'Combining spatial transition probabilities for stochastic simulation of categorical fields'

with communications on some issues related to Markov chain geostatistics', *International Journal of Geographical Information Science*, 26(10), pp.1741-1750.

Note: A Matlab toolbox associated with this paper is available.

7. **Cao, G.**, Kyriakidis, P.C., and Goodchild, M.F. (2011): A geostatistical framework for categorical spatial data modeling, *The SIGSPATIAL Special*, 2011, 3(3), pp.4-9.

6. **Cao, G.**, Kyriakidis, P.C. and Goodchild, M.F. (2011): A multinomial logistic mixed model for prediction of categorical spatial data, *International Journal of Geographical Information Science*, 25(12), pp.2071-2086.

   Note: A Matlab toolbox associated with this paper is available.

5. **Cao, G.**, Kyriakidis, P.C. and Goodchild, M.F. (2011): Combining spatial transition probabilities for stochastic simulation of categorical fields, *International Journal of Geographical Information Science*, 25(11), pp.1773-1791.

   Note: A Matlab toolbox associated with this paper is available.

4. Li,K., Zhong, E., Zeng, Z. and **Cao, G.**(2006): An optimal path algorithm based on hierarchically structured topographical network, *Journal of Images and Graphics (In Chinese)*, 11(07): 1004-1009.

3. Zhang, X., Zhang, L., **Cao, G.** and Zhong, E.(2006): A study on expressing techniques of battlefield situation evolution and variation based on GIS and its application, *Geo-Information Science (In Chinese)*, 8(4).

2. Zhang, L., Zhu,J., Zeng,Z., and **Cao, G.**(2006): GRID services for large scale elevation derivatives Computation, *Geo-Information Science (In Chinese)*, 8(2), pp.14-29.

1. **Cao, G.**, Zhang, L. and Zhong, E. (2005): A discussion on key techniques in 3D GIS rendering engine, *Geo-Information Science (In Chinese)*, 7(1), pp.87-91.

Peer-Reviewed Book Chapters

3. Liu, Y.†, **Cao, G.*** and Zhao, N.†: Spatiotemporal mapping of ground-level $PM_{2.5}$ concentrations using a machine learning based-geostatistical approach, *Spatiotemporal Analysis of Air Pollution and Its Application in Public Health*. (invited)

2. **Cao, G.** (2016): Modeling uncertainty in categorical fields, *International Encyclopedia of Geography: People, the Earth, Environment and Technology*, 1-11.

1. Wang, S. and **Cao, G.**, Zhang, Z., Zhao, Y., Padmanabhan, A. and Wu, K. (2013): A CyberGIS environment for analysis of location-based social media data, in *Location-Based Computing and Services,2nd Edition*,(edited by A. K. Hassan and H. Amin), CRC Press.

Technical Report

1. **Cao, G.**, Kyriakidis, P.C., and Goodchild, M.F. (2013): On spatial transition probabilities as continuity measures in categorical fields. (Available at: http://arxiv.org/abs/1312.5391).

Full Papers In Peer-Reviewed Conference Proceedings

16. Du, H., Long, N., Yang, Z., Abu-Gellban, H., Zhou, X., Xing, W., **Cao, G.** and Jin, F. (2019): Twitter vs News: Concern Analysis of the 2018 California Wildfire Event. In 2019 IEEE 43rd Annual Computer Software and Applications Conference (COMPSAC), Milwaukee, WI, USA, 2019 (pp. 207-212).

15. Yang, Z., Nguyen, L. H., Stuve, J., **Cao, G.**, and Jin, F. (2017): Harvey flooding rescue in social media. In Big Data (Big Data), 2017 IEEE International Conference on (pp. 2177-2185).

14. Liu, Y.†, Luo, F.† and **Cao, G.** (2015): Track Spatiotemporal Spread of Public Concerns on Ebloa in the US via Twitter. In Proceedings of Geocomputation 2015 Conference.

