

Undergraduate research in statistics

Maria Tackett
Duke University

Our FA2M2
December 19, 2020



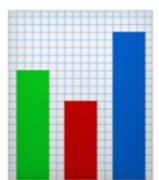
bit.ly/ourfa2m2-statistics



B.S. in Mathematics



First research experience at
SUNY-Potsdam REU after
sophomore year



First statistics class junior year



M.S. in Statistics

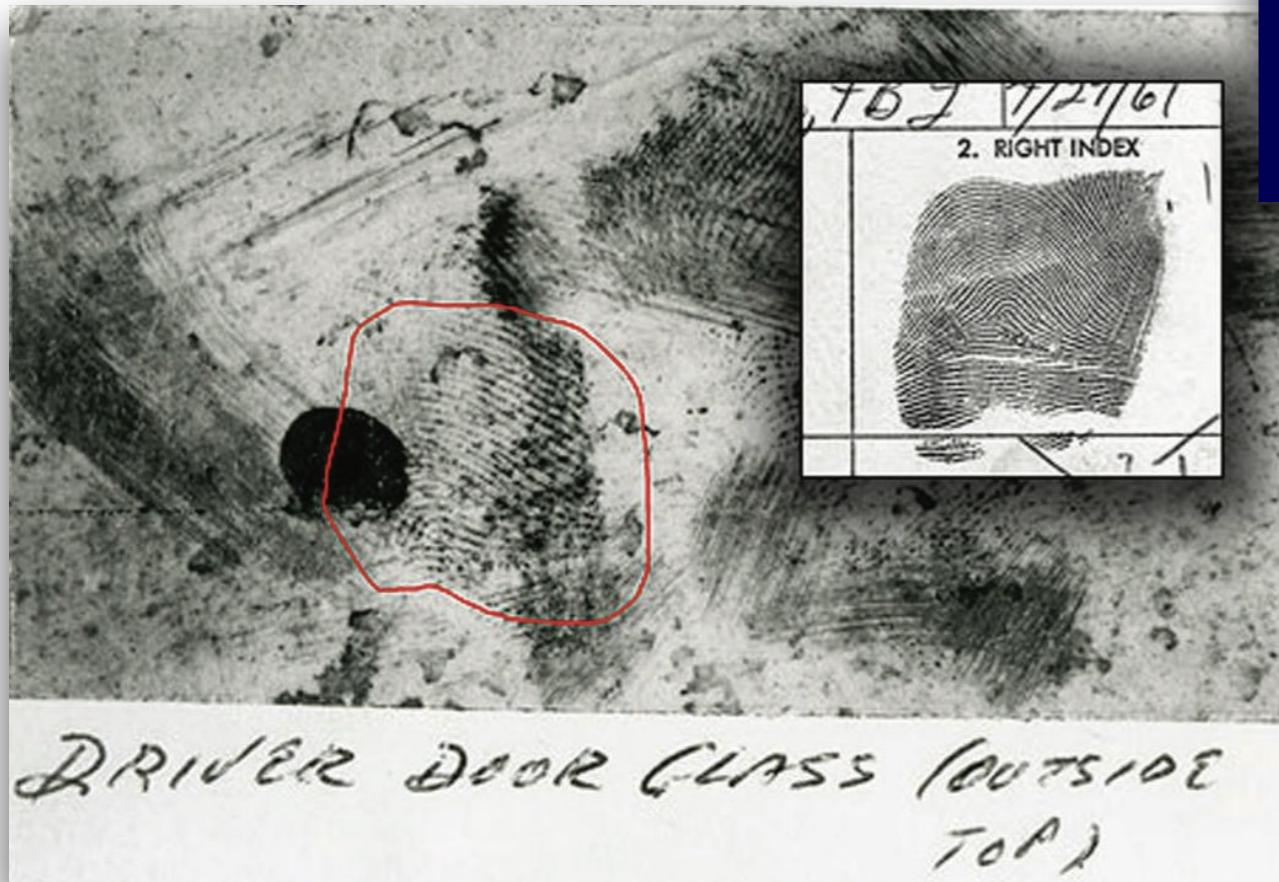
