The City is on Fire

An Analysis of the Madison City Fire Dept.

by Anna Arpaci-Dusseau

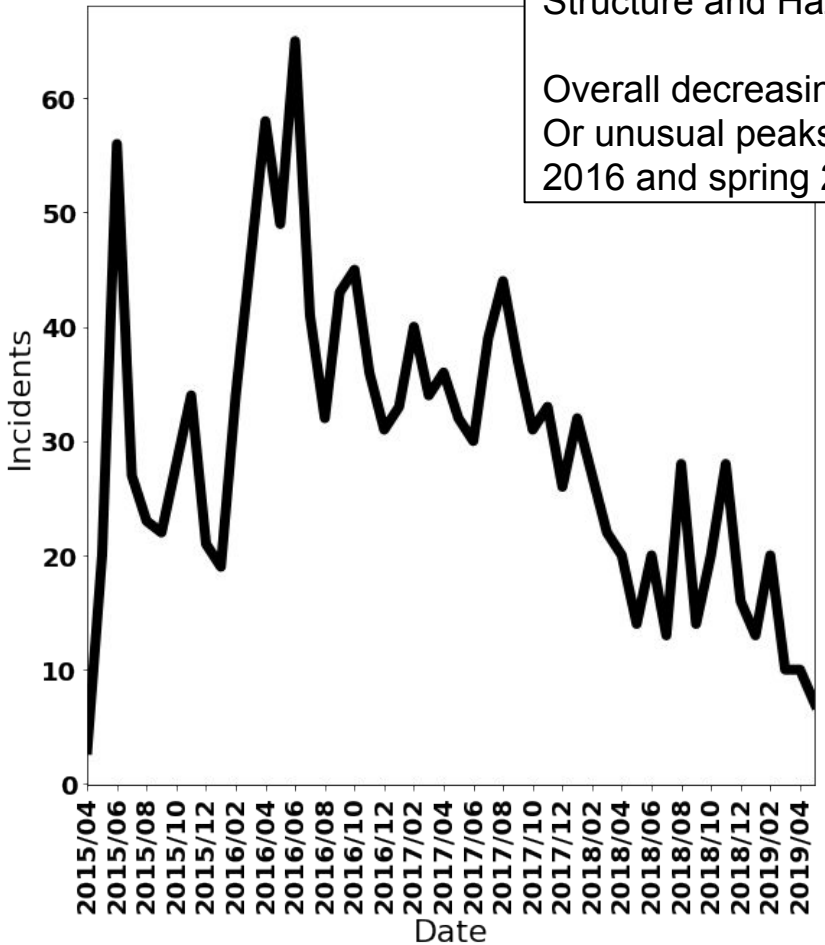
Investigating Madison Fire Incidents

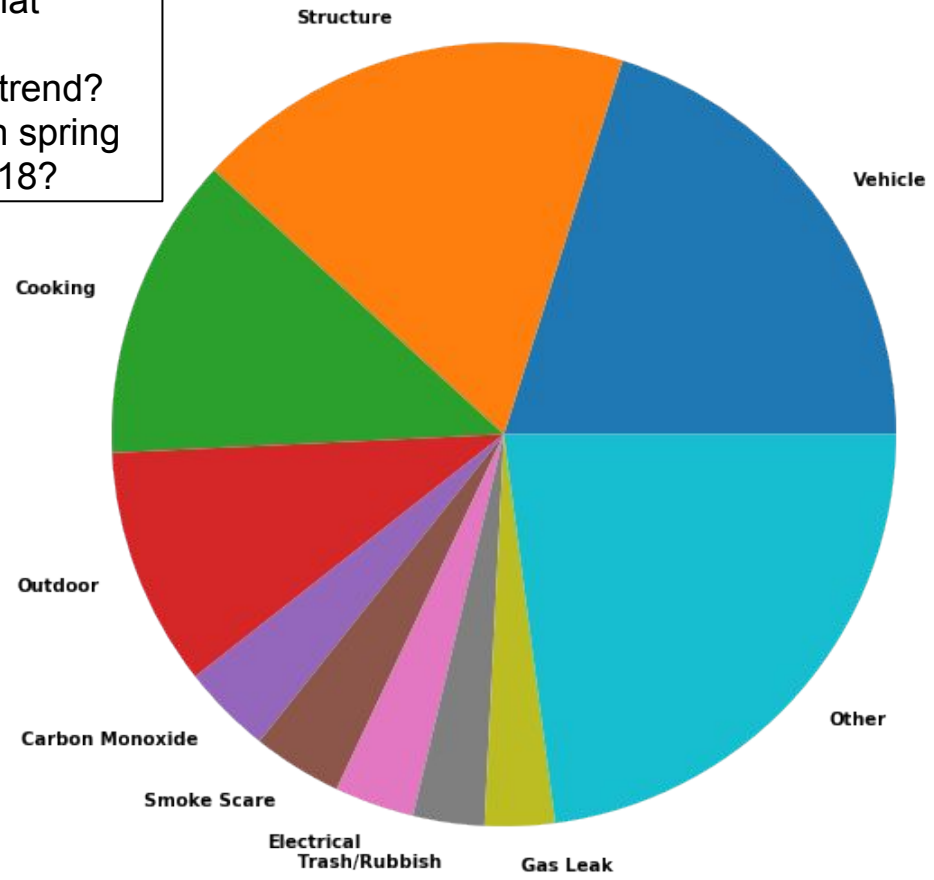
Incident	Date	Incident Type	Address	Longitude	Latitude	Time	Response
Kitchen Fire Breaks Out At West-Side Denny's	08/24/2017	Cooking	400 Block S. Gammon Road, Madison, WI	-89.50344	43.060598	2017-08-24T18:15:00-05:00	0:01:00
Firefighters Rescue Cat From A Tree	2017	Animal rescue	300 Block Grand Canyon Drive, Madison, WI 53715	-89.497121	43.061327	2017-03-27T10:52:00-05:00	0:04:00
Mysterious Symptoms Lead Firefighters To Find Man 'Practicing With Pepper Spray'		Hazmat	2300 Block Talc Trail, Madison, WI	-89.532423	43.027786	2019-02-14T18:51:00-06:00	0:10:00

Incidents

Seemingly Most Timely:
Structure and Hazmat

Overall decreasing trend?
Or unusual peaks in spring 2016 and spring 2018?