13. Luo, F.†, **Cao, G.**, and Li, X. (2014): An interactive approach for deriving geometric network models in 3D indoor environments. In Proceedings of the Sixth ACM SIGSPATIAL International Workshop on Indoor Spatial Awareness (pp. 9-16). ACM.

12. Huang, Q., **Cao, G.**, and Wang, C. (2014): From Where Do Tweets Originate?-A GIS Approach for User Location Inference. In Proceedings of the Seventh ACM SIGSPATIAL International Workshop on Location-based Social Media. ACM.

11. **Cao, G.** (2014): A Geostatistical Framework for Heterogeneous Spatatial Data Fusion, in: A. Shortridge, J. Messina, S. Kravchenko and A. Finley (Eds.), *Proceedings of the 11th International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences*.

10. Hwang, M., Wang, S., **Cao, G.**, Padmanabhan, A. and Zhang, Z.(2013): Spatiotemporal Transformation of Social Media: A Case Study of Twitter for Exploration of Flu Risk Indicators. International Conference on Advances in Geographic Information Systems.

9. Padmanabhan, A., Wang, S., **Cao, G.**, Hwang, H., Zhao, Y., Zhang Z. and Gao Y. (2013): FluMapper: an interactive CyberGIS environment for massive location-based social media data analysis. Proceedings of the Conference on Extreme Science and Engineering Discovery Environment: Gateway to Discovery.

8. Shook, E. Leetaru, K, **Cao, G.**, Padmanabhan, A and Wang, S. (2012): Happy or not : Generating topic-based geospatial emotional heatmaps for Culturomics using CyberGIS. IEEE 8th International Conference on E-Science, pp. 1-6.

7. **Cao, G.**, Wang, S., and Guan, Q. (2012): A state-space model for understanding spatial dynamics represented by areal data *Proceedings of the Seventh International Conference, GIScience 2012*, Columbus, Ohio, September 2012.

6. **Cao, G.**, Kyriakidis, P.C., and Goodchild, M.F. (2011): A geostatistical framework for categorical spatial data modeling, in *Proceedings of the 19th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems*, Chicago, Illinois, November 2011.

5. Kyriakidis, P.C. and **Cao, G** (2010): Generating fine resolution area class maps subject to coarser resolution data constraints, in *Proceedings of the Sixth International Conference, GIScience 2010*, Zurich, Switzerland, Sep.14-17,2010.

4. **Cao, G.**, Kyriakidis, P.C., and Goodchild, M.F. (2009): Prediction and simulation in categorical fields: a transition probability combination approach, in *Proceedings of the 17th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems*, Seattle, Washington, November 2009, pp.496-499.

3. **Cao, G.**, and Kyriakidis, P.C. (2008): Combining transition probabilities in the prediction and simulation of categorical fields, in: J. Zhang, and M.F. Goodchild (Eds.), *Proceedings of the 8th International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences*, Shanghai, China, June 2008, pp.25-32.

2. Li, K., Zhong, E., Song, G., **Cao, G.**, Zhang, L. and Wu, Q. (2007): NDF: An effective mobile GIS physical storage model, in *Proceedings of the SPIE 6754, Geoinformatics 2007: Geospatial Information Technology and Applications 67541W (August 07, 2007)* DOI:10.1117/12.764932.

1. Zhang, X., **Cao, G.** and Zhang, L. (2006): Research and improvement on optimal path analysis algorithm based on cost-distance grid, in *Proceedings of the IEEE International Conference on Geoscience and Remote Sensing Symposium*, Denver, Colorado, Aug 2006, pp.869-871.

In Conference Proceedings (not peer-reviewed)

1. **Cao**, G., Yu, Z., Yang, Z. (2002): Spatially visualized Internet management system based on GIS technologies. *Proceedings of International Conference on Computer Graphics & Spatial Information System*, Beijing, China, August 2002.

Presentations

In Conferences and Symposia (presenter is underlined)

38. **Cao**, G. and Y. Liu: Integrated Use of Machine Learning and Geostatistics for High Resolution Mapping of Ground-Level PM2.5 Concentrations. *22nd Conference on Geo-information Science*, Limassol, Cyprus, June 2019.

