Division of Statistics
Graduate Student Handbook
(with focus on the master's program)

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Director of Graduate Studies

Shelley Harold
Office Manager

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Chapter 1

From the Director's Desk

Dear Graduate Student:

Welcome! It is my absolute pleasure and privilege to welcome you to the graduate programs of the Division of Statistics at Northern Illinois University. Whether you have come from near or far, it is the division's goal to mentor you and work with you towards a happy, successful and mutually beneficial experience in our graduate programs. Our graduate program includes a MS program in Applied Probability and Statistics and a PhD program in Mathematical Sciences in the Department of Mathematical Sciences. Since the creation of the Division in 1986, these programs have consistently trained successful statisticians and our alums are pursuing rewarding careers in academia and industries. The Division is diverse, culturally and academically and I hope this diversity will enrich you and prepare you for careers in a diverse work-environment. The faculty and staff of the Division and I are ready to assist you in any way we can.

As you acclimatize to our program, and to your possible roles here as graduate teaching assistants (GTA), please remember this: being well-informed is the key first step. So, please read the rest of this handbook to understand what pitfalls to avoid and good practices to follow. Though the handbook attempts to cover most topics of interest to you, it is not comprehensive in its scope. Sometimes, you will have questions unanswered by the handbook. Please do not hesitate to turn to the faculty, the office staff, even fellow-students, and me for guidance and help.

Last but not least, your feedback on improving this handbook itself is welcome, as the Division wants to provide accurate and continually better information to students. Your comments will be appreciated and could be given orally or by e-mail, to me or to Professor Alan Polansky, the Director of Graduate Studies.

Wishing you a very successful academic year! Hail NIU!

Sanjib Basu
Director
Chapter 2

People in the Division

2.1 Faculty

Dr. Sanjib Basu

Director and Professor
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Dr. Basu is a professor of statistics who earned his PhD from Purdue University in 1991. Dr. Basu works in Bayesian statistical methodology and statistical applications in biomedicine.

Biography and Research:

I am interested in the development of statistical methods and their applications in problems in biomedicine, especially in cancer treatment, and to a lesser extent, in statistical applications in engineering problems. In a recent research paper in the Journal of the American Statistical Association (a premier journal in Statistics), my coauthors and I develop flexible statistical methods for modeling and predicting rates of breast, prostate, colorectal and other cancers. Interestingly, we noticed a strong connection between increase and decrease of smoking rates among males and females and increase and decrease in lung cancer rates among males and females about 10-15 years later. In another research paper (Journal of the Royal Statistical Society, Ser. A, 2010), I, and my collaborator at the National Cancer Institute, investigate whether some of the breast cancer patients can be considered to be cured from cancer with the advances made in cancer treatment.

I collaborate with physicians, nurses and other biomedical researchers at NIU and other universities. In these collaborative projects, we have investigated what genes and proteins, and more importantly, what collection of genes and proteins and what pathways may play important roles in the progression and survival from cancer and whether genetic and epigenetic differences may be able to partially explain the ethnic differences in many cancers. In engineering applications, we looked at time-to-failure of computers and whether it was caused by failure of hard drive or the competing risk of failure of power supply.

I have been at the Division of Statistics since 1996, and I am the current Director of Graduate and Undergraduate Studies – a position I held previously as well (1999-2001, 2005-2008). I mostly work on Bayesian statistics which often requires lots of numerical computations and simulations by Markov chain sampling. I earned my PhD from Purdue University and now I am a professor at NIU, associate editor of some statistics journals and an elected member of the International Statistical Institute. Come and see me if you have any questions about what courses to take or any questions related to your program.
Dr. Nader Ebrahimi

Professor
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Dr. Ebrahimi is a professor of statistics who earned his PhD from Iowa State University in 1980.

Professor Ebrahimi is a leading researcher in the areas of reliability theory and survival analysis, information theoretic statistics and modeling, and statistical applications in engineering and medical sciences.

Collaborating with a group of faculty and NIU graduate-level students, he now is developing statistical methodology relating the probability of survival of a cancer patient to his or her DNA profile. Additionally, the group is developing models for assessing nanosystem reliability.

Dr. Ebrahimi earned his PhD at Iowa State University and joined the NIU faculty in 1982. He is a founding member of NIU’s Division of Statistics and has taught nearly all of its courses.

He also has published over 140 research articles—on average about five per year—with many appearing in top journals. His groundbreaking work is used in numerous fields, including with NIU collaborators. His current research is partially supported by the National Security Agency and earlier research by the National Institutes of Health, U.S. Air Force and the National Science Foundation.

Dr. Ebrahimi is an elected member of the International Statistical Institute and a fellow of the American Statistical Association.
Dr. Lei (Larry) Hua

Assistant Professor
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Dr. Hua is an assistant professor who does research in multivariate non-Gaussian theory and applications. Dr. Hua received his PhD degree in Statistics in 2012 from the University of British Columbia.

Biography and Research:

Dr. Hua obtained a bachelor's degree in finance from the Department of Statistics and Finance at the University of Science and Technology of China (USTC). Upon graduation from USTC in 2002, he worked as an Actuary with Ping An Insurance Company of China. He became an Associate of the Society of Actuaries in 2004. He had worked for four years in the actuarial industry before he chose to pursue a Master's degree in actuarial science from the Department of Mathematics and Statistics at the University of Calgary. From 2008 to 2012, Dr. Hua had been studying in the Department of Statistics at the University of British Columbia, and he obtained a PhD degree in Statistics in 2012.

Dr. Hua joined the Division of Statistics in 2012. His research interests are mainly motivated by applications. His recent research emphasis has been on the tail behavior of multivariate non-Gaussian phenomena and its influence on risk measures. The former incorporates the tail behavior of margins (e.g., tail heaviness and skewness) and the limiting properties of their dependence structures (e.g., tail dependence and asymptotic independence); the latter concerns issues that are meaningful to finance and insurance. In addition to applications in insurance and finance, Dr. Hua is also interested in other quantitative research fields where the statistical theory of multivariate non-Gaussian can be useful. Such research fields include but are not limited to environmetrics and network data analysis.

