

Alexa, what are
the chances of an
incident at Dexter
Ave N?



Alexa, what are
the chances of
incident near me?

Abeona

PROTECTING YOU ON THE ROAD



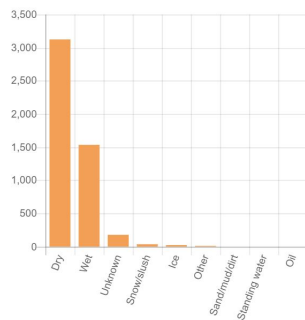
TEAM BRAINY SMURF

Motivation

- ▶ 20 accidents in Seattle every day.
- ▶ Can we identify areas of high risk collision?
- ▶ What can do to reduce collisions?
- ▶ How can we assist **cops** in efficiently navigating in Seattle?
- ▶ How can we assist **local travellers** in avoiding high risk areas?
- ▶ **Hands free** assistant for drivers!!

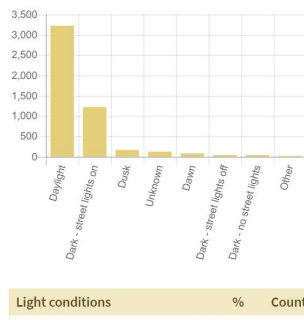
Collisions in Seattle

Road conditions



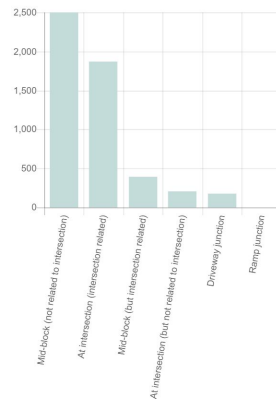
Road conditions	%	Count
Dry	63.61%	3,125
Wet	31.12%	1,529
Unknown	3.6%	177
Snow/slush	0.85%	42
Ice	0.59%	29
Other	0.08%	4
Sand/mud/dirt	0.06%	3
Standing water	0.04%	2
Oil	0.04%	2
Total		4,913
No data available		517

Light conditions



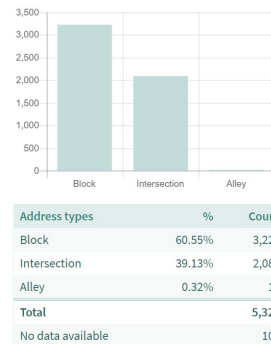
Light conditions	%	Count
Daylight	65.91%	3,235
Dark - street lights on	24.96%	1,225
Dusk	3.32%	163
Unknown	2.49%	122
Dawn	1.73%	85
Dark - street lights off	0.73%	36
Dark - no street lights	0.67%	33
Other	0.18%	9
Total		4,908
No data available		522

Junction types



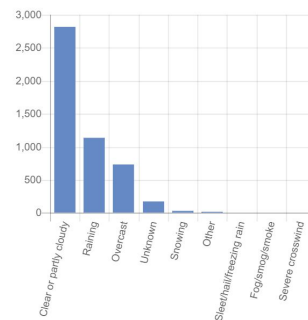
Junction types	%	Count
Mid-block (not related to intersection)	48.4%	2,500
At intersection (intersection related)	36.3%	1,875
Mid-block (but intersection related)	7.69%	397
At intersection (but not related to intersection)	4.03%	208
Driveway junction	3.52%	182
Ramp junction	0.06%	3
Total		5,165
No data available		265

Address types



Address types	%	Count
Block	60.55%	3,223
Intersection	39.13%	2,083
Alley	0.32%	17
Total		5,323
No data available		107

Weather



Weather	%	Count
Clear or partly cloudy	57.27%	2,813
Raining	23.03%	1,131
Overcast	14.82%	728
Unknown	3.52%	173
Snowing	0.69%	34
Other	0.35%	17
Sleet/hail/freezing rain	0.18%	9
Fog/smog/smoke	0.12%	6
Severe crosswind	0.02%	1
Total		4,912
No data available		518