37. **Cao**, G.: A Deep Learning-Based Geostatistical Framework for Geospatial Data Analysis and Modeling *Annual Meeting of American Association Geographers*, Washington DC, April 2019.

36. **Cao**, G.: A Statistical Framework of Functional Data Analysis for Modeling Positional Uncertainty of Geographic Information. *Spatial Accuracy Assessment in Natural Resources and Environmental Sciences*, Beijing, China, May 2018.

35. **Cao**, G.: High Resolution Mapping of Ground-level $PM_{2.5}$ concentrations. *Annual Meeting of American Association Geographers*, New Orleans, LA, April 2018.

34. **Cao**, G.: Uncertainty Modeling in Geospatial Data Science. *NSF SI2-S2I2 Conceptualization: Geospatial Software Institute*, Los Angeles, CA, January 2018.

33. **Cao**, G.: High Resolution Mapping of Ground-level $PM_{2.5}$ concentrations. *The Third International Conference on CyberGIS and Geospatial Data Science*, Boston, MA, April 2017.

32. **Cao**, G.: Explore Spatiotemporal and Demographic Characteristics of Human Mobility via Location-based Social Media. *NSF Workshop on Advancing Movement and Mobility Science by Bridging Research on Human Mobility and Animal Movement Ecology*, Columbus, Ohio, May 2017.

31. **Cao**, G.: Learning Deep of Remote Sensing Imagery for High-Resolution Mapping of Ground-Level $PM_{2.5}$ Concentrations. *Annual Meeting of American Association of Geographers*, Boston, MA, April 2017.

30. **Cao**, G.: Statistical Modeling of Animal Movement Trajectory: A Functional Data Analysis Approach. *NSF Workshop on Advancing Movement and Mobility Science by Bridging Research on Human Mobility and Animal Movement Ecology*, Austin, TX, November 2016.

29. **Cao**, G.: High Resolution Mapping of Ground-level $PM_{2.5}$ concentrations. *The Third International Conference on CyberGIS and Geospatial Data Science*, Urbana, IL, July 2016.

28. **Cao**, G.: Exploring Biases in Location-Based Social Media. *International Workshop of Cloud Computing and Big Data*, Fairfax, VA, July 2016.

27. **Cao**, G.: Integrating CyberGIS for Spatiotemporal Uncertainty Modeling. *CyberGIS All Hands Meeting*, Reston, VA, September 2015.

26. **Cao**, G.: A Scalable Framework for Scalable Spatiotemporal Analysis of Location-based Social Media Data *Texas Tech University 2015 Symposium on Big Data*, Lubbock, Texas, April 2015.

25. **Cao**, G.: Representing spatiotemporal uncertainty in function spaces. *110th Annual Meeting of the Association of American Geographers*, Chicago, IL, April 2015.

24. Ying Liu and **Cao**, G.: Geostatistical Downscaling of Gridded PM2.5 Concentration Datasets Using Nighttime Light Imagery. *110th Annual Meeting of the Association of American Geographers*, Chicago, IL, April 2015.

23. Liu, Y., Luo, F. and **Cao**, G.: Track Spatiotemporal Spread of Public Concerns on Ebloa in the US via Twitter. *The 13th International Conference of Geocomputation*, Dallas, TX, May 2015.

22. Luo, F., **Cao**, G., and Li, X.: An interactive approach for deriving geometric network models in 3D indoor environments. *ACM GIS 2014*, Dallas, Texas, November 2014.

21. Huang, Q., **Cao,**, G., and Wang, C.: From Where Do Tweets Originate?-A GIS Approach for User Location Inference. *ACM GIS 2014*, Dallas, Texas, November 2014.

20. **Cao**, G., Wang, S.: A Scalable Framework for Scalable Spatiotemporal Analysis of Location-based Social Media Data *109th Annual Meeting of the Association of American Geographers*, Tampa, FL, April 2014.

19. **Cao**, G.: A Geostatistical Framework for Heterogeneous Spatatial Data Fusion, *11th International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences*, Lansing, Michigan, July 2014.