Some recent papers:


Hua, L. and Joe, H., 2011. Tail order and intermediate tail dependence of multivariate copulas, Journal of Multivariate Analysis 102(10), 1454-1471
Dr. Alan M. Polansky

Director of Graduate and Undergraduate Studies and Associate Professor
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Dr. Polansky is an associate professor of statistics and works with resampling and smoothing methods in nonparametric statistics, often with industrial applications. He earned his PhD from Southern Methodist University in 1995.

Research Statement:

Most of my work has centered around two modern nonparametric methods: the bootstrap and smoothing methods. Nonparametric statistical methods attempt to find valid methods for statistical inference without making many assumptions about the underlying population. The bootstrap is a general methodology, developed by Bradley Efron in 1977, that replaces analytical calculations with computer-based simulations. Smoothing methods seek to replace parametric assumptions like linearity in regression with less restrictive assumptions such as the regression curve being differentiable.

In recent years, I have been developing an alternative approach to statistical problems that are usually solved using multiple comparison techniques. These methods involve a measure of confidence I developed in my 2007 book *Observed Confidence Levels: Theory and Application*, published by CRC/Chapman and Hall. I have devoted much of my recent research to applying this measure of confidence to many common statistical problems like restricted inference and principal components.

Some recent publications:


Dr. Duchwan Ryu

Assistant Professor
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Dr. Ryu is an assistant professor with special interests on Bayesian nonparametric regressions, sequential Monte Carlo methods, and functional data analysis. Dr. Ryu earned his PhD of Statistics from Texas A&M University and joined the Department of Mathematical Sciences at Northern Illinois University in 2014.

Biography and Research:

Dr. Ryu has received PhD in 2005 and has performed statistical research and teaching at several institutes, the Partnerships in Prevention Science Institute (PPSI) at Iowa State University, the Marketing team at JPMorgan Chase Bank (Chase), the Institute of Applied Mathematics and Computational Science (IAMCS) at Texas A&M University, and the Department of Biostatistics and Epidemiology at Georgia Regents University (GRU).

At GRU, Dr. Ryu has collaborated with neuroscientists, genetic researchers, medical people, and other statisticians, and has developed statistical models for micro array data, DNA sequencing data, neuroscience data, and 3D image data, in addition to teaching statistics courses to Biostatistics students.

At IAMCS, he has researched on three major topics, (1) nonparametric regressions with random effect covariates under Bayesian generalized linear model framework; (2) Bayesian modeling and uncertainty quantification in simulation-based predictive science; and (3) particle filtering with dynamically weighted importance sampling. The researches have been collaborated with scientists and engineers from multiple disciplines: physics, nuclear engineering, computer science, geoscience, petroleum engineering, applied mathematics, as well as statistics in projects and personal researches.

Dr. Ryu has also developed financial marketing models at Chase and nonlinear mixed models for cohort study at PPSI.

Some recent papers:


Dr. Chaoxiong (Michelle) Xia

Assistant Professor
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Dr. Xia is an assistant professor of statistics who works in Bayesian methods for model identification issues in medical, health and insurance areas. She completed her PhD from the University of British Columbia in 2013.

Biography and Research:

Michelle holds double bachelor's degrees in probability and statistics, and insurance from Nankai University in China. She earned a master's degree in actuarial science from the University of Calgary in 2005. In August 2013, Michelle completed her PhD degree in statistics from the Department of Statistics at the University of British Columbia, under the supervision of Professor Paul Gustafson. In addition to her academic qualifications, Michelle has over seven years of professional experiences in actuarial science, predictive modeling and biostatistics.

Michelle joined the faculty of Division of Statistics at Northern Illinois University in 2013. Her research interests include epidemiology, comparative effective research, actuarial science and road safety.

Some Recent Publications:


Dr. Haiming Zhou

Assistant Professor
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Dr. Zhou is an assistant professor with research interests on survival analysis, Bayesian nonparametric priors, spatial statistics, causal mediation analysis, frequentist nonparametric methods, measurement error models, and applications in public health. He earned his Ph.D. from the University of South Carolina in 2015.

Biography and Research:

Dr. Zhou received a B.S. in Statistics from the University of Science and Technology of China (2009), an M.S. in Mathematical Sciences from Clemson University (2011), and a Ph.D. in Statistics from the University of South Carolina (2015) under the supervision of Professor Timothy Hanson. He joined the Division of Statistics at Northern Illinois University in 2015.

Dr. Zhou's recent work is mainly focused on Bayesian nonparametric modeling for clustered and/or spatially correlated time-to-event (survival) data. He has created an R package spBayesSurv, publicly available on CRAN, to fit both his proposed and some other traditional models. In addition, he has been working with Professor Xianzheng Huang at the University of South Carolina on an errors-in-variables regression problem. In collaboration with epidemiology researchers, his recent interdisciplinary research has involved conducting longitudinal, survival and causal mediation analyses for public health data. He believes that interdisciplinary collaboration is fundamental for statisticians to make a real impact on science.

Some recent papers:


2.2 Instructors

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2.3 Office Staff

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Chapter 3

The MS Degree in Statistics

3.1 Entry Requirements and Advising

At the time of admission each student is expected to have completed a standard three-course sequence in calculus and a course in elementary linear algebra. Courses equivalent to CSCI 230 and one from STAT 570 and STAT 573, must also have been completed. Any deficiencies should be removed at the beginning of the student’s program. Each student is assigned an academic adviser upon entry to the MS program. Students need to see his/her adviser at least once every semester.

3.2 Degree Requirements

To complete the M.S. program, a student must complete at least 33 semester hours of graduate work, not more than 50 percent of which may be in courses numbered 500-599. At least 15 semester hours must be courses offered by the Department of Mathematical Sciences and numbered 600 or above. Students must follow a program of study approved by the Director of Graduate Studies in the Division of Statistics. See the course requirements listed in section 3.3.

