



# Group 10 Boston Crash Statistics

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# Overview

1. Why we choose this topic
2. Partner
3. Data Exploration
4. Visualization Design
5. Video
6. Learning Outcome
7. Future Work

# Project Motivation

- Public Safety Awareness
- Emphasizing on Boston Car Crash Incidents
- Could be later referred by Police and Government officials



# Partner

- Working with David Conditt, a Boston Police Officer
- Help inform us what visualization we should focus on
- “Hot” Zone in the area

The background is a solid dark blue. On the left, a large, light blue arrow points upwards and to the right. On the right side, there are several overlapping geometric shapes: a yellow triangle pointing upwards, a blue triangle pointing downwards, and a light blue triangle pointing upwards. In the bottom right corner, a small, dark image of a city skyline at night is visible, with various buildings and lights.

# Data Exploration

# Original Dataset

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	ATTLEBORO	1:00:00	Property d	No injury	1	0	0	Single vehi	V1: Travelli	V1:(Collisic	Dark - light	Rain	Wet	Collision with embankment	V1:(Passenger car)	WEST ST	CUL DE SAC
2	SALEM	12:00:00	Non-fatal ii	Non-fatal ii	2	1	0	Angle	V1: Turning	V1:(Collisic	Dark - light	Rain/Rain	Wet	Collision w D1: (No improper driving),(No i	V1:(Passenger car)	CONGRESS/DERBY / CONGRESS ST / DERBY ST	
3	SALEM	10:00:00	Non-fatal ii	Non-fatal ii	1	1	0	Single vehi	V1: Turning	V1:(Collisic	Dark - light	Clear/Clear	Dry	Collision with other light pole or other post	V1:(Passenger car)	WASHINGTON SQUARE NORTH / WINTER ST	
4	EVERETT	4:00:00	Property d	No injury	1	0	0	Single vehi	V1: Turning	V1:(Collisic	Dusk	Clear/Clear	Dry	Collision w D1: (Other improper action)	V1:Light truck(van,	BOSTON ST / SECOND ST	
5	HAVERHILL	3:00:00	Property d	No injury	1	0	0	Single vehi	V1: Travelli	V1:(Collisic	Dark - light	Rain	Wet	Collision w D1: (Fatigued/asleep)	V1:(Passenger car)	GROVELAND ST / SAVAGE ST	
6	SPRINGFIELD	4:00:00	Property d	No injury	2	0	0	Single vehi	V1: Turning	V1:(Collisic	Dark - light	Rain/Cloud	Wet	Collision w D1: (No improper driving)	V1:Tractor/semi-tr	LIBERTY STREET	
7	SPRINGFIELD	5:00:00	Property d	No injury	2	0	0	Rear-end	V1: Travelli	V1:(Collisic	Dark - light	Rain/Cloud	Wet	Collision w D1: (Inattention)	V1:(Passenger car)	POWELL AVE	
8	SPRINGFIELD	8:00:00	Non-fatal ii	Non-fatal ii	1	1	0	Single vehi	V1: Travelli	V1:(Collisic	Daylight	Clear	Wet	Collision w D1: (Operating defective equip	V1:(Passenger car)	ROOSEVELT AVE	
9	NORTH ATT	5:00:00	Property d	No injury	1	0	0	Single vehi	V1: Turning	V1:(Collisic	Dark - light	Cloudy	Wet	Collision w D1: (Made an improper turn)	V1:(Passenger car)	ELLIS RD	
10	NORTH ATT	11:00:00	Property d	No injury	1	0	0	Single vehi	V1: Turning	V1:(Collisic	Daylight	Clear/Clear	Dry	Collision w D1: (Driving too fast for condit	V1:(Passenger car)	MOUNT HOPE STREET / LANDRY AVENUE	
11	READING	1:00:00	Property d	No injury	2	0	0	Rear-end	V1: Travelli	V1:(Collisic	Daylight	Clear/Clear	Dry	Collision w D1: (Followed too closely),(Dist	V1:(Passenger car)	WALKERS BROOK DR / NEWCROSSING ROAD	
12	EASTHAMPT	6:00:00	Non-fatal ii	Non-fatal ii	1	1	0	Single vehi	V1: Travelli	V1:(Collisic	Dark - light	Clear	Wet	Collision w D1: (No improper driving)	V1:(Passenger car)	NORTHAMPTON ST	
13	LEOMINSTER	9:00:00	Property d	No injury	2	0	0	Angle	V1: Travelli	V1:(Collisic	Daylight	Clear	Wet	Collision w D1: (No improper driving) / D2: V1:	V1:(Passenger car)	LANCASTER ST / ELM HILL AVE	
14	YARMOUTH	7:00:00	Property d	No Appearance	1	0	0	Single vehi	V1: Travelli	V1:(Collisic	Dark - road	Rain	Wet	Collision w D1: (Unknown)	V1:(Passenger car)	FOREST RD	
15	BEVERLY	4:00:00	Not Report	Not reported	1	0	0	Unknown	V1: Parked	Dark - light	Clear/Cloud	Dry	Collision with motor vehicle in traffic	V1:(Passenger car)	PIPER DR		
16	NATICK	12:00:00	Non-fatal ii	Non-fatal ii	1	3	0	Single vehi	V1: Travelli	V1:(Collisic	Dark - light	Rain	Wet	Collision w D1: (Operating vehicle in errati	V1:(Passenger car)	EAST EVERGREEN RD	
