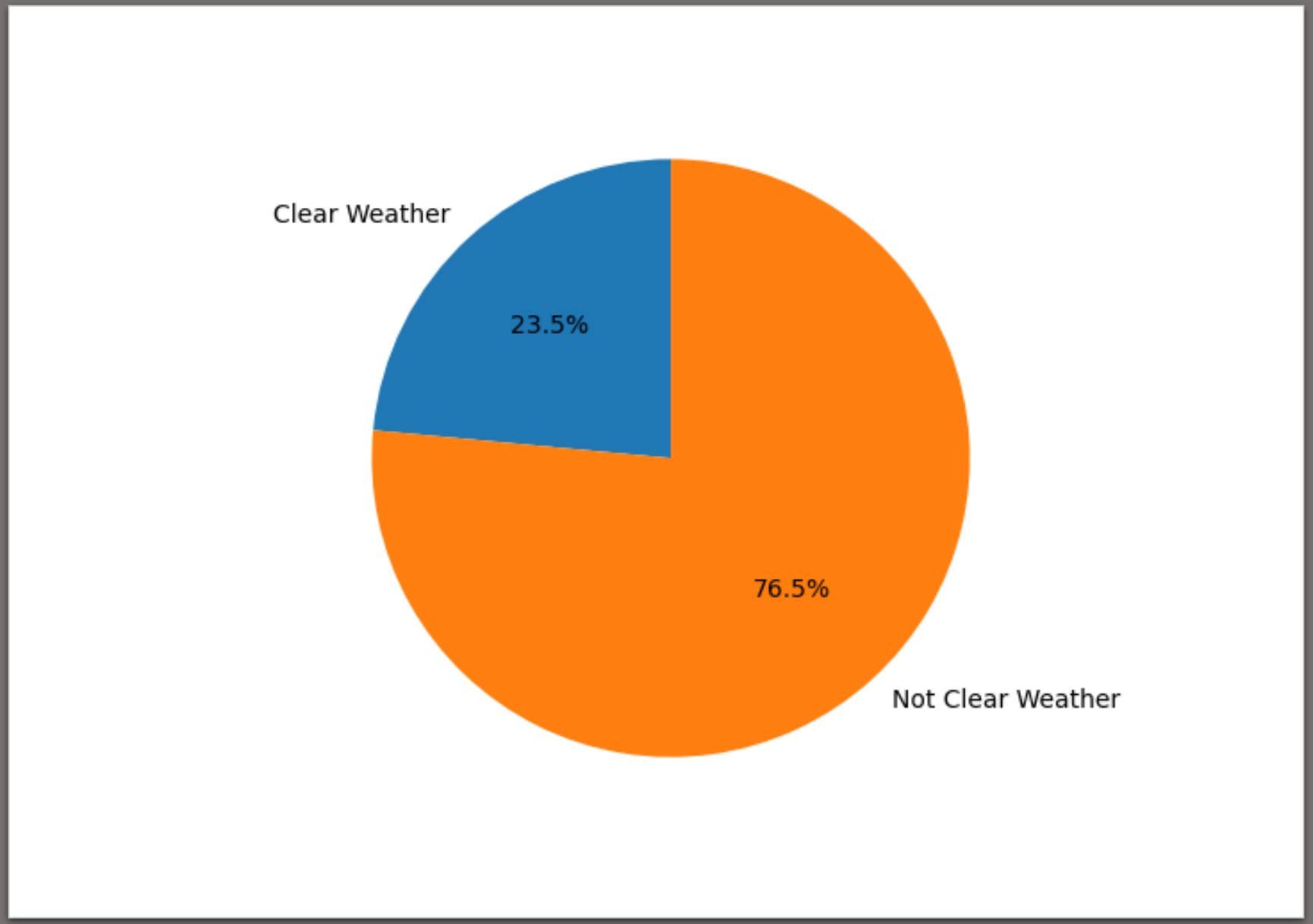
Car Accident Forecasting

Forecasting car accidents by analyzing their relationships with weather conditions, time of day and population

