

**Petruța Carmen Caragea**  
**Assistant Professor, Department of Statistics**  
**Iowa State University**

**Curriculum Vitae**

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**EDUCATION**

<b>Ph.D., Statistics</b>	University of North Carolina, Chapel Hill, NC	May 2003
<b>M.S., Statistics</b>	University of North Carolina, Chapel Hill, NC	May 2002
<b>B.S., Applied Mathematics</b> Diploma de Licenta	University of Bucharest Bucharest, Romania	July 1997
<b>Licensed, Mathematics and Physics</b> Diploma de Bacalaureat	Mircea cel Batran National College Constanța, Romania	July 1993

**EMPLOYMENT**

Assistant Professor	Department of Statistics Iowa State University, Ames, Iowa	August 2003–present
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**PUBLICATIONS, REFEREED**

- **Caragea, P.C.**, Kaiser, M.S. 2008. Autologistic models with interpretable parameters. *Journal of Agricultural, Biological and Environmental Statistics*. Accepted.
- Kaiser, M.S., **Caragea, P.C.** 2008. Exploring dependence with data on spatial lattices. *Biometrics*. In print.
- Nordman, D.J., **Caragea, P.C.** 2008. Point and interval estimation of variogram models using spatial empirical likelihood. *Journal of the American Statistical Association*, **103**: 350-361.
- Goggi, A.S., **Caragea P.C.**, Pollak L., McAndrews G., DeVries M., Montgomery K. 2008. Seed quality assurance in maize breeding programs: tests to explain variations in maize (*Zea mays* L.) inbreds and populations. *Agronomy Journal*, **100**: 337-343.
- Kyveryga, P., Blackmer, T., **Caragea, P.C.** 2008. Using soil and terrain attributes to delineate management zones in corn yield response to nitrogen fertilization. *Proceedings of the 9th Conference on Precision Agriculture*. 20-23 July, Denver, Colorado.
- **Caragea, P.C.**, Smith, R.L. 2007. Asymptotic properties of computationally efficient alternative estimators for a class of multivariate normal models. *Journal of Multivariate Analysis*, **98(7)**: 1417-1440.

- Goggi, A.S., Sanchez, H.L., **Caragea, P.C.**, Clark, C., Westgate, M., Arritt, R. 2007. Gene flow in maize fields with different local pollen densities. *International Journal of Biometeorology*, **51(6)**: 493-503.
- Thorp, K.R., Batchelor, W.D., Paz, J.O., Steward, B.L., **Caragea, P.C.** 2006. Methodology to link production and environmental risks of precision nitrogen management strategies in corn. *Agricultural Systems*, **89(2-3)**: 272-298.
- Goggi, A.S., **Caragea, P.C.**, Sanchez, H.L., Westgate, M., Clark, C., Arritt, R. 2006. Statistical analysis of outcrossing between adjacent maize grain production fields. *Field Crops Research*, **99(2-3)**: 147-157.
- Holland, D.M., **Caragea, P.C.**, Smith, R.L. 2004. Trends in rural sulfur concentration. *Atmospheric Environment*, **38**: 1673-1684.

#### PROCEEDINGS, NONREFEREED

- **Caragea, P.C.**, Kaiser, M.S. 2006. Detection of temporal changes in spatial dependence. *Proceedings of the International Workshop on Spatio-Temporal Modelling (METMA3)*. Pamplona : Instituto de Estadística de Navarra: 101-104.
- **Caragea, P.C.**, Smith, R.L. 2002. Approximate likelihoods for spatial processes. *Proceedings of the American Statistical Association*.

#### PAPERS, SUBMITTED

- **Caragea, P.C.**, Smith, R.L., Approximate likelihoods for spatial processes. Tentatively accepted by *Technometrics*. Available as Preprint Series #06-18, Department of Statistics, Iowa State University.