17	SOMERSET	12:00:00	Non-fatal ii	Non-fatal ii	1	1	0	Single vehi	V1: Unknown	V1:(Collisic	Dark - light	Rain	Wet	Collision w D1: (Physical impairment),(Ope	V1:(Passenger car)	READ ST	
18	LAKEVILLE	4:00:00	Non-fatal ii	Non-fatal ii	2	1	0	Sideswipe, V1:	Travelli	V1:(Collisic	Dusk	Clear	Dry	Collision w D1: (Inattention),(Exceeded au	V1:(Passenger car)	HARDING STREET Rte US44	IN FRONT C
19	BILLERICA	5:00:00	Non-fatal ii	Non-fatal ii	2	1	0	Angle	V1: Travelli	V1:(Collisic	Dark - light	Clear	Dry	Collision w D1: (Unknown) / D2: (Failed to	V1:Light truck(van,	POND STREET / SEQUOIA STREET	
20	GROTON	4:00:00	Property d	No injury	2	0	0	Rear-end	V1: Slowing	V1:(Collisic	Dusk	Clear	Dry	Collision w D1: (No improper driving) / D2: V1:	V1:(Passenger car)	BOSTON RD / SANDY POND RD	
21	PITTSFIELD	9:00:00	Non-fatal ii	Non-fatal ii	1	1	0	Single vehi	V1: Travelli	V1:(Collisic	Daylight	Other	Dry	Collision w D1: (No improper driving)	V1:(Passenger car)	PECKS RD	
22	HAVERHILL	11:00:00	Not Report	Not reported	1	0	0	Unknown	V1: Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	V1:(Passenger car)	PRIMROSE ST	
23	HAVERHILL	12:00:00	Property d	No injury	2	0	0	Sideswipe, V1:	Travelli	V1:(Collisic	Daylight	Clear	Dry	Collision w D1: (No improper driving)	V1:(Passenger car)	LINCOLN AVE / NETTLETON AVE	
24	HAVERHILL	4:00:00	Not Report	Not reported	1	0	0	Unknown	V1: Parked	V1:(Collisic	Dark - light	Sleet, hail	Wet	Collision with motor vehicle in traffic	V1:Light truck(van,	BROADWAY	
25	HAVERHILL	6:00:00	Property d	No injury	1	0	0	Single vehi	V1: Parked	V1:(Collisic	Dusk	Clear/Cloud	Dry	Collision with other light pole or other post	V1:Light truck(van,	MAIN ST	
26	WESTBORO	6:00:00	Property d	No injury	2	0	0	Angle	V1: Turning	V1:(Collisic	Dawn	Clear	Dry	Collision with motor vehicle in traffic	V1:(Passenger car)	E MAIN ST	
27	DRACUT	2:00:00	Property d	No injury	1	0	0	Single vehi	V1: Travelli	V1:(Ran of	Dark - road	Cloudy/Rai	Wet	Collision w D1: (Failure to keep in proper la	V1:(Passenger car)	GUMPUS RD	
28	DRACUT	7:00:00	Property d	No injury	1	0	0	Single vehi	V1: Travelli	V1:(Ran of	Dark - unk	Clear	Dry	Collision w D1: (Inattention)	V1:(Passenger car)	ISLAND POND RD	
29	YARMOUTH	12:00:00	Property d	No Appearance	2	0	0	Angle	V1: Travelli	V1:(Collisic	Dark - road	Cloudy/Rai	Wet	Collision w D1: (Inattention)	V1:(Passenger car)	CONNEMARA WAY	
30	LYNN	4:00:00	Property d	No injury	1	0	0	Single vehi	V1: Travelli	V1:(Collisic	Dark - light	Not Report	Wet	Collision w D1: (Disregarded traffic signs, si	V1:(Passenger car)	Rte 1A	NAHANT RC
31	FAIRHAVEN	1:00:00	Property d	No injury	1	0	0	Single vehi	V1: Travelli	V1:(Ran of	Dark - unk	Rain	Wet	Collision w D1: (Failure to keep in proper la	V1:(Passenger car)	Rte 195 W	
32	SEEKONK	10:00:00	Non-fatal ii	Non-fatal ii	2	4	0	Rear-end	V1: Travelli	V1:(Collisic	Daylight	Clear/Cloud	Dry	Collision w D1: (Distracted) / D2: (No impr	V1:(Passenger car)	Rte 195 W	
33	BOSTON	1:00:00	Property d	No injury	3	0	0	Rear-end	V1: Travelli	V1:(Collisic	Dark - light	Rain	Wet	Collision w D1: (Followed too closely) / D2: V1:	V1:(Passenger car)	Rte 93 N	
34	BOSTON	1:00:00	Non-fatal ii	Non-fatal ii	3	2	0	Rear-end	V1: Travelli	V1:(Collisic	Daylight	Clear	Dry	Collision w D1: (No improper driving) / D2: V1:	V1:Light truck(van,	Rte 93 N	
35	NORWELL	2:00:00	Non-fatal ii	Non-fatal ii	1	1	0	Single vehi	V1: Travelli	V1:(Collisic	Dark - light	Rain	Wet	Collision w D1: (Operating vehicle in errati	V1:(Passenger car)	RIVER ST	
36	NORWELL	1:00:00	Property d	No injury	1	0	0	Single vehi	V1: Travelli	V1:(Collisic	Daylight	Severe cros	Dry	Collision w D1: (No improper driving)	V1:(Passenger car)	WILDCAT LN	
37	READING	8:00:00	Property d	No injury	1	0	0	Single vehi	V1: Turning	V1:(Collisic	Dark - light	Clear/Cloud	Dry	Collision w D1: (Operating vehicle in errati	V1:(Passenger car)	CHARLES ST	
38	HANSON	11:00:00	Property d	No injury	2	0	0	Rear-end	V1: Travelli	V1:(Collisic	Daylight	Clear	Dry	Collision w D1: (Distracted) / D2: (No impr	V1:(Passenger car)	FRANKLIN ST / MAIN ST	