Spending and Incidents

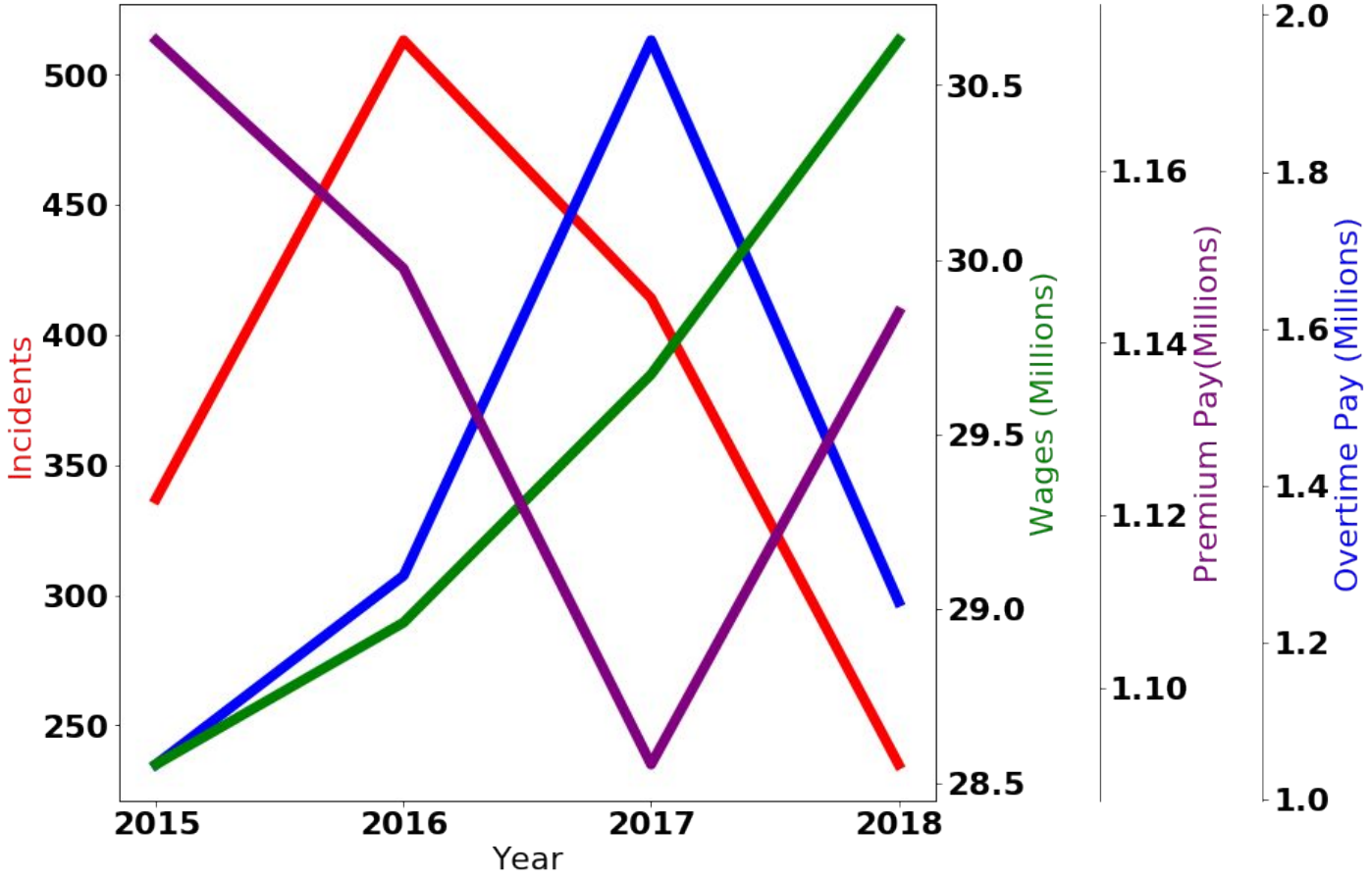
Trends:

- Incidents dropping
- Wages Rising
- Overtime peaked in 2017
- Premium Pay dips in 2017

Predictions:

When wages are high and incidents low, there should be less overtime/premium pay

Ultimately, no clear trends arise

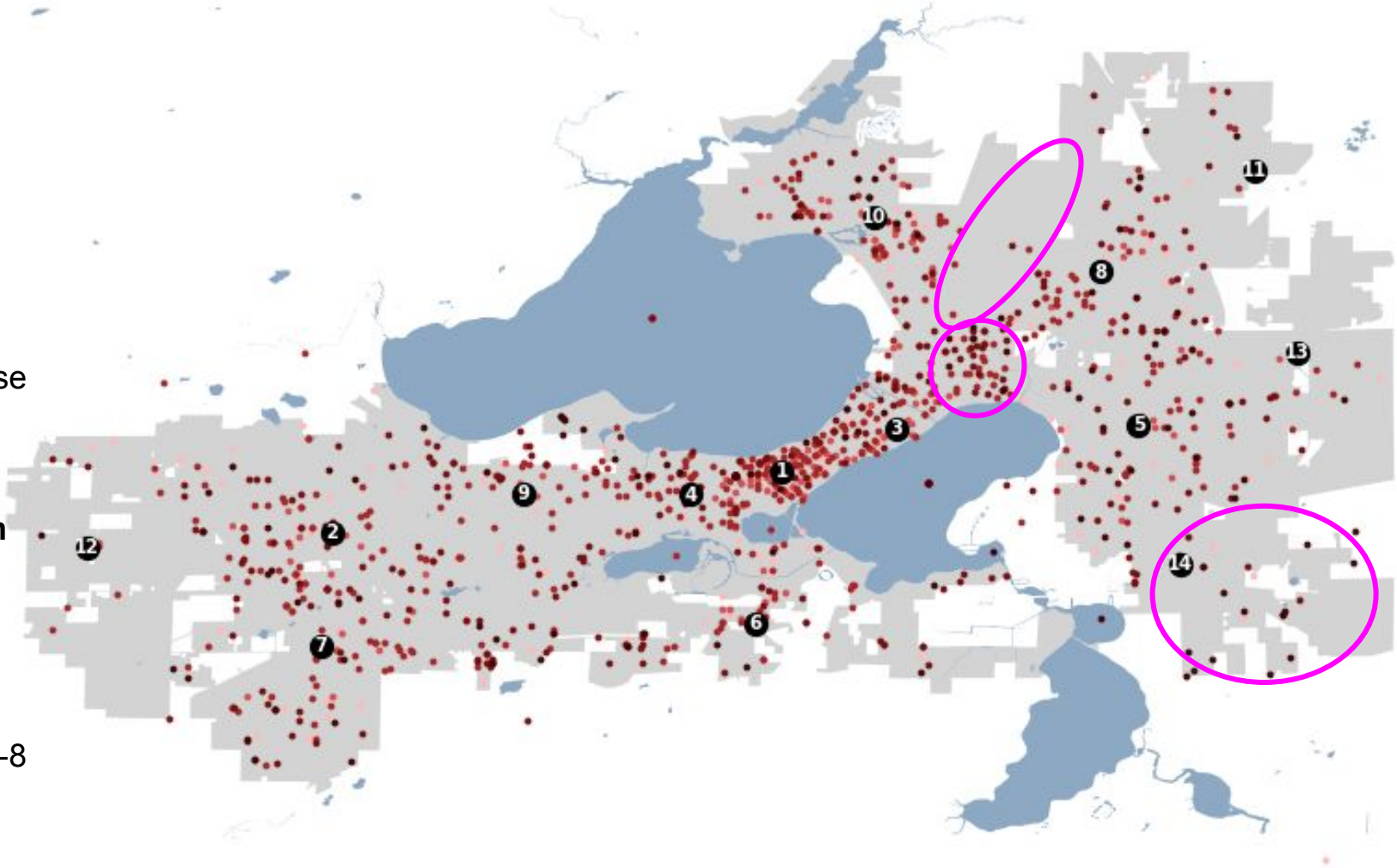


Location

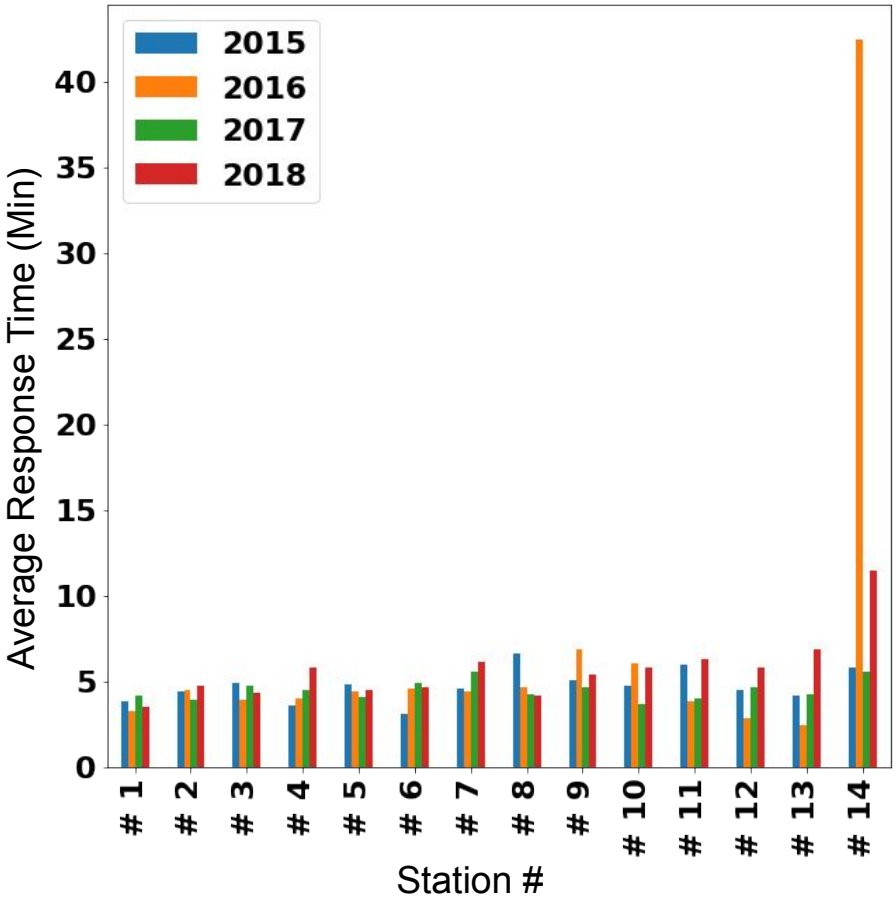
Darker colors correspond to longer response times.

Interval Breakdown in Minutes:

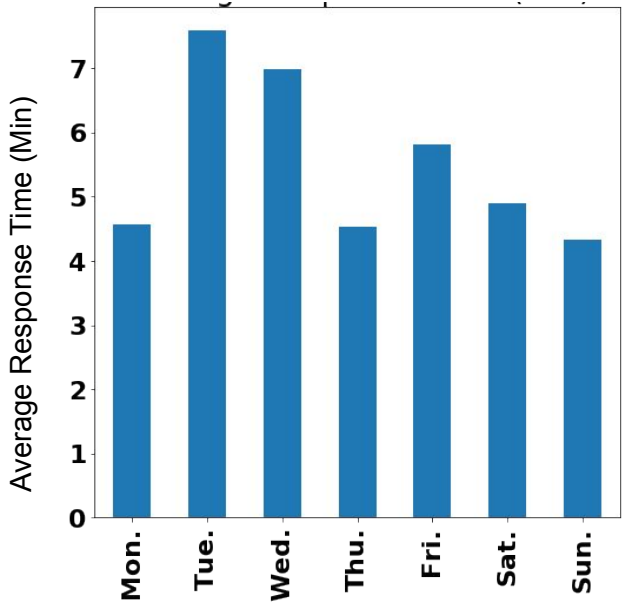
Pink: 0-2
Red: 2-4
Dark-Red: 4-6
Darker-Red: 6-8
Black: 8+



