Patterns in Road Accidents:

The case of the United Kingdom

by

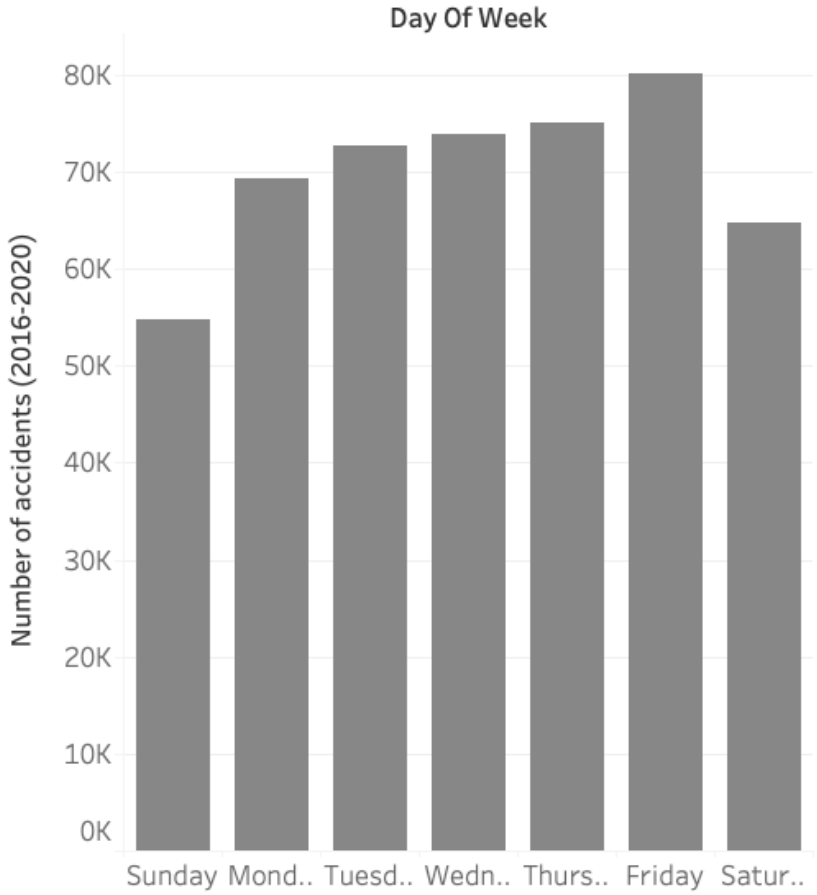
Elif Yildirim

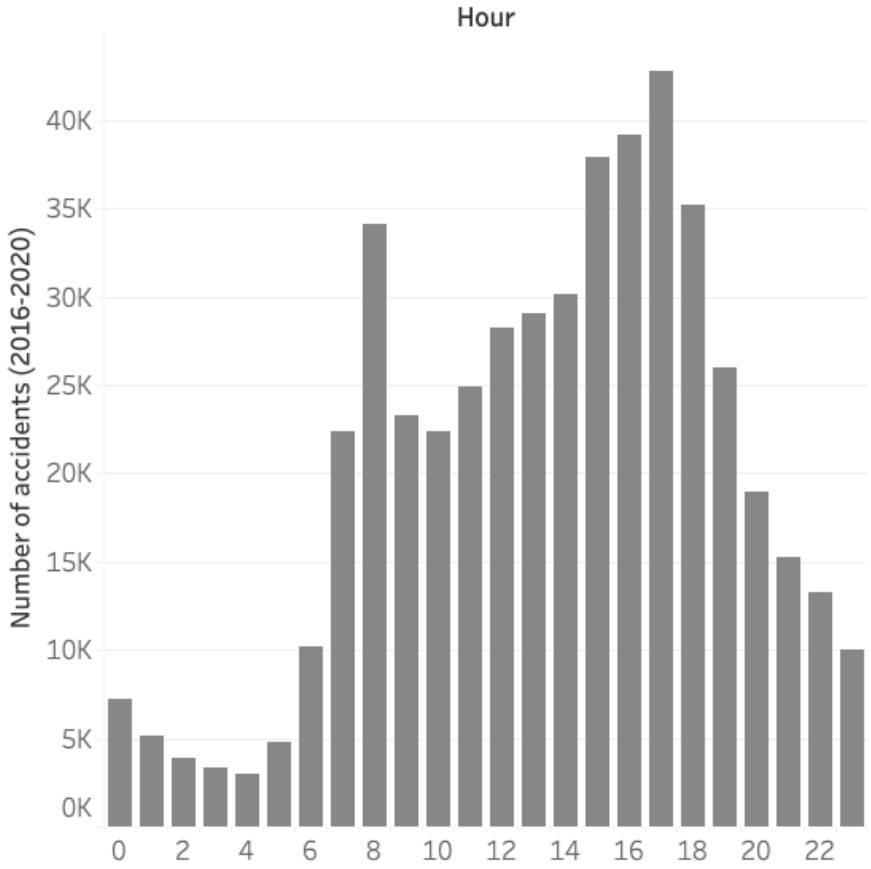
Oct 7th , 2022

- Question:
  - Are there any patterns in road accidents (spatial, temporal, demographic etc.) ?

