



The Y-Distribution

Brigham Young University

Department of Statistics

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FROM THE CHAIR DR. H. DENNIS TOLLEY



This has been a productive yet challenging year. We hired three new faculty members who began work this last year: Garrett Page, Brian Hartman and Robert Richardson. They have added significantly to our faculty climate. Brad Barney has accepted a visiting position here in our faculty beginning Fall 2016. We're excited for what he will add to our faculty. All our faculty members are involved in teaching and research, which made this last year a productive one. The challenge we encountered was the increase in the number of majors.

Last year at this time we had 318 majors. We currently have 444 majors. Compare these numbers with six years ago when we had 186 majors. This increase in majors has required us to offer more sections of each of our major's courses, which required us to leverage our resources more efficiently.

I also wish to express gratitude to our faculty, staff, and students for making this a successful year and for shouldering heavier loads to meet our growth based needs. Below are a few of the projects our faculty members have been busy with this year.

Dr. Candace Berrett continues to work on her grants and research related to spatial and environmental statistics, with projects ranging from environmental signal processing to foreign aid analysis to accounting for spatial uncertainty in infant bronchiolitis rates. She has several collaborations across campus including Drs. Christensen, Heaton, Reese, and Tass (Statistics), Dr. Chantel Sloan (Health Science), Dr. Gus Williams (Civil Engineering), and Professors Kif Augustine Adams and Jim Rasband (Law), as well as several other collaborators across the nation. She is also involved in national and international statistics organizations and served as a conference organizer for this year's ENVR/EnviBayes Workshop on Bayesian Environmetrics.

Dr. Natalie Blades is currently on sabbatical studying algorithms for Approximate Bayesian Computation with Professor Christian Robert at Université Paris-Dauphine. In her spare time Dr. Blades is studying couture embroidery and French butter.

Dr. William Christensen continues to work on problems related to environmental statistics with projects related to climate change, environmental assessment, and statistical models for correlated data. Along with Shane Reese and colleagues at the University of Utah, William is beginning a 3-year NASA-funded project to develop a comprehensive statistical model for assessing trends in snow and ice accumulation in Antarctica. William is being inducted as an ASA Fellow at the Joint Statistical Meetings in August 2016 and is looking forward to a 1-semester sabbatical during Fall 2016 in the Department of Biostatistics at Columbia University.

Dr. David Dahl is researching flexible Bayesian models in which priors facilitate the sharing of information whose covariates are similar. He is also working on a few projects in statistical computing. He continues to apply his methodology research to protein structure prediction. Several students, in various stages, are working with Dr. Dahl on this research.

Dr. Dennis Eggett has been quite busy this year with the Consulting Center and projects involved therein. He's been working with the IACUC committee on campus. In addition, Dr. Eggett has increased his teaching load in SAS programming classes.

Dr. David Engler completed his sabbatical at Wake Forest University and continues his work in modeling of financial derivatives based on weather extremes. He is also working with Brian Hartman on regime switching models for clustered financial assets. This next year, Dr. Engler will be working with the Computer Science Department to jointly teach a new senior capstone course in the analysis of big data.

Dr. Gilbert Fellingham continues to work in sports analytics. This past year he began modeling player and position importance for the BYU football team. He continues to work with a number of teams, including men's and women's basketball, volleyball, soccer, and tennis. He also works closely with the strength and condition coaches in developing a data base to track various dimensions of an athlete's strength and the impact that it has on performance. He continues to work in non-parametric Bayesian methods, particularly as applied to performance curves.

Dr. Scott Grimshaw collaborated with alum Willis Jensen (MS 2001) on a paper in the Journal of Quality Technology on nonlinear profile monitoring using a big data application where a key measurement of a manufacturing process is collected at high frequency. He also published a paper in The American Statistician advocating the infusion of

DEPARTMENT OF STATISTICS FRIENDS AND ALUMNI OPEN HOUSE BREAKFAST 2016



If you are attending the JSM 2016 in Chicago, Illinois, please meet us at our annual Brigham Young University Friends and Alumni Open House Breakfast. We look forward to seeing you there!

Date: Tuesday, August 2, 2016

Time: 7:00 AM

Location: Hilton Chicago Hotel, 720 South Michigan Ave, Chicago, IL 60605
Room Name: Boulevard A

"authentic data experiences" within courses to allow students the opportunity to demonstrate connections between data skills and statistical skills.

Dr. Brian Hartman serves as the director of our Actuarial Program. He continues to develop novel (and often Bayesian) statistical methodology for insurance and risk. He recently published papers in long-term care insurance pricing, property/casualty reserving, and the prediction of storm damage to overhead power lines. He spoke at the SOA Annual Meeting on health insurance predictive modeling to an audience of 300 in the room and another 700 attending the session virtually.

Dr. Matthew Heaton is working on applying spatial methodology to applications in traffic safety, disease, agriculture, remote sensing, and forestry. He is collaborating with researchers from the Departments of Health Science, Plant and Wildlife Science, Geography and Civil Engineering. His research, along with student support, is currently funded by the National Institute of Environmental Health Science, the National Science Foundation and the Federal Highway Administration.

Dr. John Lawson continues to work on research projects using experimental designs. He has just completed a new book with co-author John Erjavec titled Basic Experimental Strategies for Science and Engineering. It will be published later this summer by CRC Press, and he is working to develop a one credit online class based on this book that will be offered by BYU Online/Independent Study. John will present a short course at the beginning of the ASA-ASQ Fall Technical Conference in Houston this October based on his book Design and Analysis of Experiments with R.

Lynne Nielsen is currently involved in developing a Stat 121 online course and setting up virtual labs. She will pilot this course in fall 2016. She continues to be involved in BYU's WomanStats project whose aim is to make the linkage between the status of women and fate of nations visible and demonstrable. Professor Nielsen has been exploring the relationship among inequitable family laws, level of violence against women, and state peacefulness with data from 176 countries using grants from the Department of Defense.