Response Time By Station



Response Time By Weekday

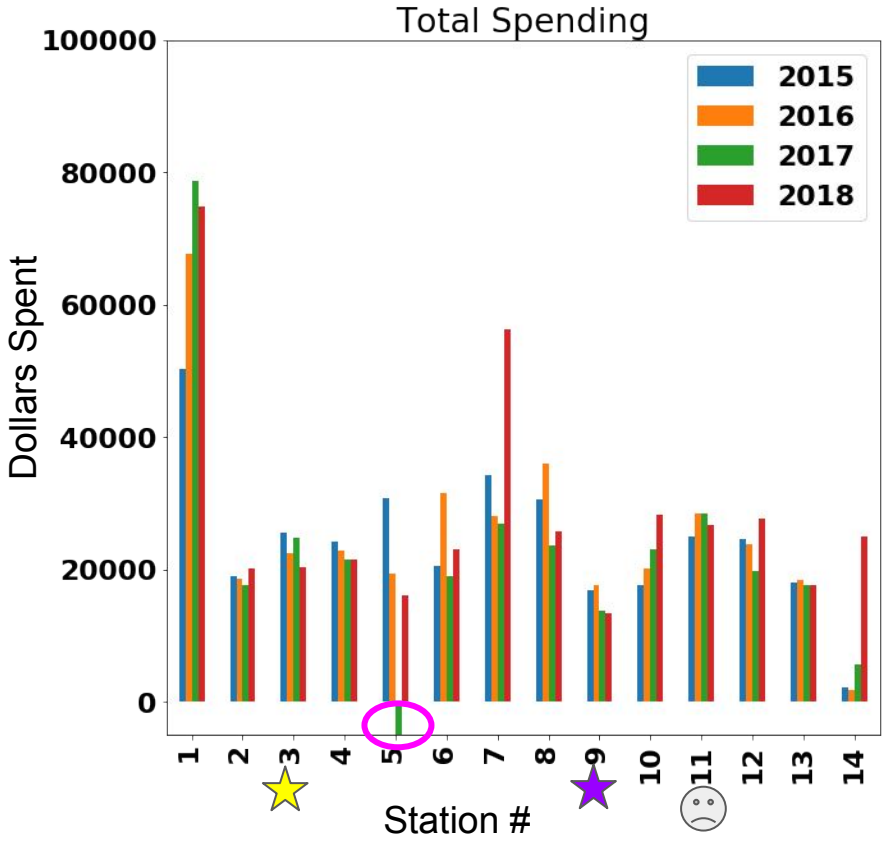


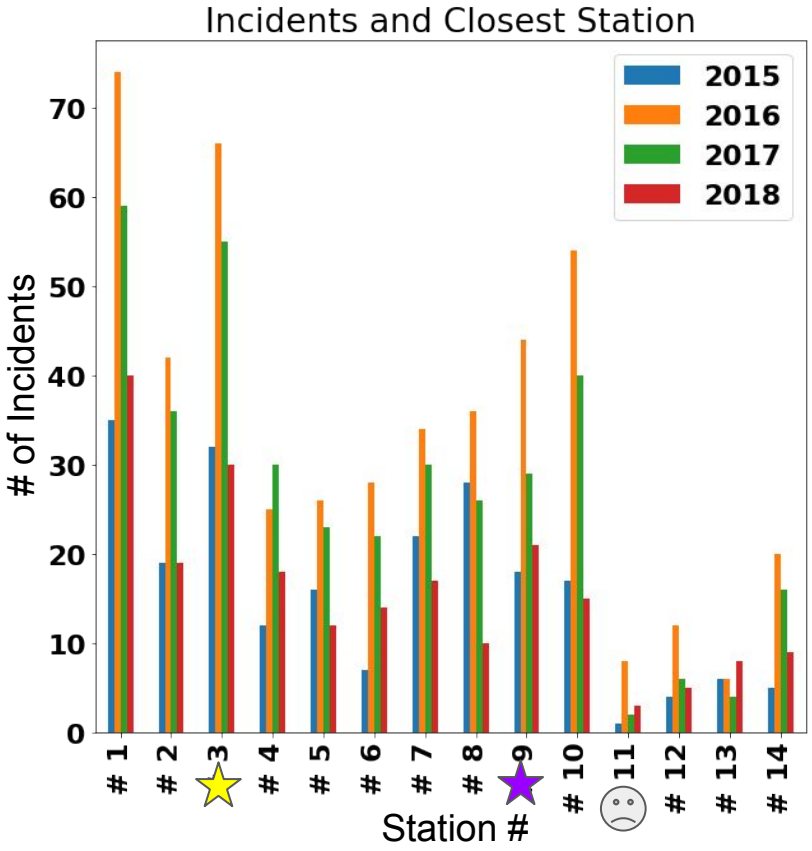
Similar across stations, yet as previously noted, station 14 has a much longer average response time. Newest station?

Not consistently higher some years compared to others.