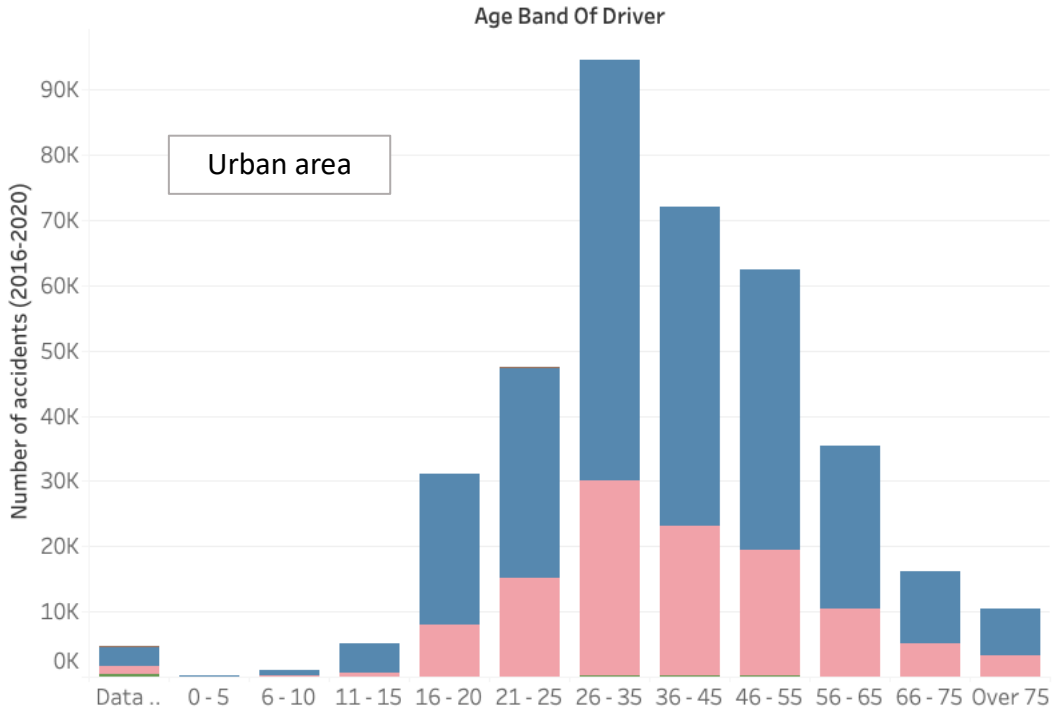
- Data:
  - Road Safety datasets (2016-2020) published by the UK Department for Transport. 3 dataframes in total: Accidents, vehicles, casualties. Source: https://www.data.gov.uk/