# Data Preparation

jupyter FinalClean Last Checkpoint: 11/29/2020 (unsaved changes) Python 3

```
In [12]: def countdr(df):
temp = df.groupby(df.columns.tolist()).size().reset_index().\
rename(columns={0:'num'})
return temp

In [42]: df = pd.read_csv("bosCrash.csv")
df = df[df["latitude"].notna()]
df.to_csv("bosCrash.csv")

In [4]: df = pd.read_csv("AllDataFinal.csv")
df

Out[4]:
```

	CITY_TOWN_NAME	CRASH_HOUR	AMBT_LIGHT_DESCR	DRVR_CNTRB_CIRC_CL	RDWY	TRAF_CNTRL_DEVCTYPE_DESCR	LAT
0	CHELMSFORD	13	Daylight	Diregarded traffic markings	CENTRAL SQUARE	No controls	42.596275 -71.3
1	CHELMSFORD	13	Daylight	Diregarded traffic markings	CENTRAL SQUARE	No controls	42.596275 -71.3
2	BRAINTREE	16	Daylight	NaN	WASHINGTON ST	No controls	42.174790 -71.0
3	BRAINTREE	16	Daylight	NaN	WASHINGTON ST	No controls	42.174790 -71.0
4	METHUEN	3	Dark - lighted roadway	Tailgating	OSGOOD STREET / LOWELL STREET	Traffic control signal	42.726152 -71.1
...	...	...	...	...	...	...	...
149000	BOXFORD	21	Dark - roadway not lighted	Other causes	TYLER ROAD	No controls	42.708039 -71.0
149001	WINCHESTER	1	Dark - lighted roadway	Reckless Driving	FOREST ST	No controls	42.468130 -71.1
149002	NEWTON	0	Dark - lighted roadway	NaN	WASHINGTON ST	No controls	42.356892 -71.1
149003	QUINCY	0	Not reported	Other causes	HANCOCK STREET	Not reported	42.283539 -71.0
149004	RAYNHAM	0	Dark - roadway not lighted	Speeding	Rte 495 S	No controls	41.959293 -71.0

149005 rows x 12 columns

```
In [5]: for index, row in df.iterrows():
if isinstance(row["DRVR_DISTRACTED_CL"], str) and row["DRVR_CNTRB_CIRC_CL"] != "Reckless Driving":
df.at[index, "DRVR_CNTRB_CIRC_CL"] = "Distracted/Inattention"
```

```
def findCause(causes):
    if isinstance(causes, float):
        return "Other causes"
    elif "reckless" in causes:
        return "Reckless Driving"
    elif "Fatigued" in causes:
        return "Drowsy Driving"
    elif "too fast" in causes or "speed limit" in causes:
        return "Speeding"
    elif "improper turn" in causes or "wrong way" in causes or "yield" in causes or "signals" in causes:
        return "Diregarded traffic markings"
    elif "too closely" in causes:
        return "Tailgating"
    elif "Distracted" in causes or "inattention" in causes:
        return "Distracted/Inattention"
    elif "defective" in causes:
        return "Defective vehicle"
    elif "illness" in causes or "avoiding" in causes or "history" in causes or "glare" in causes:
        return "Uncontrollable factors"
    elif "over-correcting" in causes or "emotional" in causes or "other" in causes or "unknown" in causes or "no im" in causes:
        return "Other causes"
```








```
def cleanWeather(weather):
    if "Rain" in weather or "storm" in weather or "sleet" in weather:
        return "Rain"
    elif "Clear" in weather or "Cloudy" in weather:
        return "Clear"
    elif "Snow" in weather:
        return "Snow"
    elif "Unkown" in weather:
        return "Unkown"
    else:
        return "Other"
```

```
crash_by_weather.WEATH_COND_DESCR = crash_by_weather.WEATH_COND_DESCR.apply(cleanWeather)
```