Dr. Garrett Page has been working on five projects this year that are all collaborations

with colleagues from Chile. His first project has been developing methods that calibrate covariate influence on product partition models to "cap" the influence that covariate information might have on partition probabilities. The second project has been developing exploratory tools that identify interactions by employing partition estimates from a covariate dependent partition model. His third project has been working on extending extreme value mixture models in order to accommodate non-stationarity. His fourth project has been developing cohort varying time dependent value added models to assess school effectiveness in education studies. Lastly, he has been working with Jose Quinlan (Chile) on his dissertation that deals with the theory and application of a certain kinds of repulsive processes.

Dr. Shane Reese continues to work on building resilient cities with Virginia Tech's Social and Decision Analytics Lab. They are building models for emergency services, such as fire departments across the country, to increase the quantitative assessments which improve firefighter safety. In collaboration with BYU Exercise Science, he is working on injury recovery strategy estimation through functional data analysis. Dr. Reese is also working on another research project on campus with BYU Geology. This project has produced 3 research proposals on Ice Sheet modeling.

Dr. Robert Richardson finished his associateship in the Society of Actuaries. He continues to work on his research in Bayesian stochastic processes and differential equation modeling. Specific projects include spatio-temporal methodology to be used for climatology applications, integral projection modeling in ecology and evolutionary demography, and various laboratory and chemistry applications.

Dr. Del Scott has been working on making the introductory computing classes available as online courses offered through the department. Stat 123 focuses on R and uses a commercial vendor that specializes in online education as the course materials. Stat 124 focuses on SAS and uses free materials from the SAS website, as well as other materials through the department. The evaluation of these new courses is in progress. We're excited to see how these new online course options will benefit our students.

Dr. Shannon Tass continues to be involved

in autism research with an interdisciplinary group. She is currently working on a project to determine the efficacy of counseling for college students with autism. The group is going to be featured in the McKay Today Magazine associated with the BYU David O. McKay School of Education. In addition to the autism research, Dr. Tass also continues to work on several projects with the geology department using spatial statistics applied to planetary geology.

As we move forward, I wish to express appreciation to our alumni who have volunteered their skills and resources to the department. Your efforts and support are key to our success. We are proud of your work and all the achievements you continually have. We are sincerely grateful for the association that we share. ♦

NEW FACULTY



Dr. Bradley Barney will be joining our faculty as a visiting professor in Fall 2016. He received his bachelor's degree (Economics 2003) and master's degree (Statistics 2007) from BYU. He then received his PhD (Statistics 2011) from Texas A&M University.

Brad was previously an assistant professor at Kennesaw State University (2011-16). Brad's research interests include longitudinal data analysis, spacial statistics, Bayesian methods, and biostatistics. We are excited to have Brad join our faculty! ♦

PRESTIGIOUS FACULTY AWARDS



Dr. Shane Reese received the Distinguished Citizenship Award at our annual college dinner held Feb. 19, 2016. Shane has been serving on the university's Task Force for New Student Ratings.

His contributions to the development of a new course rating system and commitment and effectiveness in communicating with college faculty have been impressive. Shane's frank comments and clear insights in a process that is inherently sensitive and complex, have allowed college faculty to be informed and supportive without having to delve into all the subtleties of this important issue. This

has been a mammoth undertaking and one that is believed to collectively benefit BYU students for many years to come.

Shane has also contributed significantly in his department and to the University. This service includes such assignments as Associate chair, graduate coordinator, member of the Faculty Advisory Committee, and member of the University Awards Committee. We are fortunate to have Shane and his unbounded enthusiasm in our department!



Pete Dotson, our department CSR (computer support representative), received the Outstanding Performance by an Administrative Employee Award at our annual college dinner held Feb. 19, 2016. One of the first processes Pete instituted when he joined our department three years ago was the back up of critical department systems. This has saved much time and frustration to the whole department. In addition to backup and security, Pete has also focused on disaster recovery. His ability for disaster recovery has let Pete recover not only files and but also complete systems for the unfortunate.

Pete created RStudio and Shiny servers that are used not only by our faculty and students but also by researchers in several departments outside our college. His efforts have led him to support faculty across campus. Several of the departments in our college have benefitted from Pete's expertise, both in UNIX and in system engineering, maintenance and disaster recovery. A remark from one chair in our college assessing Pete's performance for their department was "simply stellar."

In addition to the Outstanding Performance Award, Pete received his 15-year Service Award to BYU. He has epitomized good service to faculty and students. Pete's pleasantness, promptness, and attention to detail directly and indirectly enhance the educational experience of the students studying statistics. We are lucky to have him in our department. ♦

2015 - 2016 SEMINAR SPEAKERS

During Fall semester of 2015 and Winter semester of 2016, we were pleased to have many great presenters at our Thursday Seminar series. Those who presented

during Fall 2015 included **Richard Robinson** ("Effects of Microbial Species and Active Ingredients on Disinfectant Efficacy Testing"), **Dongbin Xiu** ("The State-of-the-art of Uncertainty Quantification Algorithms"), **Larry Baxter** ("Statistics Adventures of an Engineering Amateur"), **Mandy Hering** ("Clustering Multivariate Time Series for Identifying Regional Wind Regimes for Wind Speed Forecasting"), **Ross Larsen** ("Classroom Approach using MPlus"), **Zach Knowlton** ("Points Added Summary Statistics: Rating NCAA Football Teams and Players through Expected Points"), **Charlie Casper** ("Conducting Valid Trials: The Critical (and Misunderstood) Roles of Randomization and Complete Follow-up"), **Alex Peterson** ("Representation of Samples of Density Functions and Regression for Random Objects"), **Mike Anderson** ("A Semi-parametric Bayesian Framework for Identifying up and down Regulated Genes in Subjects with Neurocysticercosis (NCC) Associated Epilepsy"), and **Garrett Page** ("Predictions Based on the Clustering of Heterogeneous Functions via Shape and Subject-Specific Covariates").