#### PAPERS, IN PREPARATION

- **Caragea, P.C.**, Berg, E.J., Bivariate models and covariates for spatially correlated binary data. To be submitted to *Environmental and Ecological Statistics*. This manuscript is rooted in my interests in developing interpretable models for binary geo-referenced data, and provides the context in which multivariate models can be developed. Berg is currently conducting research towards her Ph.D. in Statistics at ISU.
- **Caragea, P.C.**, Zhang, L. Properties of the S-value: an empirical measure of spatial dependence for lattice data. To be submitted to *Statistical Modelling*. This manuscript draws on the research Zhang is conducting under my supervision toward a M.S. degree in Statistics at ISU.
- **Caragea, P.C.**, Kyveryga, P., Classifying spatial variability in corn yield response to nitrogen fertilization by using soil and terrain attributes. To be submitted to *Agronomy Journal*. This manuscript is a product of the successful collaboration with researchers at Iowa Soybean Association.
- **Caragea, P.C.**, Modeling global covariance structures using local information. To be submitted to *Environmetrics*. This manuscript develops the approximations to spatial likelihoods introduced by myself and Smith, R.L. (2007) to allow for modeling non-stationary spatial processes.

- **Caragea P.C.**, Goggi, A.S., Arrit, R., Westgate, M. Models to predict outcross in a maize field. To be submitted shortly. This manuscript emerged from the continuing and fruitful collaboration with researchers in the Department of Agronomy at ISU.
- Kaiser, M.S., **Caragea, P.C.**, Furukawa, K., Centering Markov random field models. To be submitted to *Journal of Statistical Planning and Inference*. This manuscript develops concepts introduced by Furukawa in his research toward a Ph.D. in Statistics at ISU.
- DeVries, M., Fan X., Goggi S., **Caragea P.C.**, A unique approach to analyzing and interpreting freezing characteristics in maize seeds. To be submitted to the *Annals of Botany*. This manuscript is based on the research work Fan completed towards her M.S. degree in Statistics at ISU under my supervision.

## INVITED PRESENTATIONS

- Smith, E., Huang, L., Weaver, B., **Caragea, P.C.**, April 2008, *Statistics projects at Hy-Vee*, Iowa ASA Chapter meeting. Invited talk.
- **Caragea, P.C.**, March 2008, *Interpretability and bivariate extensions of the centered autologistic model*, Department of Statistics, Penn State University. Invited seminar.
- **Caragea, P.C.**, November 2006, *Incorporating covariates in the autologistic model*, Department of Statistics, University of Iowa. Invited seminar.
- Nordman, D.J. and **Caragea, P.C.**, August 2006, *Recent advances in resampling methods for complex data structures*, The Joint Statistical Meetings, Seattle. Invited talk presented by D.J. Nordman.
- **Caragea, P.C.**, March 2005, *Modeling global covariance structures using local information*, 2005 ENAR Spring Meeting, Austin, Texas. Invited talk.
- **Caragea, P.C.**, October 2004, *A collection of problems in spatial statistics and an application of standard (and non standard) tools to an environmental problem*, Department of Community and Regional Planning, Iowa State University. Invited GIS Seminar.
- Kaiser, M.S., **Caragea, P.C.**, Kyoji Furukawa, June 2004, *Centering the effects of neighbors in Markov random field models*, The Graybill Conference on Spatial Statistics: Agricultural, Ecological, and Environmental Applications, Colorado State University. Invited talk.
- **Caragea, P.C.**, March 2004, *Three alternative estimators for spatial parameters*, Department of Community and Regional Planning, Iowa State University. Invited GIS Seminar.
- **Caragea, P.C.**, January 2003, *Approximate likelihoods for spatial processes*, Department of Statistics, Purdue University. Invited seminar.
- **Caragea, P.C.**, January 2003, *Approximate likelihoods for spatial processes*, Department of Statistics, Iowa State University. Invited seminar.
- **Caragea, P.C.**, January 2003, *Approximate likelihoods for spatial processes*, Department of Statistics, Colorado State University. Invited seminar.