# Data Preparation

latitude	longitude	driver_fact	roadway	num
42.23452971	-71.12262	Speeding	NEPONSET	1
42.23515175	-71.12496	Diregarded	NEPONSET	2
42.23522732	-71.12487	Reckless Dr	TRUMAN P	2
42.23522732	-71.12487	Tailgating	TRUMAN H	2
42.23523597	-71.12487	Diregarded	TRUMAN P	1
42.23542175	-71.12561	Reckless Dr	NEPONSET	1
42.23613262	-71.12776	Other cause	NEPONSET	1
42.23633571	-71.12881	Diregarded	NEPONSET	1
42.23639874	-71.12902	Other cause	NEPONSET	1
42.23697426	-71.13105	Distracted	NEPONSET	2
42.23723583	-71.1319	Other cause	HYDE PARK	1
42.23872004	-71.13485	Other cause	MILTON ST	1
42.23920268	-71.13215	Diregarded	MILTON ST	3
42.23920268	-71.13215	Diregarded	MILTON ST	1
42.23984548	-71.12577	Diregarded	TRUMAN P	2

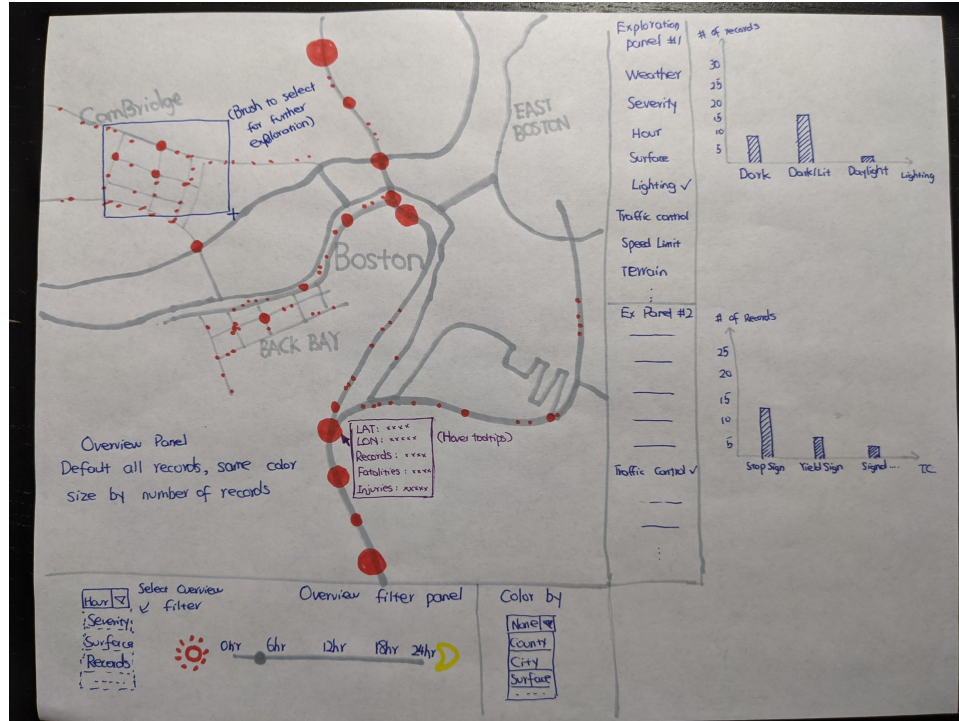
hour	roadway_fa	driver_fact	roadway	traffic_cont	latitude	longitude	structure_csum
15			JAMAICAW	No controls	42.323573	-71.11508	Good
15			JAMAICAW	No controls	42.323573	-71.11508	Good
2			CAMBRIDG	No controls	42.360486	-71.12016	Good
7		Other cause	STORROW	No controls	42.350684	-71.09599	Fair
7		Other cause	STORROW	No controls	42.350684	-71.09599	Fair
9			SOLDIERS F	No controls	42.36348	-71.14031	Good
2		Diregarded	WILLIAM J	Traffic cont	42.32213	-71.05005	Good
2		Diregarded	WILLIAM J	Traffic cont	42.32213	-71.05005	Good
14	Road surfac	Tailgating	Rte 93 N	No controls	42.299939	-71.04814	Fair
14	Road surfac	Tailgating	Rte 93 N	No controls	42.299939	-71.04814	Fair
17		Diregarded	Rte 93 N	No controls	42.317868	-71.05149	Fair
17		Diregarded	Rte 93 N	No controls	42.317868	-71.05149	Fair
17		Diregarded	Rte 93 N	No controls	42.317868	-71.05149	Fair
5		Distracted	Rte 90 W	No controls	42.35489	-71.11823	Good
15		Tailgating	INTERSTAT	No controls	42.372096	-71.06743	Fair

 bosCrash.csv	12/7/2020 1:27 AM	XLS Worksheet	748 KB
 county.csv	11/29/2020 9:26 PM	XLS Worksheet	1 KB
 driverFactor.csv	12/7/2020 12:23 PM	XLS Worksheet	211 KB
 hour.csv	12/7/2020 11:31 AM	XLS Worksheet	331 KB
 location.csv	12/6/2020 9:04 PM	XLS Worksheet	279 KB
 roadwayFactor.csv	12/7/2020 11:31 AM	XLS Worksheet	84 KB
 structure_condition.csv	12/7/2020 11:31 AM	XLS Worksheet	247 KB