Those who presented during Winter 2016 included **Brad Barney** ("Joint Modeling of Mixed Response Types to Assess Primate Cognition"), **Brooke Alahanti** ("Bivariate calibration of numerical model outputs with application to climate models"), **Devin Francom** ("Adaptive Splines for Computer Model Emulation and Sensitivity Analysis"), **Gary Mercado** ("On nonparametric EWMA control charts based on linear rank statistics for monitoring location"), **Jani Radebaugh** ("Histories of dunes on Saturn's moon Titan and volcanoes and mountains on Jupiter's moon Io from statistical studies"), **Jose Javier Quinlan Binelli** ("A Class of Repulsive Distributions"), **Larry Cook** ("Using Probabilistic Linkage to Combine Injury Related Databases"), **Murali Haran** ("Statistical Methods for Studying Ice Sheets"), **Raquel Prado** ("Bayesian approaches for brain activation and connectivity"), and **Richard Hahn** ("Bayesian Regularized Regression for Treatment Effect Estimation With Many Potential Confounders").

It is always wonderful to have experts come and share their knowledge and experiences with our faculty and students each Thursday during Fall and Winter semester. Our students look forward and appreciate their

presentations. We would like to thank all of those who participated in our Thursday Seminars. ♦

41ST ANNUAL SUMMER INSTITUTE OF APPLIED STATISTICS



This year we had a great turn out at our 41st Annual Summer Institute of Applied Statistics. We were honored to have Dr. Gordon Dahl from UC San Diego be our SIAS presenter. Dr.

Dahl's course discussed various strategies for obtaining causal estimates without an experiment, with empirical examples from a variety of fields. In his course he explored the pros and cons of using panel data, social experiments, regression discontinuity, register data, instrumental variables, and other methods to arrive at causal estimates.

His course concentrated on the assumptions and properties of various approaches and how to implement them. He also focused on current best practices, with empirical examples ranging from the evaluation of social safety net programs, to the effect of educational policy reforms, to the identification of peer effects in networks. He successfully provided a practical guide to the key advantages and disadvantages of each approach.

We would like to thank Dr. Gordon Dahl and all those who attended. Next year's SIAS will be held June 21-22, 2017. We look forward to seeing you next summer! ♦

RACHEL MESSICK WINS 2016 3MT COMPETITION



Rachel Messick, one of our recent master's graduates, participated in the Graduate Student Society's 3rd annual 3MT competition at BYU. In order to win this competition, master's students must effectively condense their entire theses into short three minute presentations.

Rachel started out by placing 2nd in the Department, then moved up and placed 2nd in the College. That led her to victory at this year's BYU 3MT competition as champion. Her successful 3MT presentation was titled "Saving the Planet with Spatial Statistics."

We are proud of her success in this competition and in our master's program. ♦

JARED WARD TO COMPETE IN 2016 OLYMPICS



Photo by Iain Hunter

Jared Ward, one of our alumni and adjunct professors, is preparing to compete in the 2016 Olympics in Rio de Janeiro. Last year, he won the U.S. Marathon champion title at the L.A. Marathon with a time of 2 hours, 12 minutes and 56 seconds. He later graduated from our department in April 2015 with his master's project entitled "Marathon Pace Strategy Analyzing Splits from the St. George Marathon."

This year he made the Olympic team when he finished third in the men's marathon at the 2016 Olympic trials in February. His time at the Olympic trials was 2 hours and 13 minutes. He will compete in the Olympic marathon on August 21, 2016. We wish him luck in Rio at the 2016 Olympics! ♦

ZACH KNOWLTON RECOGNIZED FOR FOOTBALL STATISTICS



Congratulations to Zach Knowlton, one of our alumni and adjunct professors, on winning first place in the 2015 Undergraduate Research Competition at JSM. Zach was featured in an article on the BYU news page that described his work in sports statistics, particularly in football.

Zach focused much of his graduate work on predicting player performance for the BYU Football team. It all started when Zach tweeted Bronco Mendenhall about the helpful statistics he had to offer. Zach and other researchers created a statistical model that was able to determine the team's MVPs, which is very beneficial to coaches and recruiters.

To read more about his football statistics research, visit news.byu.edu. We appreciate having Zach in our department and the great work he has done as an adjunct professor. ♦

Dean's List 2015

Winter 2015

David Arthur
Nathan Bean
McCall Booth
Madison Callaway
Michael Christensen
Benjamin Clegg
Christian Davis
Matthew Denkers
Kaylea Drake
Robert Gardner
Mathew Madsen
Austin Murphy
Kendall Naatjes
Alexander Neilson
Marelise Oberholzer
Sierra Pugh
Mary Rasmussen
Kendra Shakespear
Marian Strong
Michael The
Angela Teuscher
Michael Vaughn
Kyle Zollinger

Spring and Summer 2015

Benjamin Bates
Benjamin Clegg
Melanie Gilchrist
Taylor Holiday
Othon Hamill
Simi Im
Chad Larson
Colten Larson
Matthew Oehler
Colten Sammons
Sara Thompson

Fall 2015

Trevor Alder
David Arthur
Rylan Bateman
Nathan Bean
Aaron Chan
Michael Christensen
Christian Davis
Kaylee Dudley
Nathaniel Duren
Kaleb Erickson
Shandon Esplin
Jacob Fisher
Scott Fleming
Emily Gatenby
McKay Gerratt
William Horton
Alison Jepsen
Alexia Kalfopoulos
David Lowe
Mathew Madsen
Joshua Meyers
Austin Murphy
Alexander Neilson
Marelise Oberholzer
Daniel Pimentel
Sierra Pugh
Mary Rasmussen
Braden Sharp
Dean Sobczak
Landon Swalberg
Angela Teuscher
Ojastro Todd
Michael Vaughn
Andrew Wiser
Jin Lin Zhou