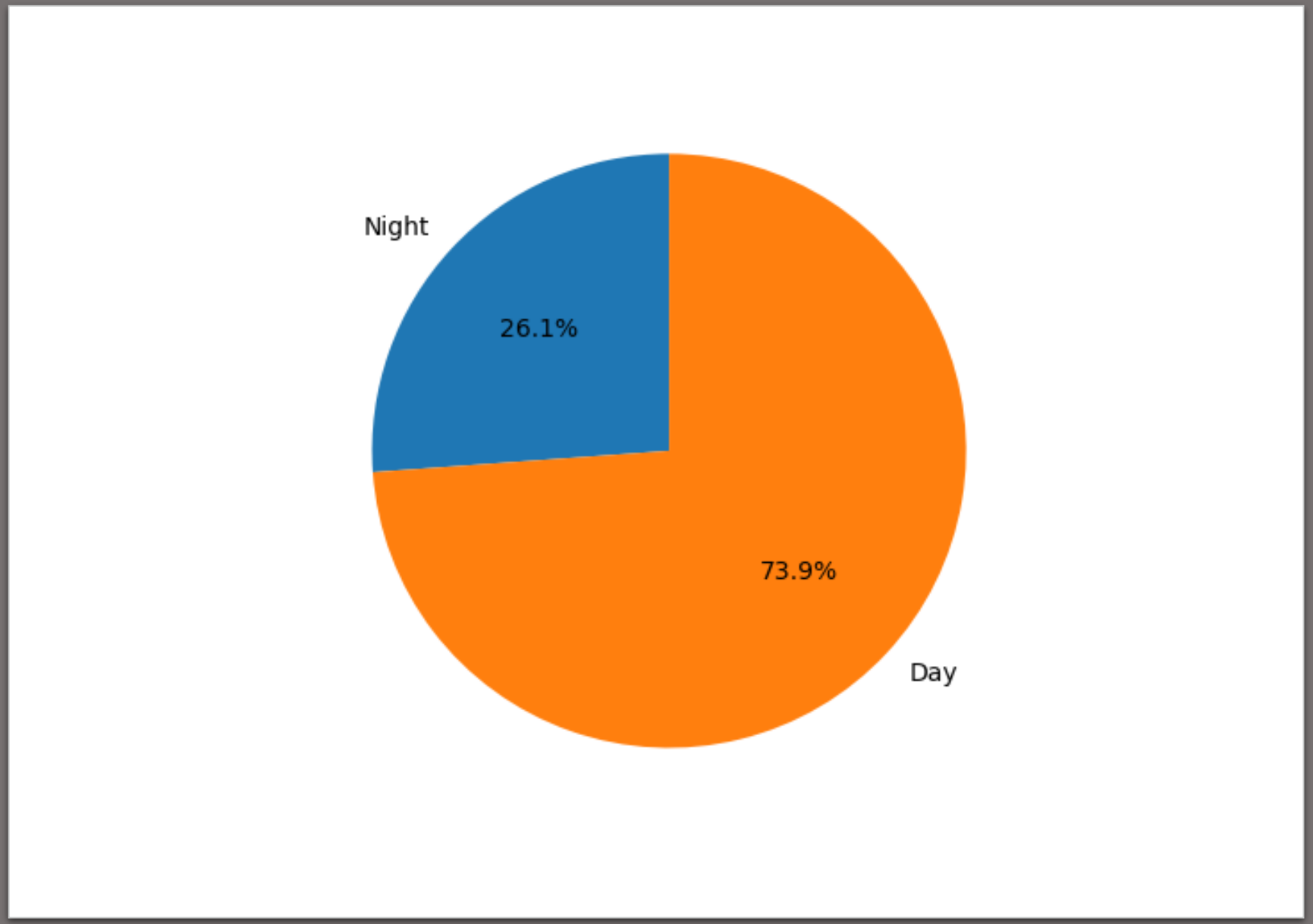
Gregory Happ

The Datasets

- **US-Accidents: A Countrywide Traffic Accident Dataset**
  - **https://smoosavi.org/datasets/us_accidents**
- **Census Data**
  - **https://blog.splitwise.com/2013/09/18/the-2010-us-census-population-by-zip-code-totally-free/amp/**



