# US Traffic Fatalities

Kirk Hazen
September 21, 2022

# Fatalities

Traffic fatalities occur more often under certain conditions, and understanding which features contribute to fatalities can help us prevent them in the future.

# Understanding Fatalities

## Data Collection

The NHTSA collects accident data for the US, and their primary data collection is from the Fatality Analysis Reporting System (FARS). Here, the 2019 dataset is used to assess fatality patterns.

## The Dataset

FARS provides data from all states across many factors, including:

- Harmful events
- Drunk driving
- Weather conditions
- Pedestrians/cyclists
- Rural/Urban

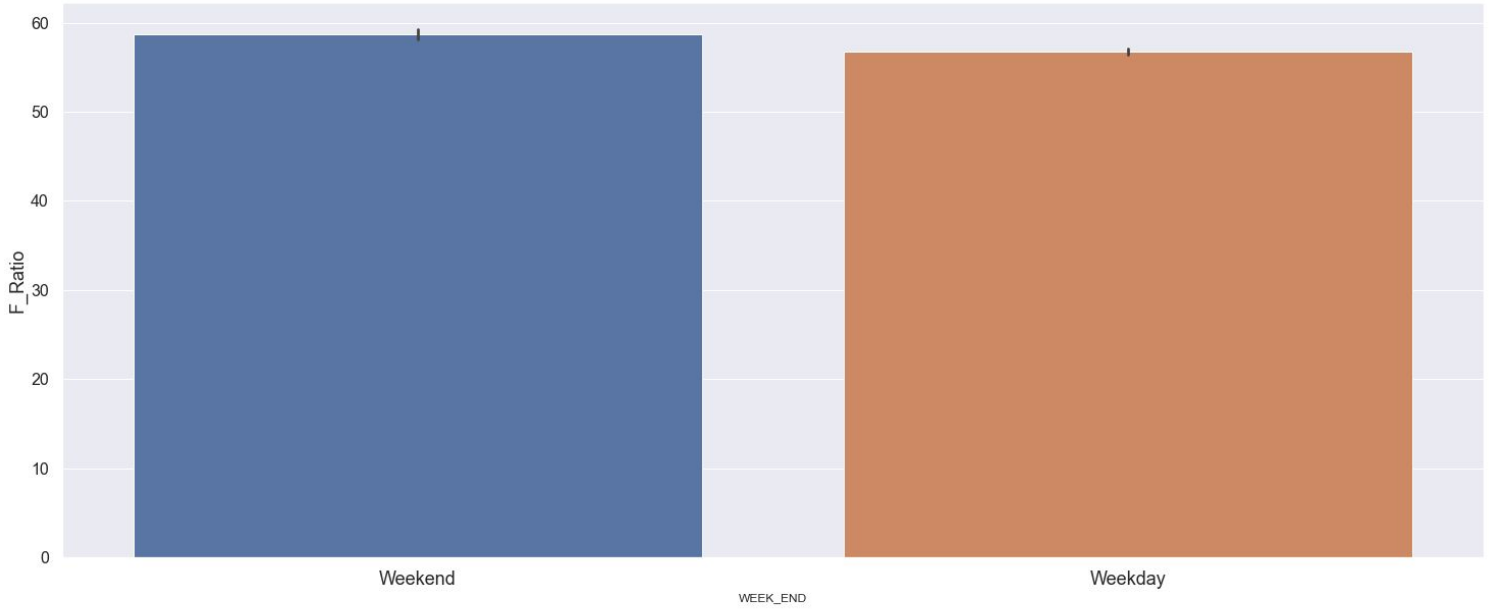
## Methodology

Machine Learning (ML) models allow researchers to understand what factors most influence fatalities.

