

Graduate Interdisciplinary Program in Statistics



Annual Report

for the Academic Year July 1, 2009 – June 30, 2010

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Graduate Interdisciplinary Program (GIDP) in Statistics

Introduction

Chartered by the Arizona Board of Regents in 2006 and commencing full operations in the Fall of 2008, the Graduate Interdisciplinary Program (GIDP) in Statistics at the University of Arizona focuses and enhances statistical training and research across the UA campus. It administers both the M.S. and Ph.D. degrees, as well as a Ph.D. Minor and a 12-unit Graduate Certificate, in Statistics. The Program boasts a diverse and distinguished research faculty who hail from a variety of campus units, including departments in the Colleges of Agriculture & Life Sciences, Engineering, Education, Law, Management, Public Health, Science, Social & Behavioral Sciences, the BIO5 Institute, and the Arizona Research Laboratories. This diversity fuels an intellectually stimulating atmosphere in which modern statistical research is developed and put directly into practice.

The educational goal of the GIDP in Statistics is to train active researchers and practitioners who will work at the forefronts of modern scientific study, and who will develop practical, innovative statistical techniques to advance the associated subject matter. The Program sponsors or co-sponsors a variety of seminars, colloquia featuring distinguished invited speakers, special lecture series, workshops, and conferences.

The University of Arizona is renowned for its atmosphere of flourishing interdisciplinary research. The GIDP in Statistics fits naturally into this environment, encompassing a wide range of transdisciplinary studies in both theoretical and applied statistics. Up-to-date details on the GIDP's activities are available at the Program website: <http://stat.arizona.edu>.

Summary of Activities: July 1, 2009 – June 30, 2010

1. Personnel

A. Regular Members

Regular Members of the GIDP in Statistics are those University faculty and staff involved in teaching core Statistics courses, directing M.S. and Ph.D. students in the GIDP, and/or others who have agreed to be significantly active in the Program.

Lingling An, Ph.D. (Purdue University), Assistant Professor of Biometry.
Statistical genetics/genomics; Bioinformatics; Data mining and pattern recognition.

Jacobus J. (Kobus) Barnard, Ph.D. (Simon Fraser University), Associate Professor of Computing Science; Associate Professor of Electrical and Computer Engineering.
Machine learning; Mathematical modeling of geometric form; Multi-modal data; Statistical applications in computer vision.

Katherine Y. Barnes, Ph.D. (University of Minnesota), J.D. (University of Michigan), Associate Professor of Law; Director, Rogers Program on Law and Society.
Bayesian statistics; Causation and selection models; Empirical methods in law; Discrimination; Expert witnesses.

Rabindra N. (Rabi) Bhattacharya, Ph.D. (University of Chicago), Professor of Mathematics.
Markov processes; Large sample theory; Statistical shape analysis; Economic theory of growth under uncertainty.

D. Dean Billheimer, Ph.D. (University of Washington), Associate Professor of Biometry; Director, Statistical Consulting Laboratory.
Measurement and normalization, Quantitative proteomics, Statistical methods for compositional data.

Zhao Chen, Ph.D. (University of Arizona), Professor of Public Health; Director, Division of Epidemiology & Biostatistics.
Research study design; Longitudinal data analysis; Risk assessment.

Peter Chesson, Ph.D. (University of Adelaide, Australia), Professor of Ecology & Evolutionary Biology.
Mathematical ecology; Ecological statistics; Stochastic processes; Biodiversity.

Melinda F. (Mende) Davis, Ph.D. (University of Arizona), Research Assistant Professor of Psychology.
Latent variable modeling; Measurement of change; Item response theory; Health outcomes research; Statistical consulting.

Scott R. Eliason, Ph.D. (Pennsylvania State University), Associate Professor of Sociology.
Categorical data analysis; Maximum likelihood estimation; Causal inference; Social statistics; Mathematical demography.

William G. Faris, Ph.D. (Princeton University), Professor of Mathematics.
Stochastic processes; Mathematical statistics.

James T. (Jake) Harwood, Ph.D. (University of California at Santa Barbara), Professor of Communication.
Applied statistics in the social sciences; Hypothesis testing; Moderator and mediator effects.

Keisuke Hirano, Ph.D. (Harvard University), Associate Professor of Economics.
Econometrics; Causal inference.

