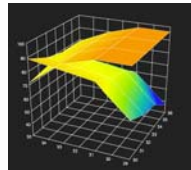


Graduate Interdisciplinary Program in Statistics



Annual Report

for the Academic Year
July 1, 2008 – June 30, 2009

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THE UNIVERSITY OF ARIZONA®

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, Education, Management, Public Health, Medicine, 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 and creative 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 receives enthusiastic support from all departments and colleges with which it interacts. In addition, 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, 2008 – June 30, 2009

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.

Mark S. Aldenderfer, Ph.D. (Pennsylvania State University), Professor of Anthropology.
Applied multivariate analysis; Spatial statistics; Cluster analysis.

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. (Kathie) 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.

Rabi N. 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, Arizona Statistics Laboratory.
Measurement and normalization, Quantitative proteomics, Statistical methods for compositional data.

Zhao Chen, Ph.D. (University of Arizona), Associate 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 Pediatrics; Assistant Professor of Public Health.
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.

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.

Alan P. Ker, Ph.D. (North Carolina State University), Professor of Agricultural Resource Economics; Professor of Economics.
Nonparametric regression; Empirical Bayes methods; Nonparametric kernel density estimation.

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

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

Walter W. Piegorsch, Ph.D. (Cornell University), Professor of Mathematics; Professor of Public Health; *Chair*,
GIDP in Statistics.
Environmental statistics; Quantitative risk assessment; 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 Animal Science; Adjunct Professor of Plant 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.

John J. Cheslock, Ph.D. (Cornell University), Associate Professor of Higher Education.
Applied econometrics; Analysis of panel data.

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, France), 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.

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.

Thomas G. (Tom) Kennedy, Ph.D. (University of Virginia), Professor of Mathematics; Professor of Physics;
Interim Head, Department of Mathematics.
Monte Carlo simulations; Random walks.

Robert S. Maier, Ph.D. (Rutgers University), Professor of Mathematics.
Applied probability; Mathematical statistics; Limit laws and large deviation theory; Bioinformatics.

Joanna 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

Mark Aldenderfer (ANTH) led an excavation in South America that discovered what is, to date, the oldest collection of gold artifacts found in the Americas. The team excavated a site in the Peruvian Andes, and uncovered a necklace made of turquoise and native gold that had been hammered into shape. Such materials were not available from the local region, requiring either a trade or a trip of some distance to acquire the raw gold and turquoise, or the finished necklace itself. Professor Aldenderfer published this research in the prestigious *Proceedings of the National Academy of Sciences*, and gives a short PodCats podcast at <http://uanews.org/node/19378>.

Lingling An received the I.W. Burr Award from Purdue University. This award recognizes outstanding Ph.D. graduates from the Statistics Program at Purdue who show contributions to the profession as evidenced by academic excellence, quality of the thesis research, and excellence in teaching or consulting. The award is named after Professor I.W. Burr who taught at Purdue for 35 years and whose work and reputation helped transform Purdue from a regional college to a national research university.

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

Joanna Masel (ECOL) was named a 2007 Pew Scholar in the Biomedical Sciences. Pew Scholars are young researchers with outstanding promise in the basic and clinical sciences, relevant to improving human health. Funding of the award is provided by the Pew Charitable Trusts, and will assist Dr. Masel in her research into theoretical population genetic and comparative genomic modeling of developmental evolution.

J. Bruce Walsh (ECOL) identified a new species of moth: *Lithophane leae*, discovered in the Chiracahua mountains east of Tucson and reported in the journal *Zoo Keys*. *Lithophane* moths are members of the noctuid family, which often are dull colored. In contrast, this new moth is bright pink and despite its colorful feature, has never been observed before! More information is available at Dr. Walsh's podcast on the discovery at <http://uanews.org/node/26027>. Besides having been a former Chair of our GIDP, Prof. Walsh is best known in the scientific community as an authority on plant and animal breeding, having written one of the leading textbooks on the subject.

Joseph C. Watkins was named a 2009 Galileo Circle Fellow by the University's College of Science. The Galileo Circle recognizes outstanding accomplishments in academic scholarship; Fellowships therein are some of the highest honors the College of Science bestows on its faculty.

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: Bonnie J. LaFleur (Epidemiology and Biostatistics)

Paul Hsu (Epidemiology and Biostatistics)

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

Colloquia & Forums (C&F) Committee

Chair: Chengcheng Hu (Epidemiology and Biostatistics)

Mende Davis (Medicine)

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

Examinations Committee

Chair: Lingling An (Agricultural and Biosystems Engineering)

Peter L. Chesson (Ecology & Evolutionary Biology)

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

C. New Faculty Recruits in 2007-2008 and in 2008-2009

In Fall 2007 the GIDP welcomed new faculty **Daoqin Tong** (GEOG) and **Katherine Y. (Kathie) Barnes** (LAW). Dr. Tong joined us as an Assistant Professor after completing her Ph.D. at the Ohio State University. Her interests include the modern areas of spatial analysis, geostatistics, and optimization, with applications to the problem of geo-spatial emergency facilities coverage. Dr. Barnes, who served previously on the faculty of the Washington University Law School, joined us as an Associate Professor and as Director of the Rogers Program on Law and Society; her previous accomplishments include serving as a law Clerk for the Honorable Sonia Sotomayor, United States Court of Appeals for the Second Circuit, New York. Dr. Barnes' expertise includes Bayesian statistics, empirical methods in law, and expert witnesses.

