

Analyzing Police Misconduct in North vs. South of Chicago

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The Wise Kingfishers:
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Background

Chicago Police Are 14 Times More Likely to Use Force Against Young Black Men Than Against Whites

Internal Chicago police files document thousands of police uses of force over more than a decade. Nearly 90 percent were against people of color.

[Andrew Fan](#)

August 16 2018, 8:02 a.m.



130 Chicago Officers Account for 29 Percent of Police Shootings

While more than 95 percent of all Chicago police officers never fired their gun from 2004 to 2016, 130 officers have done it more than once.

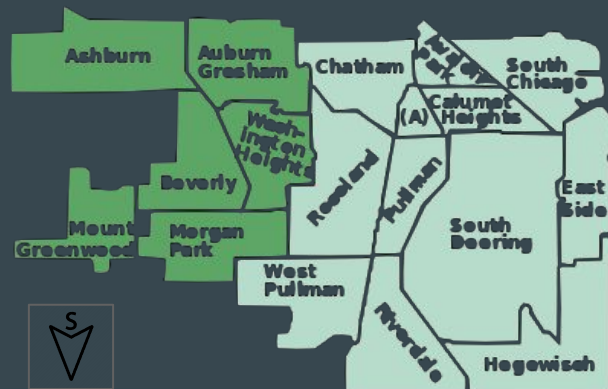
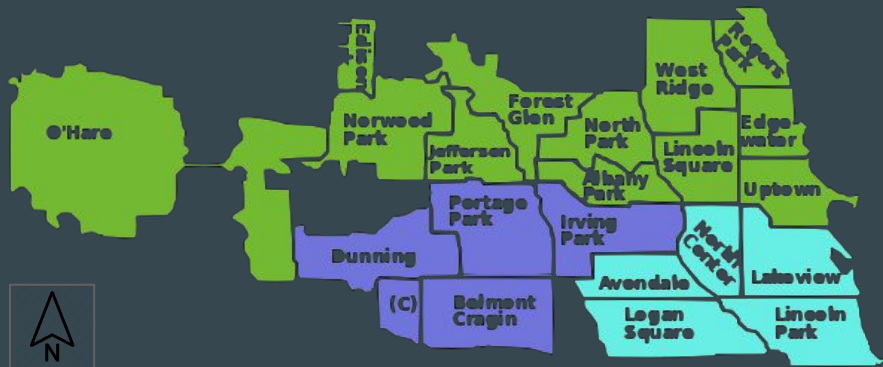
[Rob Arthur](#)

August 16 2018, 8:01 a.m.



Objectives

Study a pattern of allegations of procedural misconduct by police officers in North vs. South sides of Chicago, while paying special attention to the racial, gender, and economic aspects.



SQL

Q1: How many complaint reports are filed per capita on the north and south sides annually?

	year	south_per_capita_perc	north_per_capita_perc
1	2000	0.00274822260122106887	0.00239711960876545454
2	2001	0.00192289088744869327	0.00151407153458941631
3	2002	0.0017237714040560572	0.00138805922770808624
4	2003	0.00143423167603101634	0.00124280840069220195
5	2004	0.00151503346059614402	0.00107158557149466949
6	2005	0.00150156649650195608	0.00112833920589160441
7	2006	0.00159294946714108857	0.00112545342787142127
8	2007	0.002099884472686592	0.00158910176311417773
9	2008	0.00196040520171107398	0.00154581509281143076
10	2009	0.00210180832470004742	0.00154389124079797534
11	2010	0.00209603676865968116	0.00141787893391664526
12	2011	0.00193924282956306435	0.00132745788928424048
13	2012	0.00186325067503157522	0.00119375017434908872
14	2013	0.0017699438523789873	0.00113218690991851525
15	2014	0.00147270871630012476	0.00086380955404148402
16	2015	0.00114084424397906464	0.00083976140387329126
17	2016	0.00102829890119192251	0.00077146465739562381
18	2017	0.00094268748659315628	0.00065891931460848169
19	2018	0.00051078270957241427	0.00030781632215286736

- Complaints per capita south greater for every single year.