Chiu-Hsieh (Paul) Hsu, Ph.D. (University of Michigan), Assistant Professor of Public Health.
Survival analysis; Missing data; Statistical modeling.

Chengcheng Hu, Ph.D. (University of Washington), Assistant Professor of Public Health.
High-dimensional data; Survival analysis; Longitudinal data; Missing data; Measurement error.

Christopher S. Johnson, Ph.D. (University of Michigan), Assistant Professor of Educational Psychology.
Hierarchical generalized linear models; Repeated measures analysis; Item response theory.

Bonnie J. LaFleur, Ph.D. (University of Colorado Health Sciences Center), Associate Professor of Public Health.
Biostatistics; Exact tests/permutation tests; Cancer biology; Genomics.

Zhenqiang (James) Lu, Ph.D. (Purdue University), Statistician, Arizona Statistical Laboratory.
Data visualization; Data mining; Computational statistics; Bioinformatics.

Nirav Merchant, M.S. (University of Arizona), Director of Information Technology, Arizona Research Labs.
Data mining; Classification; Quality control.

Yue (Selena) Niu, Ph.D. (Princeton University), Assistant Professor of Mathematics.
Nonparametric statistics; Semiparametric modeling; Statistical genetics.

Walter W. Piegorsch, Ph.D. (Cornell University), Professor of Mathematics; Professor of Public Health;
Professor of Agricultural & Biosystems Engineering; *Chair*, GIDP in Statistics.
Environmental statistics; Quantitative risk assessment; Statistical toxicology; Biometry; History of statistics.

Denise J. Roe, Dr.P.H. (University of California at Los Angeles), Professor of Public Health.
Clinical trials; Epidemiological studies; Pharmacokinetics.

Moshe Shaked, Ph.D. (University of Rochester), Professor of Mathematics.
Reliability theory; Stochastic modeling; Stochastic orders.

Duane L. Sherrill, Ph.D. (University of Colorado Health Sciences Center), Professor of Public Health; Associate
Dean of Research, Mel and Enid Zuckerman College of Public Health.
Longitudinal analyses; Respiratory disease assessment; Applied data analyses; Biometry.

Robert J. Steidl, Ph.D. (Oregon State University), Associate Professor of Natural Resources.
Quantitative ecology; Dynamics of animal populations; Conservation biology.

Michael Tabor, Ph.D. (Imperial College), Professor of Applied Mathematics; Professor of Physics; Professor of
Mathematics; Head, GIDP in Applied Mathematics.
Nonlinear growth dynamics; Chaotic dynamical systems; Biomechanical models; Biomathematics.

Daoqin Tong, Ph.D. (Ohio State University), Assistant Professor of Geography & Regional Development.
Spatial statistics; Optimization; Geographic information systems (GIS).

Bruce Walsh, Ph.D. (University of Washington), Professor of Ecology & Evolutionary Biology; Professor of
Public Health; Adjunct Professor of Plant Science; Adjunct Professor of Animal Science.
Biostatistics; Statistical genetics/genomics; Mixed models; Bayesian analysis; Resampling and MCMC
methods.

Joseph C. Watkins, Ph.D. (University of Wisconsin), Professor of Mathematics.
Stochastic processes; Limit theorems; Statistical applications in the life sciences.

B. Affiliate Members

Affiliate Members of the GIDP in Statistics are those with a general interest in statistical issues who wish to be fully informed of the Program's operation, and who wish to engage in a limited subset of Program activities. Affiliate members often rotate to Regular status at pertinent intervals, and *vice versa*.

Ronald L. Breiger, Ph.D. (Harvard University), Professor of Sociology.
Statistical models for social network analysis; Log-linear models; Log-multiplicative models for contingency tables.

Emily A. Butler, Ph.D. (Stanford University), Assistant Professor of Family Studies & Human Development.
Multivariate time-series analysis; Multilevel modeling; Dyadic models; Social-relations modeling.

Noel A. Card, Ph.D. (St. John's University), Assistant Professor of Family Studies & Human Development.
Latent variable modeling; Structural equation modeling; Meta-analysis; Dyadic data analysis.

Andrew C. Comrie, Ph.D. (Pennsylvania State University), Professor of Geography & Regional Development; Associate Vice President for Research; Dean of the Graduate College and Director of Graduate Interdisciplinary Programs.