18. Hwang, M., Wang, S., **Cao**, G., Padmanabhan, A. and Zhang, Z.: Spatiotemporal Transformation of Social Media: A Case Study of Twitter for Exploration of Flu Risk Indicators. *ACM GIS 2013*, Orlando, Florida, November 2013.

17. **Cao**, G.and Wang, S.: A Statistical Framework for Spatiotemporal Dynamics Modeling. *AAG 2013*, Los Angels, CA, April 2013.

16. **Cao**, G., Wang, S., and Guan, Q.: A state-space model for understanding spatial dynamics represented by areal data. *GIScience 2012*, Columbus, Ohio, September 2012.

15. **Cao**, G., Wang, S.: A CyberGIS-enabled statistical framework for spatiotemporal data fusion *The First International Conference on Space, Time and CyberGIS*, Champaign, Illinois, August 2012.

14. **Cao**, G., Goodchild, M.F., Wang, S., Kyriakidis,P.C.,: A spatial multinomial logistic mixed model for mapping thematic classification uncertainty. *107th Annual Meeting of the Association of American Geographers*, New York City, New York, February 2012.

13. **Cao**, G., Kyriakidis,P.C., Goodchild, M.F.: A geostatistical framework for categorical spatial data modeling. *The 19th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems*, Chicago, Illinois, November 2011.

12. **Cao**, G., Goodchild, M.F., Kyriakidis,P.C.: A multinomoial mixed model for prediction of categorical saptial data. *National Geospatial-Intelligence Agency Academic Research Program Symposium (NARP)*, National Academy of Sciences, Washington, D.C., September 2011.

11. **Cao**, G., Goodchild, M.F., Kyriakidis,P.C.: A computer package for modeling, prediction and simulation of categorical spatial data. *107th Annual Meeting of the Association of American Geographers*, Seattle, WA, April 2011.

10. Marston, J. R., **Cao**, G., Brabyn, J. A. Evaluation of an online mapping program with user-defined map features for persons with low vision. *First European Congress On Visual Impairment*, Valladolid, Spain, October 2010.

9. **Cao**, G., Goodchild, M.F., Kyriakidis,P.C.: A geostatistical framework for geospatial data analysis and modeling across multiple spatial and temporal scales. *National Geospatial-Intelligence Agency Academic Research Program Symposium (NARP)*, National Academy of Sciences, Washington, D.C., September 2010.

8. Kyriakidis, P.C. and **Cao**, G: Generating fine resolution area class maps subject to coarser resolution data constraints, in *Proceedings of the Sixth International Conference, GIScience 2010*, Zurich, Switzerland, Sep.14-17,2010

7. **Cao**, G., Kyriakidis,P.C., Goodchild, M.F..: Transition probability-based geostatistical methods for modeling categorical spatial data. *106th Annual Meeting of the Association of American Geographers*, Washinton, D.C., March 2010.

6. Marston, J.R. and **Cao**, G.: Making geographical information accessible for people with low vision. *106th Annual Meeting of the Association of American Geographers*, Washinton, D.C., March 2010.

5. **Cao**, G., Kyriakidis,P.C., Goodchild, M.F.: Prediction and simulation in categorical fields: A transition probability combination approach. *The 17th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems*, Seattle, Washington, November 2009.

4. **Cao**, G., Kyriakidis,P.C., Goodchild, M.F.: Prediction and simulation in categorical fields: A transition probability combination approach. *2009 Annual Conference of the International Association for Mathematical Geosciences*, Stanford, CA, August 2009.

3. **Cao**, G., and Kyriakidis, P.C.: Combining transition probabilities in the prediction and simulation of categorical fields. *105th Annual Meeting of the Association of American Geographers*, Las Vegas, NV, March 2009.

2. **Cao**, G., and Kyriakidis, P.C.: Combining transition probabilities in the prediction and simulation of categorical fields, *The 8th International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences*, Shanghai, China, June 2008.

1. **Cao**, G.: Distributed GIS based on Google's MapReduce. *104th Annual Meeting of the Association of American Geographers*, Boston, MA, April 2008.

