STA234 HW6

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Problem 5 [15 points]

15/15

Using what you have already reported in previous assignments for your project, do some additional research to see which statistical models will help you address your research questions. Report the possible models and references used to find these.

For this question, I went through several academic papers to see the previous work on similar datasets and the statistical models that were used. I also used Google to further learn about the tests that are used.

Pierson et al. (2020) worked on the dataset I used and worked on an extensive analysis of the complete dataset. This paper uses the following statistical methods I can also use in my study:

- *Veil of Darkness Test:* This test was originally developed by Grogger & Ridgeway (2005) to detect racial bias in the traffic stops. It comes from the assumption that if an officer is racially biased, it would not be able to do so after a certain time of the day. Figure 2 shows the illustration of the veil of darkness test in Texas for different time frames. One of the key points in the paper is the adjusting the time for the sunset which I did not do in my previous exploration of the data. **Doable!**
- *Outcome (Hit Rate) Test:* This test was based on Gary Becker's theory of discrimination and mainly focuses on detecting if the officers apply the same threshold for deciding to stop/search drivers. Rather than looking at the rate different racial groups are searched, it focuses on the hit rate, which checks whether any violation was found or not. Figure 3 shows that Hispanic drivers have a lower hit rate, while Black drivers show a significantly low hit-rate. I can implement this in my paper as well. **Doable!**

Xu et al. (2024) analyzed the Police-Public Contact Survey conducted 4 times from 2005 to 2015. The paper provides an investigation into how people evaluate police behavior during traffic stops. It uses the following statistical methods:

- *Binary Logistic Regression:* This model used to identify th significant predictors of whether people believe if the stop was legit or not. It models a relationship between the outcome of the stop, and different variables like race, age, gender, stop

outcome, etc. The model achieved an AUC of 0.838 which is considered as good. I can use a similar model in my project to try to determine the outcome of the stop. **Definitely doable!**

- *Random Forest Classification:* Following this regression model, a random forest classifier was built to create a decision tree to predict the outcome of the public opinion (police was right / wrong). The model was trained on 80% of the data and tested on 20% of the data, achieving over 90% accuracy. I can build a similar model on guessing the stop outcomes. **Save for latter!**

Resources

How to calculate the percentiles in dplyr:
https://stackoverflow.com/questions/30488389/using-dplyr-window-functions-to-calculate-percentiles

References

Grogger, J., & Ridgeway, G. (2005). *Testing for racial profiling in traffic stops from behind a veil of darkness* (Working Papers 0507). Harris School of Public Policy Studies, University of Chicago. https://EconPapers.repec.org/RePEc:har:wpaper:0507

Pierson, E., Simoiu, C., Overgoor, J., Corbett-Davies, S., Jenson, D., Shoemaker, A., Ramachandran, V., Barghouty, P., Phillips, C., Shroff, R., & Goel, S. (2020). A large-scale analysis of racial disparities in police stops across the United States. *Nature Human Behaviour*, *4*(7), 736–745. https://doi.org/10.1038/s41562-020-0858-1

Xu, W., Smart, M., Tilahun, N., Askari, S., Dennis, Z., Li, H., & Levinson, D. (2024). The racial composition of road users, traffic citations, and police stops. *Proceedings of the National Academy of Sciences*, *121*(24). https://doi.org/10.1073/pnas.2402547121