Statistician @ Capital One



Design of Experiments

Regression Modeling

🎓 PhD in Statistics

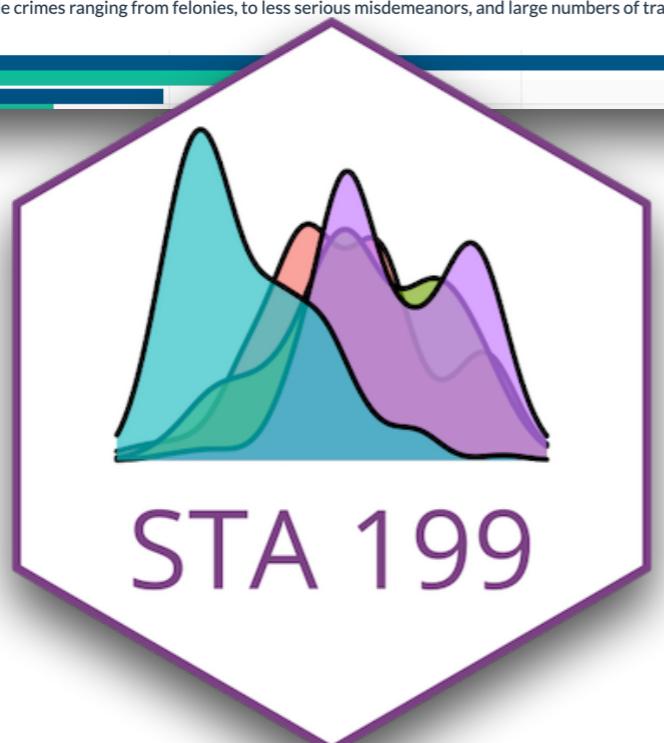
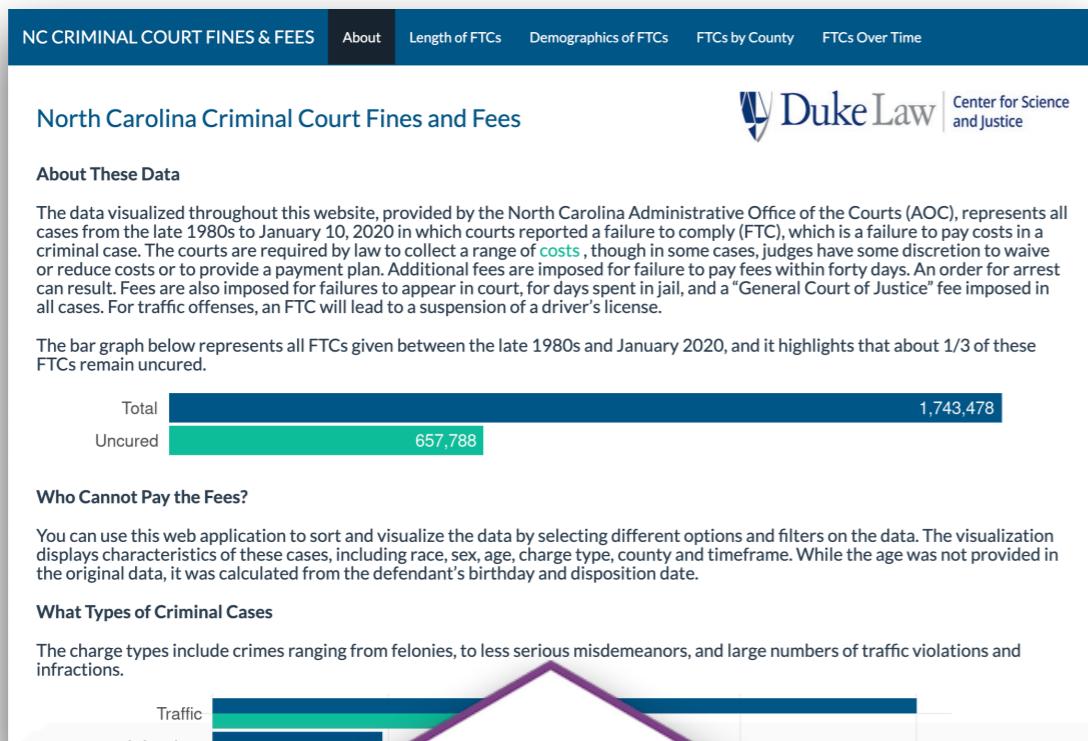


Bayesian approach to
analyzing forensic evidence

Assistant Professor of the Practice

@

Duke
UNIVERSITY





What is
undergraduate
research in
statistics?