Station Spending and Efficiency

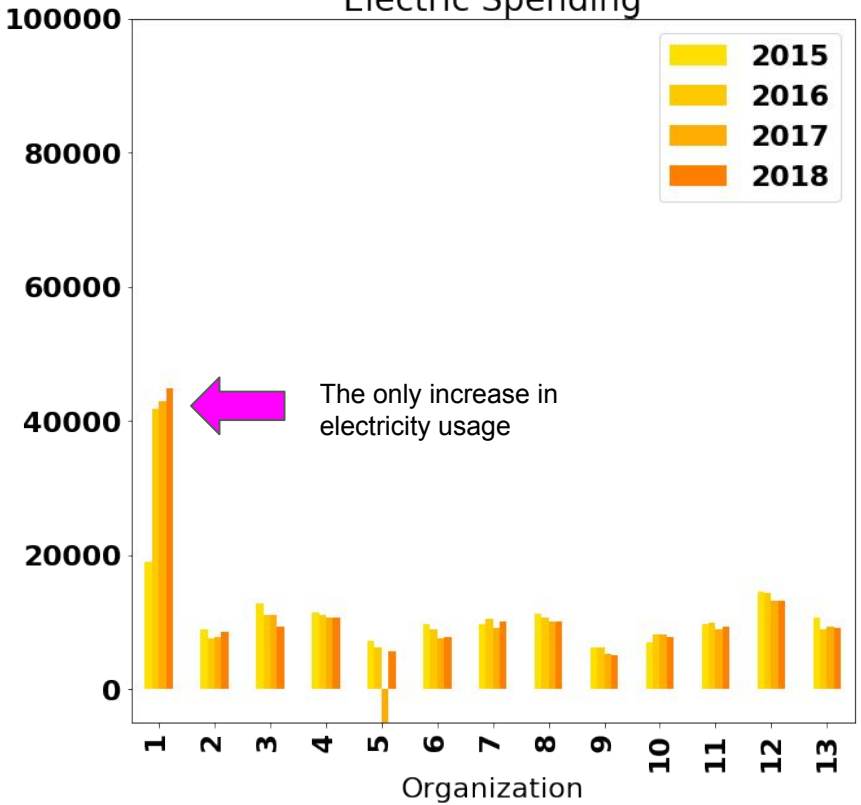
High efficiency stations, 3 and 9, who have high incident concentration and low spending. 11 has lower efficiency. 1 holds to logical trend.

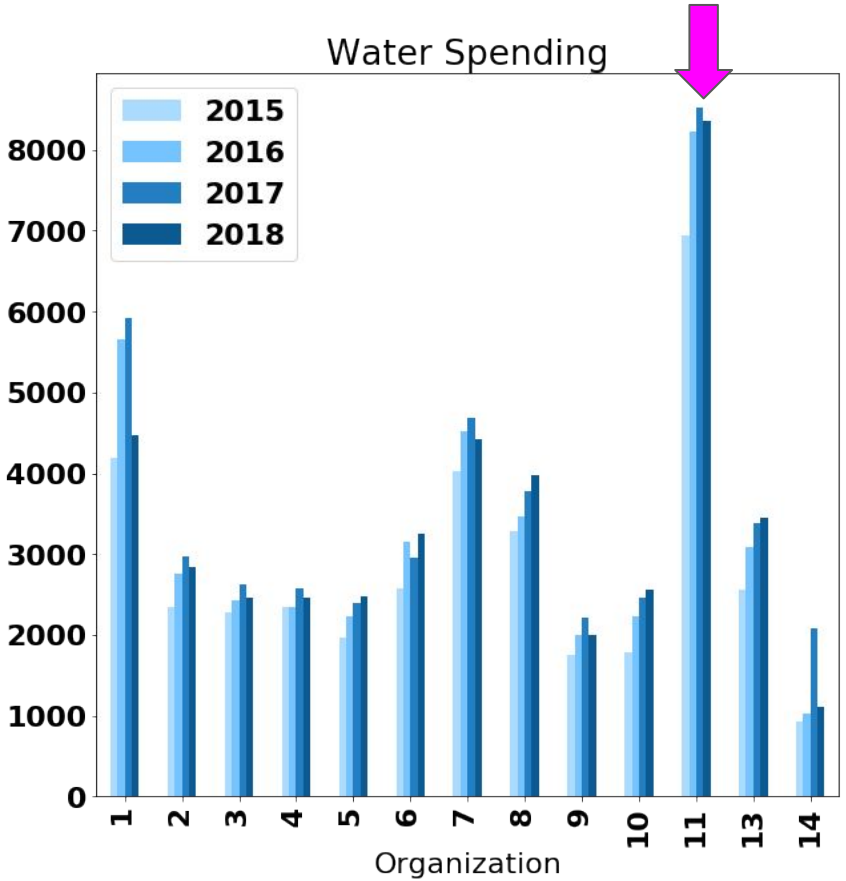




Areas of Spending by Station

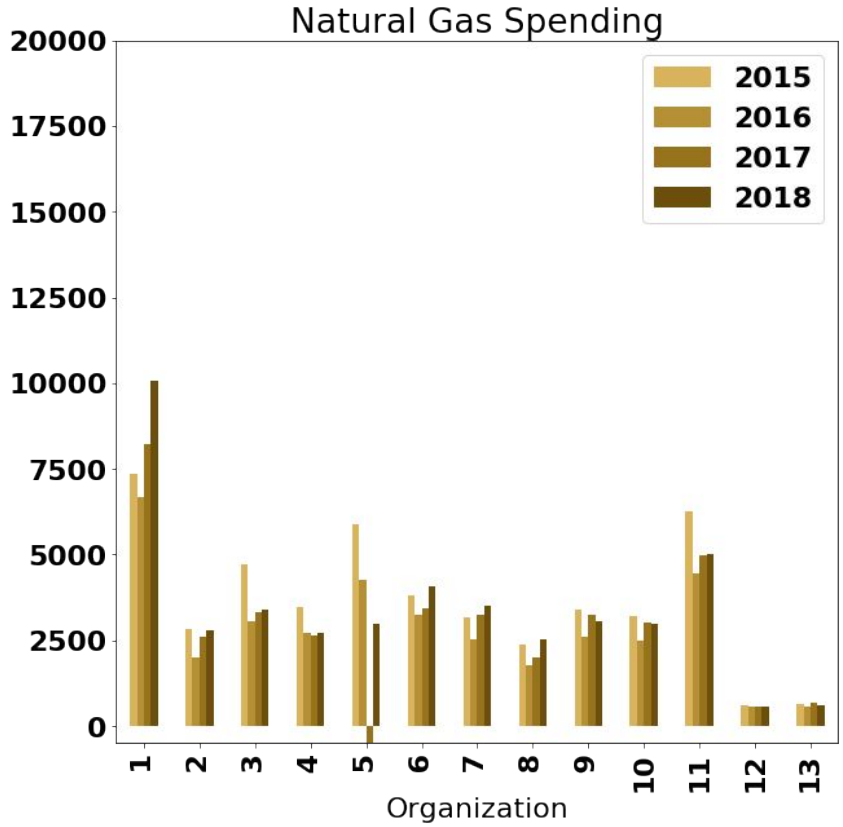
Normally, 1 has highest spending. Unexplained high water usage at station 11. Most stations using less electricity but more water over time.