Students in the M.S. program must either pass comprehensive examinations or write and successfully defend a master's thesis. The comprehensive exams consists of two parts, the first covering material from STAT 572 and STAT 672 courses and the second covering material from STAT 574 and STAT 673 courses. Usually, a student pursuing full-time graduate study will be required to take the comprehensive examinations within two academic years of admission to the Graduate School. A student who fails one or both parts may, with the permission of the Division, repeat each part once.

A student in the M.S. program opting to write a master's thesis will do statistical research under the direction of a professor from the Division. A master's thesis typically requires joint research work with the thesis director for at least two regular semesters and often more. Students interested in this option should consult with possible research directors early in the program to allow sufficient time to complete their research. To complete this option a student must write up the research following the format provided by the Graduate School and must successfully defend the thesis during a public presentation before the deadline set by the Graduate School. The defense and the formal approval of the thesis by the Graduate School will count as the student's comprehensive examination. A student writing a master's thesis must register for STAT 699, Master's Thesis. With the consent of the Division, a student may include STAT 699, for 3 semester hours of credit, in the 33 semester hours required for a master's degree. Students should take STAT 699 during any semester that they are actively pursuing their research. Note that once a student registers for STAT 699, the student must continue to enroll in STAT 699 until the completion of degree.
3.3 Course Requirements

The course requirements below are what are expected to be in the 2014-15 Graduate Catalog (subject to approval by the College and the University committees).

All students must complete the following five courses (15 credit hours):

STAT 572 - Introduction to Mathematical Statistics (3 credit hours)
STAT 574 - Statistical Methods and Models II (3 credit hours)
STAT 672 - Theory of Statistics (3 credit hours)
STAT 673 - Linear Models (3 credit hours)
STAT 691 - Statistical Consulting (3 credit hours)

Four of the following (12-13)

STAT 578 - Statistical Methods of Forecasting (3)
STAT 579 - Practice of Bayesian Statistics (3)
STAT 583 – Stochastic Processes I (4)
STAT 665 - Regression Analysis (3)
STAT 666 - Discrete Multivariate Data Analysis (3)
STAT 667 - Reliability and Life Testing (3)
STAT 668 - Methods in Biostatistics (3)
STAT 669 - Methods for Quality Control and Improvement (3)
STAT 674 - Design and Analysis of Experiments (3)
STAT 675 - Multivariate Methods of Statistics (3)
STAT 676 - Distribution-Free Statistics (3)
STAT 677 - Sampling Techniques (3)

Two additional courses as follows (6)

One STAT course numbered above 600 (3)

One STAT course numbered 500 or above, or a graduate level course that has been approved by the Division of Statistics (3).

It is essential that each graduate student meets with his/her adviser before registering for courses for the next semester.
3.4 Course Offering Schedule

- Courses offered every semester (including summer): STAT 208, STAT 301, STAT 350
- Courses offered every fall and spring: STAT 470, STAT 473, STAT 473A, STAT 570, STAT 573, STAT 573A
- Courses offered every fall: STAT 382, STAT 474, STAT 478, STAT 483, STAT 486, STAT 574, STAT 578, STAT 583, STAT 586, STAT 672, STAT 675
- Courses offered every spring: STAT 472, STAT 479, STAT 481, STAT 485, STAT 572, STAT 579, STAT 581, STAT 585, STAT 673, STAT 674, STAT 691
- Courses offered every other fall: STAT 677, STAT 666
- Courses offered every other spring: STAT 668, STAT 669
- Courses offered every other summer: STAT 665, STAT 676
- Courses offered based on demand: STAT 484, STAT 584, STAT 668, STAT 669, STAT 680, STAT 785

Please note that in paired courses like STAT 470/570, graduate students enroll in the 500-level section (400-level courses are generally for undergraduate students.)

3.5 Course Descriptions

570. INTRODUCTION TO PROBABILITY THEORY (3 Credit Hours). Includes probability spaces, random variables, discrete, continuous, mixed probability distributions, moment generating functions, multivariate distributions, conditional probability, conditional expectation, special distributions, laws of large numbers, and central limit theorem. Prerequisites: MATH 232 and STAT 350, or consent of division. Co-requisite: MATH 240 or consent of division.

572. INTRODUCTION TO MATHEMATICAL STATISTICS (3 Credit Hours). Includes distributions of functions of random variables, interval estimation, sufficiency, completeness, point estimation, statistical hypotheses, analysis of variance, and the multivariate normal distribution. Prerequisite: STAT 570 or consent of division.

573. STATISTICAL METHODS AND MODELS I (3 Credit Hours). A first course in statistical methods and models including exploratory data analysis and graphical techniques, regression analysis, experimental design, and basic sampling techniques. Extensive use of statistical computer packages. Prerequisite: MATH 211 and STAT 301, or STAT 350, or consent of division. Co-requisite: STAT 573A.

573A. STATISTICAL COMPUTING PACKAGES (1 Credit Hour). Introduction to statistical computing with the aid of software packages. Data entry, transformations, simple plots,
summary statistics, and statistical procedures. No previous computer experience is required. Pre-
requisites: MATH 211 and STAT 301, or STAT 350, or consent of division. Co-requisite: STAT
573 or consent of division.

574. STATISTICAL METHODS AND MODELS II (3 Credit Hours). Continuation of STAT 573.
Topics include factorial experiments: interactions, nested models, and randomized block designs.
Categorical response data analysis: ordinal data, measures of association, Cochran-Mantel-
Haenszel Test, logistic regression, and measures of agreement. Prerequisite: STAT 573 and
STAT 573A, or consent of division.

578. STATISTICAL METHODS OF FORECASTING (3 Credit Hours). Introduction to forecasting
including use of regression in forecasting; removal and estimation of trend and seasonality;
exponential smoothing; stochastic time series models; stochastic difference equations;
autoregressive, moving average, and mixed models; model identification and estimation;
diagnostic checking; and the use of time series models in forecasting. Prerequisite: STAT 573 or
consent of division.