Research areas in statistics

Methodology

- Statistical theory
- Bayesian statistics
- Spatial statistics
- Time series
- Network analysis
- Survival analysis
- High dimensional data
- Missing data
- Causal inference
- Machine learning
- ...and more

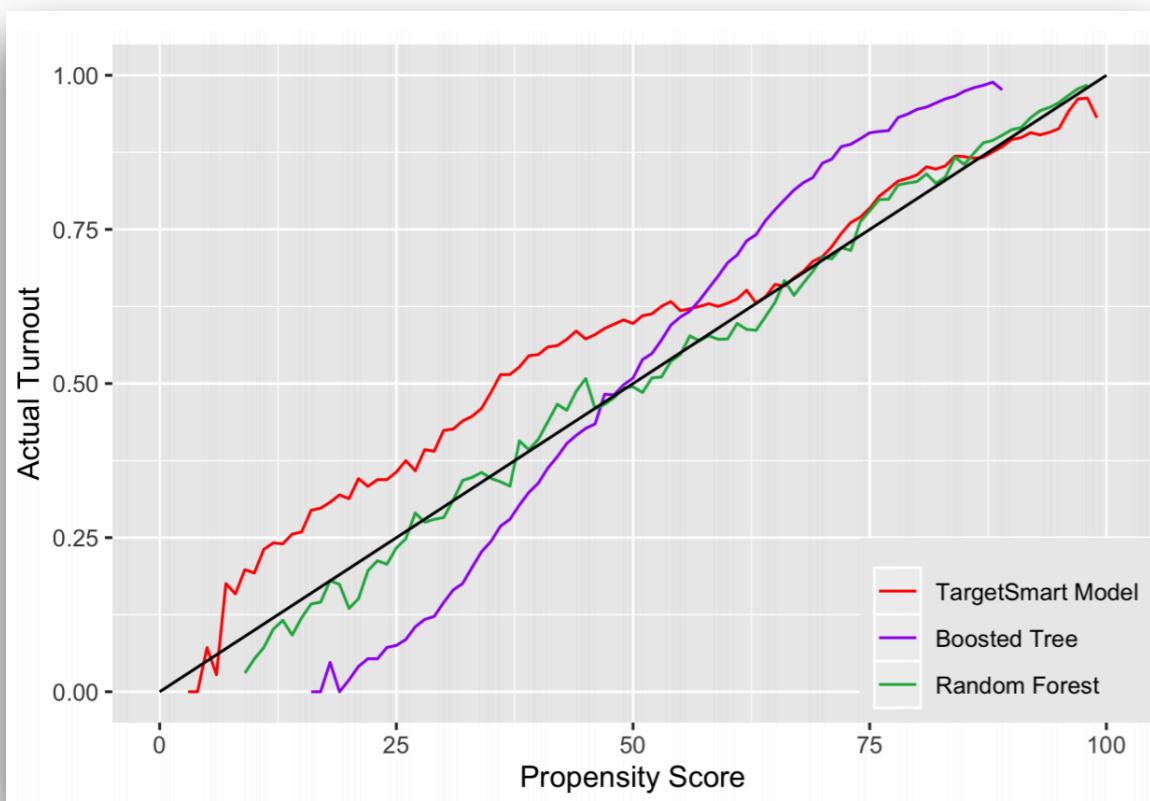
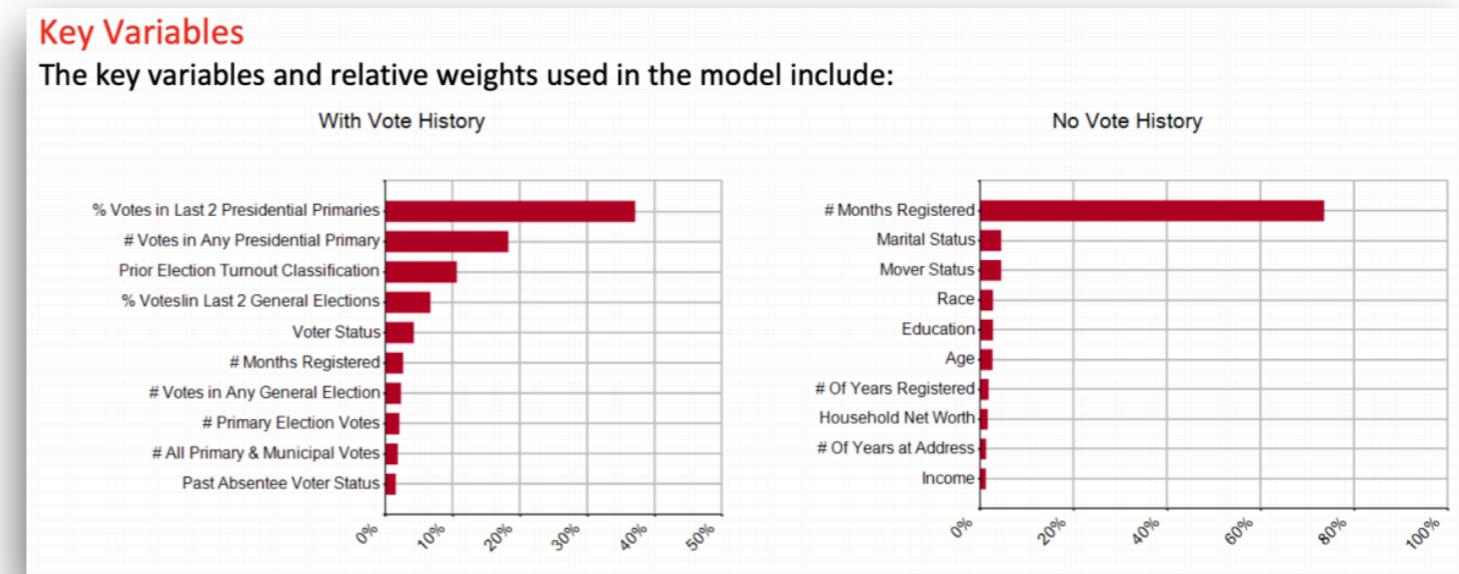
Application