Q2: What is the racial distribution of the complainants and the general population in the North vs. South sides of Chicago?

	racial_distribution.race	population	complainant_distribution.race	complainants
1	White	550086	White	6538
2	Other/Unknown	26170	Other/Unknown	1385
3	Hispanic	326498	Hispanic	2600
4	Black	63957	Black	3619
5	Asian/Pacific Islander	83944	Asian/Pacific Islander	343
6	<null>	<null>	Native American/Alaskan Native	31



	racial_distribution.race	population	complainant_distribution.race	complainants
1	Black	351617	Black	14887
2	White	70993	White	3712
3	Hispanic	50751	Hispanic	841
4	Asian/Pacific Islander	10007	Asian/Pacific Islander	84
5	Other/Unknown	7338	Other/Unknown	1216
6	<null>	0	Native American/Alaskan Native	11



racial_distribution.race	▼ 1	population
1 White	~8 times no. of black people	550086

complainant_distribution.race	complainants
White	6538
Other/Unknown	1385
Hispanic	2600
Black	3619
Asian/Pacific Islander	343
Native American/Alaskan Native	31



~ 1% total white pop.

~ 5% total resp. pop.

complainant_distribution.race	complainants
Black	14887
White	3712
Hispanic	841
Asian/Pacific Islander	84
Other/Unknown	1216
Native American/Alaskan Native	11



~ 4% total black pop. (3 times more on average than hispanics)


~ 5% total white pop.

~ 16% total o/u pop.


What other factors apart from race are contributing to police misconduct on both sides of Chicago?

Q3: What is the distribution of complaint categories in the North vs. South sides of Chicago?

category	count
1 Operation/Personnel Violations	7982
2 Use Of Force	6375
3 Verbal Abuse	2188
4 Illegal Search	1816
5 Traffic	1585
6 Lockup Procedures	1222
7 Conduct Unbecoming (Off-Duty)	1084
8 Domestic	789
9 Criminal Misconduct	585
10 False Arrest	440
11 Supervisory Responsibilities	386
12 Drug / Alcohol Abuse	166
13 Bribery / Official Corruption	130
14 Unknown	8
15 First Amendment	6
16 Medical	5
17 Money / Property	5
18 Excessive Force	2



category	count
1 Operation/Personnel Violations	10241
2 Use Of Force	6738
3 Illegal Search	2521
4 Verbal Abuse	1956
5 Lockup Procedures	1552
6 Traffic	1392
7 Conduct Unbecoming (Off-Duty)	1288
8 Domestic	871
9 False Arrest	789
10 Criminal Misconduct	573
11 Supervisory Responsibilities	526
12 Drug / Alcohol Abuse	287
13 Bribery / Official Corruption	84
14 Unknown	14
15 Medical	10
16 First Amendment	8
17 Money / Property	7
18 Racial Profiling	7
19 Excessive Force	3



Q4: What is the median income of the population on the North vs. South sides of Chicago?

	■ north_median_income ↕	■ south_median_income ↕
1	51713	37084

D3 Data Visualizations

Q1: What is the distribution of complaint categories across the North and South of the city? Within those categories, how many complaints involved using weapons or firearms by police officers?

