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Guofeng Cao

CurriculumVitae

Updated: June 2014

Education

- **Ph.D.: Department of Geography** 2011
  University of California, Santa Barbara *Santa Barbara CA, U.S.A.*
  - Specialization: GIScience and Environmental Statistics
  - Dissertation Title: **A Geostatistical Framework for Categorical Spatial Data Modeling**
  - Dissertation (co)Advisors: Phaedon C. Kyriakidis and Michael F. Goodchild
- **M.A.: Department of Statistics and Applied Probability** 2009
  University of California, Santa Barbara *Santa Barbara CA, U.S.A.*
  - Specialization: Applied Statistics
- **M.Sc.: Institute of Geographic Sciences and Natural Resources Research** 2004
  Chinese Academy of Sciences *Beijing, China*
  - Specialization: Cartography and GIS
  - Thesis Title: **Real-time Rendering of Large Scale Terrain Dataset**
- **B.Sc.: Department of Earth Sciences** 2001
  Zhejiang University *Hangzhou, China*
  - Specialization: Remote Sensing Geology
  - Thesis Title: **WebGIS Based on CORBA**
- **B.Sc.(Minor): Department of Computer Science** 2001
  Zhejiang University *Hangzhou, China*

Academic Experiences

- **Assistant Professor** August 2013-
  Texas Tech University *Lubbock TX, U.S.A.*
  - Geosciences Department at Texas Tech University
- **Postdoctoral Research Associate** August 2011- August 2013
  University of Illinois *Urbana IL, U.S.A.*
  - CyberInfrastructure and Geospatial Information Laboratory
- **Graduate Research Assistant** 2007 - 2010
  University of California,Santa Barbara *Santa Barbara CA, U.S.A.*
  - Department of Geography and Center for Spatial Studies
- **Graduate Research Assistant** Jun.2008 - Sept.2008
  Los Alamos National Laboratory *Los Alamos NM, U.S.A*
  - High Energy Physics (T-8) Group

- **Teaching Assistant** 2006 - 2007
  University of California,Santa Barbara *Santa Barbara CA, U.S.A.*
  - Department of Geography
- **Research Scientist** Jul. 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, U.S.A*
  - 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, U.S.A*
  - Geostatistics Group of ESRI
- **Team Leader** Jul. 2001 - Sept. 2006
  SuperMap Software Co., Ltd *Beijing, China*
  - As one of the founding contributors to SuperMap GIS software (the leading GIS platform in China), I led the research and development of a national award winning (of China) 3D GIS 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

- Texas Tech National Wind Institute: Toward a Geospatial Cyberinfrastructure for Enhancement of Community Resilience to Tornado Hazards. PI (2014-2015).
- Texas Tech Transdisplinary Research Academy: A Big Data Approach for Spatial Environmental Epidemiology. PI (2014-2015).
- USDA: Development of Current Hydrologic Data and Analysis of Water Availability in the Ogallala Aquifer over the Next 50 Years. co-PI (2014-2016).
- National Institute on Minority Health and Health Disparities Pilot Research Core: Center of Excellence at Meharry (HDRCOE): "Linking climate, air pollution and housing conditions to develop strategies to reduce racial disparities in infant mortality". Role: co-PI (2014-2015)
- NSF Travel Grant, CyberGIS 2012
- NSF Travel Grant, ACM GIS 2011

- Jack Dangermond Travel Grants, UCSB 2007,2010,2011

Publications

Manuscripts in Revision

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

In Peer-Reviewed Journals

- **Cao**, G., Wang, S., Hwang, M., Padmanabhan, A., Zhang, Z. and Soltani, K.: A General Framework for Scalable Spatio-temporal Analysis of Location-based Social Media Data, *Computers, Environment and Urban System* (in press).
- Padmanabhan, A., Wang, S., **Cao**, G., Hwang, H., Zhao, Y., Zhang Z. and Gao Y., FluMapper: an interactive CyberGIS environment for massive location-based social media data analysis, *Concurrency and Computation: Practice and Experience*, 26(13) 2253-2265.
- **Cao**, G., Yoo, E.H., Wang, S. (2014): A statistical framework of data fusion for spatial prediction of categorical variables. *Stochastic Enironmental Research and Risk Assessment*, 28 1785-1799.
- Leetaru, K., Wang, S., **Cao**, G., Padmananabhan, A., Shook, E. (2013): Mapping the global Twitter heartbeat: the geography of Twitter. *First Monday*.
- 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.
- 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.
- **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.
- **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.
- **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.
- **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.
- 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.
- 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).

- 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.

- **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

- **Cao**, G.: Modeling uncertainty in categorical fields, *International Encyclopedia of Geography*. (in press)

- 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.

- Leetaru, K.,Padmananabhan, A., Shook, E., **Cao**, G. and Wang, S. (2014): Towards a CyberGIS framework for spatially integrated digital humanities and social sciences, *CyberGIS: Fostering a New Wave of Geospatial Innovation and Discovery*. (accepted)

In Peer-Reviewed Conference Proceedings

- 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.

- Huang, Q., **Cao,** G., and ang, 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.

- **Cao**, G.: 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*, Lansing, Michigan, July 2014.

- 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.

- 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.

- 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.

- **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.

- **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.

- 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.
- **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.
- 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
- 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)

- **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.