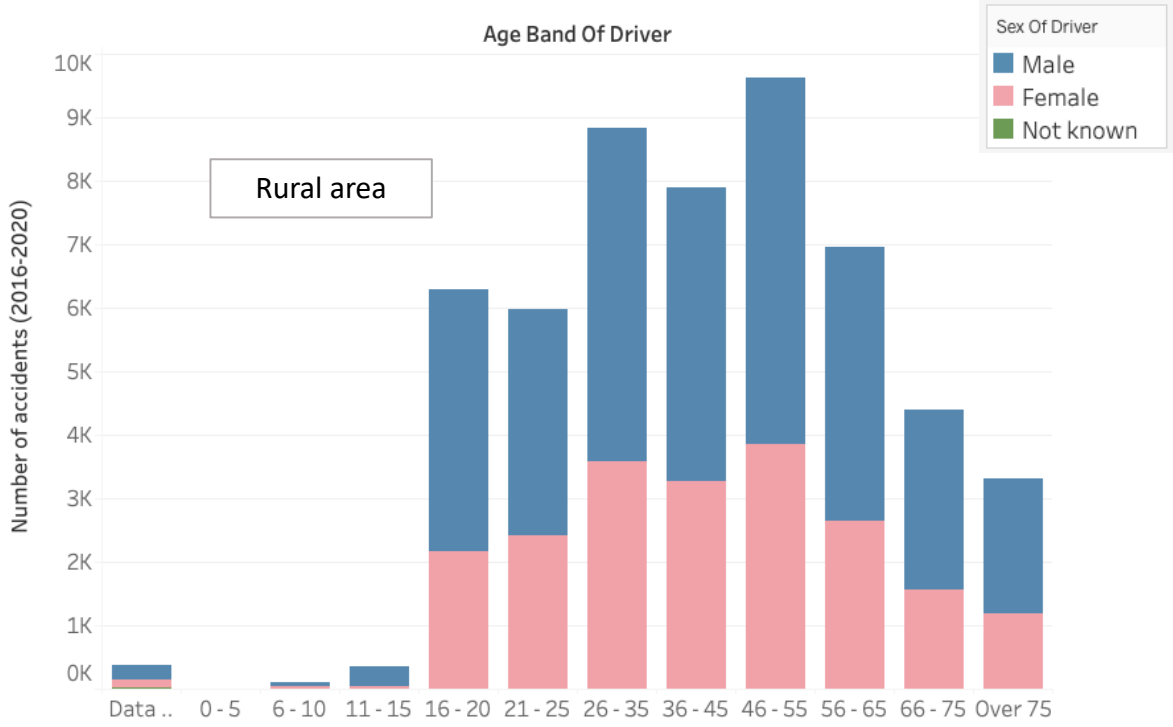
Temporal distribution of accidents



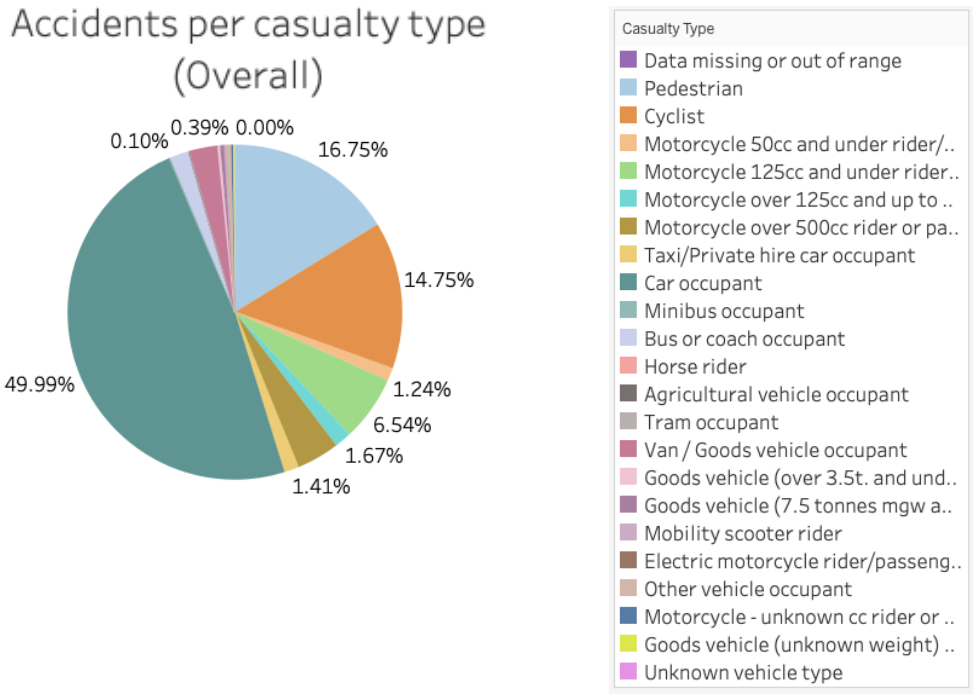


Demographic distribution of accidents

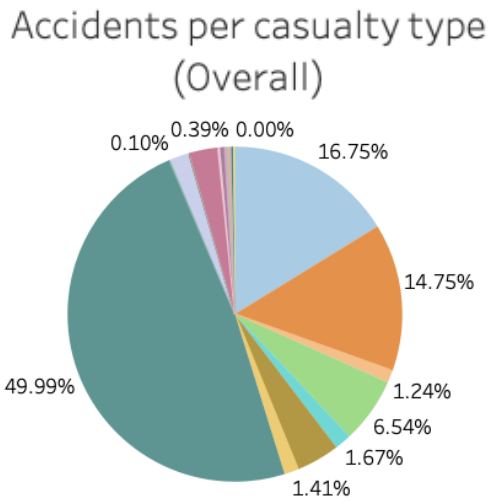


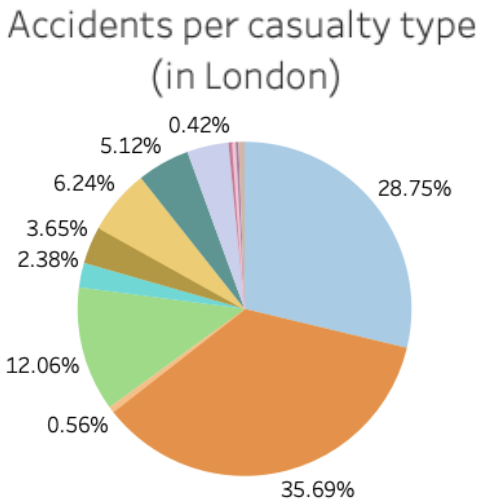


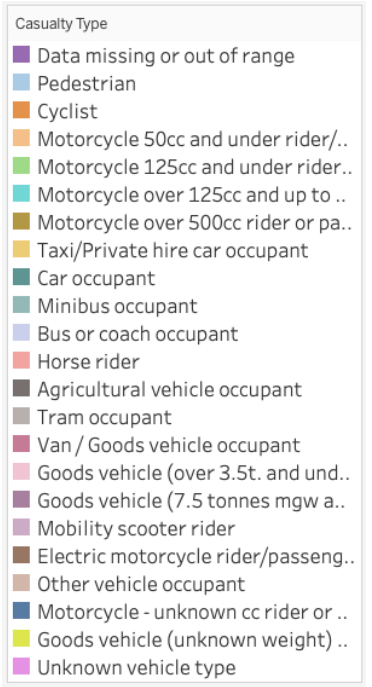
Casualty Types



Casualty Types







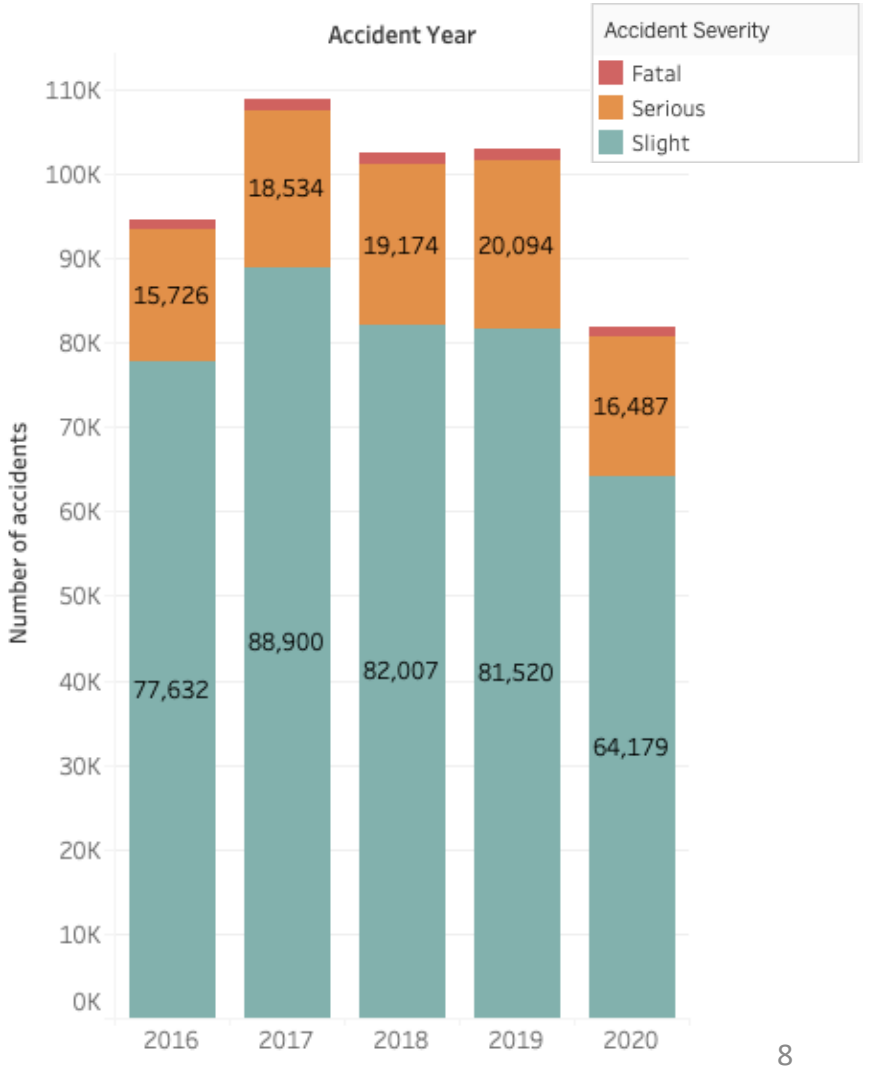
Accident Severity (as a Function of Features?)

Predicting the Severity of an Accident

Features used in the logistic regression model:

```
age_of_driver
engine_capacity_cc
age_of_vehicle
vehicle_type
towing_and_articulation
vehicle_manoeuvre
vehicle_direction_to
vehicle_location_restricted_lane
junction_location
skidding_and_overturning
hit_object_in_carriageway
vehicle_leaving_carriageway
hit_object_off_carriageway
first_point_of_impact
vehicle_left_hand_drive
sex_of_driver
propulsion_code
driver_imd_decile
driver_home_area_type
day_of_week
number_of_vehicles
first_road_class
road_type
speed_limit
junction_detail
junction_control
second_road_class
pedestrian_crossing_human_control
pedestrian_crossing_physical_facilities
light_conditions
weather_conditions
road_surface_conditions
special_conditions_at_site
carriageway_hazards
urban_or_rural_area
trunk_road_flag
month
age_of_casualty
casualty_class
sex_of_casualty
number_of_casualties
pedestrian_location
pedestrian_movement
car_passenger
bus_or_coach_passenger
pedestrian_road_maintenance_worker
casualty_type
casualty_home_area_type
casualty_imd_decile
hour
```