In Colloquia

6. **Cao**, G.: Spatiotemporal Analysis of Location-Based Social Media Data *Zhejiang University*, Hangzhou, Zhejiang, China, June 2018.

5. **Cao**, G.: A Scalable Framework for Scalable Spatiotemporal Analysis of Location-based Social Media Data. *Chinese University of Geosciences*, Wuhan, Hubei, China, June 2014.

4. **Cao**, G.: A Scalable Framework for Scalable Spatiotemporal Analysis of Location-based Social Media Data. *Institute of Geographic Research and Natural Resource Research, Chinese Academy of Sciences*, Beijing, China, June 2014.

3. **Cao**, G.: A geostatistical framework for categorical spatial data modeling. Department of Geography, University of Illinois at Urbana-Champaign, October 2011.

2. **Cao**, G.: Markov chain-based geostatistical methods for modeling categorical spatial data. Geography Department Colloquium, UCSB, October 2007.

1. Marston, J. R., **Cao**, G., Brabyn, J. A. (2010) Accessible maps customized for the visually impaired person. Atlanta Vision Seminar, Atlanta, GA

Teaching

Texas Tech University

3. GEOG 5330: Applied Spatial and Spatiotemporal Analysis (**newly developed**)
    - Fall 2016, Fall 2017, Fall 2018
2. GEOG 3340: Introduction to Human Geography Research
    - Fall 2015
1. GIST 4302/5302: Spatial Analysis and Modeling:
    - Fall 2013, Spring 2014, Fall 2014, Spring 2015, Fall 2015, Spring 2016, Fall 2017, Spring 2018, Fall 2018

University of Illinois at Urbana-Champaign

2. Geog 480: Principles of GIS
    - Spring 2013
1. Course Development of Geog 379: Introduction to GIS (**online course**)
    - Summer 2012

University of California at Santa Barbara

2. TA of Geog 183 (for Prof. Martin Raubal): Cartographic Design and Geovisualization
    - Spring 2008
1. TA of Geog 172 (for Prof. Phaedon Kyriakidis): Intermediate Geographical Data Analysis
    - Winter 2007

Advising and Mentoring

(∗∗ indicates serving the Chair of the Committee, and ∗ the co-Chair of the Committee)

Postdoctoral Scholar

1. Dr. Naizhuo Zhao**: Center for Geospatial Technology and Department of Geosciences, Texas Tech (2016-2018). Current employment: Postdoc at McGill University

Ph.D. Advisees

15. Congliang Zhou**: Geosciences, Texas Tech (In progress).
14. Jimin Chun* (co-chair with Dr. Song-lak Kang): Geosciences, Texas Tech (In progress)
13. Lucy Lim: Environmental Toxicology, Texas Tech (In progress).

12. Bogdan Duda: Soil and Plant Science, Texas Tech (In progress).
11. Chad Kronkosky: Petroleum Engineering, Texas Tech (In progress).
10. Amal Aljaddani: Geosciences, Texas Tech (In progress)
9. Mehdi Jamali: Civil and Environmental Engineering, Texas Tech (In progress).
8. Prudence Venner: Geosciences, Texas Tech (In progress).
7. Ying Liu**: Geosciences, Texas Tech (Completed in Summer 2018). Dissertation: *High-resolution Mapping of Ground-Level Fine Particulate Matter and the Associated Human Health Risks* (**Doctoral Dissertation Completion Awardee**). Current employment: Postdoc at the University of Montreal
6. Hasan Almekdash* (co-chair with Dr. Valerie Paton): Higher Education, Texas Tech (Completed in Summer 2018). Dissertation: *Visualizing, Analyzing, and Modeling Data in Quantitative Higher Educational Research Using Geospatial Technologies: A Spatial Analysis of Texas Public School District Factors and Four-Year College Degree Completion*
5. Jason Post: Geosciences, Texas Tech (Completed in Fall 2017). Dissertation: *Human Interactions with the Aquatic Ecosystems of The Los Angeles River: The Creation of the LA River as a Human Landscape and the Effect of Exotic Fish on Human Activity*
4. Thu Nguyen: Geosciences, Texas Tech (Completed in Fall 2017). Dissertation: *An Evaluation of Coastal Flooding Risk due to Storm Surge in Sea Level Rise Condition in Thua Thien Hue Province, Vietnam*
3. Fahad Abdulaziz F Almutlaq: Geosciences, Texas Tech (Completed in Fall 2017). Dissertation: *Analysis of Dune Morphology within the Rub'al Khali Using Geospatial Technology*
2. Marina Fisher-Phelps: Biological Sciences, Texas Tech (Completed in Fall 2017). Dissertation: *Historical Records in Species Distribution Models: Impacts on Spatial Bias and Uncertainty*
1. Lionel Plummer: Natural Resource Management, Texas Tech (Completed in Fall 2014). Dissertation: *An Examination of Hydrologic Restoration Efforts for Wetland Mitigation Banks*.