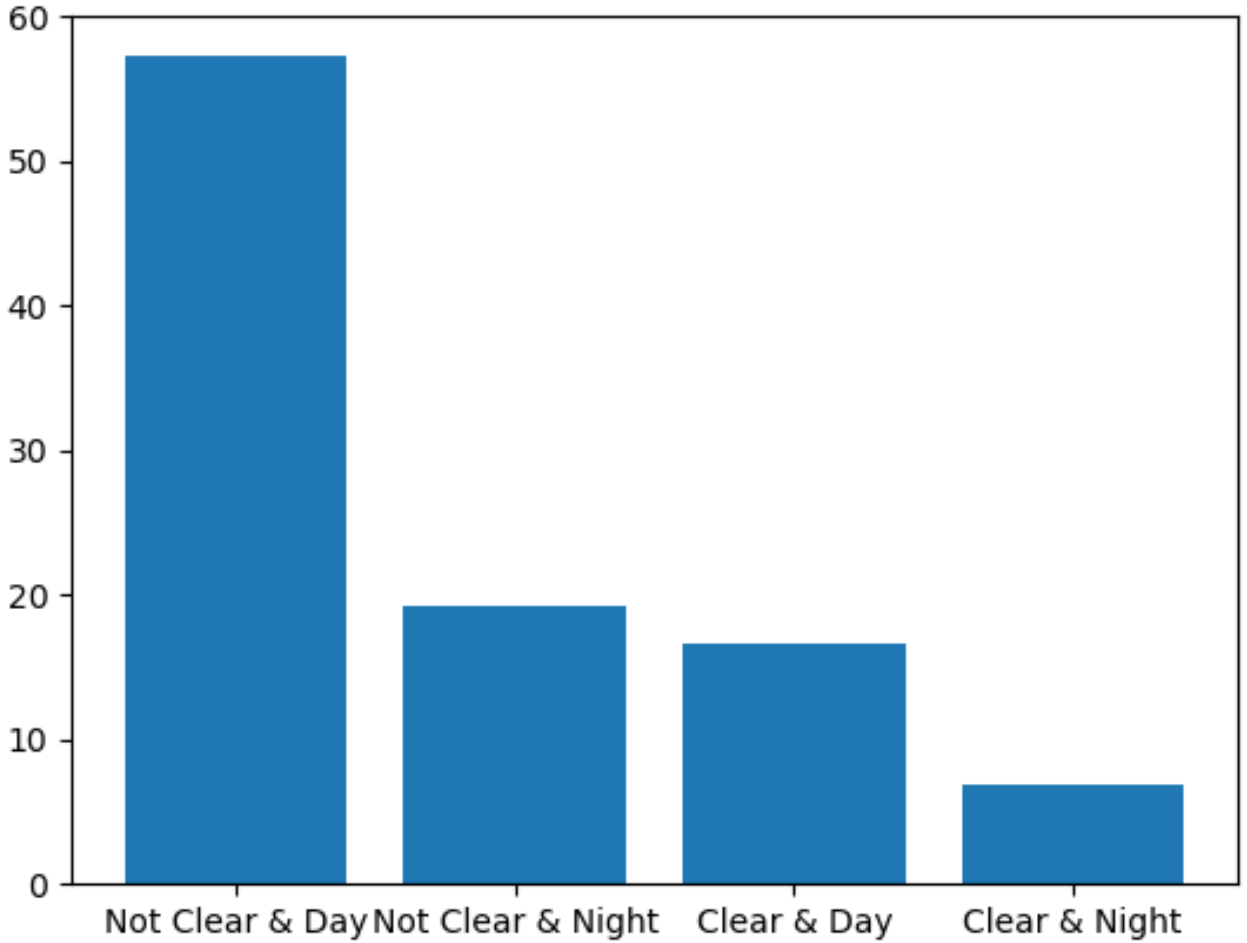
Weather Conditions



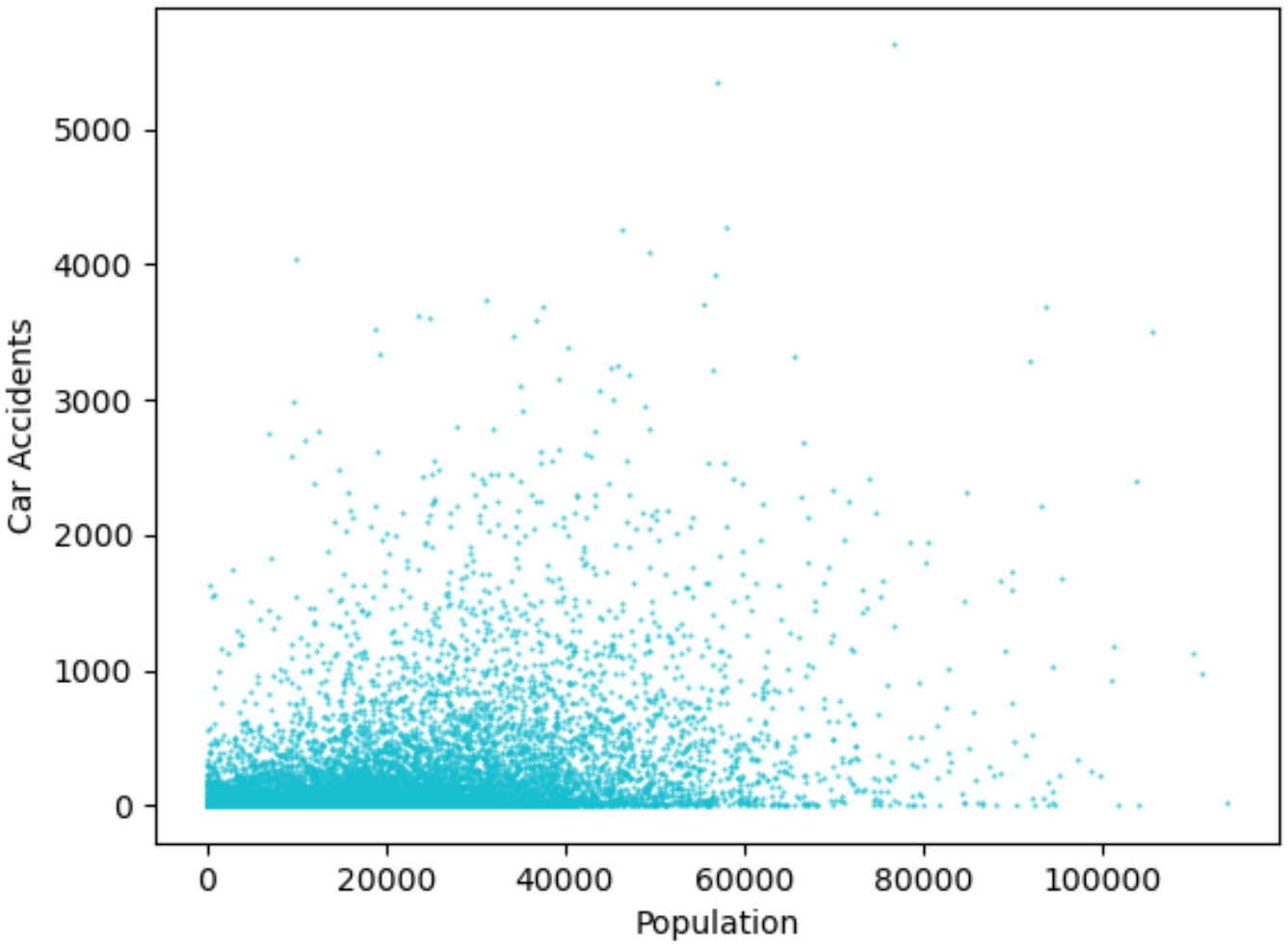