Presentations

In Conferences and Symposia (presenter is underlined)

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

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

In Colloquia

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

- **Cao**, G.: Markov chain-based geostatistical methods for modeling categorical spatial data, Geography Department Colloquium, UCSB, October 2007.
- Marston, J. R., **Cao**, G., Brabyn, J. A. (2010) Accessible maps customized for the visually impaired person. *presented at the Atlanta Vision Seminar*, Atlanta, GA

Teaching Experiences

- **GIST 4302: Spatial Analysis and Modeling** — Lubbock, TX, U.S.A.
  Department of Geosciences, Texas Tech University — *Fall 2013, Spring 2014*
- **Instructor of Geog 480: Principles of GIS** — Urbana, IL, U.S.A.
  Department of Geography, University of Illinois at Urbana-Champaign — *Spring 2013*
- **Course Development of Geog 379 (*on-line course*): Introduction to GIS** — Urbana, IL, U.S.A.
  Department of Geography, University of Illinois at Urbana-Champaign — *Summer 2012*
- **TA of Geog 183: Cartographic Design and Geovisualization** — Santa Barbara CA, U.S.A.
  Department of Geography, University of California, Santa Barbara — *Spring 2008*
  - Instructor: Prof. Martin Raubal
- **TA of Geog 172: Intermediate Geographical Data Analysis** — Santa Barbara CA, U.S.A.
  Department of Geography, University of California, Santa Barbara — *Winter 2007*
  - Instructor: Prof. Phaedon C. Kyriakidis
- **Course Development: GIS Certificate Program of SuperMap** — Beijing, China
  SuerpMap Software, Inc — *2003*

Advising and Mentoring

Chair:

- Feixiong Luo (PhD in Geoscience,Texas Tech)
- Ying Liu (PhD in Geoscience, Texas Tech)

Committee Member:

- Lionel Plummer (PhD in Natural Resource Management, Texas Tech)
- Marina Fisher-Phelps (PhD in Biological Sciences, Texas Tech)
- Jason Post (MS in Geography, Texas Tech)
- Tiffany Lambert (MS in Geography, Texas Tech)

Professional Services

University Services

- **Search Committee of GIS position in the Department of Geography at UCSB** 2011
- **Executive Board of CSSA (Chinese Students and Scholars Association) at UCSB** 2007-2009
- **Executive President of CSSA (Chinese Students and Scholars Association) at UCSB** 2007-2008

Grant Refereeing

- **NSF Proposal Review** *(Geography and Spatial Sciences Program)* 2011

Publication Refereeing

- **XHPC 2012** 2012
- **eScience 2012** 2012
- **GIScience 2012** 2012
- **International Journal of Geographical Information Science** 2010-
- **International Journal of Remote Sensing** 2011-
- **Stochastic Environmental Research and Risk Assessment** 2012-
- **The 19th ACM GIS Conference** 2011
- **The 2nd International Workshop on HPDGIS** 2011

Conference Session Organized

- Computational and Statistical Methods for Spatiotemporal Data Analytics, AAG 2012, 2013
- CyberGIS and Digital Epidemiology, AAG 2014

Professional Society Memberships

- **Member of the ACM SIGSPATIAL** 2009-
- **Member of the Association of American Geographers (AAG)** 2007-
- **Member of the International Association for Mathematical Geosciences** 2009-

Project Experiences

- **SI2-SSI: CyberGIS Software Integration for Sustained Geospatial Innovation** UIUC
  NSF Cyberinfrastructure *Aug.2011 -*
  - Spatiotemporal statistics and applications in large-scale geo-spatial ('big data') problems
  - Location-based social media data analysis
  - Spatiotemporal uncertainty modeling and mapping
  - Principal Investigator: Prof. Shaowen Wang (PI)
- **Geostatistical Modeling Across Multiple Spatial and Temporal Scales** UCSB
  NGA Academic Research Program (NARP) *Aug.2007 - Aug.2010*
  - A comprehensive statistical framework for spatio-temporal process modeling
  - Hypothesis testing with geospatial data accounting for spatiotemporal correlation
  - Spatiotemporal classification and simulation of geospatial data
  - Developement of a Matlab toolbox
  - Principal Investigator: Prof. Michael F. Goodchild (PI) and Prof. Phaedon C. Kyriakidis (co-PI)

- **Data mining and conflation of crowd-source geospatial information** UCSB
  Telenav *Jun.2010 - Sep.2010*
  - Large scale vehicle GPS traces and other user-generated contents
  - Map-matching/Conflation
  - Update OpenStreetMap data based on crowd-source information.
  - Traffic estimation and forecast
- **Large Print Map for Low Vision People** UCSB
  UCSB Senate funds *Sep.2008 - Aug.2009*
  - Tactile representations (accessible maps for the blind and visually impaired people)
  - Principal Investigator: Prof. Reginald Golledge and Dr. James Marston
- **Global Energy Observatory** Los Alamos, NM
  Los Alamos National Laboratory *Jun.2008 - Sep.2009*
  - A Volunteer Geographic Information (VGI) project
  - A one-stop map portal for global energy information
  - Principal Investigator: Prof. Rajan Gupta
- **Network Oriented Large Scale Spatial Database** Beijing, China
  National High Technology Research and Development Program of China (863) *May.2003 - May.2005*
  - Spatial index for large scale spatial database
  - Efficient spatial analytical methods and large scale terrain modeling
  - Real-time 3D rendering of large scale spatial datasets
  - Principal Investigator: Prof. Ershun Zhong and Prof. Guanfu Song
- **Computer Network Management System Based on GIS** Beijing, China
  Graduate Student Research Project *Oct.2001 - May.2002*
  - GIS system to manage, visualize and analyze network topology
- **WebGIS Based on CORBA** Hangzhou,China
  Graduation Research Project *Feb.2001 - Jul.2001*

Technical Skills

Total Experiences: 10+ years

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

Programing IDE: Eclipse, Visual Studio, gcc/g++

Operating Systems: Linux/Windows/MacOSX

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

Others: Hadoop (MapReduce), MongoDB, Redis, Hive, MySQL, OpenGL, GSLIB, SGeMS, Latex

References

Available upon request