579. PRACTICE OF BAYESIAN STATISTICS (3 Credit Hours). Introduction to Bayesian data
analysis and applications with appropriate software. Topics include Bayes Theorem, discrete and
continuous single parameter models, comparison of Bayesian and non-Bayesian inference,
multiparameter and hierarchical models, Bayesian computation including Markov chain
simulation, mixture models, Bayesian sample-size determination and applications to modeling
data from a wide variety of areas in business, engineering, and science. Prerequisite: STAT 350
and STAT 573, or consent of division.

581. PROBABILISTIC FOUNDATIONS OF ACTUARIAL SCIENCE (3 Credit Hours). Actuarial
populations. Univariate parametric actuarial distributions including Weibull and Pareto.
Multivariate actuarial distributions. Exact and asymptotic relationships among these distributions.
Mixtures of distributions. Jointly discrete, continuous, and mixed distributions. Moment,
cumulant, and probability generating functions. Transformations of variables, and in-depth study
of conditioning, for multivariate distributions. Basic theory of individual and collective risk
models for aggregate loss from insurance policies. Prerequisite: STAT 570 or consent of division.

583. STOCHASTIC PROCESSES I (4). Review of probabilistic tools including conditioning for joint
Homogeneous, and non-homogeneous, Poisson and compound Poisson processes. Thinning
and summing of independent Poisson processes. Brownian motion processes. Introduction to
the SDE and Ito’s lemma. Prerequisite: STAT 570 or consent of division.

584. FINANCIAL DERIVATIVES FOR ACTUARIES (3). Review of financial derivatives
including futures, European and American options, Exotic options. Greeks, trading and hedging
strategies. Pricing derivative security with appropriate boundary conditions, including Black-
Scholes formula, binomial trees, lattice models and finite difference methods. Simulation and
variance reduction techniques. Interest rate models. This course will cover all the learning
outcomes regarding financial models of the exam MFE of the Society of Actuaries (SOA), which is also the Exam 3F of the Casualty Actuarial Society (CAS). Prerequisite: STAT 583 or consent of division.

585. LIFE CONTINGENCIES AND PAYMENT MODELS I (3 Credit Hours). Survival-time distributions and their curtate versions, for one or two lives, possibly dependent, truncated, or censored. Mortality tables, aggregate, select and ultimate, and their use in modeling continuous life-time data. Present-value-of-benefit distributions for life insurances and annuities in the single and multiple-decrement models. Prerequisite: STAT 382 and STAT 570, or consent of division.


591. PROGRAMMING AND COMPUTING IN STATISTICS (3 Credit Hours). A study of algorithms useful for implementing computer intensive techniques in statistical inference and probability. Topics include computation of maximum likelihood estimators, bootstrap approximation, randomization and permutation testing techniques, Bayesian techniques, approximation of distribution functions and quantiles, simulation of random variables and stochastic processes. Implementation of the algorithms is achieved using the C++ (or C or FORTRAN) and R programming languages, as well as other specialized statistical computation software. Prerequisite: STAT 572 and either CSCI 230 or CSCI 240, or consent of division.

665. REGRESSION ANALYSIS (3 credit hours). Simple and multiple linear regression, estimation, confidence intervals and tests, and prediction. Diagnostic methods using residuals, transformations, outliers, and influence analysis. Polynomial regression, stepwise variable selection, and collinearity. Prerequisite: STAT 574 or consent of division.

666. DISCRETE MULTIVARIATE DATA ANALYSIS (3 credit hours). A first course in the analysis of discrete data including two-dimensional tables, the log linear model, goodness-of-fit of the model, measures of dependence, three and higher dimensional tables, hierarchical models, model selection, ordered categories, logit model, zero frequency problem, and introduction to Bayesian analysis of categorical data. PRQ: STAT 572 and STAT 574, or consent of division.

667. RELIABILITY AND LIFE TESTING (3 credit hours). Survival function, failure rate, types of censored data, estimation for parametric models, accelerated life tests, competing risks, and Bayesian analysis of survival data. Prerequisite: STAT 572 and STAT 574, or consent of division.

668. METHODS IN BIOSTATISTICS (3 credit hours). Survival function, failure rate, types of censored data, life tables, regression models for lifetime data, bioassay, direct assay, indirect
669. METHODS FOR QUALITY CONTROL AND IMPROVEMENT (3 credit hours). Control charts for attributes and variables, special control charts, process control techniques, acceptance sampling, process capability, Taguchi's approach to improving quality of a product, and the philosophy of Deming. Prerequisite: STAT 572 and STAT 574, or consent of division.


672. THEORY OF STATISTICS (3 credit hours). Exponential class, elements of decision theory, unbiased estimation, shrinkage estimators, methods for estimating standard errors, multiparameter estimation, generalized likelihood ratio tests, sequential probability ratio test, and linear models. Prerequisite: STAT 572 or consent of division.

673. LINEAR MODELS (3 credit hours). Theory of linear models with applications to the analysis of variance and regression and to the design of experiments. Prerequisite: STAT 572 and STAT 574, or consent of division.

674. DESIGN AND ANALYSIS OF EXPERIMENTS (3 credit hours). Intermediate course in the design and analysis of experiments including linear models of less than full rank, distributions of quadratic forms, estimable functions; confounding, fractional replication; incomplete block, hierarchical, Latin square, cross-over, split plot, repeated measures and related designs, response surface methods, covariance analysis. Prerequisite: STAT 572 and STAT 574, or consent of division.

675. MULTIVARIATE METHODS OF STATISTICS (3 credit hours). Introduction to the techniques of multivariate analysis including description of multivariate data, reducing the dimension, principal components, factor analysis, estimation and testing for the parameters in multivariate populations, and multivariate analysis of variance. Problems which involve the use of computers will be treated. Prerequisite: STAT 572 or STAT 574, or consent of division.

676. DISTRIBUTION-FREE STATISTICS (3 credit hours). Survey of nonparametric statistical techniques and their logical foundations including the distributions of order statistics and ranks, tests of hypotheses, confidence intervals and Hodges-Lehmann estimators for one-sample, two-
sample, and paired sample location problems, the two-sample dispersion problem, analysis of one-way and two-way layouts, tests of independence, goodness-of-fit tests, linear rank statistics, and U-statistics. Prerequisite: STAT 572 or STAT 574, or consent of division.