MS Statistics Graduates

April 2016

J. Keaton Baughan-Spatial Factor Analysis with Two Factors for Combining Climate Models

Chun Ling Chan-Bayesian Imputation and Filtering Algorithm on Low Frequency Data

Cameron Faerber-Spatial Modelling of Highway Crash Risk in Minnesota

Scott K. Ferguson-Comparison of Different Cluster Analysis Methods

Rebecca M. Gardner-A New Approach to Echocardiographic Diagnosis of Rheumatic Heart Disease

Rachel M. Marker-Multiple Imputations: An Application in Metabolic Function and Cognitive Impairment

Rachel Messick-Multivariate Spatial Mapping of Soil Water Holding Capacity with Spatially Varying Cross-correlations

Jacob W. Mortensen-Urban Heat Risk Mapping of Houston, Texas Using Multiple Point Patterns

Nathan Sandholtz-Bayesian Factor Analysis with Spatio-temporal Dependence

Ammon Lot Slade-A Statistical Disclosure Control Technique Using Linear Models

Kevin Williams-Predicting Injuries for Athletes using Force Plate Scans via Nonlinear Multinomial Logistic Regression

June 2016

Justin M. Barnes-Selection of Classification Method for Predictive Biomarker Modeling Based on Internally-Validated Performance Metrics and Data Characteristics

UNDERGRADUATE MENTORING

This year we had 32 students mentored by our faculty. Below is a description of the projects they worked on this year.

Elliot Adair (Dr. Fellingham, mentor): We used a Bayesian model to analyze football player performance using data directly from the coaches. Using this model we created weekly reports for the coaches that they used to review how each player did during that week's game. Seeing how the reports were positively received made all of the hard work extremely rewarding and it was great to learn

from excellent teachers and peers. I gained real experience with high-level analytics as well as more practice with R and SQL.

David Arthur (Dr. Berrett, mentor): My work with Dr. Berrett involved researching different ways to perform a Bayesian spatiotemporal change point analysis on water temperature data collected at different locations across Utah over a period of several years.

Working on this project has helped me to better develop my programming skills. I was not only able to hone my skills using R, but was also able to learn a new probabilistic programming language called STAN.

Overall, my experience in research has been very challenging and because of this it has been extremely rewarding. I am learning to apply myself in my field of study and am having to learn how to come up with solutions to different problems that I encounter.

Christopher Beckett (Dr. Fellingham, mentor): For my undergraduate research I spent my time gathering injury data of the NBA players during their season. I used two to three different sources to gather all of the information, and input it into Excel. Periodically, I met with Brayden Kinard, who is helping Dr. Fellingham, to come up with a model for the injury data. I did this for the entire 2014 and 2015 seasons.

Dallin Bergquist (Dr. Fellingham, mentor): Dr. Fellingham and a former student, Brad George, put me in contact with Coach Quincy Lewis and got me started with working on some projects to help the BYU Men's Basketball team. I was able to do a large project focusing on the team's defense in pick and roll situations. I ran ANOVA on the different types of defense we can run on pick and roll plays and showed which was most effective in stopping the other team from scoring. I learned how to do an analysis and present it in a way that a basketball coach could understand and apply. It was very good experience to have under my belt and to add to my resume for future job applications.

Aaron Chan (Dr. Page, mentor): Participating in the Undergraduate Mentorship program was like solving a puzzle. On day 1, I knew relatively nothing about Bayesian statistics. Over the course of the semester, I learned and demonstrated the mathematics behind conjugate prior and posterior distribution relationships, struggled through conceptually understanding Markov Chain Monte Carlo

sampling methods such as Gibbs sampling and the Metropolis-Hastings algorithm, and more. One of the most mind-bending ideas I encountered was using a mixture of normal models to estimate the density of a multi-modal data set. I probably wouldn't have known some of what I know now until graduate school. I now have the confidence to explore the field in more depth.

Michael Christensen (Dr. Reese, mentor): The work I've done with Dr. Reese and former adjunct faculty member Erika Ball has accelerated my comprehension and competency as a statistician. For my research I've been taught how to use basic Bayesian Hierarchical models, and have been applying this to data from BYU's counseling center in order to better understand the way in which patient OQ45 scores, (a common psychological testing tool for progress measurement in therapy,) can be used to assess potential differences in the quality of therapy between therapists.

I'm super grateful that the department has afforded me this opportunity as an undergrad, and hope to continue working in this function until graduation.

Gavin Collins (Dr. Christensen, mentor): In my research mentorship, I helped predict ground reaction force (GRF) using shoe sensor data from the exercise science and mechanical engineering departments. We ended up using Functional Data Analysis (FDA) to predict GRF from the sensor data, which essentially involved using finite Fourier series to approximate the curves, and then building a regression model based on the coefficients of the Fourier series. My role was to research potential methods of doing this, to work closely with the collaborators to clarify their goals, to produce clear results, and to present the results to the collaborators in a clear way.

Devin Eddington (Dr. Tolley, mentor): I helped with the continuation of the Pioneer research study. When I began working for Dr. Tolley most of the overland analysis had been completed so we began talking about expanding our research to those who traveled by ship to the Americas and then onward to Utah. My role was to help sort through the ship data to determine what information was relevant and where there were discrepancies in the data. A big part of what I did was figuring out how many church members came across the ocean on each ship and comparing

the records of the saints to the ships records. Dr. Tolley was excellent at directing our thoughts, expanding our understanding of statistical and practical topics, and allowing us to grow through personal trial and error.