- **Caragea, P.C.**, February 2003, *Approximate likelihoods for spatial processes*, Department of Biostatistics, Johns Hopkins University. Invited seminar.
- **Caragea, P.C.**, February 2003, *Approximate likelihoods for spatial processes*, Department of Statistical Sciences, Southern Methodist University. Invited seminar.
- **Caragea, P.C.**, February 2003, *Approximate likelihoods for spatial processes*, Department of Mathematical Sciences, Clemson University. Invited seminar.
- **Caragea, P.C.**, March 2003, *Approximate likelihoods for spatial processes*. Department of Mathematics, California State University, Fullerton. Invited seminar.
- **Caragea, P.C.**, March 2003, *Approximate likelihoods for spatial processes*, Department of Statistics, North Carolina State University. Invited seminar.

## CONTRIBUTED PRESENTATIONS

- **Caragea, P.C.** and Kaiser, M.S., August 2008, *Introducing the S-value: an exploratory tool for spatial dependence on a lattice*, The Joint Statistical Meetings, Denver, Colorado. Contributed talk.
- Grubh, K., Schulte, L., **Caragea, P.C.**, Palik, B.J., August 2008, *Mapping pre-Euro-American vegetation in the Midwest Driftless Area*, 93-rd ESA Annual Meeting, Milwaukee, Wisconsin. Contributed talk presented by Grubh.
- Kyveryga, P., Blackmer, T., **Caragea, P.C.**, July 2008, *Using soil and terrain attributes for delineating management zones in corn yield response to nitrogen fertilization*, 9-th International Conference on Precision Agriculture, Denver, Colorado. Contributed talk.
- **Caragea, P.C.** and Kaiser, M.S., March 2008, *Introducing the S-value: an exploratory tool for spatial dependence on a lattice*, 2008 ENAR Spring Meeting, Arlington, Virginia. Contributed talk.
- Berg, E.J. and **Caragea, P.C.**, March 2008, *Bivariate models and covariates for spatially correlated binary data*, 2008 ENAR Spring Meeting, Arlington, Virginia. Contributed talk.
- Kyveryga, P., Blackmer, T., **Caragea, P.C.**, November 2007, *Classifying spatial variability in corn yield response to nitrogen fertilization by using soil and terrain attributes*, ASA-CSSA-SSSA International Annual Meetings, New Orleans, Louisiana. Contributed poster presented by P. Kyveryga.
- **Caragea, P.C.**, June 2007, *A practical approach to analyzing large scale nonstationary spatial data*, TIES North American Regional Meeting, University of Washington, Seattle. Contributed talk.
- **Caragea, P.C.** and Kaiser, M.S., April 2006, *Exploring dependence with spatial lattice data*, 32nd Annual Spring Lecture Series, Fayetteville, Arkansas. Contributed talk.
- **Caragea, P.C.** and Kaiser, M.S., September 2006, *Detection of temporal changes in spatial dependence*, International Workshop on Spatio-Temporal Modelling (METMA3), Pamplona, Spain. Contributed talk.