Statistics of climate data; Data reduction; Spatial modeling.

Sandy Dall'erba, Ph.D. (University of Pau), Assistant Professor of Geography & Regional Development.

Spatial statistics; Spatial econometrics.

Michael N. Evans, Ph.D (Columbia University), Adjunct Associate Professor of Dendrochronology.

Paleoclimatology; Spatiotemporal data analysis; Forward and inverse modeling.

Jonah B. Gelbach, Ph.D. (Massachusetts Institute of Technology), Associate Professor of Economics.

Applied microeconometrics; Bootstrap-based inference; Public economics; Law and economics.

Gautam Gowrisankaran, Ph.D. (Yale University), Associate Professor of Economics.

Structural econometric modeling; Applied Bayesian econometrics; Estimation of dynamic models.

Thomas G. Kennedy, Ph.D. (University of Virginia), Professor of Mathematics; Professor of Physics.

Monte Carlo simulations; Random walks.

Jian Liu, Ph.D. (University of Michigan), Assistant Professor of Systems and Industrial Engineering.

Engineering statistics; Statistical quality and reliability engineering; Applied data mining.

Robert S. Maier, Ph.D. (Rutgers University), Professor of Mathematics; Professor of Physics.

Applied probability; Mathematical statistics; Limit laws and large deviation theory; Bioinformatics.

Joanna Monti-Masel, D.Phil. (Oxford University), Assistant Professor of Ecology & Evolutionary Biology.

Stochastic processes; Bayesian learning models; Theoretical population genetics; Stochasticity in gene expression.

Brian J. McGill, Ph.D. (University of Arizona), Associate Professor of Natural Resources.

Habitat models; Advanced regression & data mining; Spatial & temporal analysis; Philosophy of science and statistics.

David M. Meko, Ph.D. (University of Arizona), Associate Research Professor of Dendrochronology.

Spectral analysis; ARMA modeling; Time series filtering; Regression.

Chris Segrin, Ph.D. (University of Wisconsin), Professor of Communication; Professor of Psychology; Professor of Family Studies; Head, Department of Communication.

Meta-analysis; Longitudinal data analysis; Regression analysis; Dyadic data analysis.

C. Staff

Stacey L. Wiley; Program Coordinator, Senior

Anne Keyl; Graduate Coordinator

2. Faculty Activities

A. Selected Achievements

The past experiences of **Katherine Y. Barnes** (LAW) were highlighted in 2009-2010: Dr. Barnes served previously as a law Clerk for the Honorable Sonia Sotomayor in the United States Second Circuit Court of Appeals. (Justice Sotomayer was in 2009 sworn in to serve on the U.S. Supreme Court.) Prof. Barnes, who holds a Ph.D. in Statistics along with her J.D., directs the UA's Rogers Program on Law and Society, and teaches courses on public employment law, racial profiling, and Bayesian statistics. More information is available at <http://uanews.org/node/26822>.

Noel A. Card (FSHD) was recently elected to the Society for Multivariate Experimental Psychology. The Society is a highly-respected and active group in experimental psychology and related fields. Election is determined by a competitive nomination process, and limited to only 65 active members.

Zhao Chen (EPID) has been promoted to Professor of Public Health and Director, Division of Epidemiology & Biostatistics.

Sandy Dall'erba (GEOG) has edited a book-length treatment on problems in spatial analysis. *Progress in Spatial Analysis: Theory and Computation, and Thematic Applications* (ISBN: 978-3-642-03324-7) was published in 2010 by Springer-Verlag as part of its series on Advances in Spatial Sciences.

Keisuke Hirano (ECON) has been named Co-Editor of the *Journal of Business and Economics Statistics*. JBES is a leading, peer-reviewed, scientific journal in econometrics and economic statistics, with a long history of producing articles of the highest quality and impact. The Journal is published by the American Statistical Association (ASA), the nation's preeminent statistical society. Dr. Hirano's term began July 1, 2009.

Walter W. Piegorsch (MATH) was featured on local television station KOLD-13 in its "60-Second Science" series, in which issues of scientific interest are distilled and described in a 60-second segment. He discussed his work on statistical models for setting safe exposures to environmental pollutants. **Prof. Piegorsch** also was named Editor-in-Chief of the journal *Environmetrics*, the oldest scientific journal publishing on quantitative methods in the environmental sciences. His term began January 1, 2010.