Nate Garrett (Dr. Berrett, mentor): Working with Dr. Berrett was awesome because she set aside all the time I needed and was very accessible. She didn't hold back on information because she felt I wasn't ready for it. She really pushed me to learn new things, building on what she knew I already knew. This then helped me learn even more and solidify the concepts I'd learned in class. She taught me how to do Poisson Bayesian Regression. We were working with a data set of charitable donations given to Malawi based on county. Each county had different characteristics, and we wanted to see how the characteristics might have an effect on charitable donations. She taught me about Metropolis Walks and helped me with the coding. She was very easy to work with and if I had the opportunity to do it again, I absolutely would.

Brad George (Dr. Fellingham, mentor): I did research for the BYU Men's Basketball team involving analyses on defensive strategies for game preparation and an analysis of BYU's strengths and weaknesses on both defensive and offensive aspects of the game. The analyses on defensive strategies involved defensive scouting reports, in game analyses and post-game analyses on the effectiveness of the defensive strategy the coaches prepared. With Dr. Fellingham's guidance I analyzed and created a report for the coaches that highlighted their strengths and weaknesses on both the offensive and defensive sides of the ball. The report explained a simple solution that would both improve their defensive weaknesses and create more opportunities for their offensive strengths.

Kaitlin Gibson (Dr. Heaton, mentor): This last summer, I had the opportunity of assisting Dr. Heaton in a research project commissioned by the Federal Highway Administration. Basically, our goals were to determine which road factors (such as number of lanes, median type, light conditions, etc.) are associated with a higher risk of car crashes. Through this experience, I've learned new statistical methods such as generalized linear models and spatial statistical methods. Dr. Heaton has also helped me improve my technical writing skills. Working with Dr. Heaton was an extremely

rewarding experience and I'm very thankful that he's continuing to let me work with him.

Matt Goodwin (Dr. Reese, mentor): Research was hard at first because it's very open ended at times. Dr. Reese first had me start by looking at a couple of papers from a professor at Utah State, and to try and code up the algorithms described in there. This had to do with finding the fundamental frequency in a nonlinear chirp signal. It was challenging because a lot of the terms were signal processing terms and as a statistician and mathematician, this took some getting used to. I was able to do a fairly good job of recreating the results of the papers, but there were some things that I could never figure out until I was able to reach the professor at Utah State and get some of the code they had. All of this could be considered prep work for the overall goals of the research I am currently doing with Dr. Reese.

Aaron Havens (Dr. Christensen, mentor): Dr. Christensen is really patient with me and highly knowledgeable and understanding. We have been working through a problem for the last couple of semesters and there are times I feel he could do it all in a few days but he is kind enough that he lets me struggle through it for a week or so. He understands me and is highly supportive of decisions that I make on the project and helps me with decisions about life too. All in all I'd give him a double high-five, an 11 out of 10, and if anything ever goes wrong with the mentorship it is most likely 100% my fault.

James Hill (Dr. Fellingham, mentor): Dr. Fellingham and I have answered questions for the men's and women's volleyball team and for the women's soccer team here at BYU. It has been interesting and very educational work. What I have enjoyed the most about working with Dr. Fellingham is how he points me in the right direction and lets me learn and work by myself to try and answer the questions. Because of my work with him I feel a lot more capable with my statistical skills and my problem solving abilities. It has been a great experience.

Braden Kinard (Dr. Fellingham, mentor): We have been working with the Jazz to analyze injury risk for NBA players. Up until now, we have been spending most of our time collecting and cleaning data from multiple sources concerning player injuries, characteristics, game statistics, and salary information for every player and game

to play since the 2003 season. Now that the data has been collected we have been doing some exploratory analysis of the factors that seem to influence a player's injury risk, such as height, position, age, minutes played, and previous injury history. We plan on using these to develop models that will a) help the Utah Jazz understand factors that increase or decrease injury risk and b) predict the potential for injury in the future for players. By providing this information to the Jazz, they will be able to use it to further inform their decisions regarding player personnel and contracts.

Zach Knowlton (Dr. Fellingham, mentor): Dr. Fellingham has been very helpful in helping me understand and apply statistics. I am very lucky to be mentored by someone with so much experience in the particular field we are working with. I have also learned great work ethic from him as we've worked on research. The current research we are finishing up includes building a model that will produce expected points scored for each play of the 2014 college football season. We will then rank the teams from that season by evaluating the expected point gain on each play. We have also worked directly with the BYU Football team in helping them rate players during this last season. This has been really cool research and will be something that I will apply in my career. I'm very grateful for this experience.

Aimee Maddox (Dr. Grimshaw, mentor): We worked on the data analysis of a grant proposal by the engineering department measuring wrist movement and flexibility. First we focused on the age, height, weight, etc. variables from the sample data and looked at how well it represented the data from the population. Then we looked at the wrist measurement data to see how well that represented the population. The conclusion of my mentorship was fitting linear models and comparing regression coefficients.

This experience was ideal for me and my future plans. It allowed me to apply what I have learned in the classroom with a real data set. This project allowed me to get a feel for what type of research a statistician does help the medical research world.

Brad McKeen (Dr. Fellingham, mentor): I used SQL to load football-position grades into the Statistics Department's Athletic Database. Each week I received reports from the coaches with grades for their players (I

received Defensive Back grades). I entered them into Excel and then loaded it into the database using SQL.

Jacob Merrell (Dr. Tolley, mentor): I had the privilege of working with Dr. Tolley on the pioneer mortality project. Dr. Tolley is very knowledgeable, helpful, and dedicated. Through his mentorship, I have gained invaluable skills in leadership, project management, and technical abilities that I wouldn't have discovered otherwise. I would greatly encourage any student associated with the statistics department to seek work opportunities with Dr. Tolley. I am grateful for his help.