Number of accidents per year & severity



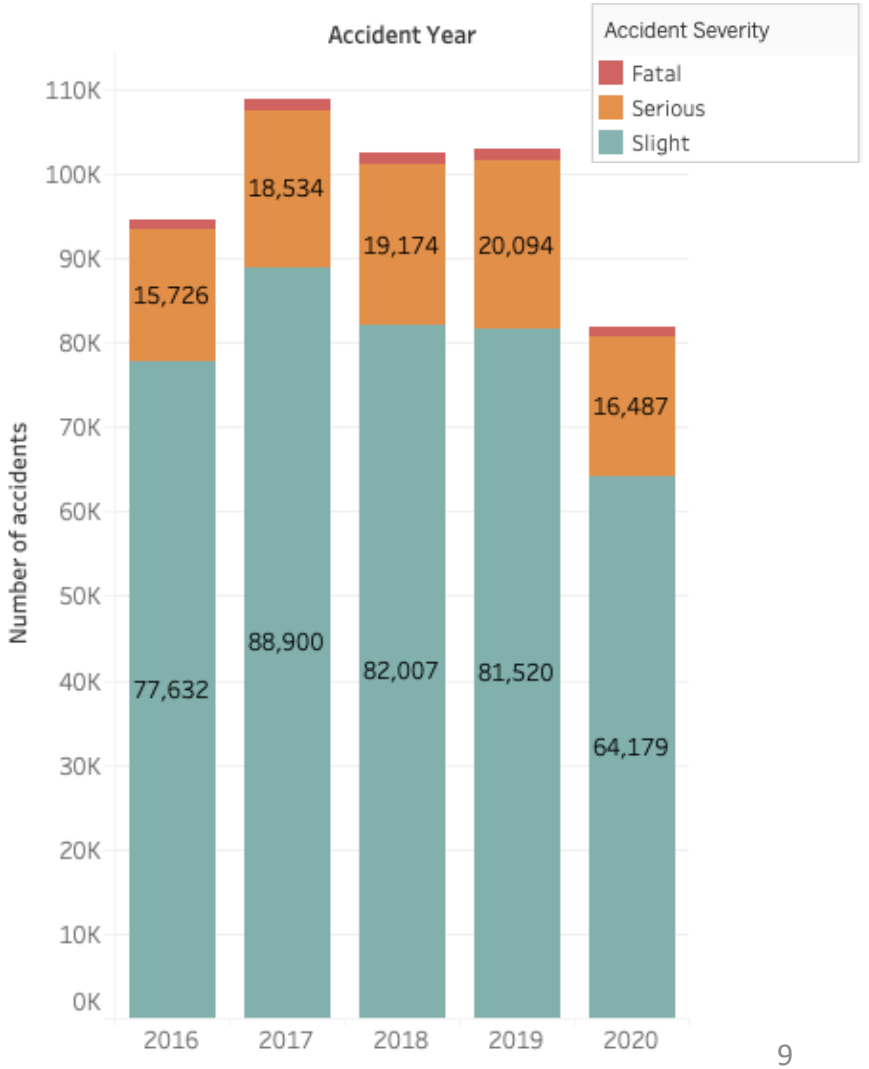
Predicting the Severity of an Accident

Features used the in logistic regression model:

age_of_driver
engine_capacity_cc
age_of_vehicle
vehicle_type
towing_and_articulation
vehicle_manoeuvre
vehicle_direction_to
vehicle_location_restricted_lane
junction_location
skidding_and_overturning
hit_object_in_carriageway
vehicle_leaving_carriageway
hit_object_off_carriageway
first_point_of_impact
vehicle_left_hand_drive
sex_of_driver
propulsion_code
driver_imd_decile
driver_home_area_type
day_of_week
number_of_vehicles
first_road_class
road_type
speed_limit
junction_detail
junction_control
second_road_class
pedestrian_crossing_human_control
pedestrian_crossing_physical_facilities
light_conditions
weather_conditions
road_surface_conditions
special_conditions_at_site
carriageway_hazards
urban_or_rural_area
trunk_road_flag
month
age_of_casualty
casualty_class
sex_of_casualty
number_of_casualties
pedestrian_location
pedestrian_movement
car_passenger
bus_or_coach_passenger
pedestrian_road_maintenance_worker
casualty_type
casualty_home_area_type
casualty_imd_decile
hour

Hypothesis: The average age of cars in the UK was reported to be 8.6 in 2020 (source: www.nimblefins.co.uk).

Number of accidents per year & severity



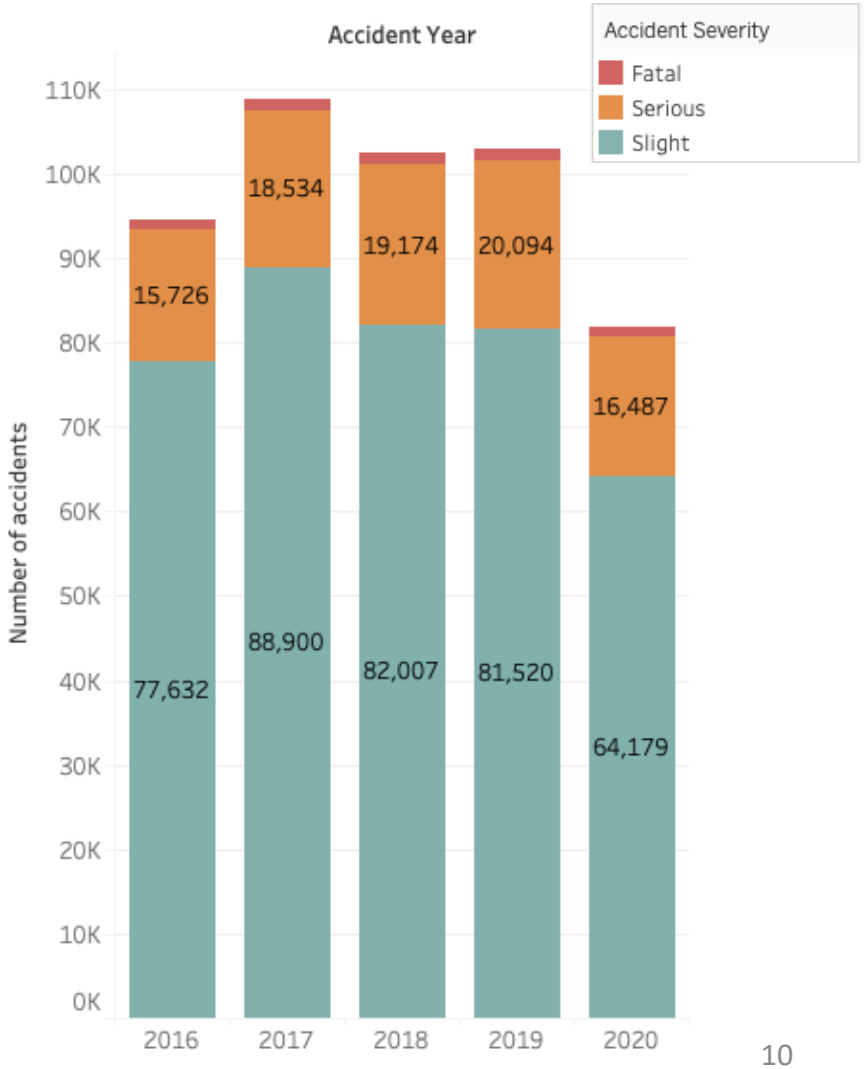
Predicting the Severity of an Accident

Features used the in logistic regression model:

age_of_driver
engine_capacity_cc
age_of_vehicle
vehicle_type
towing_and_articulation
vehicle_manoeuvre
vehicle_direction_to
vehicle_location_restricted_lane
junction_location
skidding_and_overturning
hit_object_in_carriageway
vehicle_leaving_carriageway
hit_object_off_carriageway
first_point_of_impact
vehicle_left_hand_drive
sex_of_driver
propulsion_code
driver_imd_decile
driver_home_area_type
day_of_week
number_of_vehicles
first_road_class
road_type
speed_limit
junction_detail
junction_control
second_road_class
pedestrian_crossing_human_control
pedestrian_crossing_physical_facilities
light_conditions
weather_conditions
road_surface_conditions
special_conditions_at_site
carriageway_hazards
urban_or_rural_area
trunk_road_flag
month
age_of_casualty
casualty_class
sex_of_casualty
number_of_casualties
pedestrian_location
pedestrian_movement
car_passenger
bus_or_coach_passenger
pedestrian_road_maintenance_worker
casualty_type
casualty_home_area_type
casualty_imd_decile
hour

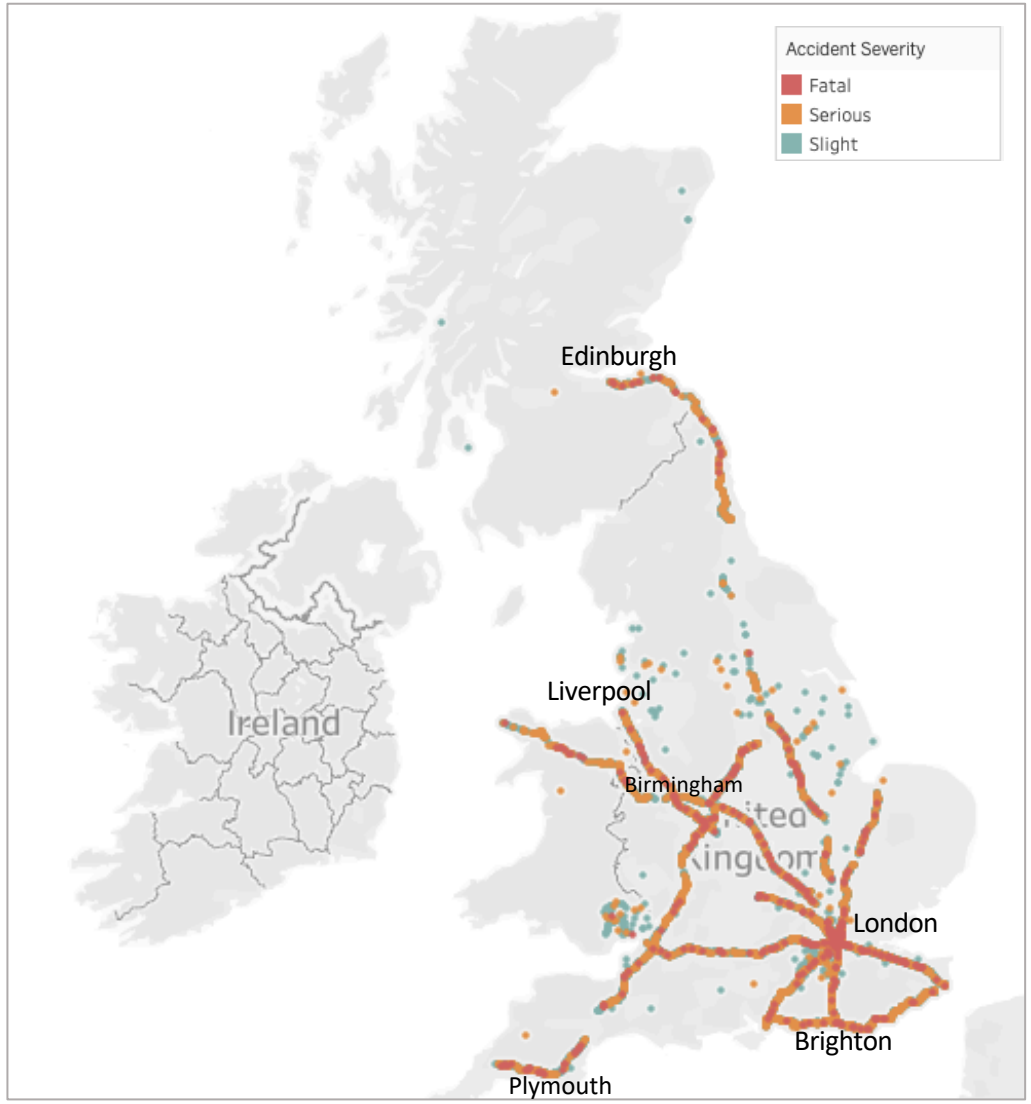
Hypothesis: The average age of cars in the UK was reported to be 8.6 in 2020 (source: www.nimblefins.co.uk). - REJECTED. A car is more likely to be 8.3 years old on average.