- Top 3:
Operation/Personnel
Violations, **Use of Force**,
and Verbal Abuse

Category: Use Of Force

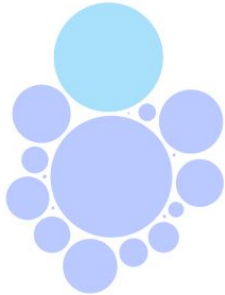
Charges in this category : 6,375

Involved Weapon or Firearms: 1,074

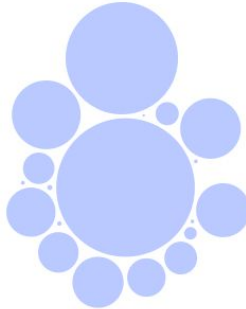
Subcategories:

- Excessive Force / On Duty - Injury : 3382
- Excessive Force / Off Duty - No Injury : 938
- Excessive Force / On Duty - No Injury : 586
- Excessive Force - Use Of Firearm / Off Duty - Injury : 468
- Excessive Force - Use Of Firearm / On Duty - Injury : 304
- Excessive Force / Off Duty - Injury : 105
- Excessive Force - Use Of Firearm / Off Duty - No Injury : 105
- Unnecessary Display Of Weapon / On Duty : 96
- Unnecessary Physical Contact / On Duty - No Injury : 93
- Unnecessary Display Of Weapon / Off Duty : 86
- Unnecessary Physical Contact / Off Duty - No Injury : 84
- U Converted To C.R. (Records Keeping Only, Initial) : 23
- Miscellaneous : 20
- Civil Suits - Third Party : 20
- Excessive Force - Use Of Firearm / On Duty - No Injury : 20
- Injury : 6
- Push/Pull/Grab : 6
- Miscellaneous : 5
- No Injury : 4
- Excessive Force - Taser - Use Of : 4
- Closed Hand Strike (Punch) : 4
- Arrestee-During Arrest : 3
- Miscellaneous : 2
- Coercion - Threat Of Arrest/Charges : 2

North



South



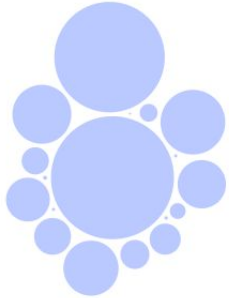
Category: Use Of Force

Charges in this category : 6,730

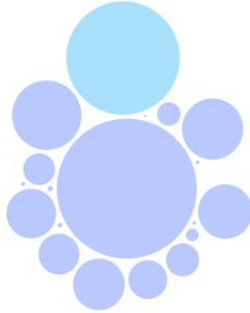
Involved Weapon or Firearms: 1,193

- Subcategories:**
- Excessive Force / Off Duty - No Injury : 919
 - Unnecessary Display Of Weapon / On Duty : 85
 - Closed Hand Strike (Punch) : 8
 - Take Down (Thrown To Ground) : 6
 - Excessive Force - Use Of Firearm / Off Duty - Injury : 572
 - Excessive Force / On Duty - No Injury : 572
 - Miscellaneous : 5
 - Arrestee-During Arrest : 5
 - Push/Pull/Grab : 5
 - Open Hand Strike (Slap) : 4
 - No Injury : 4
 - Injury : 4
 - Closed Hand Strike (Punch) : 4
 - U Converted To C.R. (Records Keeping Only, Initial) : 36
 - Excessive Force / On Duty - Injury : 3433
 - Arrestee-After Arrest,Prior To Lockup : 3
 - Open Hand Strike (Slap) : 3
 - Excessive Force - Use Of Firearm / On Duty - Injury : 251
 - Kicked : 2
 - Push/Pull/Grab : 2
 - Arrestee-Lockup/Deletion : 2
 - Taser (Probe Discharge) : 2
 - Injury / Death (Under Color Of Law) : 2
 - Coercion - Violence : 2
 - Dragged : 2

North



South



- Top 3:
Operation/Personnel
Violations, **Use of Force,**
and Illegal Search



Q2: What is the distribution of police misconduct allegations (total count and per capita values) per police district across the North and South of the city? Then, what is the racial distribution of the civilian community and police officers per given police district?