- Nordman, D.J. and **Caragea, P.C.**, September 2006, *An empirical likelihood method for variogram estimation*, International Workshop on Spatio-Temporal Modelling (METMA3), Pamplona, Spain. Poster presentation by D. J. Nordman.
- Nordman, D.J. and **Caragea, P.C.**, August 2006, *A spatial blockwise empirical likelihood*, Ninth Meeting of New Researchers in Statistics and Probability, Seattle. Oral presentation by D.J. Nordman.
- **Caragea, P.C.**, August 2006, *Nonstationary processes viewed as locally stationary processes*, Ninth Meeting of New Researchers in Statistics and Probability, Seattle. Oral presentation.
- Schmitz, J., Myers, D.J., Paquette, K.M., **Caragea, P.C.**, April 2006, *The effect of soy protein hydrolysate on curing properties of phenol formaldehyde resin*, 97th American Oil Chemists Society Conference, St Louis, MO. Poster presentation by J. Schmitz.
- **Caragea, P.C.**, Kaiser, M.S., Furukawa, K., March 2006, *Parametrization of spatial models and stability of estimators*, 2006 ENAR Spring Meeting, Tampa, Florida. Contributed talk.
- DeVries, M., Goggi, S., Fan, X., **Caragea, P.C.**, November 2005, *Freezing characteristics of maize seeds during a frost event*, ASA-CSSA-SSSA International Annual Meetings, Salt Lake City, UT. Contributed talk presented by M. DeVries.
- **Caragea, P.C.**, August 2005, *A model for corn pollen dispersion*, The Joint Statistical Meetings, Minneapolis. Contributed talk.
- Haddad, M.A., **Caragea, P.C.**, July 2005, *Exploratory spatial data analysis of the distribution of student performance and some of its correlates*, Computers in Urban Planning and Urban Management, London, UK. Poster presentation by M.A. Haddad.
- **Caragea, P.C.**, December 2004, *Alternative estimation of spatial parameters for large data sets*, SemStat2004, Germany (European Mathematical Society Summer School): Statistics of Spatio-Temporal Systems. Contributed talk.
- **Caragea, P.C.**, Smith, R.L., August 2004, *Likelihood approximations in spatial statistics*, COMPSTAT 2004-16th Symposium of the International Association for Statistical Computing, Prague, Czech Republic. Contributed talk.
- Holland, D. M., **Caragea, P.C.**, Smith, R.L., July 2003, *Trends in rural sulfur concentrations*, International Conference on Environmental Statistics and Health, Santiago de Compostela, Spain. Contributed talk presented by D. Holland.
- **Caragea, P.C.**, Smith, R.L., July 2003, *Three alternative estimators for spatial parameters*, The Joint Statistical Meetings, San Francisco. Contributed talk.
- **Caragea, P.C.**, Smith, R.L., October 2002, *Approximate likelihoods for spatial processes*, Frontiers of Statistics Conference, Texas A&M. Poster presentation.
- **Caragea, P.C.**, Smith, R.L., August 2002, *Approximate likelihoods for spatial processes*, The Joint Statistical Meetings, New York. Contributed talk.
- **Caragea, P.C.**, Smith, R.L., June 2002, *Approximate likelihoods for spatial processes*, Southern Regional Conference on Statistics (SRCOS), Natchez, Mississippi. Poster presentation.
- D. Holland, **Caragea, P.C.**, Smith, R.L., June 2001, *Trends in rural sulfur concentration*, Southern Regional Conference on Statistics (SRCOS), St. Augustine, Florida. Poster presentation.

## ACADEMIC HONORS AND AWARDS

- National Center for Environmental Research, 2005 Level III Scientific and Technological Achievement Award (STAA) for the paper “Regional Trends in Rural Sulfur Concentrations” by Holland, D.M., Caragea P.C. and Smith R.L. — for *accomplishing an unusually notable research effort*
- American Statistical Association, Section on Statistics and the Environment *Best Student Paper Award*, The Joint Statistical Meetings, New York, August 2002
- *R.L. Anderson Student Paper Award*, Southern Regional Conference on Statistics (SRCOS), Natchez, Mississippi, June 2002
- *Teaching Award*, Department of Statistics, UNC at Chapel Hill, Fall 2001
- *R.L. Anderson Student Paper Award*, Southern Regional Conference on Statistics (SRCOS), St. Augustine, Florida, June 2001

## GRANTS AND CONTRACTS

- *Research Consulting Agreement between Hy-Vee and Iowa State University* from Hy-Vee Corporation, 2007–2009. \$149,103.51
- *Developing Statistical Methodology for Analyzing Spatial Variability in Crop Yield Response to Various Inputs* from Iowa Soybean Association, 2007. \$10,327
- Travel award from the NSF to attend 9-th NRC in Seattle, August 2006
- Travel award from the European Union to attend SemStat, December 2004
- *Spatial Analysis for Local Public Finance Decision Support* — University Research Grant, ISU. 2005–2006. \$11,600. Joint with M.A. Haddad (Department of Community and Regional Planning)

## COLLABORATIVE ACTIVITIES AND TECHNOLOGY TRANSFER

As a natural complement to my research in the theory and application of methods for analyzing geo-referenced data, I have established collaborations with colleagues and students at Iowa State and elsewhere. In particular, I have focused my collaborative work in areas including Ecology, Agronomy, Department of Geological and Atmospheric Sciences, Community and Regional Planning, Natural Resource Ecology and Management, Sociology, and others where the collection, analysis and interpretation of geo-spatial information is central to the research.