Tony Mickelsen (Dr. Fellingham, mentor): Since this semester coincided with the men's and women's tennis schedule, most of my time was spent managing the collecting of tennis data at live collegiate tennis matches. I recruited and trained six interns to collect the data. I taught them all steps in the data collection process, including data-entry, cleaning, and MySQL uploads. Their internship was for class credit and so I helped them in fulfilling the necessary academic requirements as well. Also, I trained Sean Miner to lead this project since this was my last semester at BYU. Overall, this research experience through the years has been invaluable in preparing me for my career. Thank you!

Sean Miner (Dr. Fellingham, mentor): During Spring and Fall 2015 I researched under Dr. Fellingham through the BYU tennis team. Since I have a passion for statistics and tennis, it was a great opportunity for me. We currently maintain a database for the women's and men's tennis team. Through this opportunity, I was able to learn more about SQL, prepare a team of interns in order to collect the data for the BYU tennis matches in 2016, and work on a research project that I will be able to present in the 2016 Student Research Conference.

Jacob Moody (Dr. Tolley, mentor): The question of the study is the following: "What statistical model can best record link two sets of genealogical records?" In our case, the datasets used consist of the Mormon pioneers voyaging to the United States and going across the plains. At the beginning of the semester, I learned the basics of MySQL to handle the databases and tables for the students involved. The class mostly used R, and we created a training dataset to test models such as "Random Forests", "Stochastic

Gradient Boosting" and "Probability Record Linkage." During the close of the semester, I also worked with Dr. Tolley on a side actuarial project of investing X amount of dollars at different and changing interest rates. I used Excel for this project.

Ben Nealy (Dr. Tass, mentor): My most recent project with Dr. Tass was a study predicting aggression levels in autism spectrum patients based on the volumes of various regions of their brains. Due to the nature of the data collected (many brain section measurements from only a few patients), I had the opportunity to learn and use several high dimensional model selection techniques. This project stretched my R programming and statistical thinking skills, and helped solidify my aspirations to pursue graduate study in biostatistics.

Benjamin Peaden (Dr. Tolley, mentor): I worked on biomarker detection in conjunction with Dr. Lee and Dr. Graves in the Chemistry department. A paper was published recently from the work we did. The paper was entitled "Detection and Confirmation of Serum Lipid Biomarkers for Preeclampsia Using Direct Infusion Mass Spectrometry" and was published in the Journal of Lipid Research. Research involved running iterations to find out which biomarkers gave the best AUC in the ROC plots.

Hayden Ringer (Dr. Fellingham, mentor): Dr. Fellingham's 497R class covered R and MySQL. Being a non-stats major, his class was my first exposure to both tools. My project was on modeling "expected runs" in Major League Baseball. I used play-by-play data from the 2013 MLB season to generate a matrix of run expectancy values for the various combinations of outs and baserunners. I then used this framework to analyze in-game strategy decisions that managers make. I found the whole experience to be very valuable, especially with Dr. Fellingham's instruction on research presentations. I presented my project at the March Student Research Conference.

Corinne Saltzman (Dr. Tolley, mentor): I ran a class for Dr Tolley as a continuation of the pioneer mortality project. The aim of the class was to clean a large amount of available data and to combine two large data sets to end up with an improved database that would give better insights into the pioneer trek from Europe continuing on to the trek across the plains. Due to the age

and inconsistencies of the data we could not use conventional methods to join the separate data sets as so much had to be checked and updated. Therefore we used the man power of the class, we taught the students new methods of updating the database and researching to fact check. Then the people running the class were able to take the results from each individual in the class and combine them to make one cohesive database combining all previous data.

Jorgen Sumsion (Dr. Reese, mentor): This experience was beyond what I imagined it would be when I first heard about it. Dr. Reese was patient and understanding, but pushed me to learn and stretch myself academically. It was exciting to take what I was learning in my classes and find a new application for them. I am grateful for the opportunity I had and for the opportunities that it will bring in the future.

Angela Teuscher (Dr. Christensen, mentor): I worked with Dr. Christensen doing research to attempt to quantify uncertainty in extrapolation and identifying outliers in high dimensional spaces. We explored using a version of Mahalanobis' distance quantifying how far points were from other points in a data set in an effort to be able to identify single outliers and particularly clusters of outliers when graphing the data and other techniques failed. I learned a significant amount simulating data to solve problems and existing techniques to identify outliers. It was definitely a very valuable and enjoyable experience.

William White (Dr. Fellingham, mentor): I worked with Dr. Fellingham to rank holes on the PGA Tour based on difficulty. We used ShotLink data provided by the PGA Tour for graduate research. Dr. Fellingham would give me tasks to do but allowed me the freedom to explore and grow. I learned a lot about how to use computing resources efficiently for large simulation studies. I learned how to use Unix commands to interact with the database, which has been a valuable skill, and I wouldn't have learned it in any of my classes. My mentorship has helped me see how I can apply what I learn in class to answer questions that may be difficult to answer.

Zachary White (Dr. Christensen, mentor): We developed some algorithms for variable selection of Excitation-Emission matrices for prediction of Biochemical Oxygen Demand.

I was comparing our methods with some established methods like Bayesian lasso, Bayesian horseshoe, and Random Forests. We eventually phased out the EEM project, and for the past months, I've been working on a new project where we are building a Bayesian model for melt-rates of glaciers in High Mountain Asia. We have five out of seven data sets functional, and I'll be working on getting the last two. The challenges with these datasets are due to differences in both spatial and temporal resolution.