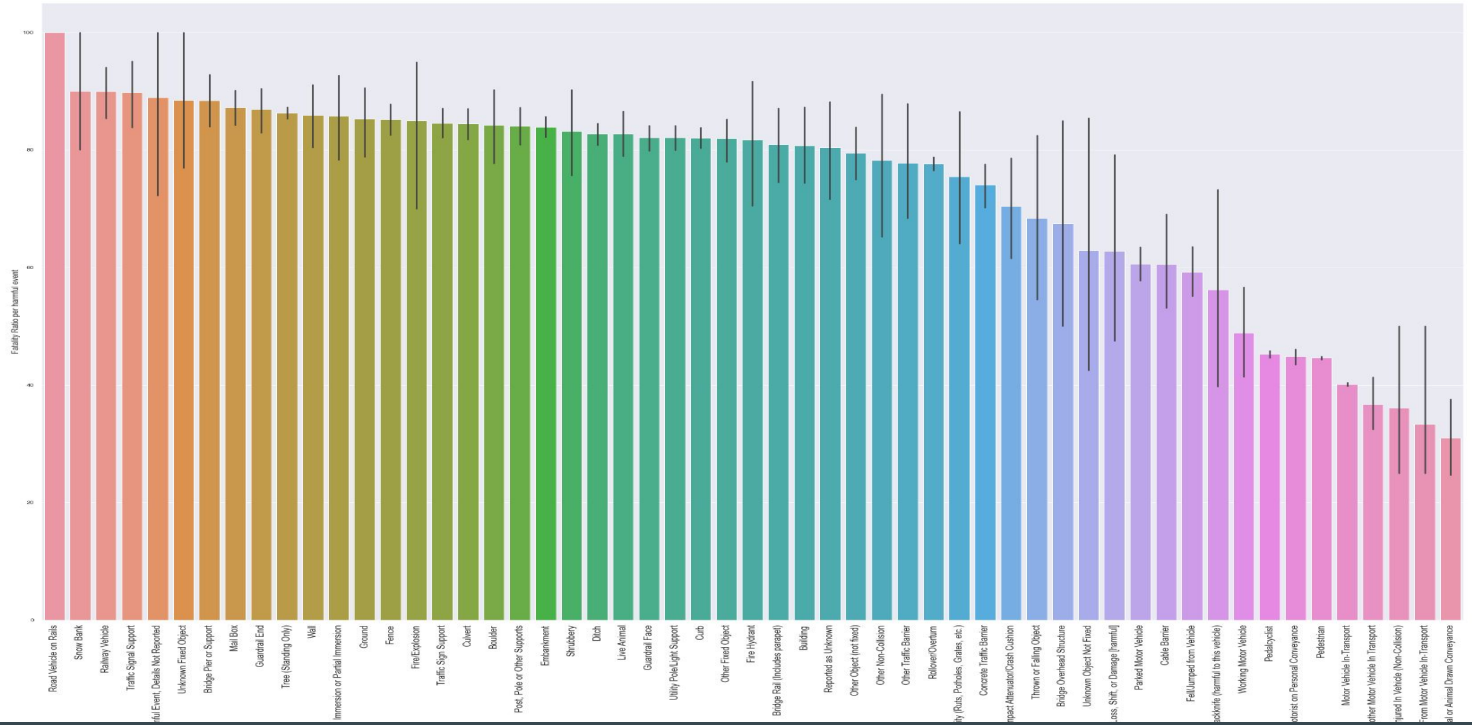
**Project objective:**
Which accident factors contribute the most to fatalities

Target Measure:
Fatality Ratio - the number of fatalities in an accident divided by the number of total persons

