INDIANA UNIVERSITY

University Graduate School 2008-2009 Academic Bulletin

Statistics

College of Arts and Sciences
Bloomington

Chairperson
Professor Stanley Wasserman*

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Departmental URL
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Graduate Faculty

(An asterisk [*] denotes membership in the University Graduate School faculty with the endorsement to direct doctoral dissertations.)

Rudy Professors
Karen Kafadar*, Stanley Wasserman*

Chancellor's Professor
J. Scott Long*

Professors
Steen Andersson*, Lanh Tran*, Michael Trosset*

Assistant Professor
Chunfeng Huang*

Visiting Assistant Professor
Brian Marks

Adjunct Professors
Franklin Acito* (Business), Richard Bradley* (Mathematics), Jerome Busemeyer* (Psychological and Brain Sciences), Victor Goodman* (Emeritus, Mathematics), Andrew Hanson* (Computer Science), John Kruschke* (Psychological and Brain Sciences), Russell Lyons* (Mathematics), Robert Nosofsky* (Psychological and Brain Sciences), Joanne Peng* (Education), Scott Robeson* (Geography), Richard Shiffrin* (Psychological and Brain Sciences), James Townsend* (Psychological and Brain Sciences), Pravin Trivedi* (Economics), Alessandro Vespignani* (Informatics)

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Adjunct Associate Professors
Elizabeth Housworth* (Mathematics), Christopher Raphael* (Informatics)

Adjunct Assistant Professors
Juan Carlos Escanciano* (Economics), David Jacho-Chavez* (Economics), Ken Kelley* (Education), Yoon-Jin Lee* (Economics), Rusty Tchernis* (Economics)

Director of Graduate Studies
Stanley Wasserman*

Ph.D. Minor in Statistical Science

Doctoral students obtaining a Ph.D. in another discipline are welcome to choose Statistics as an outside minor. Five graduate courses in statistics are required, at least three of which must be at the 600-level or above taken from the Department of Statistics. The specific minor courses must be approved by the Director of Graduate Studies of the Department of Statistics.

Degrees Forthcoming

Master of Science in Statistical Science
Master of Science in Applied Statistics
Doctor of Philosophy in Statistical Science

Courses

S620 Introduction to Statistical Theory (3 cr.) P: STAT S320 and MATH M463 (or equivalent courses). Fundamental concepts and principles of data reduction and statistical inference, including the method of maximum likelihood, the method of least squares, and Bayesian inference. Theoretical justification of statistical procedures introduced in S320.

S625 Nonparametric Theory and Data Analysis (3 cr.) P: Two statistics courses at the graduate level, or consent of instructor. Survey of methods for statistical inference that do not rely on parametric probability models. Statistical functionals, bootstrapping, empirical likelihood. Nonparametric density and curve estimation. Rank and permutation tests.

S626 Bayesian Theory and Data Analysis (3 cr.) P: Two statistics courses at the graduate level, or consent of instructor. Introduction to the theory and practice of Bayesian inference. Prior and posterior probability distributions. Data collection, model formulation, computation, model checking, sensitivity analysis.

S631 Applied Linear Models I (3 cr.) P: STAT S320 and MATH M301 or M303 or S303 (or equivalent courses), or consent of

instructor. Part I of a 2-semester sequence on linear models, emphasizing linear regression and the analysis of variance, including topics from the design of experiments and culminating in the general linear model.

S632 Applied Linear Models II (3 cr.) P: STAT S631, or consent of instructor. Part II of a 2-semester sequence on linear models, emphasizing linear regression and the analysis of variance, including topics from the design of experiments and culminating in the general linear model.

S637 Categorical Data Analysis (3 cr.) P: Two statistics courses at the graduate level, or consent of instructor. The analysis of cross classified categorical data. Loglinear models; regression models in which the response variable is binary, ordinal, nominal, or discrete. Logit, probit, multinomial logit models; logistic and Poisson regression. Equivalent to EDUC Y637.

S639 Multilevel Models (3 cr.) P: Two statistics courses at the graduate level, or consent of instructor. Introduction to the general multilevel model with an emphasis on applications. Discussion of hierarchical linear models, and generalizations to nonlinear models. How such models are conceptualized, parameters estimated and interpreted. Model fit via software. Major emphasis throughout the course will be on how to choose an appropriate model and computational techniques. Equivalent to EDUC Y639.

S640 Multivariate Data Analysis (3 cr.) P: Two statistics courses at the graduate level or consent of instructor. Elementary treatment of multivariate normal distributions, classical inferential techniques for multivariate normal data, including Hotelling's T^2 and MANOVA. Discussion of analytic techniques such as principal component analysis, canonical correlation analysis, discriminant analysis, and factor analysis. Equivalent to PSY P654.

S645 Covariance Structure Analysis (3 cr.) P: Two statistics courses at the graduate level, or consent of instructor. Path analysis. Introduction to multivariate multiple regression, confirmatory factor analysis, and latent variables. Structural equation models with and without latent variables. Mean-structure and multi-group analysis. Equivalent to EDUC Y645.

S650 Time Series Analysis (3 cr.) P: Two statistics courses at the graduate level, or consent of instructor. Techniques for analyzing data collected at different points in time. Probability models, forecasting methods, analysis in both time and frequency domains, linear systems, state-space models, intervention analysis, transfer function models and the Kalman filter. Stationary processes, autocorrelations, partial autocorrelations, autoregressive, moving average, and ARMA processes, spectral density of stationary processes, periodograms, estimation of spectral density. Course equivalent to MATH M568.

S655 Longitudinal Data Analysis (3 cr.) P: Two statistics courses at the graduate level, or consent of instructor. Introduction to methods for longitudinal data analysis; repeated measures data. The analysis of change—models for one or more response variables, possibly censored. Association of measurements across time for both continuous and discrete responses. Course is equivalent to EDUC Y655.

S660 Sampling (3 cr.) P: Two statistics courses at the graduate level, or consent of instructor. Design of surveys and analysis of sample survey data. Simple random sampling, ratio and regression estimation, stratified and cluster sampling, complex surveys, nonresponse bias.

S670 Exploratory Data Analysis (3 cr.) P: Two statistics courses at the graduate level, or consent of instructor. Numerical and graphical techniques for summarizing and displaying data. Exploration versus confirmation. Connections with conventional statistical analysis and data mining. Applications to large data sets.

S675 Statistical Learning and High-Dimension Analysis (3 cr.) P: STAT S640, or two statistics courses at the graduate level, or consent of instructor. Dataanalytic methods for exploring the structure of high-dimensional data. Graphical methods, linear and nonlinear dimension reduction techniques, manifold learning. Supervised, semisupervised, and unsupervised learning.

S681 Topics in Applied Statistics (3 cr.) P: Consent of instructor. Careful study of a statistical topic from an applied perspective. May be repeated with different topics.

S682 Topics in Mathematical Statistics (3 cr.) P: Consent of instructor. Careful study of a statistical topic from a theoretical perspective. May be repeated with different topics.

S690 Statistical Consulting (4 cr.) P: Consent of instructor. Development of effective consulting skills, including the conduct of consulting sessions, collaborative problem-solving, using professional resources, and preparing verbal and written reports. Interactions with clients will be coordinated by the Indiana Statistical Consulting Center.

S695 Readings in Statistics (1-3 cr.) P: Consent of instructor. Supervised reading of a topic in statistics. May be repeated with different topics.