Ph.D. Dissertation Examiner

1. Azadeh Mousavi: Dept. of Infrastructure Engineering, University of Melbourne. Dissertation: *Decentralized Data Mining for Event Detection in Spatiotemporal Fields*. (June, 2015)

M.S./M.A. Committees

11. Chan-mi Lee: Geography, Dept. of Geosciences, Texas Tech (In progress).

10. Hannah Greenberg: Environmental Toxicology, Texas Tech (Completed in Spring 2018). Thesis:*Geospatial Assessment and Species Distribution Modelling of Aedes aegypti and Aedes albopictus, Potential Zika Virus Vectors, in the United States with an Emphasis on Current and Predicted Distribution in Texas*

9. Alexandria Herdt* (co-chair with Dr. Jennifer Vanos): Atmospheric Science, Dept. of Geosciences, Texas Tech (Completed in Summer 2017). Thesis: *A Multi-Index Investigation of the Spatiotemporal Relationships Between Heat and EMS Calls During the 2015 Pan American Games in Toronto, Canada*

8. Ashley Morris**: Geography, Dept. of Geosciences, Texas Tech (Completed in Spring 2017). Thesis: *Mapping Local Community Preparedness to Tornado Hazards in Lubbock, Texas*

7. Vaughn Smith: Natural Resource Management, Texas Tech (Completed in Fall 2017). Thesis: *Near real-time monitoring of tropical dry forests in Latin and Central America*

6. Evan Levine: Geography, Dept. of Geosciences, Texas Tech (Completed in Spring 2016). Thesis: *A Geospatial Contextualization of Archaic Greek Epigram on Thasos*

5. Feixiong Luo**: Geography, Dept. of Geosciences, Texas Tech (on leave at Alibaba).

4. Morgan Kraft**: Geography, Dept. of Geosciences, Texas Tech (Completed in Summer 2016).Thesis: *Exploring Biases in Location-Based Social Media A Case Study of Twitter in the 2012 U.S. Presidential Election*.

3. Aaron Hardin: Atmospheric sciences, Dept. of Geosciences, Texas Tech (Completed in Summer 2015). Thesis: *Assessment of Urban Heat Islands During Hot Weather in the U.S. Northeast and Linkages to Microscale Thermal and Radiational Properties*.

2. Jason Post: Geography, Dept. of Geosciences, Texas Tech (Completed in Spring 2014). Thesis: *Environmental Inequality in Lubbock Texas*.

1. Tiffany Lambert: Geography, Dept. of Geosciences, Texas Tech (Completed in Spring 2014). Thesis: *Analysis of Marine Stratus Surges in the Pacific Northwest*.