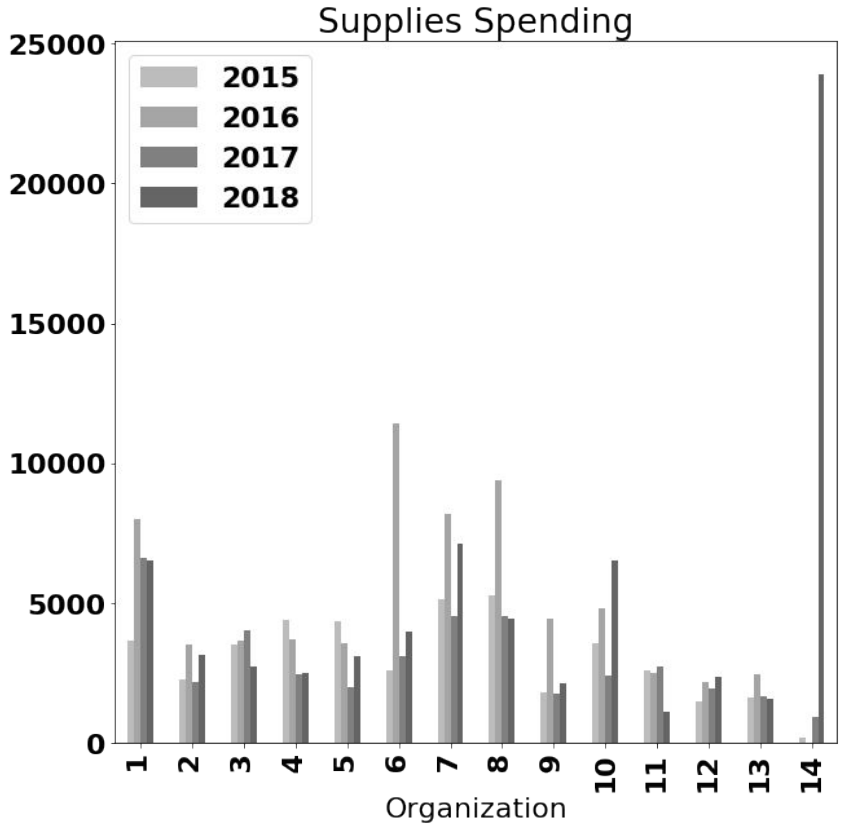




Areas of Spending by Station (continued)

14 has high supplies cost, possibly a start-up spending for a newer station? Supplies is sporadic.





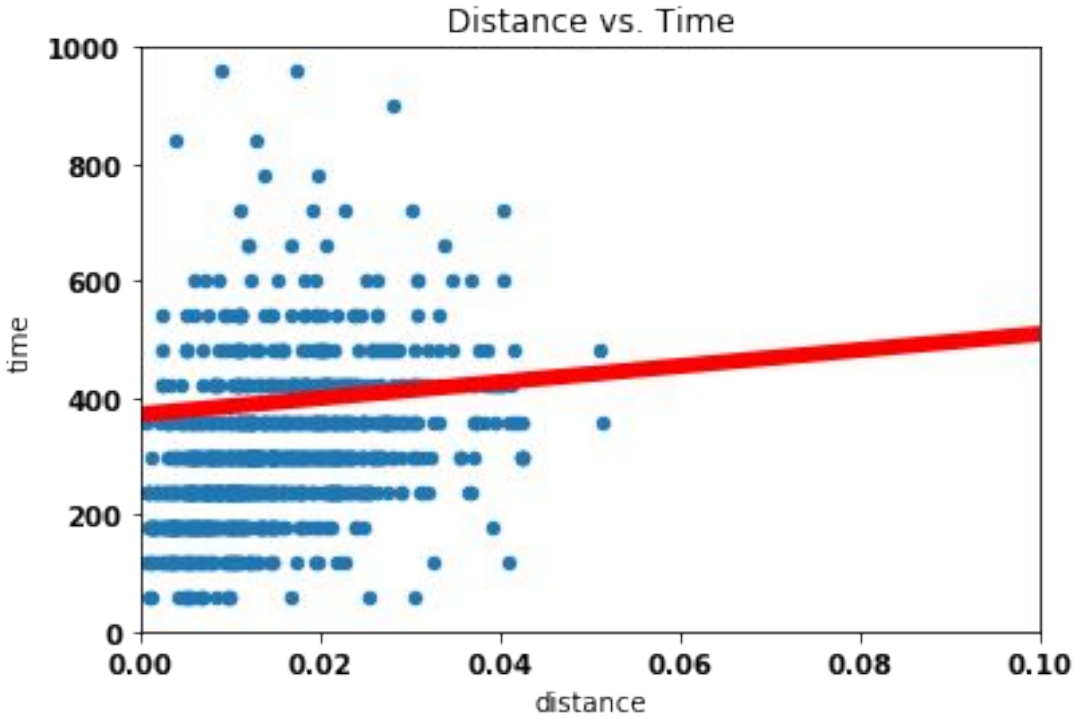
Applying the Data: A Predictive Model

Can we predict where the best station location would be to reduce response times the most?