Per Capita

Display racial breakdown of police officers and civilians:

Police

Allegations of police misconduct per capita
0.0 0.1 0.2 0.3

7TH Police District

Allegations of police misconduct per capita: 0.15454967567643624

Racial Distribution of Police Officers in %:

BLACK: 29.27
HISPANIC: 21.73
NATIVE AMERICAN/ALASKAN NATIVE: 0.22
WHITE: 46.34

Per Capita

Display racial breakdown of police officers and civilians:

Civilian

Allegations of police misconduct per capita
0.0 0.1 0.2 0.3

7TH Police District

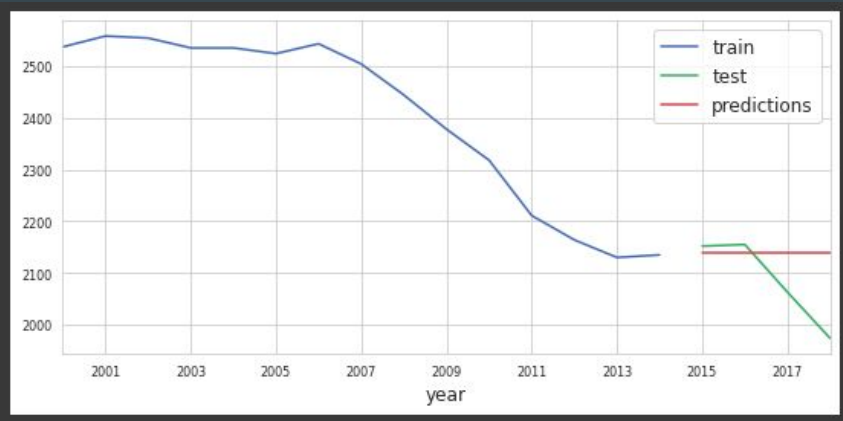
Allegations of police misconduct per capita: 0.15454967567643624

Racial Distribution of Civilian Population in %:

BLACK: 96.79
HISPANIC: 1.64
NATIVE AMERICAN/ALASKAN NATIVE: 0.19
WHITE: 0.37

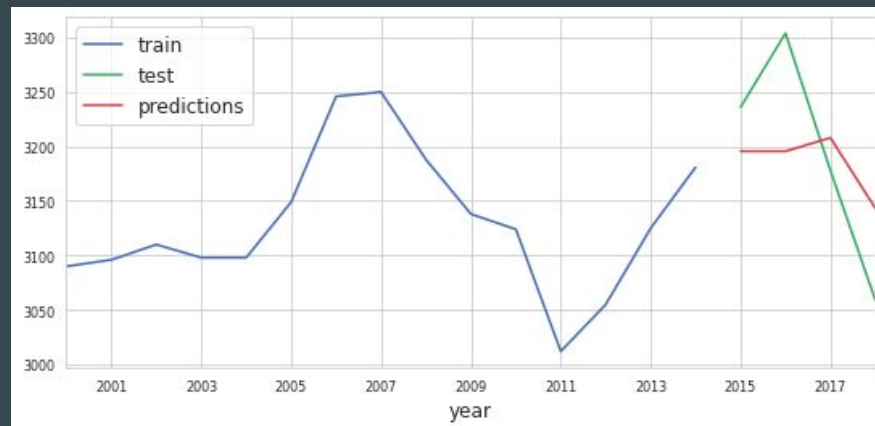
ML

Q1: Two time-series predictive models that predict the number of police officers for the North and South side of Chicago, respectively, while accounting for the number of allegations per 10,000 people.



