Developing Interactive Statistics Apps

A look at the project and student experience

Maria Tackett, Sean Li, Emmanuel Mokel, Shari Tian
Duke University

USCOTS 2021

Introduction

- **Overall project goal**: Use R Shiny to develop interactive learning apps on statistical concepts in 1st year courses
- Motivated by the Book of Apps for Statistics Teaching (BOAST) led by Dennis Pearl at Penn State
- Aims to *expand opportunities*:
  - ✓ Open to students at all levels (intro statistics course or equivalent required)
  - ✓ Positions posted on Muser, a university-wide platform
  - ✓ Opportunity to earn pay or course credit

Program structure

Summer 2020 (6 weeks)

- Team:
  - 4 undergrad students
  - 1 faculty member
  - 1 project manager
- ~ 15 hours per week
- 3 meetings per week
- Focused on app development

Spring 2021 (12 weeks)

- Team:
  - 3 undergrad students
  - 1 faculty member
- ~ 6 - 8 hours per week
- 1 meeting per week
- Focused on preparing apps for classroom use

Weekly workflow

Team meeting

- Project updates
- Feedback and idea sharing
- Plan for upcoming week

Independent work

- Implement updates
- Use R documentation and online resources for ideas and to learn new skills

Communication

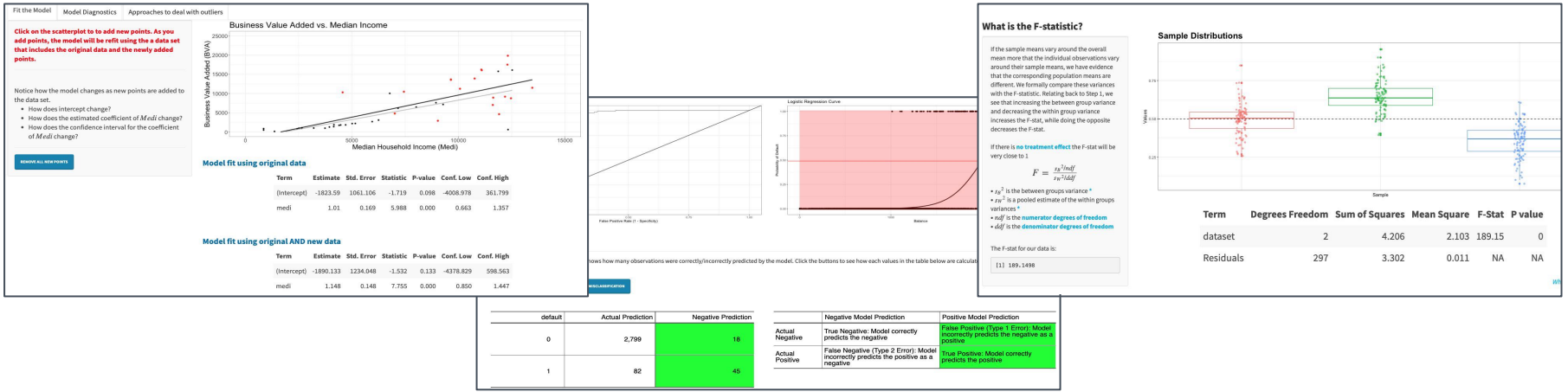
- Google docs for meeting notes and resources
- Slack for communication and idea sharing between meetings

Learning outcomes

- ✓ **Acquired new skills** seldom covered through regular statistics coursework
  - Interactive app and web development
  - Effectively explain and teach complex statistical concepts
- ✓ **Improved understanding of statistical concepts and R** programming
- ✓ Learned how to **give effective and constructive feedback** and reflect on own work
- ✓ Encouraged to take on **future data-driven projects and research opportunities**

Next steps & conclusion

- Conduct a formal research study in upcoming academic year to assess effectiveness of apps in a classroom setting
- Find the apps at https://duke-shiny-ed.netlify.app/



Thank you!

Resources

- Project website: https://duke-shiny-ed.netlify.app/
- Reflection on Summer 2020 program
- Related Projects:
  - Book Of Apps for Statistics Teaching (BOAST)
  - Shiny Ed

What motivated you to get involved with the project?

“A primary motivator to get involved in a statistics project outside of class was the curiosity of applying learned technical knowledge to help improve other students’ education in statistics. Furthermore, with online classes, I was looking for ways to connect more with my peers and professors.” - Sean

“I took an introductory data science course which was my first time using R. I wanted to expand my programming experience, and I found the concepts in the course extremely interesting. “ - Emmanuel

“Spring 2020, I took an Introduction to Data Science course and learned a significant amount of R programming. Toward the end of the course, we were introduced to the R Shiny package. While we did not get the chance to use it extensively, the introduction motivated me to take advantage of its app-building capabilities to create something meaningful.” - Shari

How do you plan to get involved in future statistics projects?

“This summer, I am conducting data-driven urobiome research at Loyola University Chicago while simultaneously working on a machine learning project for a microbiology lab at Duke. In the future, I plan on continuing to find computational research opportunities that pertain to health and medicine, whether through individual projects or working in a lab.” - Shari

“At the moment I am working on a project through Duke which focuses on using wearables data to predict COVID-19. Its primarily data engineering work which is new to me, but the premise of the object is interesting. In the fall, I will be working in a statistical genetics lab which focuses on predicting ancestry of admixed individuals. “ - Emmanuel

“This summer, I am working on a machine learning research project targeting to identify and remove bias and discrimination. In the future, I am pursuing data science research to improve educational outcomes.” - Sean