Undergraduates

1. John Wells: Geography, Dept. of Geosciences, Texas Tech (Spring 2016)

University Services

Texas Tech University

8. Textbook Committee in the Department of Geosciences

7. Search Committee of Atmospheric Science position in the Department of Geosciences, Spring 2017

6. Search Committee of Climate Science position in the Department of Geosciences, Spring 2015

5. Organizer of Geography Seminar in the Department of Geosciences
4. Dean's representative of dissertation defense: Yuepeng Cui (Civil Engineering)
3. Dean's representative of dissertation defense: Hoonill Won (Wind Science and Engineering)
2. Dean's representative of dissertation defense: Liann Gallagher (Political Science)
1. Dean's representative of dissertation defense: Ali Jamali (Petroleum Engineering)

University of California at Santa Barbara

3. Graduate representative in the search Committee of GIS position in the Department of Geography.
2. Executive Board of CSSA (Chinese Students and Scholars Association)
1. Executive President of CSSA (Chinese Students and Scholars Association)

Professional Services

Refereeing

Funding Proposals

3. NSF GSS Program
2. NSF DIBBs Program
1. Louisiana Board of Regents Support Fund

Journals and Conferences

31. Nature
30. Environmental Science & Technology
29. Atmospheric Environment
28. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing
27. IEEE Transactions on Geosciences and Remote Sensing
26. IEEE Transactions on Parallel and Distributed Systems
25. International Journal of Geographical Information Science
24. Applied Geography
23. Environmetrics

22. Cities
21. The Annals of the American Association of Geographers
20. Transactions in GIS
19. Geoinformatica
18. Journal of Medical Internet Research
17. Journal of Geographical Systems
16. Computers, Environment and Urban Systems
15. Science of Total Environment
14. ISPRS International Journal of Geo-Information
13. Mathematical Geosciences
12. Journal of Marine and Petroleum Geology
11. Arabian Journal of Geosciences
10. International Journal of Digital Earth
9. International Journal of Remote Sensing
8. Stochastic Environmental Research and Risk Assessment
7. Neural Computing and Applications
6. XHPC 2012
5. eScience 2012
4. GIScience 2012
3. The 2nd International Workshop on HPDGIS
2. The International Workshop on Location-based Social Network, 2014, 2015, 2016
1. The 1st International Workshop on Spatiotemporal Computing

Conference Program Committee and Session Organizer

Program Committee

- ACM GIS International Workshop on Location-based Social Networks 2014, 2015, 2016
- CyberGIS Symposium, AAG 2015
- The Third International Conference on CyberGIS and Geospatial Data Science, 2016

Session Organizer

- Deep Learning for Geospatial Patterns & Applications, AAG 2018, 2019
- Classification Methods and Accuracy Assessment in Land Cover Mapping, AAG 2016
- CyberGIS and Spatiotemporal Uncertainty, AAG 2015, 2016
- CyberGIS and Digital Epidemiology, AAG 2014
- Computational and Statistical Methods for Spatiotemporal Data Analytics, AAG 2012, 2013

Professional Society Memberships

- Board of Directors, Chinese Professionals in Geographic Information Systems (CPGIS) 2018 -
- Member, Association of American Geographers (AAG) 2007-
- Member, International Spatial Accuracy Research Association 2008-
- Member, American Geophysical Union, 2015-
- Member, International Society of Biometeorology, 2015-2018
- Member, ACM SIGSPATIAL, 2009-2015
- International Association for Mathematical Geosciences, 2009-2010

Technical Skills

Total Experiences: 10+ years

Programming Languages: C/C++, Java, Matlab/Octave, R, Python, MPI

Programming IDE: Vim (and Emacs), Eclipse, Visual Studio, gcc/g++

Operating Systems: Linux/Windows/MacOSX

Software Packages: ArcGIS, GDAL/OGR, OpenLayers, Geoserver, Mapnik, SuperMap

Others: Hadoop, MongoDB, Redis, Hive, MySQL, OpenGL, GSLIB, SGeMS, LaTeX

Media Mentions

- "40 more maps that explain the world" by Washington Post: the 25th map in https://www.washingtonpost.com/news/worldviews/wp/2013/08/12/40-maps-that-explain-the-world/

- http://www.poynter.org/news/mediawire/213847/study-twitter-has-a-distinct-geographic-profile-from-mainstream-media/
- http://globalnews.ca/news/613788/researchers-map-the-geography-of-twitter-with-geo-referencing/
- http://news.abs-cbn.com/lifestyle/06/17/13/manila-among-top-20-most-tweeting-cities