677. SAMPLING TECHNIQUES (3 credit hours). Introduction to sample survey techniques and sampling theory including estimation of population parameters based on simple random sampling, cluster sampling, stratified sampling, and ratio sampling. Includes a summary of recent advances in sampling theory and discussions of practical problems and sources of error in surveys. Prerequisite: STAT 572 or STAT 574, or consent of division.

678. TIME SERIES ANALYSIS (3 credit hours). Models for analysis of time series data including mean and covariance functions of stationary time series, moving average, autoregressive and mixed models, identification and estimation in ARMA (p,q) models, asymptotic properties of estimators, periodogram and spectral analysis, and regression with time series error. Prerequisite: STAT 572 and STAT 574, or consent of division.

679. ADVANCED STATISTICAL METHODS (3 credit hours). Various topics discussed from the perspective of modeling and analyzing data. Emphasis on application of statistical methodology. Data analytic techniques illustrated with several types of data including categorical data, multivariate data, survival data, linear and nonlinear regression data, time series data, and data from designed experiments. Extensive use of modern statistical software. Prerequisite: STAT 572 and STAT 574, or consent of division. Recommended: MATH 662.

680. BAYESIAN STATISTICS (3 credit hours). Topics include Bayesian inference, Loss function and Risk, One parameter models and posterior inference, conjugate priors, non-informative priors, Multi parameter models, Bayesian computation, Gibbs sampling and Markov Chain Monte Carlo Methods and Applications in different areas. Additional topics may include Decision theory, Theoretical and convergence properties of the Markov chain samplers, Bayesian model checking, selection and assessment criteria, Hierarchical models, Bayesian survival analysis. Prerequisite: STAT 572 and STAT 579, or consent of division.

691. STATISTICAL CONSULTING (3 credit hours). Content varies; topics may include techniques for problem formulation; identification of parameters and solutions; client-consultant interaction techniques; ill-posed problems and their formulation; management of consulting time, facilities, and personnel. Participation under supervision in actual consulting projects. PRQ: STAT 574 or consent of division. CRQ: STAT 572.

693. GRADUATE READING IN PROBABILITY AND STATISTICS (1-9 credit hours). May be repeated to a maximum of 9 semester hours. Prerequisite: Consent of division.

699. MASTERS THESIS (1-6 credit hours). May be repeated to a maximum of 6 semester hours. Prerequisite: Consent of division.
TOPICS IN STATISTICS (3 credit hours). Content varies; may include courses in linear models, estimation, hypothesis testing, decision theory, and Bayesian inference. May be repeated to a maximum of 15 semester hours. Prerequisite: Consent of division.

Asymptotic Theory of Statistics (3 credit hours) Review of modes of convergence of random variables, weak convergence, weak and strong laws of large numbers, and central limit theorems. Law of the iterated logarithm. Convergence of moments and uniform integrability. Asymptotic expansions including Edgeworth and Cornish-Fisher expansions. Saddlepoint approximations. Asymptotic expansions for random variables and stochastic order notation. The delta method. Applications to problems in statistical inference that may include nonparametric statistics, the bootstrap, density estimation, nonparametric regression and Bayesian statistics. Prerequisite: STAT 670 or consent of division.

SEMINAR IN STATISTICS (1-9 credit hours). Discussions on topics in advanced probability and statistics as scheduled. Topics include but are not limited to probability theory, stochastic processes, statistical inference, nonparametric statistics, multivariate analysis, linear and nonlinear models, discrete data analysis, time series. One to 9 semester hours as scheduled. May be repeated to a maximum of 24 semester hours, not more than 15 of which may be on a single topic. Prerequisite: Consent of division.
Chapter 4

Computing

4.1 Wireless Connections

A wireless connection is available in DuSable.

Please follow the directions at http://securenet.niu.edu/index.shtml to set up your computer.

The use of computing technology is an integral part of your graduate education. Not only will you learn to use several types of statistical computing software, but you will also be expected to write professional project reports in many courses and keep an electronic grade book for all classes you are assigned to assist.

4.2 Computing Facilities

As a graduate student of the Division of Statistics, you have several options for computing in the Division and across campus.

- The university provides computing laboratories across campus. Visit the ITS web site for lab locations and hours: http://www.its.niu.edu/its.asp2/lab_stats/labhours.aspx. The most conveniently located lab is Wirtz 332. All students pay fees that allow use of the computers and printers in these labs.

  — There are Microsoft Windows based personal computers and a black and white printer located in DU 359B. These machines are intended for the use by the faculty and qualified graduate students in the Division.

  — These machines are intended for use on work related to GA assignments to Statistical Consulting Services and/or to those who can show evidence as to why work cannot be completed elsewhere. These computers are not for personal use.

  — This room is near many faculty members’ and instructors’ offices. Hence, a quiet atmosphere is required in this room.

  — No food or drink is allowed in this room.

  — If you print something on the printer in this room, please remember to pick it up. Do not leave it in the printer tray or it will be recycled.

  — Do not leave your personal items or trash behind.

  — If you are the last person to leave this room after 4:30 pm, you are responsible for closing and locking the door.
4.3 E-mail

4.3.1 Email for Students (not GAs)

If you are a GA, please skip this section and go to section 4.3.2.

Each NIU Graduate Student has been assigned a Z-ID with a password that must change 365 calendar days; you will not be able to reuse an old password.

Go to https://directory.niu.edu:8443/IDMProv/portal/cn/GuestContainerPage/People%20Search to look up your Z-ID. The Z-ID and password are related to your student status and are used to access the following information:

- MyNIU
- Blackboard
- ITS Labs
- Student email (http://webmail.students.niu.edu)

Assign an alias that will be displayed in the NIU Directory (https://directory.niu.edu:8443/IDMProv/portal/cn/GuestContainerPage/People%20Search). This is a separate alias from your A-ID (example@niu.edu). This is a convenient address to pass out to people because it is easy to remember.