- Health and medicine, epidemiology
- Education
- Government and public policy
- Forensic science
- Environmental science
- Sports analytics
- Economic and financial data
- Data privacy and confidentiality
- ... and more

Replication study on voter turnout

Vote by Mail: A study on the effects of voting by mail on election turnout in Utah

by Naomi Boss & Timothy Shinners
Reed College

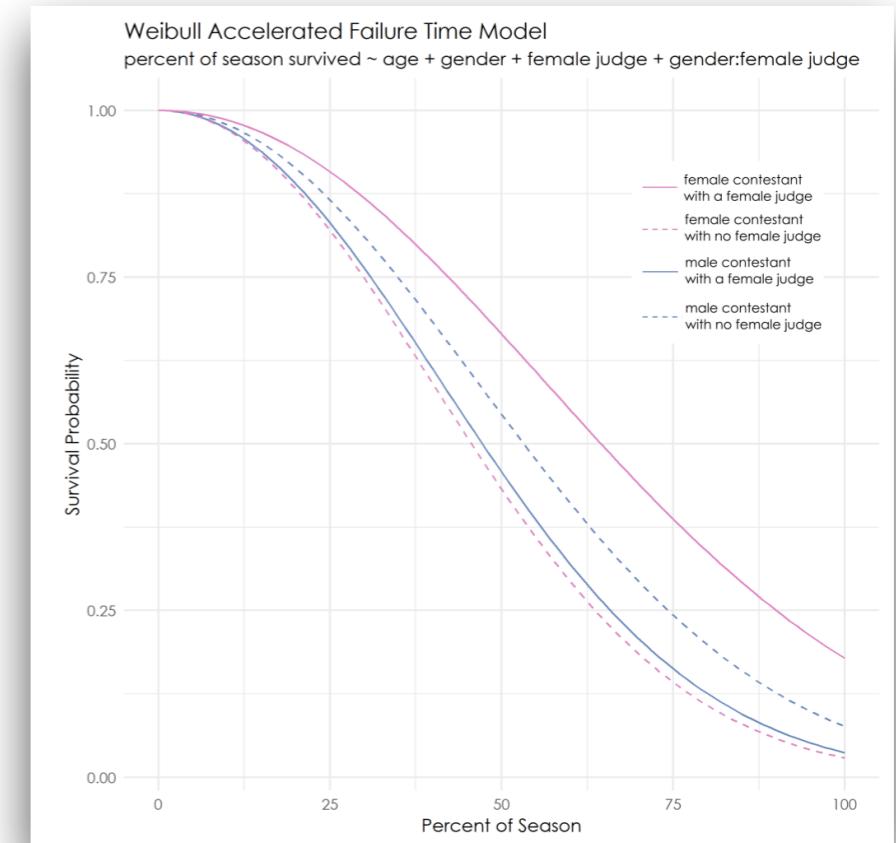
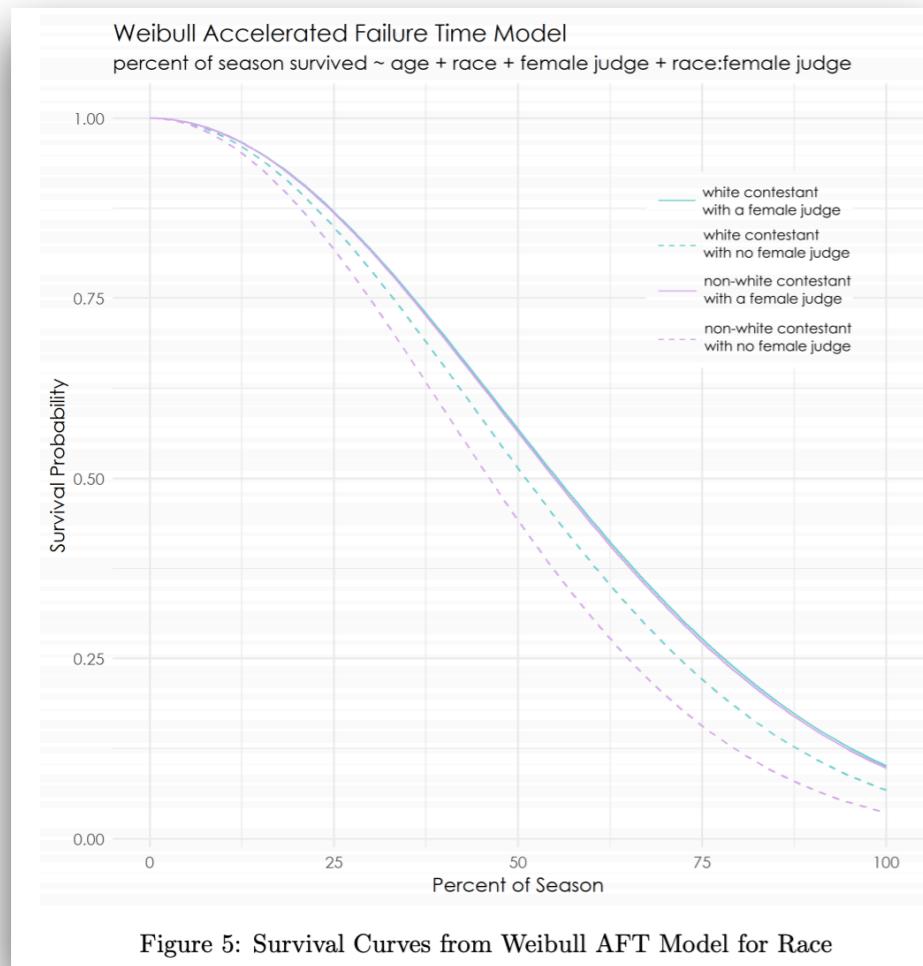