### *Representative projects at ISU*

- Parsons, M. and Munkvold, G., Department of Plant Pathology and Seed Science Institute. “Regional analysis of environmental influences on Fusarium ear rot.” Report submitted to Parsons, and was included in his Ph.D. thesis.
- Sekar, R., Department of Marketing, College of Business, “Effects of marketing strategies on the attitude towards a healthy diet in school children.” Report submitted to Sekar and is incorporated into a publication to be submitted to the *Journal of Marketing*.

- Welch, B. and Parker, M., Department of Sociology, “Spatial analysis of political protests in Germany.” Assisted with model development, implementation and interpretation. No report written.
- Schulte, L. and Grubh, K., Department of Natural Resource Ecology and Management, “Detecting changes in spatial distribution of tree species in the Driftless area.” Assisted with model development, implementation, exploratory analysis. No report written yet; this work will be included in Grubh’s Ph.D. thesis.
- Goggi, A.S., DeVries, M., Department of Agronomy, “Temporal changes of freezing characteristics in corn kernels.” Summary report submitted to Goggi.
- Dias, A.P., Department of Plant Pathology. “Analysis of the effect of different environmental variables on Asian Soybean Rust distribution in Brazil during 3 growing seasons.” A summary report was written and it was followed up by several discussions regarding applicability of the models developed to newly acquired data.
- Yurkonis, K.A., Department of Ecology, Evolution and Organismal Biology, “Spatio-temporal aspects of exotic species invasion in an old-field successional system.” Summary report submitted to Yurkonis and several examples from this collaboration have been used in subsequent articles.
- Stakhanov, O., Department of Sociology, “Spatial patterns of internet diffusion among Iowa farmers.” Report submitted to Stakhanov.
- Clark, C. and Arrit, R., Department of Agronomy, “Numerical simulations of the effect of natural windbreak on the dispersal of maize pollen.” Summary report submitted to Clark, and included in his Ph.D. thesis.
- Barbazan, M. and Mallarino, A., Department of Agronomy, “Treatment application effects on soil test Phosphorus spatial variability.” Report on model development and implementation provided to Barbazan.
- Thorp, K., Department of Agricultural and Biosystems Engineering, “ Spatial analysis of corn population density using machine-vision-based sensing systems for automatic detection of early-stage corn plant population.” Summary report submitted to Thorp and work incorporated in his Ph.D. thesis.
- Guan, J, Nutter, F.W., Department of Plant Pathology, “Improving the relationship between IKONOS satellite image intensity and soybean yield as affected by SCN using geostatistics.” The results of this collaboration appeared as American Phytopathological Society Publication no. P-2005-0013-NCA.
- Lopez, H., Goggi, A.S., Arrit, R., Westgate, M., Department of Agronomy, “Modeling dispersion of genetically modified corn pollen fields.” Several reports submitted to Goggi, and incorporated into Lopez’ Ph.D. thesis, and two articles.
- Potoski, M., Department of Political Science, “Analysis of panel data on the diffusion of environmental management practices among countries around the world.” Report submitted to Potoski and later incorporated in a journal article.

- Haddad, M.A., Department of Community and Regional Planning, “Spatial analysis for local public finance decision support.” Summary report submitted to Haddad and results incorporated in a conference presentation and a submitted manuscript.
- Mora, G., Surge, D., Department of Geological and Atmospheric Sciences, “Isotopic characterization of carbon cycling in southwest Florida estuaries.” A report on model development and initial analysis was submitted to Mora and Surge. The report was included into a grant proposal to USDA.