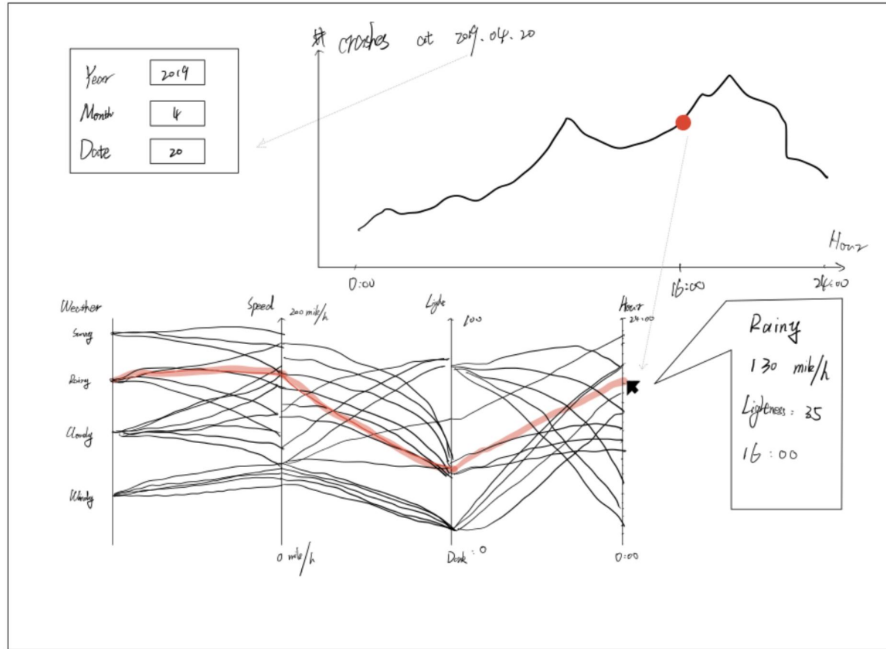


# Initial Sketches

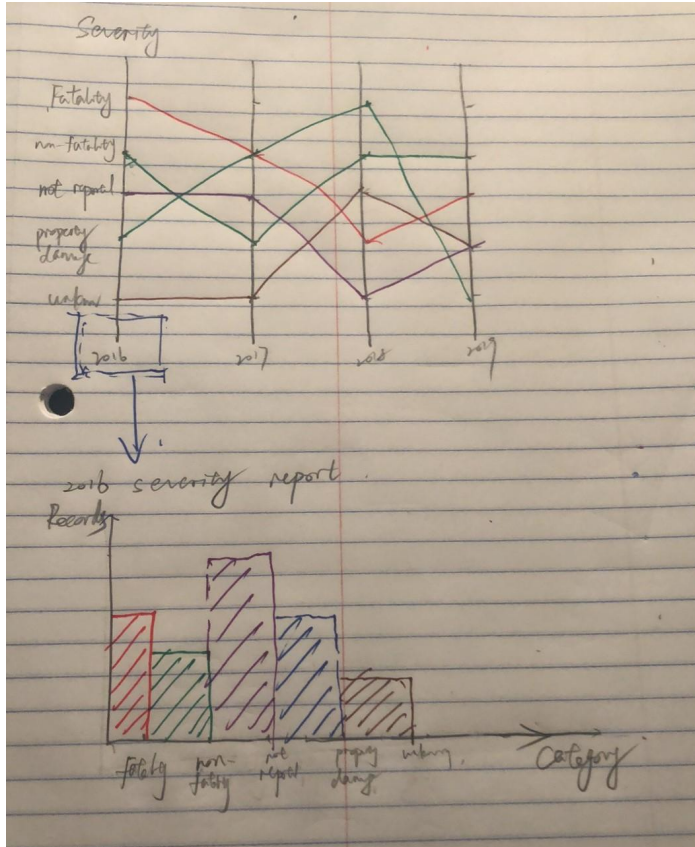




- Points inform the location of the crash
- Size of the points inform how many crash has happened
- Visualizations on the right side changes corresponding to brushed data