NOTE: If you do not have a student e-mail alias in the NIU directory, it is because your status is listed as AC (Accepted) and not EN (Enrolled). Once you have done everything you need to do to have permission to enroll in classes your status will change to EN and your alias will become visible in the directory.

- Go to www.niu.edu.
  Click the “Directory” link in the upper right-hand corner.
  Enter your name in the search box and click on the Search button.

- This email may be read at the address above or, if you prefer, forwarded to another email account (like your Z-ID email, or even Yahoo, Google, etc.)

- When forwarding email from your student mail account to other email addresses, periodically, manually delete the mail in your inbox and trash bins or risk being scolded by ITS.

  If you request coverage under FERPA for “Do Not Release Data" your student Z-ID will not be published.
4.3.2 Email for Graduate Assistants

Each NIU Graduate Student has been assigned a Z-ID with a password that must change 365 calendar days; you will not be able to reuse an old password.

Go to https://directory.niu.edu:8443/IDMProv/portal/cn/GuestContainerPage/People%20Search to look up your Z-ID. The Z-ID and password are related to your student status and are used to access the following information:

- MyNIU
- Blackboard
- ITS Labs
- Graduate Assistant Mail (http://o365.niu.edu/doit/office365/)

- Assigned an alias that will be displayed in the NIU Directory (https://directory.niu.edu:8443/IDMProv/portal/cn/GuestContainerPage/People%20Search). This is a separate alias from you’re A-ID (example@niu.edu). This is a convenient address to pass out to people because it is easy to remember.

NOTE: If you do not have a student e-mail alias in the NIU directory, it is because your status is listed as AC (Accepted) and not EN (Enrolled). Once you have done everything you need to do to have permission to enroll in classes your status will change to EN and your alias will become visible in the directory.

- Go to www.niu.edu.
  Click the “Directory” link in the upper right-hand corner.
  Enter your name in the search box and click on the [Search] button.

- This email may be read at the address above or, if you prefer, forwarded to another email account (like your Z-ID email, or even Yahoo, Google, etc.)

- When forwarding email from your student mail account to other email addresses, periodically, manually delete the mail in your inbox and trash bins or risk being scolded by ITS.

- If you request coverage under FERPA for “Do Not Release Data” your student Z-ID will not be published. However, FERPA does not apply to your staff e-mail alias and it will be listed in the directory.

a. A-ID – related to your employee status

- A-ID is used to access the following EMPLOYEE information (all A-ID passwords are synced)
  - MyNIU
- Blackboard
- ITS Labs

- **POP or IMAP** –
  - If you currently use another Email Client, examples are Thunderbird, Macmail etc., you will need to setup the new O365 Incoming and Outgoing SMTP Servers. This information can be found at
  - [https://support.office.com/en-ie/article/Set-up-email-on-Apple-iPhone-iPad-and-iPod-Touch-b2de2161-cc1d-49ef-9ef9-81acd1c8e234#toc354585561](https://support.office.com/en-ie/article/Set-up-email-on-Apple-iPhone-iPad-and-iPod-Touch-b2de2161-cc1d-49ef-9ef9-81acd1c8e234#toc354585561)

  - **Forwarding Rules** –
  - If you currently forward your email to another email account, examples are Gmail, Yahoo, or Hotmail, you will need to setup your Forward Rules in O365. You may choose to forward your A-ID or Z-ID mail elsewhere, however, IT IS YOUR RESPONSIBILITY TO MAKE ABSOLUTELY SURE that we are able to contact you via you’re A-ID address.

**Initial password used the first time login with you’re A-ID**

- NIU.YYYYMmmDD

- Example: NIU.1956Feb29 or NIU.1991Jun05

- [http://www.niu.edu/doit/accounts/password_help.shtml](http://www.niu.edu/doit/accounts/password_help.shtml)
Chapter 5

Working for the Division

Many students in our MS program also work for the Division of Statistics as a graduate assistant (GA). If you have been hired as a GA you will receive a tuition waiver along with a semimonthly stipend. The amount of your stipend may depend on your experience and the number of hours you have been hired to work. A fulltime GA is expected to work 20 hours per week for the Division, while a half-time assistant is expected to work ten hours per week.

If you are a GA, you have two competing and, at the same time, supporting roles; being a graduate student and being a GA. Your primary focus during your time here at NIU will be on your education and obtaining your degree. Topics related to your graduate student role were discussed in earlier chapters.

Typically, a GA is a teaching assistant, a grader, or a research assistant. As a GA you are a university employee and have strong responsibilities that come with your position. When you sign the GA contract, you agree to abide by the rules of the university as well as fulfill the responsibilities associated with your GA position. If you fail to comply with the rules or fulfill the responsibilities, your assistantship may be terminated.

Graduate assistants must remember that they are also NIU employees and, hence, must understand their rights and responsibilities. The Division of Statistics takes your employment here very seriously. You are expected to take your assigned work here very seriously as well, and your work for the Division should be completed in a competent and timely manner. Please note, that this may help you in your search for employment and, perhaps, further education when you leave NIU. Instructors for whom you have worked may be able to provide you with valuable recommendations that highlight your abilities in the work you performed for them. There are several types of employment which you may obtain from the Division:

- **GTA assigned to teach recitations** – mainly teach recitation classes for our lower-level undergraduate statistics courses but are also required to do some grading and proctoring.

- **GTA assigned to grade** – mainly grade homework papers from our undergraduate courses and help proctor exams.

- **Graduate Research Assistant (GRA)** – hired to support our Statistical Consulting Services by meeting with clients, running statistical analyses, and writing reports. These GRAs work closely with the Director of Statistical Consulting Services, currently Dr. Xia.

When you are hired as a GA, the Director of the Division – in consultation with the Director of Graduate Studies and the Director of the Statistical Consulting Services, will assess the needs of the Division and your experience to help find the best position for you within the Division.
When hired as a GA, you will be issued a key to your office by the Department of Mathematical Sciences. Should you lose said key(s), you will be charged $150 per key for the issuance of a replacement.