Dylan Woodbury (Dr. Fellingham, mentor): I am working on the strength and conditioning database. One part of this project is managing the database. I receive data from Josh Morzelewski, the head strength and conditioning coach, and load it into the database so other individuals can access it, if needed. I then use this data to perform statistical analyses for Josh. The majority of the analyses are matched pairs t tests comparing the results from one test date to another. From this project I learned how to use SQL more in depth, and how to use SQL queries in R to perform analyses.

Aubrey Wride (Dr. Christensen, mentor): I worked on a research project with Dr. Christensen and with Dr. Borup. Our project focused on developing an algorithm for optimizing water source apportionment using excitation-emission matrices. Over the course of this project, I learned about alternate uses for statistical methods and approaches, such as Hotelling's T-squared. I also improved my coding by writing functions, developing algorithms, and performing data cleaning in R. Dr. Christensen and I have been working on writing up our findings to publish in an environmental statistics journal. ◆

ALUMNI UPDATES

Ray Goodson (BS 1963) is spending most of his time working on projects of a humanitarian nature for the Philippines. He has started a 501C3 foundation (Rise and Rebuild Foundation) to do the following: build over 70 communal bathrooms in the Tacloban area (was hit by a massive typhoon in Nov. 2013), an affordable housing project, a major mobile medical/dental unit with 2 state of the art operating rooms, a school lunch program, and a major undertaking to provide employment for returned missionaries.

Joseph Ollivier (BS/MBA 1965) worked for TWA for three years at the beginning of his career, and then went on to start and become chairman of Bonneville bank, Aspen Corporation, and a stock brokerage firm along with other companies. He started the Utah Angels Venture Group with four others and funded some of Utah's most successful companies like Omniture, TruVision, Property Solutions, Imagine Learning, etc. He had a lot of dealings in the Oil Field in Eastern Utah and he's still a partner at age 74 in Western Well Service out of Roosevelt. He's climbed three of the seven summits along with the Grand Teton, Castleton Tower, Devils Tower, the Eiger, and Mt. Rainier. He has also written about 70 short stories that are published on his website *Talesuntold.net*. His novel, *The Searchers*, was published last June.

A. Brent Belliston (BS 1970) was the Mission President in the Maryland Baltimore Mission from 2009-2012. He was the First Counselor in the Boise Idaho Temple Presidency from 2012-2015 and is currently the President of the Boise Idaho Temple.

Jesse Seegmiller (BS/MBA 1975/1979) was recently featured in an article in the New York Times (<http://nyti.ms/1LgHXQP>) and a related article on CNBC.com (<http://www.cnbc.com/2016/03/01/secrets-of-a-small-school-out-investing-ivy-league-billions.html>) for his work managing the endowment fund of SVU. Mr. Seegmiller is employed as the university's Controller and has been managing the small fund since 2008. The articles discuss the success the university has had with its investments ranking second in its 10 year annualized return out of all college and university endowments surveyed in the 2015 NACUBO-Common Fund Study of Endowments (n=555 reporting 10 year returns). He invests in a portfolio of US Common Stocks that he chooses plus a selection of International and Fixed Income exchange traded funds.

Susan Mathews Hardy (BS/MS 1982/1986) was promoted to Senior Lecturer in 2015, which is the highest rank for a Lecturer at her University. She teaches and mentors undergraduate statistics students.

Melinda Chappell Trego (BS 1986) is currently in her 20th year in business with her brother, Robert C. Chappell (MSEE), despite the saying to never to go into business with family. Their eye tracking

business, EyeTech Digital Systems, Inc. sells eye tracking hardware, software, and design services throughout the world. She keeps business operations running, while Robert provides the technical expertise.

Gary Peterson (BS/MBA 1986/1988) has been working the O.C. Tanner Company (\$460 million) for almost 29 years. He started as a Marketing Intern, a job he received because of his statistics training. He's been working in production for the last 25 years, and is currently the Executive Vice President of Supply Chain and Production. He serves on the Shingo Institute Executive Advisory Board and was inducted last year into the AME (Association for Manufacturing Excellence) Hall of Fame. He is also the proud father of six kids and seven grandkids (and counting).

Kimberlee (Callister, Davison) Everson (BS/MS 1987) is working as an Assistant Professor of Quantitative Methods in the department of Educational Administration, Leadership, and Research at Western Kentucky University. She teaches courses in intermediate and advanced statistics and psychometrics to doctoral students in the fields of psychology and education. Her research focuses on quasi-experimental methods and the use value-added modeling for teacher accountability purposes.

Stirling Adams (BS 1989) has worked as an attorney in Novell's legal department for 21 years, the last 5 as Chief Counsel. As of June he is leaving Novell to form a Provo-based law firm serving technology-focused businesses, international companies, and non-profit organizations.

Todd Frost (BS/MS 1992/1994) is about complete my 20th year of teaching. He currently teaches Geometry and Statistics at Flintridge Preparatory School in La Canada, CA, where he's also the Director of Scheduling. He also officiates high school and collegiate volleyball in Southern California.

Chuck Jensen (MS 1996) has current positions in Strategic Planning and Forecasting Manager and Basic American Foods in Blackfoot, ID. His roles and responsibilities include managing demand planning processes and strategic planning initiatives including capacity planning, energy consumption forecasting, raw sourcing analytics, and consulting statistician. He also supports business process improvement

strategies.

Kenneth L. Decker Jr., Lt Col, USAF (BS 1998) has served as an Air Force officer for 18 years. He's had various assignments as an Acquisitions-Program Manager, working on several space, nuclear, radar, and command and control systems. Kenny is currently the Deputy Director for Acquisition Excellence and Program Execution, Air Force Life Cycle Management Center, Wright-Patterson AFB, OH. He and his wife Jennifer celebrated their 20th wedding anniversary in June; they have four wonderful children.

