FACULTY ACTIVITY REPORT 2013

Rose-Hulman Institute of Technology

Name: Eric Reyes **Title:** Assistant Professor of Mathematics

TEACHING, STUDENT ADVISING AND CURRICULUM DEVELOPMENT

COURSES TAUGHT

Quarter	Course Name and Number	Enrollment
201310	MA223-01 Engineering Statistics I	28
	MA223-02 Engineering Statistics I	29
201320	MA223-03 Engineering Statistics I	25
	MA223-04 Engineering Statistics I	28
	MA481-01 Mathematical Statistics	5
201330	MA223-01 Engineering Statistics I	12
	MA223-02 Engineering Statistics I	25
	MA482-01 Bioengineering Statistics	10
	MA494-03 Senior Project III	1
201340	MA223-01 Engineering Statistics I	14

COURSE DEVELOPMENT

COURSE

Developed MA482 (Bioengineering Statistics) to include 80% new material comprised of 4 new units (nonlinear modeling, survival analysis, missing data methods, and causal inference); this adds a great deal of breadth to the course for ABBE students (the primary audience, for which the class is cross-listed). Each unit consisted of a capstone case study, for which students were asked to apply the methods to a real-world dataset and then write a report detailing their methodology and conclusions. Each unit concluded with a webinar led by off-campus guest lecturers (from pharmaceutical and academic research companies).

Reworded the course learning objectives for MA223 to make use of current recommendations for well written learning objectives. Specifically, the objectives have been written to indicate to students how they will be assessed on each objective, and have been connected to sections within the newly adopted text.

ADVISING

OTHER

Advisee Count: 1

Advised Devon Hardman (MA) on her mathematics senior project. We received data from BD Technologies (Research Triangle Park, NC) involving results from a cell culturing study. Devon applied non-linear modeling techniques to develop a model for cell growth. This represented a new application of this methodology that greatly improved upon the standard in the field. Devon's results were received well by the company.

Devon presented her results at the Rose-Hulman Undergraduate Mathematics Conference. Devon also presented her results in a poster session of the Midwest Biopharmaceutical Statistics Workshop (Muncie, IN) in May, which is attended by major phamaceutical companies in the area.

Devon's final report received an honorable mention in the CAUSE Undergraduate Research Project competition, a national competition for research in statistics conducted by undergraduates.

THESIS ADVISEES

Advisee Count: 1

Committee Member for Cody Austin, Master's thesis for Biomedical Engineering titled "The Effect of Loading Orientation on the Structural Properties of the Anterior Cruciate Ligament." Cody received the award for Most Outstanding Master's Thesis.

THESIS ADVISEES

Advisee Count: 1

Committee Member for Brian Sutterer, Master's thesis for Biomedical Engineering. Advising Brian on the design of the clinical trial and analysis of resulting data. The data are part of his senior thesis.

PROFESSIONAL DEVELOPMENT ACTIVITIES

PROFESSIONAL DEVELOPMENT

PUBLICATIONS

BOOKS PUBLISHED

Cardiac Catheterization and Interventional Cardiology Self-Assessment Program

Lead author for "Chapter 17.1: Basic Statistics and Analysis for the Interventional Cardiologist." This book is sponsored by the American College of Cardiology.

Understanding Clinical Research

Lead author for "Chapter 15: Analytical Methods of Addressing Confounding." pg 209-226. Editors: Renato Lopes and Robert Harrington. This text was used as the foundation for the last unit in the MA482 (Bioengineering Statistics) course.

PAPERS PUBLISHED

Bayesian Average Error Based Approach to Sample Size Calculations for Hypothesis Testing, Journal of Biopharmaceutical Statistics

This methodology has applications to designing biomedical studies, similar to those discussed in MA482 (Bioengineering Statistics).

Reduction in First and Recurrent Cardiovascular Events with Ticagrelor Compared with Clopidogrel in the PLATO study., Circulation

Lead statistician on clinical paper. This was consulting work I did for Duke Clinical Research Institute. This paper was discussed in a webinar in MA482 (Bioengineering Statistics).

PAPERS SUBMITTED

Tutorial: Survival Estimation for Cox Regression Models with Time-Varying Coefficients Using SAS and R., Journal of Statistical Software

SEMINARS

CONFERENCE PRESENTATION

Engineering a Statistical Model: An Activity for an Engineering Statistics Course, US Conference on Teaching Statistics

I presented an active-learning activity I developed for MA223 (Engineering Statistics I) that highlights the application of statistics to engineering modeling. The activity is based on an example in ES201 (Conservation and Accounting Principles).

CONFERENCES ATTENDED

Attended RHIT, Mathematical Association of AmericaRose-Hulman Undergraduate Mathematics Conference

Advised Devon Hardman's senior project, which was presented at this conference.

Attended OTHER, American Statistical AssociationMidwest Biopharmaceutical Statistics Workshop

Advised Devon Hardman's senior project, which was presented at a poster presentation at the conference.

OTHER

COURSE PARTICIPATION

Survival Analysis for Multiple Endpoints

Short course offered during Midwest Biopharmaceutical Statistics Workshop.

OTHER

Data to Decisions: A Video Series for Enhancing Engineering Statistics, RHIT Mult-Media Grant

The grant supported the development of five 40-minute videos that each explore a case study. The case studies cover the five primary applications of statistics discussed in MA223 (Engineering Statistics I). The videos act as a capstone review for the course and allow students to review material for which MA223 is a pre-requisite. In addition, an interactive online lab was developed to aid in review toward the end of the course.

NON FUNDED RESEARCH

Complete Least Squares with Applications to Variable Screening

Developed a new statistical estimation method for linear regression. This method allows estimates to be constructed for high-dimensional big data (when there are more factors than subjects). This estimation method was applied to develop a new method of screening out unimportant variables prior to the application of a variable selection method. That is, this aids in determining which factors are important for predicting a given response in linear regression. Draft in progress.

RESEARCH PROFILE

Scholarship statistics, variable selection
Subject

Study Area I am interested in the application of statistics to medicine. In particular, I focus on variable selection - determining which factors (variables) are associated with a particular response. I am investigating a new method for variable selection in the presence of missing data, as well as variable screening prior to variable selection when the number of factors exceeds the sample size.

Keywords Biomedical Research, Multidisciplinary
Statistics

PROFESSIONAL SERVICE ACTIVITIES

COMMITTEES

DEPARTMENTAL

Statistics and Operations Research Curriculum Development Group, MA (Member)

PROFESSIONAL SERVICE

ON CAMPUS SERVICE

Freshman Laptop Orientation

Led session.

High School Mathematics Competition

Helped set-up for the event, meet with high-school teachers who brought students, grade the exam, and distribute prizes.

OTHER

InterVarsity Leadership Training Retreat

Acted as the faculty representative and traveled with InterVarsity Christian Fellowship on a leadership training overnight retreat.