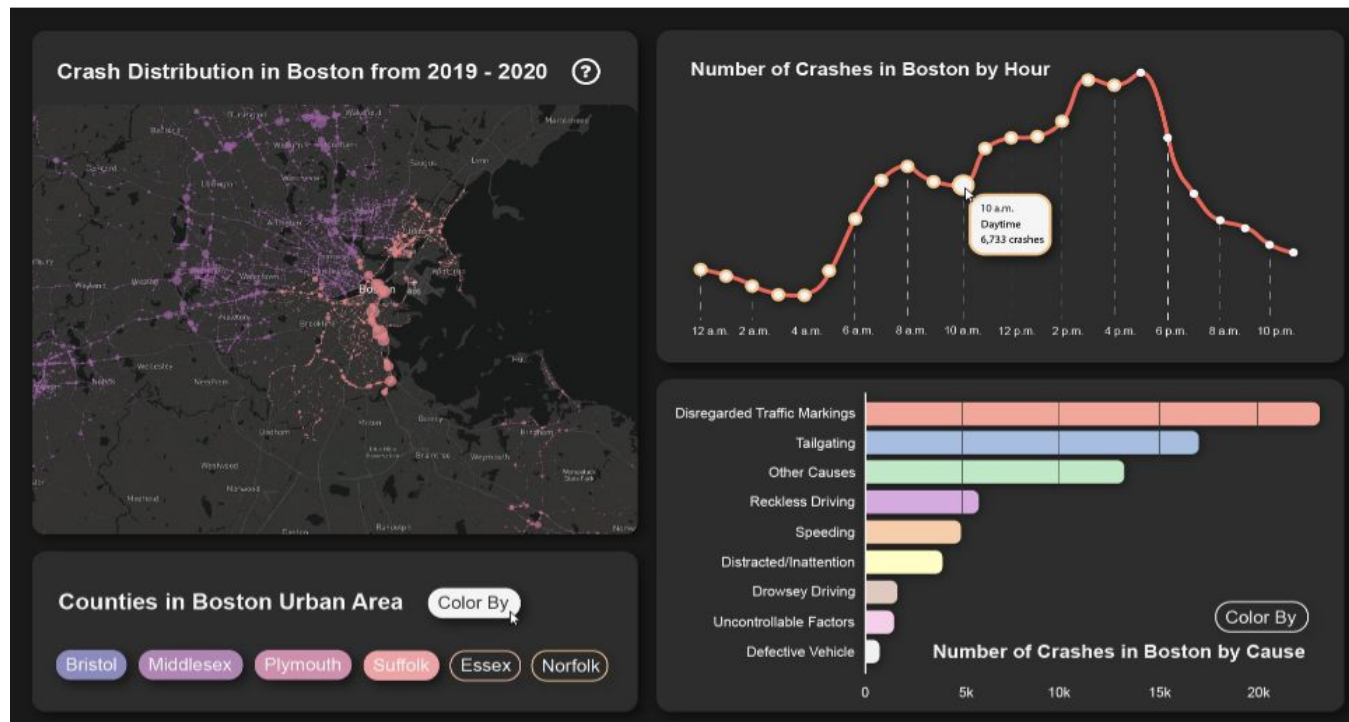


- User input year, month and date of the data he wants to look at
- Relationship between attributes of crashes
- Detail on-demand

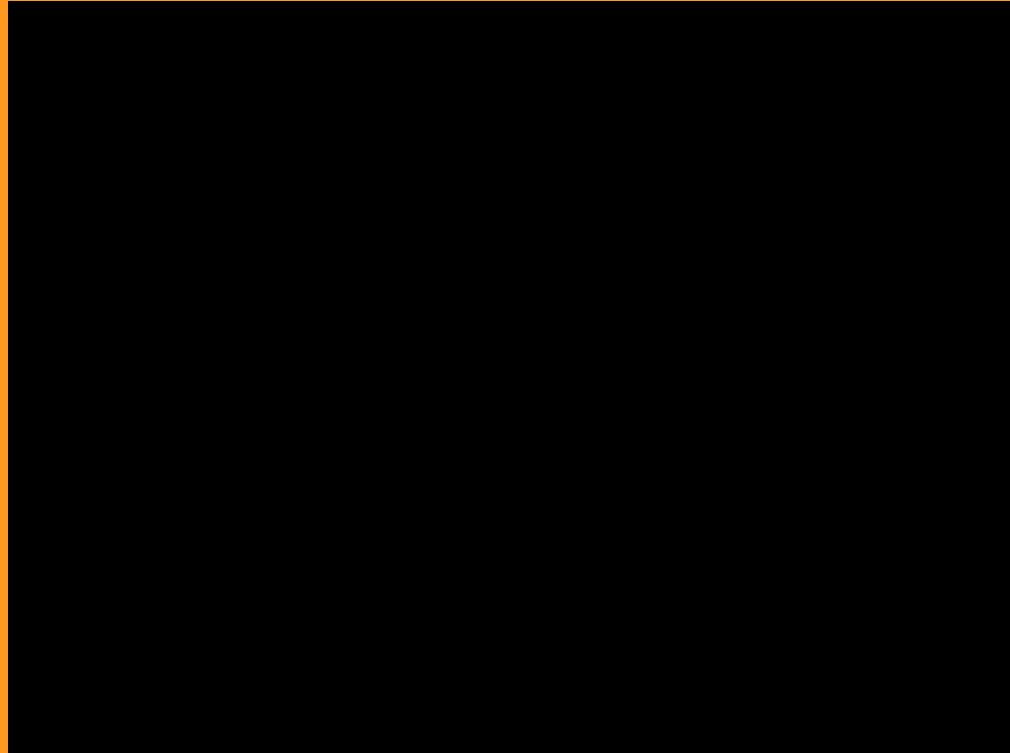


- Displays different crashes over years
- Color encoding represents different severity degrees
- Barchart corresponding to each year's data