Problem Definition

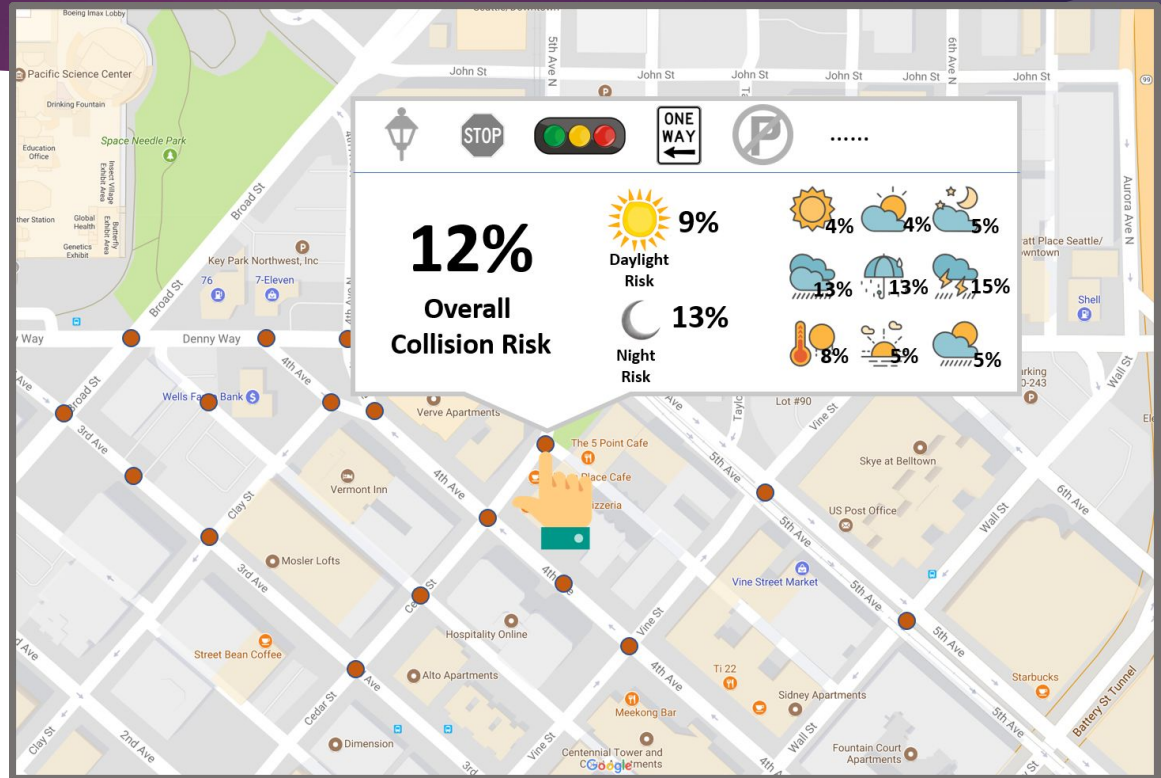
For given road and environment conditions, can we predict the collision risk?



Application

Collision Risk Map

Collision Risk Simulator





Time for demo!

**Alexa, what are the chances
of any incident near me?**

Data and Features

- ▶ Open data from Seattle.gov: <https://data.seattle.gov>
- ▶ Data Sets **(available live)**:
 - ▶ Collision data: 186197
 - ▶ Street, weather condition, road condition, light
 - ▶ Traffic data count: 813
 - ▶ Street, weekly average vehicles
 - ▶ Street details data: 23805
 - ▶ Street, is highway, is downtown, one way, direction
 - ▶ Street signs: 23805
 - ▶ Street, signs present on the street, traffic lights, camera

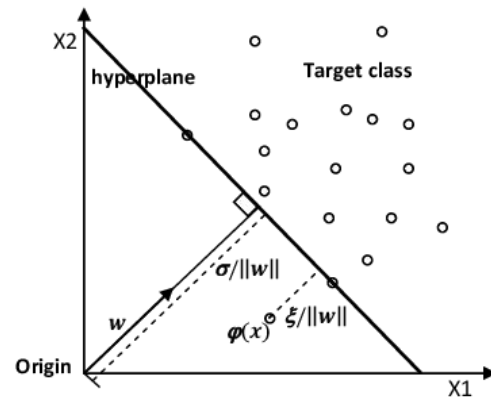
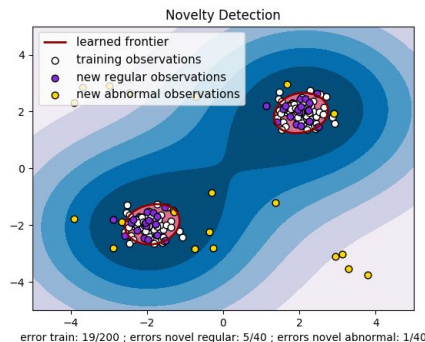
Preprocessing & Feature Engineering