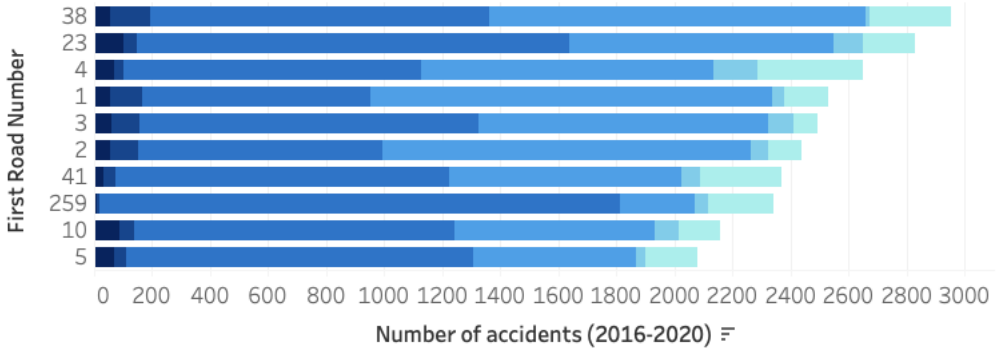
Number of accidents per year & severity

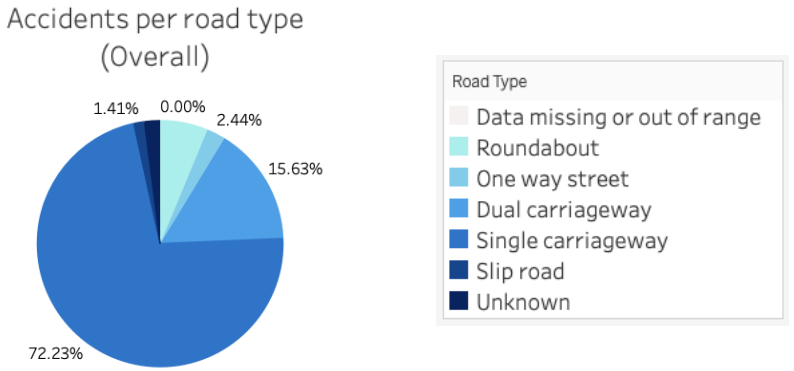


Road Accidents Facts #1: Interregional roads

10 interregional roads with the highest number of accidents (2016-2020)