# Visualization Design

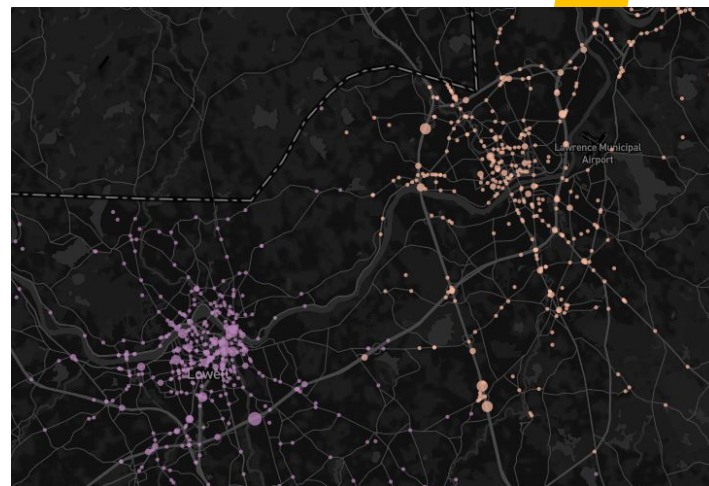
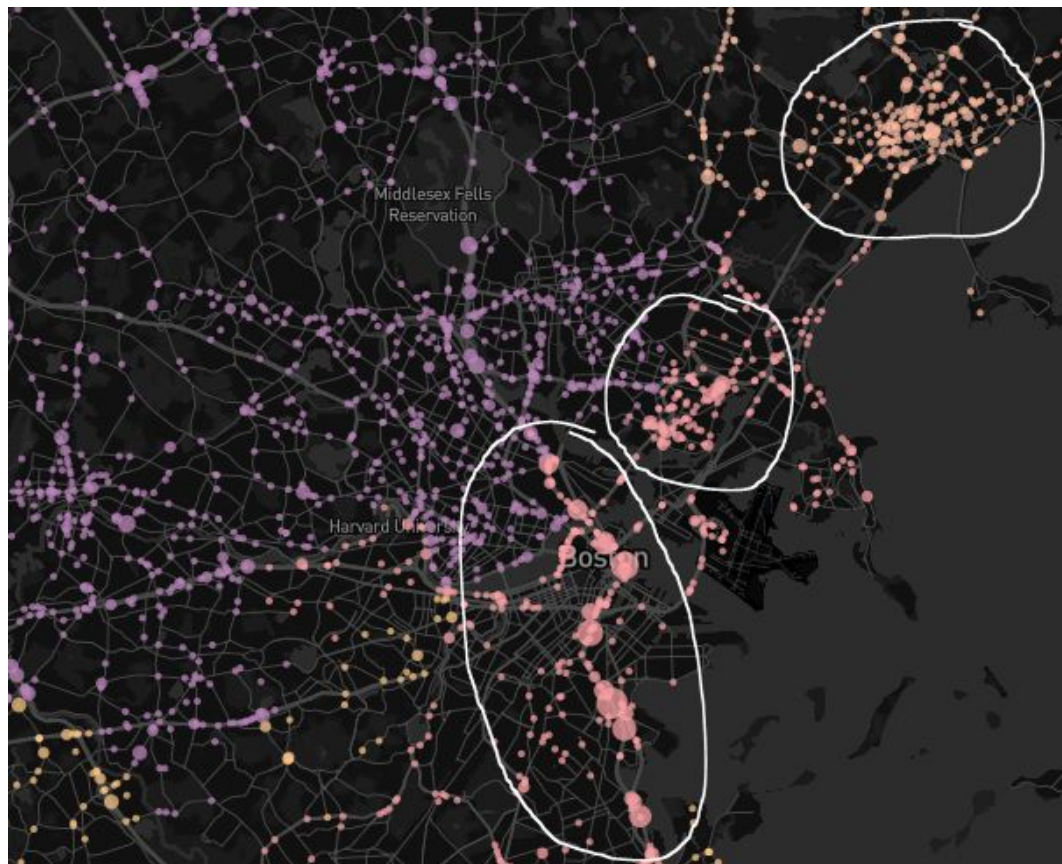


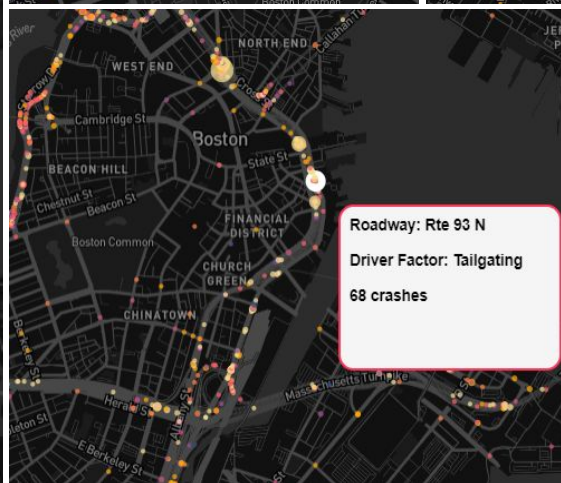
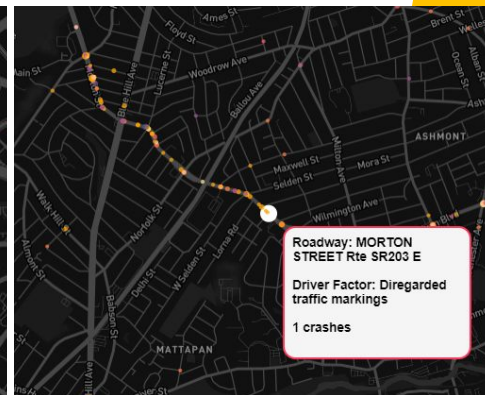
# Video-Demo