All GAs working at NIU are eligible to receive a 10% discount at the University Bookstore in the Holmes Student Center. Please keep your copy of your offer letter handy so that you will be able to prove you GA-status should you decide to take advantage of this benefit.

5.1 Graduate Teaching Assistant

A GTA is a graduate student who is hired by the Division to provide direct instructional-assistance to students enrolled in statistics courses. The Division of Statistics has three service-courses that provide assistance to the university community: STAT 208, STAT 301 and STAT 350.

- **STAT 208 (Basic Statistics)** is a basic statistics course that functions both as a general education requirement for our undergraduate students and as an introduction to the field of statistics for many majors across the university. As a general education course, there are no prerequisites for this course and the mathematical ability of the students in this class varies greatly.

- **STAT 301 (Elementary Statistics)** is also a rudimentary statistics course, but STAT 301 concentrates more on real-world applications. This course is integrated to use the Excel software package from Microsoft. The mathematical-level of STAT 301 is slightly higher than that of STAT 208.

- **STAT 350 (Introduction to Probability and Statistics)** is a calculus-based introduction to probability, probability distributions and statistical inference. A GTA in STAT 350 typically grades homework and quizzes.

As a GTA for STAT 208 or STAT 301, you will have several general duties.

1. You will provide direct-instruction to the students registered in these courses through a weekly recitation class.

2. You will have weekly office hours where you will provide one-on-one assistance to the students.

3. You will grade homework and quizzes.

The recitation classes are designed to provide additional instruction and assistance to the students in the class by meeting as a smaller group in order to enable more individualized instruction. For STAT 208 recitation classes, GTAs typically solve assigned homework problems, answer questions about examples and other material covered in the main lecture, and administer weekly quizzes. STAT 301 recitations are similar, except that GTAs in STAT 301 are also required to provide instructional assistance for using Microsoft Excel. It is very important that you are well prepared for these recitation sessions.

- If this is the first time you have been assigned to be a GTA for a course, *you are required to attend every lecture for that section of the course each week*. If you are unable to attend your instructor’s lecture,
due to a time conflict with your course schedule, you must inform your instructor so that accommodations can be made for you to attend another instructor’s lecture.

- You should meet with your instructor at least once every week. This is required so that the instructor can provide you with information on the material that is to be covered each week in recitation. This information may include what homework problems have been assigned and what examples and other parts of the lecture the instructor noticed the students having trouble. You will also need to provide your instructor with a copy of the key for the quiz.

- In advance (before each recitation), you should solve and write out all homework problems that are to be worked in recitation. You should be ready to provide your instructor with these solutions. You may, in some cases, be given a solutions manual for the course. You are not allowed to take the solutions manual with you to recitation. Please also be aware that solutions manuals often contain typographical errors.

- If you are giving a quiz in recitation, you should produce a key to the quiz before the quiz is given. This key should be checked by your instructor or another GTA assigned to the same class.

During recitation, you are required to go over the assigned homework problems for the week and answer any questions from the students. As a GTA, you should attempt to insure that all of the students have a good understanding of the material covered during the recitation. You are also required to administer quizzes during the recitation as directed to by your instructor. It is your responsibility to insure the academic integrity of the quizzes. Instances of academic dishonesty should be immediately reported to your instructor. You may also be required to return exams during your recitation. It is important that you carefully go over the solutions to the exam and answer any questions posed by the students. As with homework assignments, you should have a complete set of your own solutions to the exam before your recitation.

After recitation, you should carefully grade the quizzes and any homework as directed by your instructor. Usually, you will be responsible for keeping an electronic grade book of these scores for your instructor. This is often done in Microsoft Excel and/or on-line using the Blackboard system. It is required that all grades will be posted on Blackboard, under no circumstance are grades e-mailed to anyone. You should work very closely with your instructor to insure that you are entering the grades in the preferred format of your instructor, which the instructor should specify – if they do not specify, you should ask to avoid problems at a later point. Each week, you should print out a complete copy of the grade book – give one copy to your instructor, and keep one for yourself in a safe place. At the end of the semester, you will be required to provide the instructor with quiz and homework averages computed according to the rules outlined in the syllabus. Please keep in mind that grades are confidential and there have been legal cases for breaking this confidentiality. Electronic or printed copies of your grade book must not be left out where others may access them. You must logoff from Blackboard before leaving a public computer and make sure you have collected any electronic media that may have grade information.
You are also expected to keep regular office hours. Fulltime GTAs are required to hold four office hours per week (two in your office plus two in the Statistics Assistance Center (SAC) – see below for information about the SAC). Part-time GTAs (10 hours per week) are required to hold two office hours per week in the SAC.

<table>
<thead>
<tr>
<th>Appointment</th>
<th>GA Office</th>
<th>SAC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fulltime (20 hours)</td>
<td>1 hours</td>
<td>3 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>Part-time (10 hours)</td>
<td>1 hour</td>
<td>1 hour</td>
<td>2 hours</td>
</tr>
</tbody>
</table>

Your office hours should not conflict with the scheduled lecture time or recitation time for the students in your section. During office hours, you are to be available in the scheduled location (your office or the SAC) for consultation. You are to be prepared to answer questions pertaining to the current homework assignment, past homework assignments, exams, and the lectures from that week. You are to have your grade book handy in case students have questions about their progress in the course. Attendance at your office hours is a very important part of your assistantship. In case of an emergency, if you are unable to attend your office hours for some reason, you must find a suitable substitute and inform the statistics office of the substitution.

The Division of Statistics also participates with the Department of Mathematical Sciences in running a tutoring center, called the Statistics Assistance Center (SAC). The SAC is a resource available to all students in STAT 208, STAT 301 and STAT 350. While in the SAC, you should be prepared to answer questions about homework and exams for students registered in any section of the course(s) to which you are assigned. If you are unable to attend your SAC hours because of an emergency, you must find a suitable substitute and inform the statistics office.