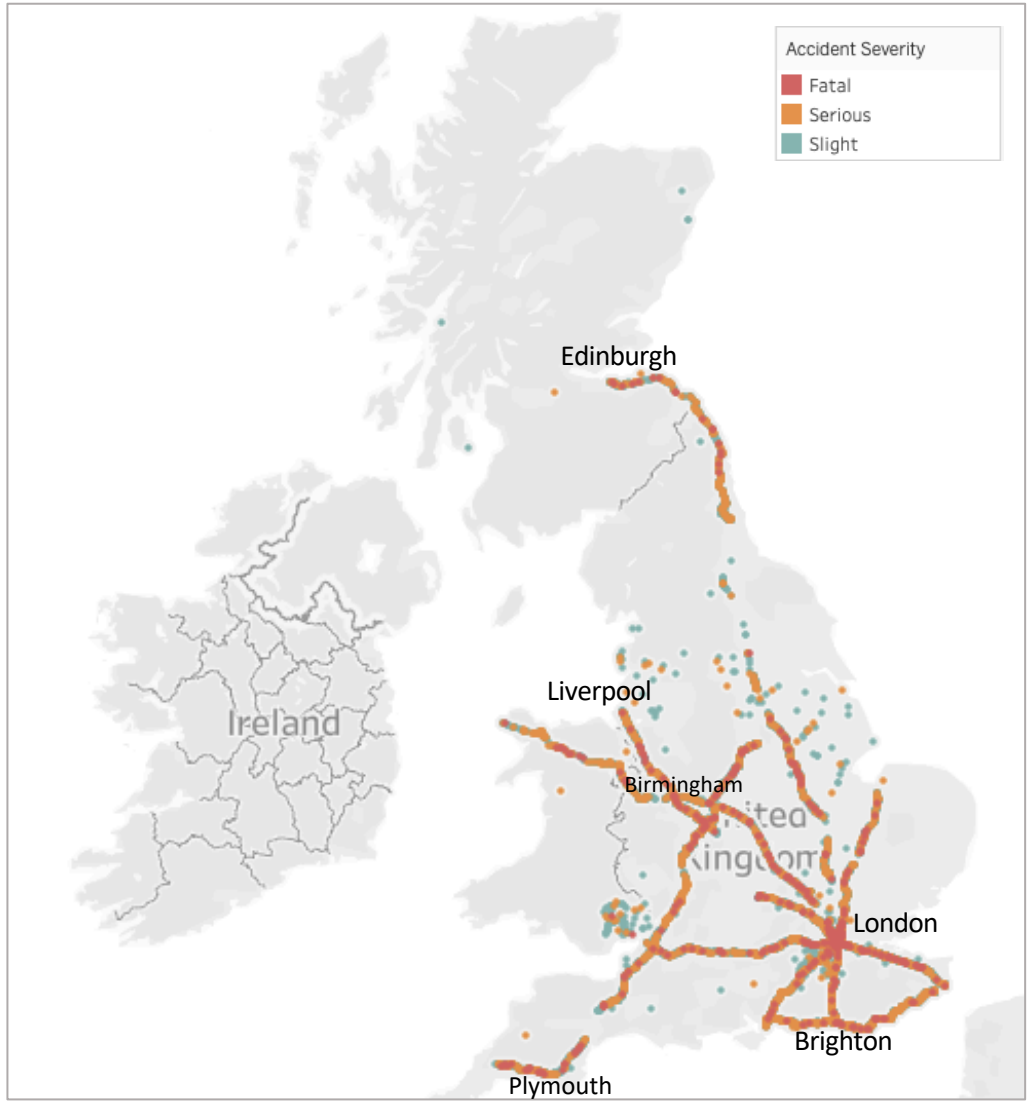


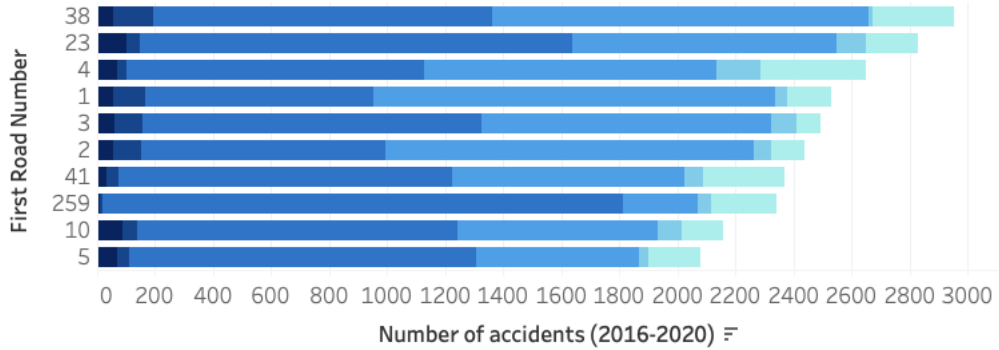


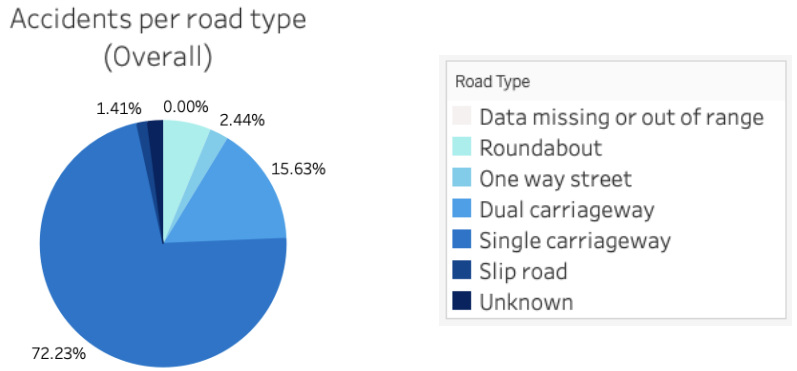


Road Accidents Facts #1: Interregional roads

10 interregional roads with the highest number of accidents (2016-2020)







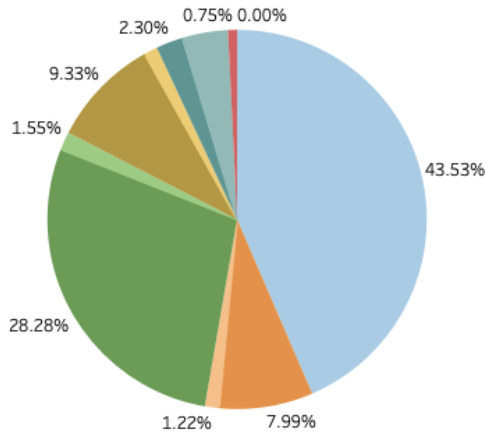
<u>Population density</u>
Scotland: 65 people/km^2
England: 407 people/km^2

Road Accidents Facts #2: Junctions

Junctions with single accidents involving 10 or more casualties (2016-2020)

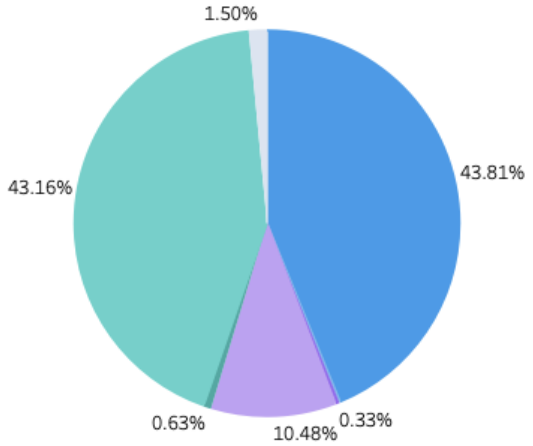
Number Of Casualties
10
11
12
13
14
15
16
19
20
21
25
26
27
58

Accidents per junction detail (Overall)



Junction Detail
Data missing or out of range
Not at junction or within 20 metres
Roundabout
Mini-roundabout
T or staggered junction
Slip road
Crossroads
More than 4 arms (not roundabout)
Private drive or entrance
Other junction
unknown (self reported)

Accidents per junction control (Overall)



Junction Control
Data missing or out of range
Not at junction or within 20 metres
Authorised person
Auto traffic signal
Stop sign
Give way or uncontrolled
unknown (self reported)

Conclusions

Conclusions

- Inital question:
  - Are there any patterns in road accidents (spatial, temporal, demographic etc.) ? – YES

Conclusions

- Inital question:
  - Are there any patterns in road accidents (spatial, temporal, demographic etc.) ? – YES

- More:
  - Can studying these patterns aid in predicting the severity of a traffic accident? – POSSIBLY (more modeling efforts are necessary)

References

- https://www.data.gov.uk/dataset/cb7ae6f0-4be6-4935-9277-47e5ce24a11f/road-safety-data
- https://www.ukpopulation.org
- https://www.nimblefins.co.uk/cheap-car-insurance/average-age-cars-great-britain

```
def end_of_presentation:

    print('Thank you, all!')

    to_be_answered = pd.read_csv('Questions?!.csv')

    for question in to_be_answered:

        return answer
```