Day or Night

Weather Conditions and Time

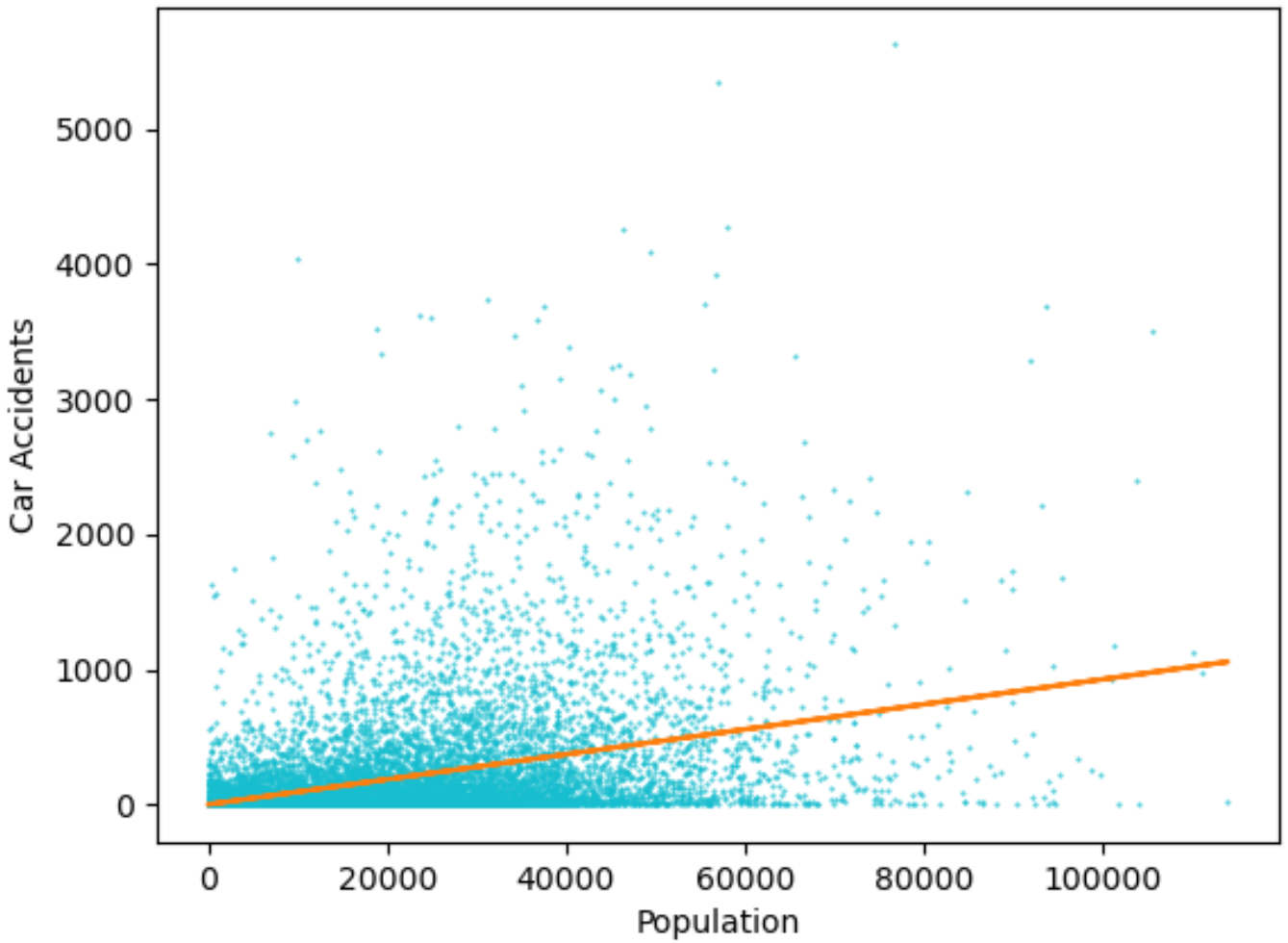
	Day	Night	Total
Weather Not Clear	1966561	662750	2629311
Clear Weather	572087	236090	808177
Total	2538648	898840	3437488