- Replicated 2018 study on the impact of vote-by-mail on election turnout in Utah
- Used **regression** to identify most important factors in TargetSmart voter propensity score
- Used **boosted tree** and **random forest** models to develop voter propensity score

Survival analysis on *MasterChefJunior*

Whip It Like A (Wo)Man: Survival Analysis of Minority Contestants in Masterchef Junior

by Katya Kelly & Katie Jolly
Macalester College



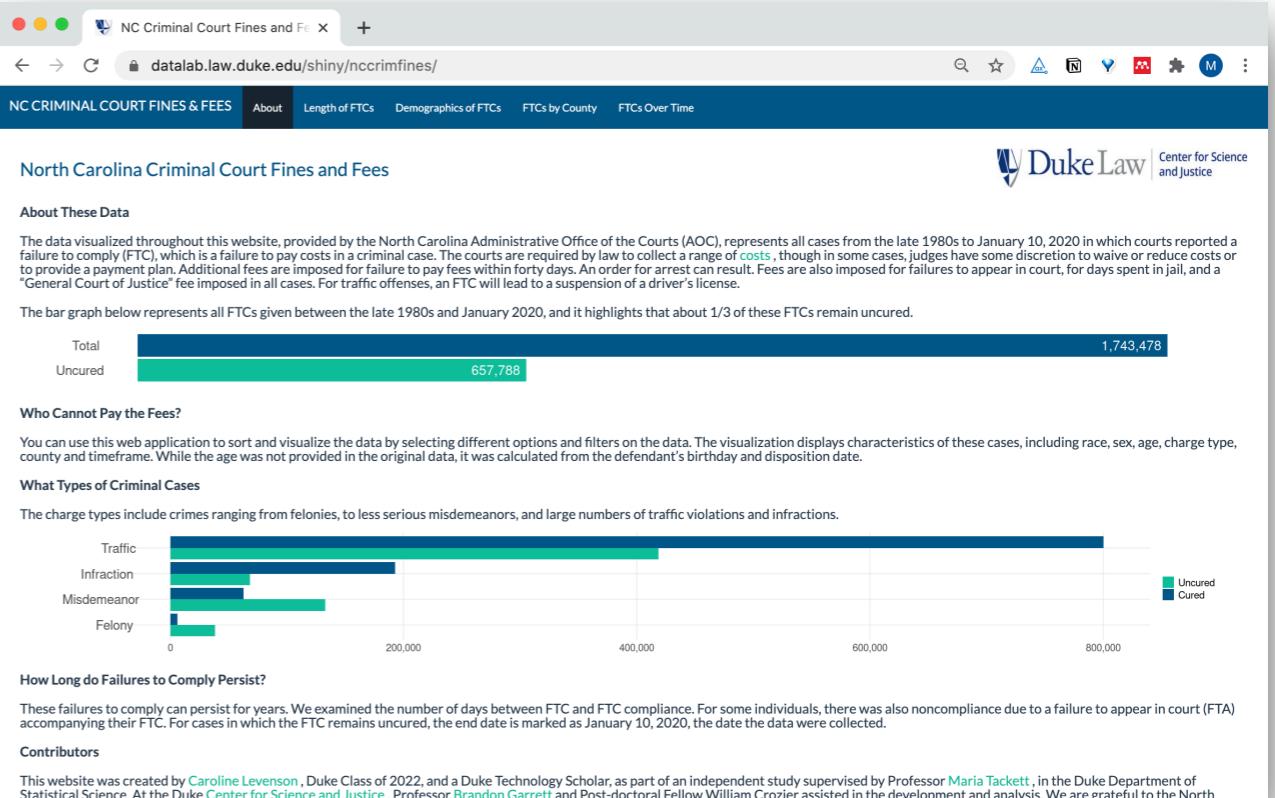
- Study of contestant survival on the TV competition show *MasterChefJunior*
- Used **survival analysis** to model how long females and people of color stay on the show and how that's impacted by the addition of a female judge.

Applied research in criminal justice

Interactive Web App of North Carolina Criminal Fines and Fees

by Caroline Levenson
Duke University

The cover page features the Duke Law logo and the text "Center for Science and Justice". Below this, it says "A Center for Science and Justice Report: The Explosion of Unpaid Criminal Fines and Fees in North Carolina". The date "April 22, 2020" is at the bottom left. The main image is a collage of yellow "FINE" signs.



- Used **R Shiny** to develop interactive web app to explore data about NC criminal fines and fees
- App used by legal professionals to better understand who is most impacted by these fines
- Used skills in **data visualization**, **data wrangling**, **missing data imputation**, and **computing**

A few reasons to do undergraduate research

-  Learn while answering relevant and interesting research questions.
-  Develop communication skills and other valuable professional skills.
-  Connect with your professors, graduate students, and other undergraduates.
-  Figure out your own academic and career interests.
-  Make a meaningful contribution to the field

Finding research opportunities

-  Find research classes and programs at your institution
-  Review math/statistics department website or directory to learn more about faculty research focus areas.
 - Email the faculty member you're interested in working with.
-  Reach out to faculty outside of math/statistics to see if there is statistical analysis in their work
-  Additional Resources:
 - [Tips for writing the introduction email](#)
 - [Advice from students about undergraduate research](#)



What are more ways to
get involved?

Present your work!

Undergraduate Statistics Project Competition

- Undergraduate Statistics Class Project
 - Next submission deadline: **December 23, 2020!**
- Undergraduate Statistics Research Project
 - Next submission deadline: **December 23, 2020!**
- Electronic Undergraduate Statistics Research Conference
 - Videos from the 2020 conference