J. Bruce Walsh (ECOL) was quoted in the *New York Times* on the effects of moths in the home. While clothes-eating moths, or rather their larvae, can cause hundreds of dollars in damage, it turns out that most species are not the clothes-eating kind, says Prof. Walsh. (So, don't rush to panic if you see one.) Dr. Walsh is an expert on moths and butterflies, and has even identified a new species of moth, *Lithophane leaeae*, in the Chiracahua mountains east of Tucson; see Dr. Walsh's podcast on the discovery at <http://uanews.org/node/26027>.

B. Faculty Committees

The GIDP in Statistics functions through the efforts of its Regular and Affiliate Faculty who serve on standing and ad hoc Faculty Committees of the Program. Standing Committees are established by rule of the Program's Bylaws.

The **Executive Committee** (EC) is appointed by and responsible to the Director of Graduate Interdisciplinary Programs. The EC serves as the executive, administrative, and policy-making board for the Statistics GIDP:

Chair: Walter W. Piegorsch (Mathematics)

Rabi Bhattacharya (Mathematics)

D. Dean Billheimer (Agricultural and Biosystems Engineering)

Keisuke Hirano (Economics)

Denise J. Roe (Epidemiology and Biostatistics)

Joseph C. Watkins (Mathematics)

Recruiting & Admissions (R&A) Committee

Chair: Joseph C. Watkins (Mathematics)

Duane L. Sherrill (Epidemiology and Biostatistics)

Walter W. Piegorsch (Mathematics), *ex officio*

Curriculum Committee

Chair: Denise J. Roe (Epidemiology and Biostatistics)

Scott R. Eliason (Sociology)

Yue (Selena) Niu (Mathematics)

Walter W. Piegorsch (Mathematics), *ex officio*

Colloquia & Forums (C&F) Committee

Chair: Keisuke Hirano (Economics)

Walter W. Piegorsch (Mathematics), *ex officio*

Examinations Committee

Chair: Rabi Bhattacharya (Mathematics)

Moshe Shaked (Mathematics)

Joseph C. Watkins (Mathematics)

Scott R. Eliason (Sociology)

Walter W. Piegorsch (Mathematics), *ex officio*

C. New Faculty Recruits in 2009-2010

In Fall 2009 the GIDP welcomed new faculty member **Yue (Selena) Niu** (MATH) of Princeton University to UA's Department of Mathematics as an Assistant Professor. Prof. Niu, whose doctoral degree is in Operations Research, specializes in nonparametric and semiparametric modeling with applications in bioinformatics and statistical genetics.

3. Graduating Students

A. Ph.D.

none

B. M.S.

Wenhai Chen, May 2010

C. Graduate Certificate

Grant I. Peterson, May 2010

4. Active Graduate Students

A. First year

1. *Ph.D.*

Qijun (Steve) Fang, M.S. (University of North Carolina, Wilmington)

Jarrold Harding, M.S. (University of Akron)

Hyeonju Kim, M.S. (University of New Mexico)

2. *M.S./Ph.D.*

none

3. *M.S.*

Colin G. Dawson, M.A. (University of Arizona)

Philip Stevenson, M.Ed. (University of Arizona)

Alissa Wickens, B.A. (Providence College)

B. Second year

1. *Ph.D.*

John S. Bear, M.S. (California State University-East Bay)

2. *M.S./Ph.D.*

Wenhai Chen, B.S. (Beijing University of Posts and Telecommunications)

3. *M.S.*

Benjamin Pope, B.S. (University of California-San Diego)

C. Third year

none

D. Graduate Certificate

William Degan, M.S. (National Technological University), M.B.A. (University of Arizona)

Paul Gladden, M.A. (University of Arizona)

Ann Manziello, B.S. (University of Arizona)

Rachel Perez, B.S. (University of Arizona)

Grant I. Peterson, M.S. (University of Arizona)

E. Awards

Quijin (Steve) Fang was awarded the 2010 **First-Year Student Award in Statistics**, by the GIDP. The award recognizes superior academic achievement by a Statistics student completing her/his first year.

Philip Stevenson was awarded a **Statistics Graduate Fellowship** by the Graduate College, to help support his studies in 2009-2010.