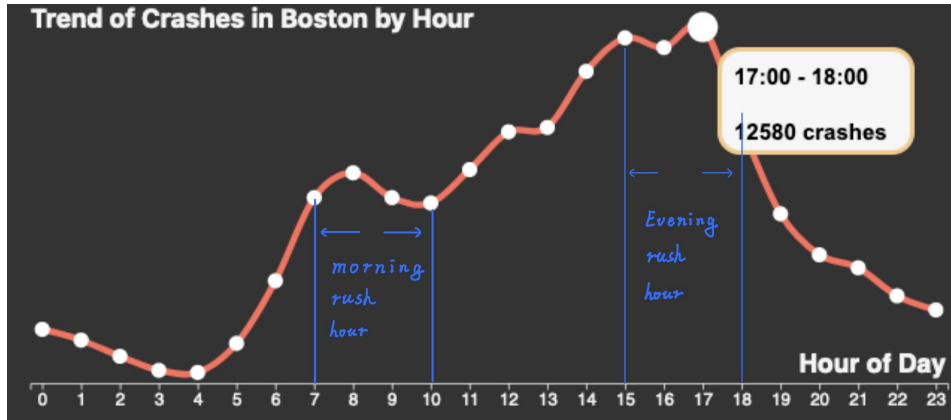




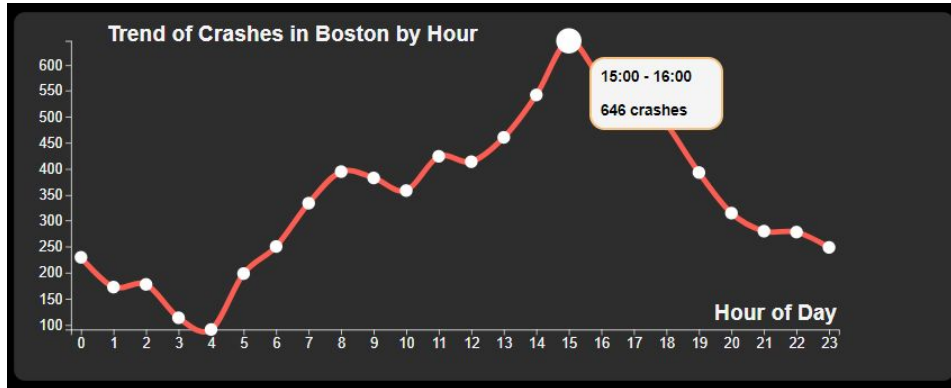
# Learning Outcomes





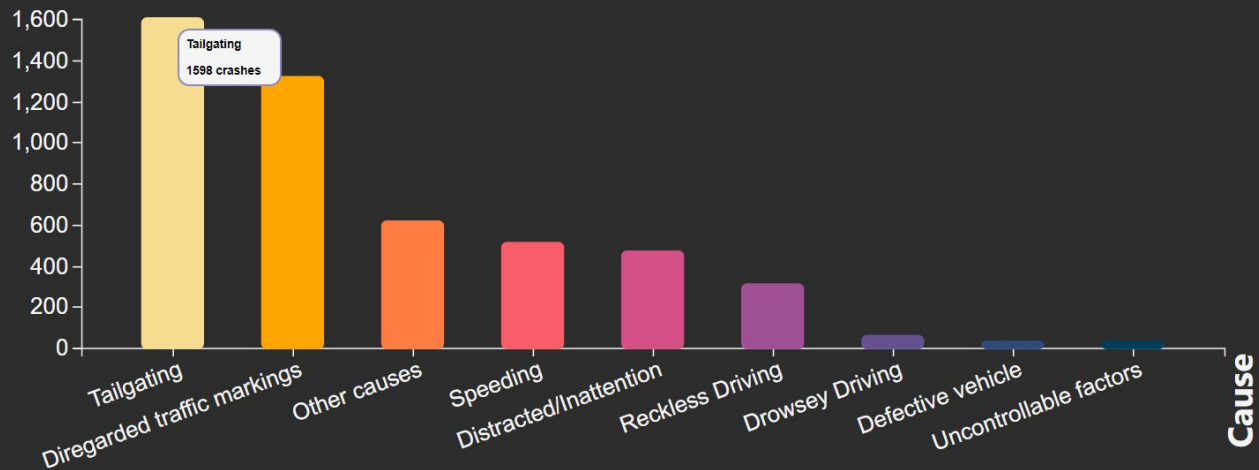


Boston Urban Area



City of Boston

## Number of Crashes





# Future Work

1. Finish implementing rest of the crash factor visualizations
2. Polish linking implementation.
3. Revise layout and color scales.

**Thank you!**