In Fall 2008 the GIDP welcomed new faculty **Christopher S. Johnson** (EDP), **Lingling An** (ABE), **Chengcheng Hu** (EPID/Biostat.), and **Scott R. Eliason** (SOC). Dr. Johnson, of the University of Michigan, came to UA's Department of Educational Psychology as an Assistant Professor. He holds degrees in Educational Studies, Applied Statistics, and Mathematics, and specializes in hierarchical regression/multilevel modeling, repeated measures analysis, and item response theory. Dr. An joined UA's Department of Agricultural and Biosystems Engineering as an Assistant Professor, after completing her Ph.D. at Purdue University. Her interests include statistical genetics/genomics, bioinformatics, and computational biology. Dr. Hu came from the Harvard School of Public Health and joined UA's Division of Epidemiology & Biostatistics as an Assistant Professor. He has extensive research experience in both statistical methodology and collaborative clinical studies, and has also served as a Senior Statistician in the Center for Biostatistics in AIDS

Research at Harvard. Dr. Eliason, from the University of Minnesota came to UA's Department of Sociology as an Associate Professor. He specializes in categorical data analysis, correlated data modeling, and causal inference in the social sciences.

In late Fall 2008, the GIDP welcomed new faculty **Bonnie J. LaFleur** (EPID/Biostat.) and **D. Dean Billheimer** (ABE). Dr. LaFleur came from the University of Utah and joined UA's Division of Epidemiology & Biostatistics as an Associate Professor. Her interests include statistical genomics, cancer epidemiology, and exact/permutation testing. Dr. Billheimer, who joins the GIDP in the important post of Director of Statistical Consulting, is Associate Professor of Biometry in UA's Department of Agricultural and Biosystems Engineering. Besides his interests in statistical consulting, he studies quantitative problems in proteomics, measurement and normalization, and compositional data analysis.

3. Graduating Students

A. Ph.D.

none

B. M.S.

none

C. Graduate Certificate

Colin G. Dawson, May 2009

Urooj Khan, May 2009

Hui Xiong, May 2009

4. Active Graduate Students

A. First 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)

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

3. M.S.

none

4. Graduate Certificate

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

Urooj Khan (M.S., Illinois Institute of Technology)

Christopher Kirkpatrick (M.S., University of Arizona)

Hui Xiong (M.S., University of Arizona)

B. Second year

none

C. Third year

none

D. Awards

Graduate student **John Bear** has been awarded the inaugural **First-Year Student Award in Statistics**, by the GIDP. The award recognizes superior academic achievement by a Statistics student completing her/his first year.

5. Graduate Student Assistantships

A. Teaching Assistants

John S. Bear, MATH 564 (Fall 2008)/MATH 566 (Spring 2009)

B. Research Assistants

Wenhai Chen, Model selection for benchmark analysis in quantitative risk assessment (Piegorisch)
Benjamin Pope, STATCOM (An)

C. Other

none

6. Statistics Colloquia

A. Fall 2008

Wednesday, 24 September 2008: A Robust Weighted Kaplan-Meier Approach Using Linear Combinations of Prognostic Covariates

Chiu-Hsieh (Paul) Hsu, Division of Epidemiology & Biostatistics, University of Arizona

12:00 pm, Drachman Hall, Room A120

Sponsor: Biostatistics Seminar & Statistics GIDP

Friday, 3 October 2008: Parameter Estimation in Fractional Levy Ornstein-Uhlenbeck Stochastic Volatility Models

Jaya Bishwal, Department of Mathematics and Statistics, University of North Carolina-Charlotte

3:00 pm, Mathematics Bldg., Room 402

Sponsor: Mathematics Dept. & Statistics GIDP

Monday, 27 October 2008: Translational Benchmark Risk Assessment

Walter W. Piegorisch, GIDP in Statistics, University of Arizona

12:00 pm, Shantz Hall, Room 440

Sponsor: Department of Agricultural & Biosystems Engineering & Statistics GIDP

Wednesday, 29 October 2008: Dynamic Clustering of Time Series Gene Expression
Lingling An, Department of Agricultural & Biosystems Engineering, University of Arizona
12:00 pm, Drachman Hall, Room A120
Sponsor: Biostatistics Seminar & Statistics GIDP

Friday, 31 October 2008: Objective Priors: A Selective Review
Malay Ghosh, Department of Statistics, University of Florida
3:00 pm, Mathematics Bldg., Room 402
Sponsor: Mathematics Dept. & Statistics GIDP

Monday, 17 November 2008: Measuring Progress in Graduate School
Melinda F. Davis, Department of Pediatrics, University of Arizona
12:00 pm, Drachman Hall, Room A120
Sponsor: Statistics GIDP

Thursday, 20 November 2008: Tail Inference for Probability Distribution Functions
Javier Rojo, Department of Statistics, Rice University
2:00 pm, Mathematics Bldg., Room 402
Sponsor: Mathematics Dept. & Statistics GIDP

B. Spring 2009

Thursday, 26 March 2009: Nonlinear Methods For Variable Selection
Peter Hall, Department of Statistics, University of California - Davis and Mathematical Science Institute,
Australian National University
10:00 am, Mathematics Bldg., Room 501 (refreshments at 11:00 am in Room 401)
Sponsor: Mathematics Dept. & Statistics GIDP

Friday, 3 April 2009: Applications of Smoothing Splines to Assessing Antitumor Activity in
Xenograft Models
Maiying Kong, Department of Bioinformatics and Biostatistics, University of Louisville
3:00 pm, Mathematics Bldg., Room 402
Sponsor: Mathematics Dept. & Statistics GIDP