- *Projects with Hy-Vee Corporation*

Another component of my consulting work is that of assisting the supermarket chain Hy-Vee, with headquarters in Des Moines, improve its financial strategies by addressing major issues such as sales forecasting, cash flow management, new stores placement as well as smaller matters, such as conducting customer satisfaction surveys or devising more efficient advertisement strategies. Two graduate students in the Department of Statistics are funded to work full time on projects requested by Hy-Vee. As PI, my responsibilities include close student/project supervision, assisting and guiding them with data analysis, report preparation and software implementation. Monthly reports are submitted to Hy-Vee representatives.

- *Projects with Iowa Soybean Association (ISA)*

Kyveryga, P. and Blackmer, T., “Developing Statistical Methodology for Analyzing Spatial Variability in Crop Yield Response to Various Inputs.” Goal of the project is to identify physical field-related factors (in addition to fertilization practices) that may play a role in obtaining economically profitable crops. My specific aim is to develop statistical methodology to assist in making recommendations to farmers about how to increase production with a very low environmental impact. Several reports submitted to Kyveryga and ISA.

## OTHER PROFESSIONAL ACTIVITIES

### American Statistical Association

- Program Chair, American Statistical Association, Section on Statistics and the Environment, 2008-2010 (Chair elect 2008-2009, Chair 2009-2010)
- Committee on Award of Outstanding Statistical Application of the American Statistical Association, 2007-2009

### Iowa State University

- Represented the VIGRE site at the Department of Statistics at ISU at the Seattle VIGRE Workshop, April 2006, University of Washington.
- Wrote and graded methods questions for the M.S. exam, 2006.
- Participated in the Iowa-NASA-NSGIC Data Integration Workshop, April 20, 2005, Ames, Iowa.
- Mentored Nicholas Larson, undergraduate VIGRE intern from St. Olaf College, Summer 2004. Currently Ph.D. student at ISU.

### Reviewing work

- Referee for
  - Journal of The American Statistical Association, 2004, 2005, 2006, 2008
  - Journal of Statistical Computation and Simulation, 2006
  - Environmental and Ecological Statistics, 2006
  - Environmental Modelling and Software, 2007
- Review panelist for the Connecticut Institute of Water Resources, 2007

## TEACHING AND INSTRUCTION

- COURSES TAUGHT AT ISU

- STAT 226: *Introduction to Business Statistics I* (undergraduate service level) – Spring 05, Spring 08
- STAT 401: *Statistical Methods for Research Workers* (Masters service level, some advanced undergraduates) – Fall 03, Fall 04, Fall 06 (on campus and distance), Fall 07
- STAT 406: *Statistical Methods for Spatial Data* (Masters service level) – Spring 04, Spring 06, Spring 08
- STAT 506: *Statistical Methods for Spatial Data* (Masters level) – Spring 04
- STAT 551: *Time Series Analysis* (Masters level) – Fall 06, Fall 08

- GRADUATE STUDENT ADVISING

- Elci, Okan Ümit, Department of Statistics, M.S., *Fall 2004*: “*Modeling the Maize Pollen Dispersion Process.*”
- Fan, Xing, Department of Statistics, M.S., *Spring 2006*: “*A Statistical Comparison of the Freezing Process in Two Genotypes of Corn Kernels.*”
- Zhang, Li, Department of Statistics, M.S., *Expected to graduate Fall 2008.*
- Bramer, Lisa, Department of Statistics, M.S., *Expected to graduate Fall 2009.* Lisa Bramer is expected to continue on for her Ph.D.
- Courtney Bokenkroger, Department of Statistics, Ph.D.
- Member in 21 Ph.D. committees and 15 M.S. committees.

## DEPARTMENTAL AND UNIVERSITY SERVICE

- Departmental Committees:

- M.S. Exam Committee, 2008–2009 chair, 2007-2008 member
- Diversity Committee, 2008–2009 chair, 2003-2004 member
- Memorial Lectures, 2007–2008
- Seminar committee, 2006–2007, chair for the Fall semester
- Search Committee, 2006–2007
- Social Committee, 2003–2006
- STATERS advisor, 2005–2006

- University Committees

- College of Arts and Sciences Assembly representative, 2007-2010
- Departmental international liaison to the College of Arts and Sciences, 2004-2005