Aaron Wright (BS 2000) is an Executive Director at USAA leading the P&C Insurance Predictive Modeling teams. He is an AIR Certified Catastrophe Modeler, a Chartered Property Casualty Underwriter, a Fellow of the Casualty Actuarial Society, and a Member of the American Academy of Actuaries. Aaron is married to another BYU graduate, Rebecca Cook, and they have eight spunky kids.

Justin W. Owens, FSA, CFA, EA, FCA, MAAA (BS 2006) works as a Senior Asset Allocation Strategist at Russell Investments in Seattle. As a subject matter expert on defined benefit pension plans, Justin meets with clients to discuss investment strategy and writes papers on asset allocation and risk management topics.

Cameron Gleed (BS 2011) works for the Milliman Health Practice in Seattle, WA. He started in January 2013. His projects include commercial rate filing, Medicare Part D, Medicaid rate filings, and health care pricing for the Department of Veterans Affairs. He achieved his Associate of the Society of Actuaries (ASA) in early 2015 and is currently working towards his Fellowship of the Society of Actuaries. His hobbies include piano playing, trampoline jumping, and taking long, luxurious bubble baths.

Doug Hicken (BS 2011) worked for Accenture as a consultant on the BI Reporting team aligned to financial services from 2012-2014. For the past two years he has been working on his MBA at BYU. During that time he has served as the President of the Graduate Entrepreneurship Association on campus, was the lead Sherpa for the entrepreneurship track (the MBA's program for 2nd years to mentor 1st year students), was Director of VC Relations for BYU's Cougar Capital, interned with Peterson Partners on their

ventures team, worked on several startups of his own (including LitemAnalytics.com), took a part time course in web development at Dev Mountain, and was on the winning team on the Venture Capital Investment Competition, an international competition against 70+ of the top MBA programs in the world. (VCIC.org). He just took a job as VP of Operations for a local startup that is doing VERY well (grow.com). It has been operating for about 18 months and has about 30 employees. He's very excited about this role and company and where this path will lead him.

Thomas Robison (BS 2011) has been working full time with Milliman in Milwaukee, WI on health insurance consulting and is currently a project manager. He primarily works on prescription drug benefits for retiree and Medicare populations. He works on developing Medicare Part D bids for a growing number of Program for the All-inclusive Care of the Elderly (PACE) organizations and determines the comparability of employer prescription drug plans to the standard Medicare Part D benefit through Creditable Coverage Certification and the Retiree Drug Subsidy (RDS) programs. He recently passed all of his actuarial exams and received the Fellowship in the Society of Actuaries (FSA) and Chartered Enterprise Risk Analyst (CERA) designations. He's also a member of the American Academy of Actuaries.

Jared Fischer (BS 2012) is finishing the 2nd year of his PhD in Business Statistics at the University of Texas at Austin. He will be presenting his research at JSM this August and looks forward to seeing fellow BYU people there.

Andrew Olsen (MS 2011) defended his Ph.D. dissertation "When Infinity is Too Long to Wait: On the Convergence of Markov Chain Monte Carlo Methods" at The Ohio State University last year. Soon after, he joined Apple as part of the Maps Evaluation group and has enjoyed the exciting opportunities and fast pace of the Bay Area, not to mention the perfect weather! If any students or alumni are interested in chatting about a statistics career in tech or data science, feel free to reach out to him on LinkedIn.

Justin Olsen (BS 2012) has been working for the Investment Management firm T. Rowe Price as a Quantitative Investment Analyst since graduating from Johns Hopkins

University in 2014 with a Master's Degree in Financial Engineering. During his first year, he was part of an investment fellowship program rotating through several investment divisions. He is currently a member of a Quantitative Equity team that runs a series of quantitative investment strategies in the Small Cap Growth, Large Cap Value, and Global Equity markets. Next year he will join the Quantitative Fixed Income team to help develop and run Corporate Credit investment strategies in US and Emerging Markets.

David A. Quinn (BS 2012) recently earned his professional designation of an Associate of the Society of Actuaries (ASA) and was accepted as a Member of the American Academy of Actuaries (MAAA). He will soon hit his four year mark working for Mercer's Government Human Services Consulting branch in Phoenix, and plans on pursuing the Fellow of the Society of Actuaries (FSA) designation.

Cameron Willden (MS 2012) has been working for W.L. Gore & Associates for the last 4 years. He started in the Fabrics division where he supported engineers and scientists in the manufacturing and development of Gore-Tex products. While there, he derived a new distribution to more accurately model data produced by a flammability test called the Vertical Flame Test. In August of this past year, he relocated to Phoenix, AZ, where he now supports Gore's Medical Products division. At Gore, a lot of his time is spent teaching. He teaches courses in introductory statistics, design of experiments, statistical process control, sampling plans, and measurement systems analysis. Their software of choice is JMP, and he has spent much of the last 4 years developing deep expertise in JMP's scripting language, JSL; which he uses to develop applications for custom analyses, educational demos, and database queries.

Noah Robins (BS 2014) currently works as a Statistician for the LDS Church's Marketing Department. Most notably he works on conversion rate optimization for the LDS Homepage and creates control charts for the site's key metrics (Thanks to Dr. Lawson for Stat 462).

Aaron Smith (BS 2014) currently works at the Hartford in Enterprise Risk Management doing variable annuity hedging. He just achieved his ASA in January 2016 and is

beginning to take fellowship exams.

Annika Champenois (BS 2015) is working at SelectHealth as an underwriting analyst. Even though the job is much more on the analytical side than the statistical side, she gets to continue learning statistical coding languages as she trains in and practices SQL.

Arthur Lui (MS 2015) is currently completing his third quarter of first-year PhD studies at UC - Santa Cruz. He has particularly enjoyed learning about Bayesian nonparametrics and advanced Bayesian computation. As a huge plus, he lives by the ocean and by the famous Santa Cruz boardwalk. ♦

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