Alissa Wickens was awarded a **Statistics Graduate Fellowship** by the Graduate College, to help support her studies in 2009-2010. Ms. Wickens also was a **winner in the BIO5 Institute's *What-Why Statement Contest***, in which she described her research on statistical models for setting safe exposures to environmental pollutants.

5. Graduate Student Assistantships

A. Teaching Assistants

Wenhai Chen, MATH 464, MATH 564 (Fall 2009)/MATH 410, MATH 466 (Spring 2010)

Philip Stevenson, MATH 112 (Fall 2009), MATH 263 (Spring 2010)

B. Research Assistants (and Supervisors)

John S. Bear, Statistics Consulting Laboratory (Billheimer)

Jarrod Harding, CPATH-2: Computational Thinking as a Foundation for Interdisciplinary Undergraduate Education (Cohen)

Hyeonju Kim, Statistics Consulting Laboratory (Billheimer)

Benjamin Pope, STATCOM (An)

Alissa Wickens, Model Selection and Multiplicity Adjustment for Benchmark Analysis in Quantitative Risk Assessment (Piegorisch)

C. Other

Qijun (Steve) Fang, Roche/Ventana Medical Systems Graduate Assistantship in Statistics (Piegorisch/ Ranger-Moore)

6. Statistics Colloquia

A. Fall 2009

Monday, 14 September 2009: Developing Measurement to Assess Protein Biomarkers

D. Dean Billheimer, Department of Agricultural & Biosystems Engineering, University of Arizona

12:00 pm, Student Union Memorial Center (SUMC), Presidio Room

Sponsor: Statistics GIDP

Monday, 12 October 2009: An Efficient Method for Estimating Chromosome Copy Number Variations and Its Theoretical Properties

Yue (Selena) Niu, Department of Mathematics, University of Arizona

12:00 pm, Student Union Memorial Center (SUMC), Presidio Room

Sponsor: Statistics GIDP

Wednesday, 26 October 2009: Why Engineers Need Statistics

D. Dean Billheimer, Department of Agricultural & Biosystems Engineering, University of Arizona

12:00 pm, Shantz, Room 440

Sponsor: Department of Agricultural & Biosystems Engineering

Friday, 8 December 2009: Minimax Regret Treatment Choice with Covariates or with Limited
Validity of Experiments
Joerg Stoye, Department of Economics, New York University
3:30 pm, McClelland Hall, Room 401KK
Sponsor: Economics Empirical Workshop

B. Spring 2010

Wednesday, 27 January 2010: Biological modeling of colorectal cancer: Implications, applications,
challenges
Georg Luebeck, Fred Hutchinson Cancer Research Center
9:00 am, Arizona Cancer Center, Kiewit Auditorium
Sponsor: Cancer Prevention and Control Seminar

Monday, 8 February 2010: On the empirical support for statistical models estimated by maximum
likelihood and related methods
Scott Eliason, Department of Sociology, University of Arizona
12:00 pm, Student Union Memorial Center (SUMC), Presidio Room
Sponsor: Statistics GIDP

Monday, 1 March 2010: Profile HMMs for DNA sequence families: the conditional Baum-Welch
and dynamic model-surgery algorithms
Paul T. Edlefsen, Department of Statistics, Harvard University
12:00 pm, Mathematics Building, Room 501
Sponsor: Statistics GIDP & Mathematics Dept.

Monday, 8 March 2010: Statistical inference in computer vision
Kobus Barnard, Department of Computer Science, University of Arizona
12:00 pm, Student Union Memorial Center (SUMC), Presidio Room
Sponsor: Statistics GIDP

Monday, 29 March 2010: Nonparametric Bayes inference on manifolds with applications to
hypersphere and shape spaces
Abhishek Bhattacharya, Department of Statistical Science, Duke University
12:00 pm, Student Union Memorial Center (SUMC), Presidio Room
Sponsor: Statistics GIDP & Mathematics Dept.

Monday, 5 April 2010: Who is there and what are they doing? Introduction to metagenomics
analysis in microbial community
Lingling An, Department of Agricultural & Biosystems Engineering, University of Arizona
12:00 pm, Shantz, Room 440
Sponsor: Department of Agricultural & Biosystems Engineering