Weather Conditions and Time


Car Accidents
5000
4000
3000
2000
1000
0
0
20000
40000
60000
80000
100000
Population

Population


Car Accidents
5000
4000
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40000
60000
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100000
Population

Population

Correlation: Population and Car Accidents

Pearson's r = 0.4278201964372337

p-value = 0.0

Spearman's rho = 0.5770351900548639

p-value = 0.0

Kendall's tau = 0.4071861941576106

p-value = 0.0

	Car Accidents
Population	0.009***
	(0.0001)
Constant	3.545
	(3.240)
N	17,249
R^2	0.183
Adjusted R^2	0.183
Residual Std. Error	310.046 (df = 17247)
F Statistic	3,863.937*** (df = 1; 17247)

Notes:
***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

OLS: Population and Car Accidents

Summary

There is evidence that suggests that weather conditions, time of day and population could be used to forecast the total amount of car accidents for a given area during a given time period.

Acknowledgments

- Python and R were used for coding the project
  - Python Packages: pandas, matplotlib, scipy, sklearn
    - McKinney, W., & others. (2010). Data structures for statistical computing in python. In *Proceedings of the 9th Python in Science Conference* (Vol. 445, pp. 51–56).
    - Hunter, J. D. (2007). **Matplotlib**: A 2D graphics environment. Computing in Science & Engineering, 9(3), 90–95.
    - Virtanen, P., Gommers, R., Oliphant, Travis E., Haberland, M., Reddy, T., Cournapeau, D., … Contributors, SciPy 1. 0. (2020). SciPy 1.0: Fundamental Algorithms for Scientific Computing in Python. *Nature Methods*.
    - Scikit-learn: Machine Learning in Python, Pedregosa *et al.*, JMLR 12, pp. 2825-2830, 2011.
  - R Packages: stargazer, dplyr
    - Hlavac, Marek (2018). stargazer: Well-Formatted Regression and Summary StatisticsTables. R package version 5.2.2. https://CRAN.R-project.org/package=stargazer
    - Hadley Wickham, Romain François, Lionel Henry and Kirill Müller (2018). dplyr: A Grammar of Data Manipulation. R package version 0.7.6. https://CRAN.R-project.org/package=dplyr
- 1st Dataset:
  - **https://smoosavi.org/datasets/us_accidents**
  - Moosavi, Sobhan, Mohammad Hossein Samavatian, Srinivasan Parthasarathy, and Rajiv Ramnath. "A Countrywide Traffic Accident Dataset.", arXiv preprint arXiv:1906.05409 (2019).
  - Moosavi, Sobhan, Mohammad Hossein Samavatian, Srinivasan Parthasarathy, Radu Teodorescu, and Rajiv Ramnath. "Accident Risk Prediction based on Heterogeneous Sparse Data: New Dataset and Insights." In proceedings of the 27th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems, ACM, 2019.
- 2nd Dataset:
  - **https://blog.splitwise.com/2013/09/18/the-2010-us-census-population-by-zip-code-totally-free/amp/**
  - Jon Bittner, The Splitwise Blog Contributor