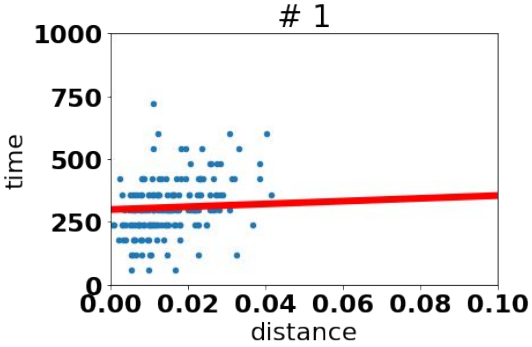
Plan:

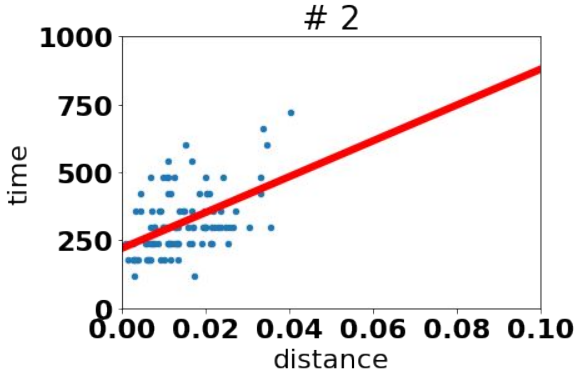
- Linear model
- Predict new response time given a closer station
- What placement reduces response times the most?

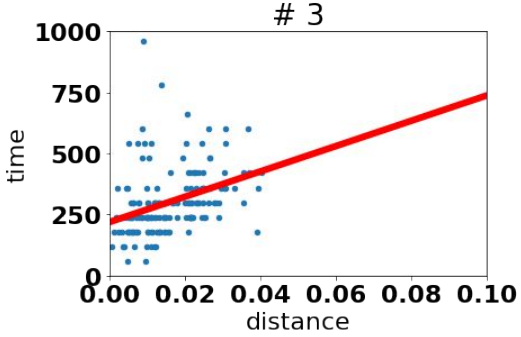
One large linear model is not accurate enough.