As a GTA, you may also be asked to help proctor exams for your instructor or other instructors. Before such a proctoring assignment, you should meet with the instructor to ascertain what time to arrive at exam location. During the exam you may be asked to help hand out the exams, take completed exams from students, and watch over the students as they turn in their exams. You should expect to remain at the exam room the entire time unless otherwise instructed. You may also answer student questions during the exam. Under no circumstances should you provide help to a student on the exam beyond clarifying the meaning of the problem or correcting typographical errors. If you feel you cannot answer the student's question, please refer them to the instructor of the class. Once again, it is your responsibility to help insure the academic integrity of the exams.

Your performance as a GTA will be evaluated throughout the semester by your assigned instructor. Expect your instructor to visit your recitation class early in the semester to evaluate your teaching methods. After this visit, your instructor will meet with you personally and discuss any issues he/she may have with your classroom performance. Please note that these meetings are designed to help you become an effective GTA. If there are any problems your instructor may visit your recitation class later in
the semester to evaluate any changes you have implemented. A GTA with consistently poor performance and no sustained improvement may be terminated from their graduate assistantship employment.

As a teaching assistant, your first and immediate point of contact is your instructor. **When in doubt, contact your instructor instead of making a quick decision yourself.**

5.2 Policy on Managing Emergencies

You must comply with the rules and responsibilities of your teaching assistant position. **THERE SIMPLY CANNOT BE A NO-SHOW IN A RECITATION.** Being proactive is the best way to cope with emergencies. At the beginning of each semester, choose one other GTA as your substitute with the approval of the professor you are assisting. **In case of an emergency,** you must immediately inform the following people in the order indicated below:

1. The GTA who will substitute for you
2. Your assigned instructor
3. The Division of Statistics office  
   Phone: 815-753-3806 or 815-753-6714
4. The Director of Graduate Studies (currently Dr. Polansky)

Only a documented medical condition or a documented emergency that prevents you from teaching can be a viable reason for not showing up in a recitation; a substitute **MUST** cover your recitation. In such a case, you must inform your instructor and the statistics office **IMMEDIATELY.** You will also have to provide **supporting documentation for the medical condition or the emergency.**

It is not acceptable to have your recitations covered for such reasons as upcoming exams or pending projects in your own courses. **In case of dire “non-emergency” needs, consult with your instructor.**

In summary, violation of any of the following may be considered a violation of your contract and may result in **immediate** termination of your contract:

1. A no-show in a recitation. In case of emergencies, the policy stated above must be followed.
2. Not strictly maintaining the privacy of students’ grades.
3. Not attending your office or SAC hours or, when appropriate, finding a suitable substitute.
4. Not keeping your instructor, the Director of Graduate Studies and/or the office staff informed of the matters discussed in this section.

**Missed Work:** Please note that there is no leave benefit for GTAs, who are expected to work from week one to the end of the finals week, as directed. You may apply for permission to miss work at the start or
end of a semester due to travel related restrictions, especially when visiting a country outside the US. The Graduate Assistant Request for Authorization to Travel and/or Absence from Regular Duties form may be found on the Division’s web site (http://www.niu.edu/stat/forms/GAtravelform.pdf): As there is no guarantee that such requests are approved; please apply BEFORE making travel arrangements, such as purchasing tickets.

5.3 Grading

An important aspect of your job as a GTA in the Division of Statistics is the evaluation of student work. As a GTA you may be asked to grade in-class quizzes and weekly homework assignments for students in many of our undergraduate courses. It is important that the integrity of this process is maintained to the highest possible standard. In particular, you must assure that your grading is both accurate and consistent.

To insure the accuracy of your grading:

- Solve all of the homework problems on your own – prior to looking at the solutions manual. This will help insure that you completely understand the solution and will also make you aware of the possible pitfalls that students may encounter when solving the problems on their own.
- Be aware that there are often typographical errors in the solutions manual. If you get an answer that differs from the solutions manual, see your assigned instructor so that they can help you determine which solution is correct.
- If a student gives an alternate solution, follow their arguments through to see if it is valid. If you are unsure about the validity of the argument, see your assigned instructor.

Consistency in grading is also important. You will want to take all possible steps to insure that the assignment of partial credit follows a consistent pattern throughout all of the papers that you grade. To help insure consistency in you grading:

- Grade your homework assignments problem by problem and not paper by paper. That is, grade the first problem for all of the papers, then proceed to the second problem. Continue in this fashion until you finish all the questions.
- On a separate paper, write out the common mistakes you encounter in the solutions along with the partial credit that you assigned for each problem.
- After you have finished grading each problem, take a final look through all of the papers to insure that the grading was consistent.

For specific instructions about grading homework, such as the number of points each assignment is worth and how the grades should be entered, please see your instructor. In general, your instructor will want you to keep an electronic version of the grades using Microsoft Excel, Blackboard, etc. In either case, your instructor will give you specific instructions on how these grades should be entered. After the
grades are entered from each assignment, you should print out a paper copy of the grades and keep them in a safe place. Do not change grades that have already been entered in your grade book unless you notify your instructor first with an explanation of why the grade is being changed.

5.4 Statistical Consulting Services

Some students may be invited to work for the Statistical Consulting Services (SCS) as part of his or her assistantship. If you are selected for this position, you will meet with clients, perform statistical analyses and write statistical consulting reports under the direction of the Director of SCS. You must follow the director’s instructions carefully and perform your work in a professional manner.

5.5 Working with the Office Staff

Assistance is available for duplicating required for your assigned courses. The Division of Statistics has two permanent staff members and a part-time student worker. While these staff members are here to provide you with help for your teaching duties, please treat the staff with the utmost respect. Do not expect that the office staff will be able to drop what they are doing in order to make copies or scan for you – you must plan in advance. Please be considerate, lack of planning on your part does not constitute an emergency for the office staff!
Attestation for Graduate Assistants

As a graduate assistant in the Division of Statistics, I agree to comply with the policies and responsibilities described in chapter 5 of this handbook

Name: ____________________________ (please print)

Signature: ____________________________

Date: ____________________________

Please print, sign and return this page to DU366