Participate in data analysis competitions



Data analysis competition held
in the fall and spring

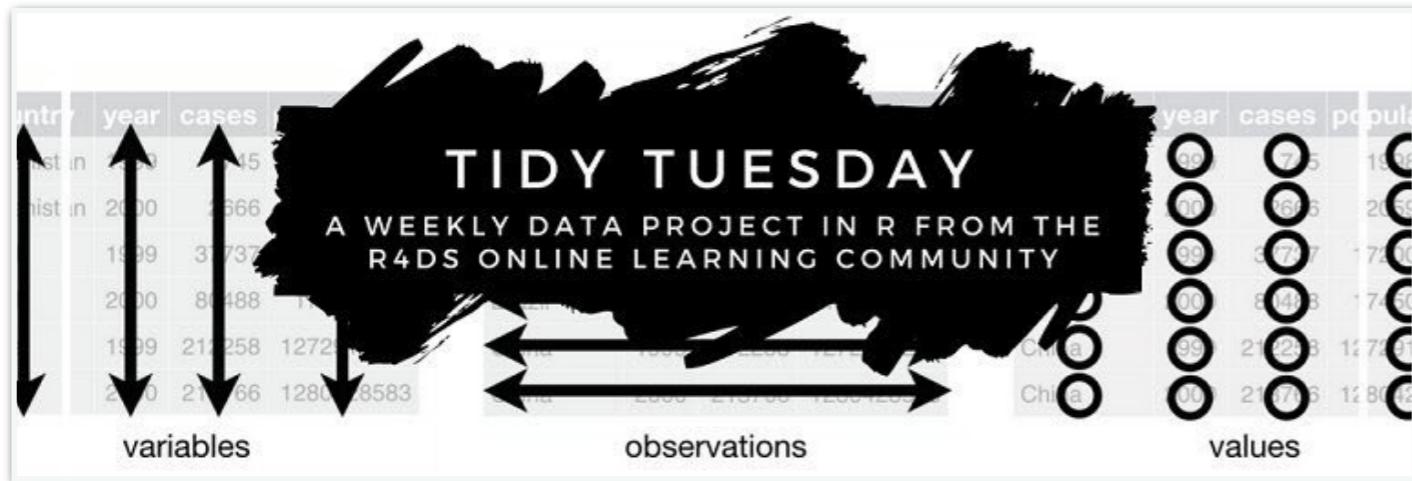
Click [here](#) for more information and winners from the fall competition.



