Samantha VanSchalkwyk

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PhD candidate completing the fifth year of a program in Applied Statistics at the University of California, Riverside. My research involves fitting Negative Binomial Gaussian Process models to RNA-seq datasets with repeated measures to detect differential expression between treatment groups.

Previous Employment

University of California, Riverside   **Department of Applied Statistics**
Teaching Assistant   *September 2016–Present*

TA for STAT048: *Statistics for Business* in Fall 2016, Winter 2017 and Winter 2018, and for STAT100A: *Introduction to Statistics* in Spring 2017, Summer 2017 and Winter 2019. Conducted lab sections and assisted the students as they completed their labs and instructed discussion sections in STAT100A.

University of California, Riverside   **Dr. Manuela Martins-Green, PhD**
Graduate Research Assistant   *June–September 2017, September–December 2018*

Data with mice that had chronic and non-chronic wounds were analyzed to cluster genes into similar behavior patterns in the two groups over time. It was also of interest to identify genes which demonstrated differential expression between chronic and non-chronic mice.

University of California, Riverside   **Dr. Jeffrey Klein, MD**
Graduate Research Assistant   *September 2017–June 2018*

Collaborating with Dr. Klein, designed a group sequential clinical trial to test if his treatment of tumescent anesthesia antibiotic delivery reduces the rate of surgical site infection compared with the currently used intravenous antibiotic delivery. Attention is given to reducing the number of patients needed for recruitment compared with a more traditional fixed sample trial.

Mount Holyoke College   **Department of Mathematics and Statistics**
Teaching Assistant and Tutor   *September 2014–May 2015*

Worked as a tutor for an Abstract Algebra class to assist students in their coursework and graded homework assignments for a Differential Equations class.

Mathematical Sciences Research Institute   **Undergraduate Program**
Research Participant   *June 2014–August 2014*

Six-week summer program using Mathematica to conduct research to study arithmetic properties of Franel numbers. Member of a 3-person research team that worked to prove properties of 'p-adic' valuations of Franel numbers.

Education

University of California, Riverside   **Riverside, CA**
Department of Applied Statistics, PhD candidate   *2015–Present*
Expected completion June 2020

Mount Holyoke College   **South Hadley, MA**
B.A. in Mathematics, B.A. in Spanish (Double Major)   *2011–2015*
Completed in May 2015

Londonderry High School   **Londonderry, NH**
Completed in June 2011   *2007–2011*

Notable Projects

- **PhD Research (Ongoing):** *'A Bayesian Longitudinal Analysis of Count Data with Gaussian Processes'*

  Current work in differential expression analysis for RNA-seq data sets uses a negative binomial distribution to model the counts of tags for the subjects in the data. This model is functional when measurements are only taken once on these subjects, but additional correlation is introduced when the subjects are measured at multiple time points. My research aims to use a Markov Chain Monte Carlo approach to extend this negative binomial model that will use Gaussian Processes to address the unpredictable temporal nature of the data. Work is done under the advisement of Dr. Daniel Jeske, PhD.

- **Graduate Research Assistant Project:** *Multi-center Randomized Group Sequential Clinical Trial*

  Dr. Jeffrey Klein's treatment of tumescent anesthesia antibiotic delivery is believed to reduce the rate of surgical site infection in highly infectious surgeries, such as emergency colon surgery. A group sequential clinical trial with two stages is proposed to allow for early stopping if his treatment proves to be very effective. The group sequential trial was selected because it has the potential to reduce the number of required subjects, which could save time and expenses. Various error spending approaches were explored, and an approach which spends half of the Type I and Type II error at stage one was selected because it has a small number of required subjects while also maintaining a low expected total sample size for the trial.

- **Summer Research:** *Gene Clustering for Mice with Chronic and Non-chronic Wounds*

  Collaborated with Dr. Manuela Martins-Green, PhD, a Professor of Cell Biology at the University of California, Riverside, and her PhD student Jane Kim, to identify genes that behave differently for mice with chronic versus non-chronic wounds. Recognizing which genes have different behavior could be crucial to understanding what is preventing wound-healing in mice with chronic wounds. My work involved clustering genes with similar behavior for these two groups over time and identifying which genes showed statistically significant difference in counts for chronic and non-chronic mice, over time, and in the two groups over time.

Technical and Personal Skills

- **Programming Languages:** Proficient in: R, SAS
  Also familiar with: Python, Java, Mathematica, MATLAB, SPSS.

- **General Business Skills:** Experienced with presentations, skilled at interdepartmental collaborated data analysis, and proficient in LaTeX.

Presentations

- **Poster Presenter at the Symposium on Advanced Wound Care Spring/Wound Healing Society, May 2019 (San Antonio, TX):** *Identifying Probiotic Bacteria By Modeling Time Trends For Mice With Chronic And Non-chronic Wounds*

  In an experiment with mice that are given chronic or non-chronic wounds, it was of interest to identify probiotic bacteria which would help heal the non-chronic wounds over time. Due to a lack of appropriate existing methods in this longitudinal setting, I fit Generalized Estimating Equations (GEE) to the data to determine when bacteria differed in groups, over time, and in their group trends over time. Although there were some model convergence issues even with the flexibilities that GEE offers, some statistically significant results were found and reported.

- **UCR Microbiome Initiative and Data Blitz Symposium, September 2018 (University of California, Riverside):** *Statistical Modeling and Analysis of Longitudinal Microbiome Data*

  I outlined the existing methodology behind detecting differential expression in longitudinal RNA-seq data sets. In particular I explained an existing method with Generalized Estimating Equations which conducts a test for interaction between treatment group and time, although the model often will not converge and the results are typically inconclusive. I suggested that my PhD research project should alleviate these problems.

- **Statistics Colloquium, January 2018 (University of California, Riverside):** *Prevention of Surgical Site Infections in Emergency Colorectal Surgery: Design of a Multi-center Randomized Clinical Trial*

  Along with Dr. Jeffrey Klein, MD, I presented my work on the design of a group sequential clinical trial and decisions that were specific to this experiment in order to minimize required sample size while addressing

ethical and economical concerns.

- **Undergraduate Poster Session at Joint Mathematics Meetings, January 2015 (San Antonio, TX):** *On the divisibility and valuations of the Franel numbers*

  My research team from my summer program at the Mathematical Sciences Research Institute received the Outstanding Presentation Award for our presentation of our research of the Franel numbers.

Other Awards and Scholarships

- **Dissertation Year Program Fellowship** *University of California, Riverside*
  Funding provided for Winter Quarter, 2020
- **2017 Outstanding Statistical Consultation Award and Recognition** *University of California, Riverside*
  For achievement and service to the UCR Statistical Consulting Collaboratory
- **Helena M. Gamer Fund named scholarship** *Mount Holyoke College*
  For academic years 2013-2014 and 2014-2015
- **College Board AP Scholar Award**
  August 2011
- **LHS Honor Award for Outstanding Scholastic Achievement** *Londonderry High School*
  For academic year 2010-2011

Activities

- **Statistics Department Graduate Student Association** *University of California, Riverside*
  Student Liaison to Faculty, Spring 2019-Present
- **Putnam Problem Solving Group** *Mount Holyoke College*
  Co-President, Fall 2014
- **Math Club** *Mount Holyoke College*
  January 2013-2015

References

- References available on request