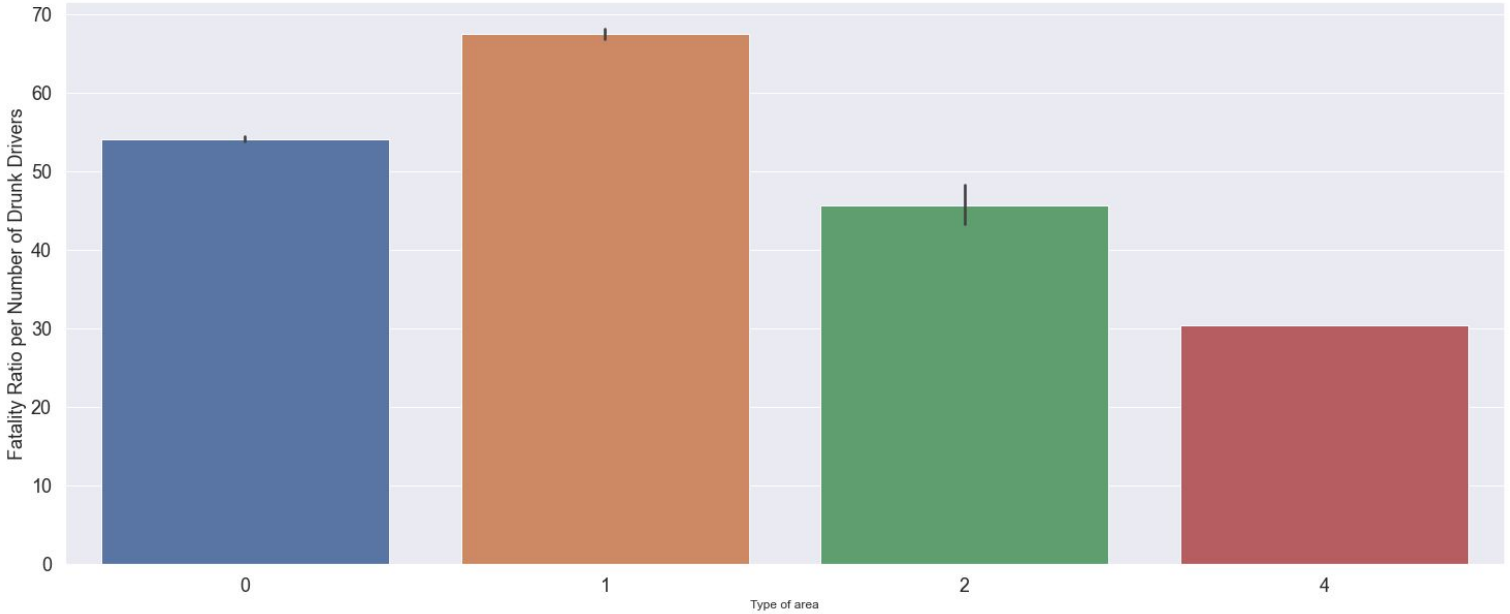
# Many factors showed little variation:



# Some showed wide variation between many factors



# Accidents with drunk drivers had variability



# Model Assessment

| Feature Set | Model | MAE | RMSE | $R^2$ |
|---|---|---|---|---|
| Full | Ordinary Least Squares | 57.47 | 59.5 | -3.35 |
| Full | Lasso (alpha = 1.0) | 12.22 | 15.63 | 0.7 |
| Full | Linear Regression | 10.99 | 15.21 | 0.72 |
| Full | Decision Tree Regressor (5) | 4.24 | 9.91 | 0.88 |
| Trimmed | Lasso (alpha = 1.0) | 12.22 | 15.63 | 0.7 |
| Trimmed | Linear Regression | 11.15 | 15.3 | 0.71 |
| Trimmed | Decision Tree Regressor (5) | 4.25 | 9.92 | 0.88 |

# Feature Selection

The most important features of the ML models were those with a rank of five or higher. These include the following:

- Number of pedestrians
- Number of persons in vehicles
- Number of drunk drivers
- Rural areas

Harmful events:

- Crash with a motor vehicle in-transport
- Crash with a cyclist
- Crash with motorist on personal conveyance
- Crash with a pedestrian
- Crash with a traffic signal support
- Crash with standing tree
- Crash with other not-fixed object
- Crash with fixed object
- Wreck without crash (e.g. rollover)

# The Future for Fatalities

Efforts to mitigate the effects of these features, such as automated braking systems, are predicted to have the most effect in reducing traffic fatalities.