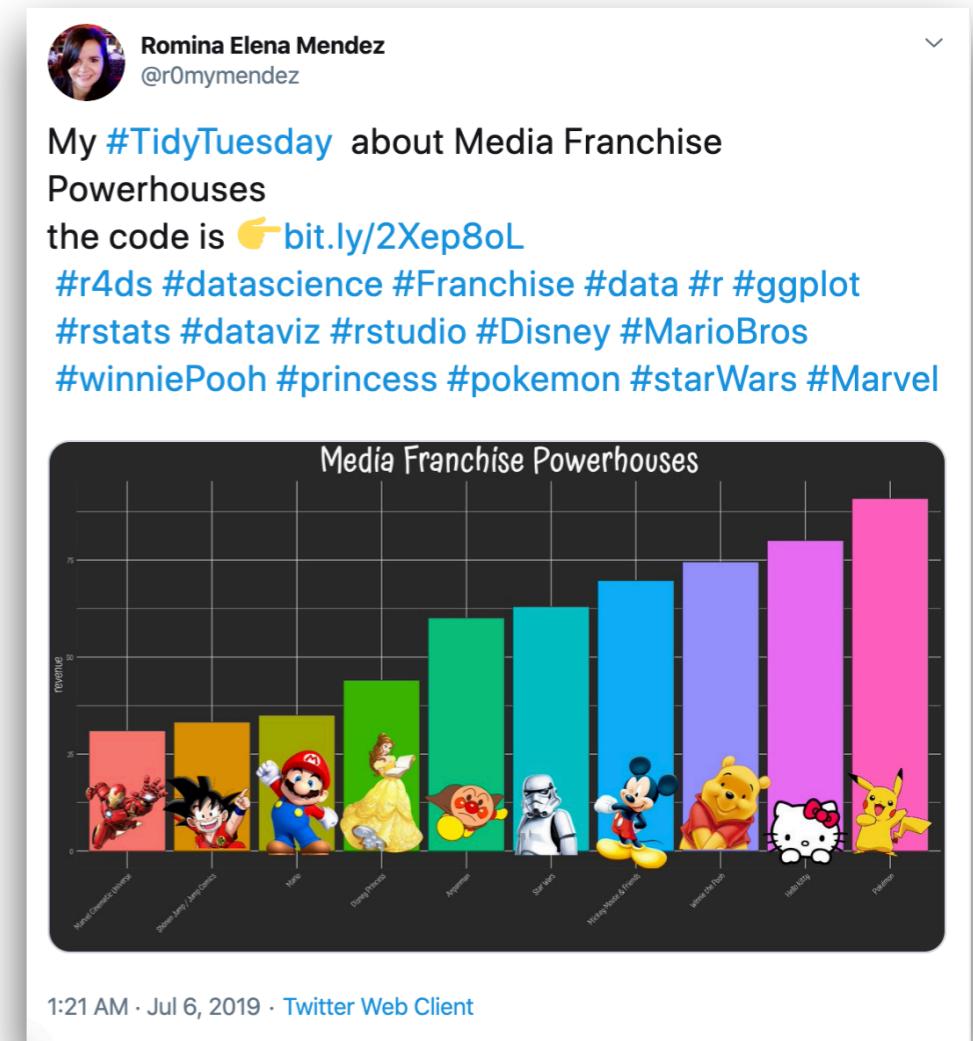
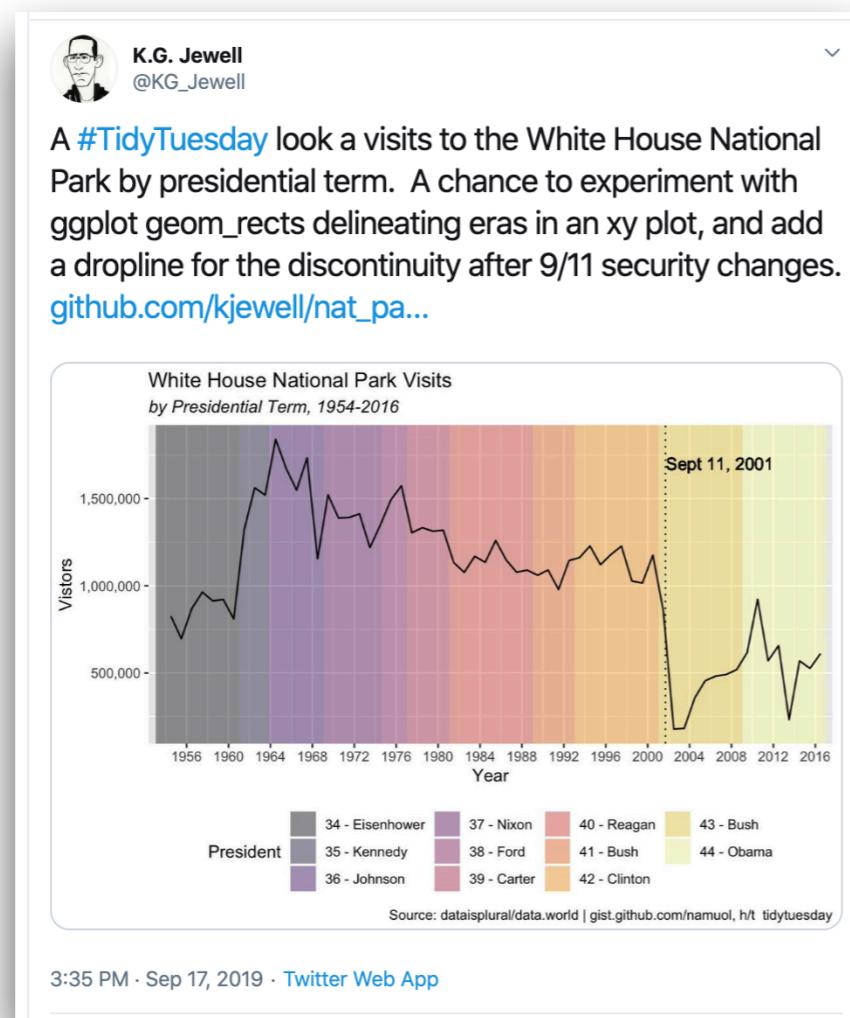
Weekend-long data analysis
competition held in the spring

Click [here](#) for more information

Work on small, informal projects



<https://github.com/rfordatascience/tidytuesday>



Thank You!



maria.tackett@duke.edu



@MT_statistics



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<https://datascience.berkeley.edu/about/what-is-data-science/>

References

"Algorithms Gave Us the Black Hole Pictures. She's the 29-year-old Scientist Who Created Them",
<https://www.washingtonpost.com/science/2019/04/10/algorithms-gave-us-black-hole-pic-this-scientist-helped-create-them/>

"Share, Contribute, Collaborate, Broadcast".

<https://speakerdeck.com/minecr/share-contribute-collaborate-broadcast>

Joseph R. Nolan, Kelly S. McConville, Vittorio Addona, Nathan L. Tintle & Dennis K. Pearl (2020) *Mentoring Undergraduate Research in Statistics: Reaping the Benefits and Overcoming the Barriers*, Journal of Statistics Education, 28:2, 140-153.