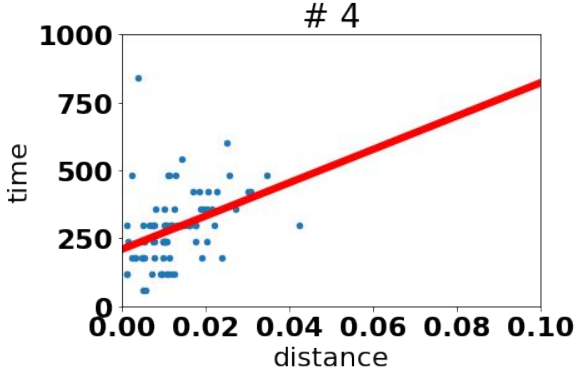


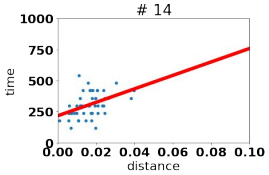
Many Mini Models

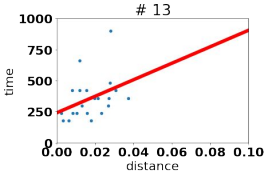


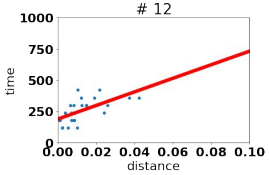


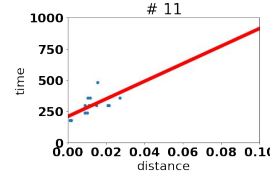


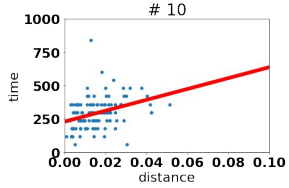


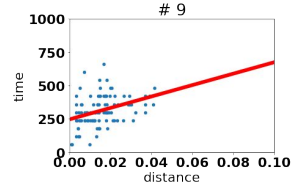


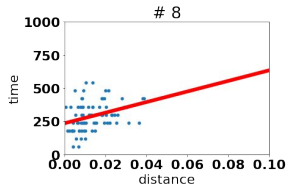


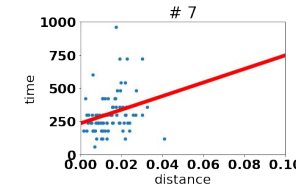


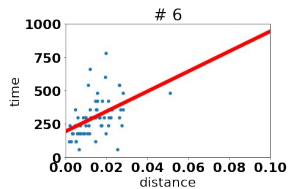


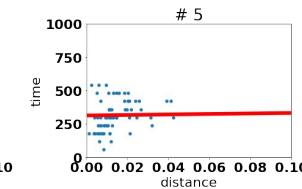






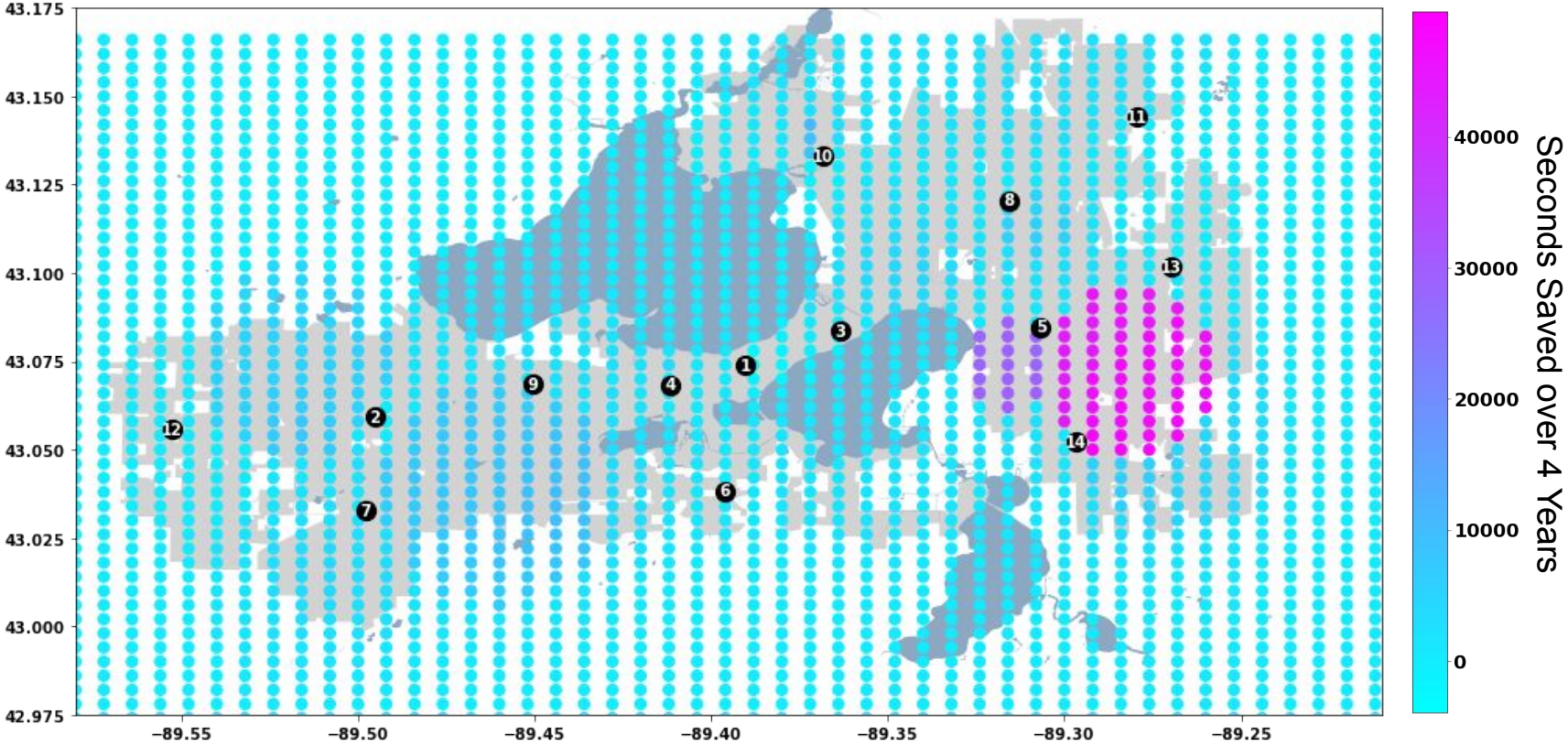






An Optimal New Station

POINT (-89.292 43.05)
49562.699954243166



A Quick Closer Look

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POINT (-89.37 43.142)
9582.052307847285
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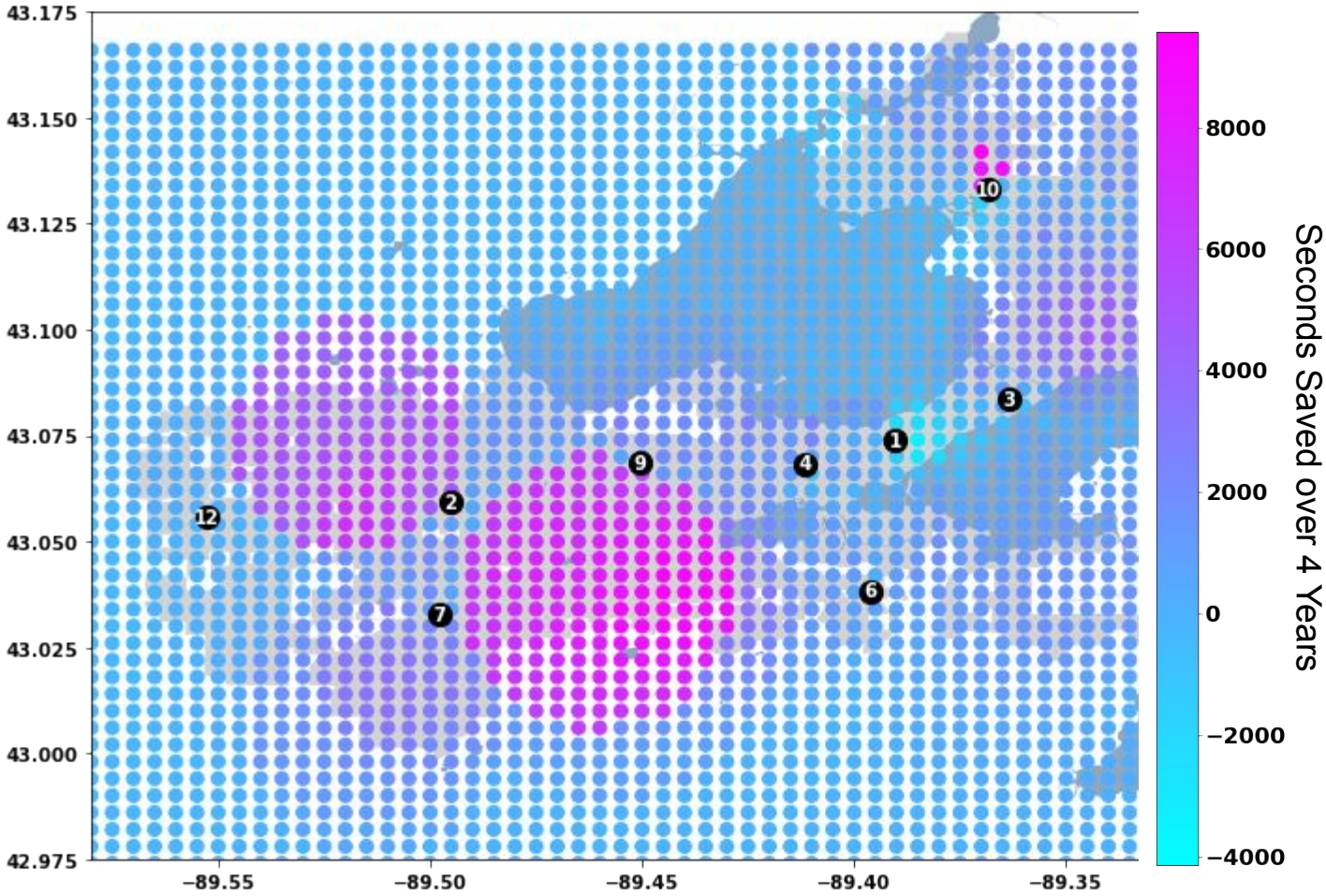
Conclusions:

Diverse paths of examining this dataset (location, time, incident type, expenses)

Use Logical ways to simplify complex problems, traffic patterns, etc.



Thank You!

Anna Arpaci-Dusseau