- ▶ Correlation/Crosstab matrix - drop irrelevant features
- ▶ Finding significant features (p-value ≤ 0.05)
- ▶ One-hot encoding for labeled features
 - ▶ Road conditions - Wet, Dry
 - ▶ Weather - Sunny, Rainy, Fog
- ▶ LabelEncoding for day of the week
- ▶ ['ADDRTYPE', 'JUNCTIONTYPE', 'LIGHTCOND', 'ARTDESCRIPT', 'SPEEDLIMIT', 'SEGDIR', 'ONEWAY', 'SEGLENGTH', 'SURFACEWIDTH', 'NATIONHWYSYS', 'STREETTYPE', 'SLOPE_PCT']

Approaches & Models

- ▶ Idea: Learn the relationship between road conditions and collisions.
- ▶ 80% train, 20% test
- ▶ One-class classification
 - ▶ **One-class SVM**
 - ▶ **Recall (# of collision detected): 83.2%**

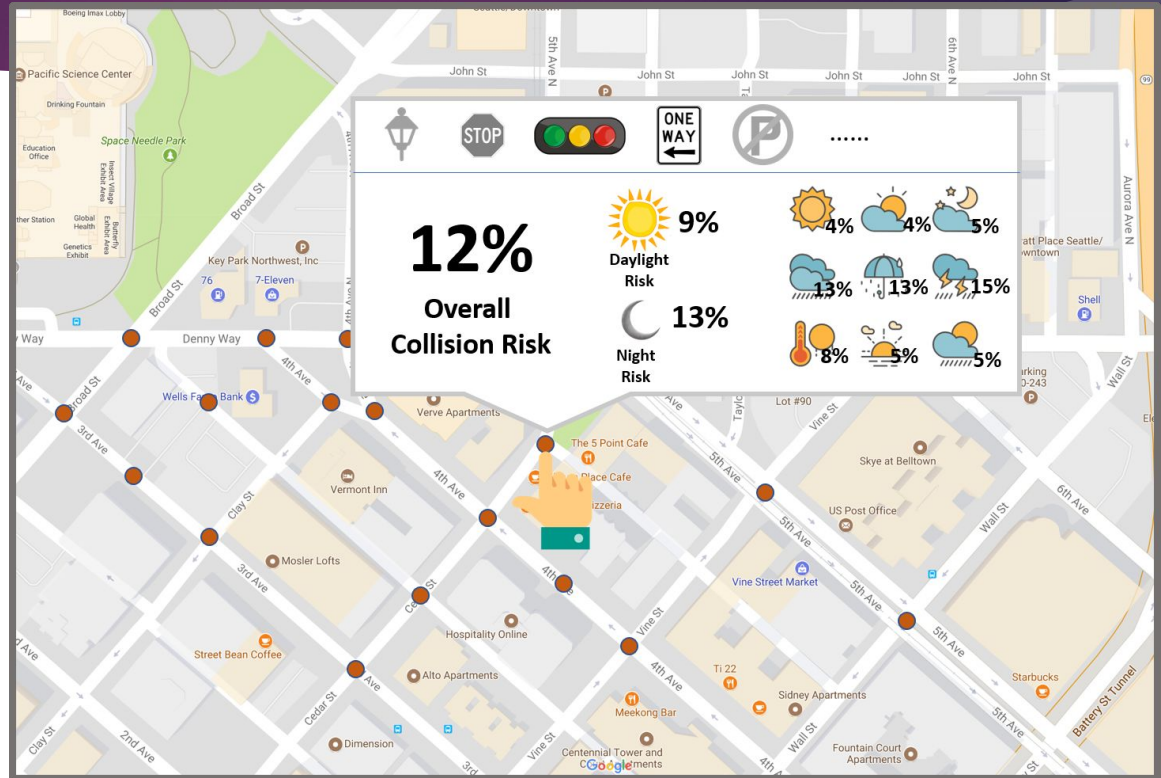
- ▶ Outlier/Novelty Detection
 - ▶ Isolation Forest
 - ▶ Recall: 78%
 - ▶ EllipticEnvelope:
 - ▶ Recall: 76%



Application

Collision Risk Map

Collision Risk Simulator



References

<http://seattlecollisions.timganter.io/collisions>



Thank you