Predictions

2015-01-01	2140.35
2016-01-01	2140.35
2017-01-01	2140.35
2018-01-01	2140.35



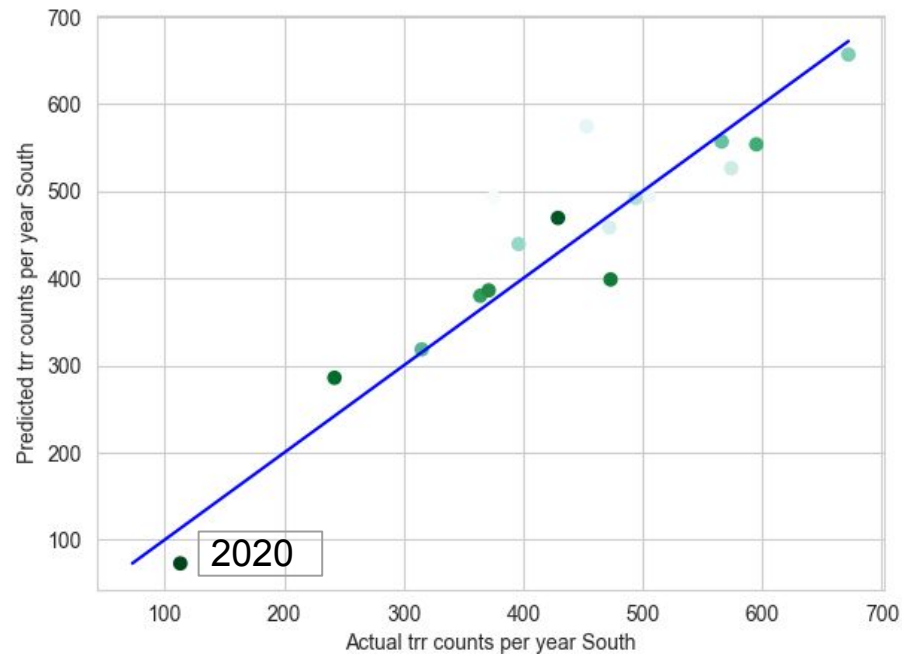
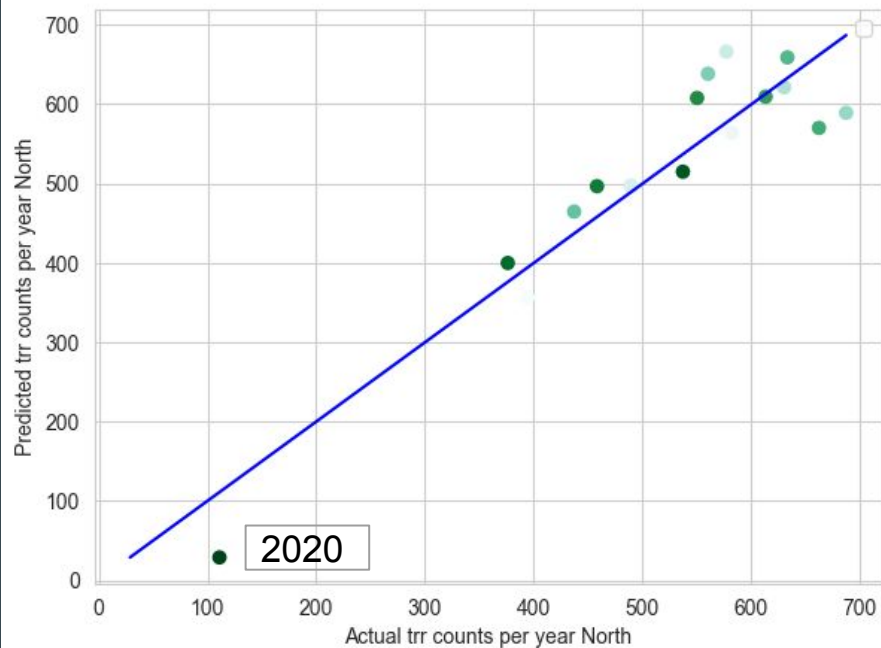
Predictions

2015-01-01	3206.40
2016-01-01	3199.55
2017-01-01	3176.17
2018-01-01	3156.85

Q2: A machine learning model predicting the number of TRRs per year in the north and south sides of Chicago, accounting for such features as demographics of the officers and the communities we serve + hyperparameter tuning.

*Colormap : years

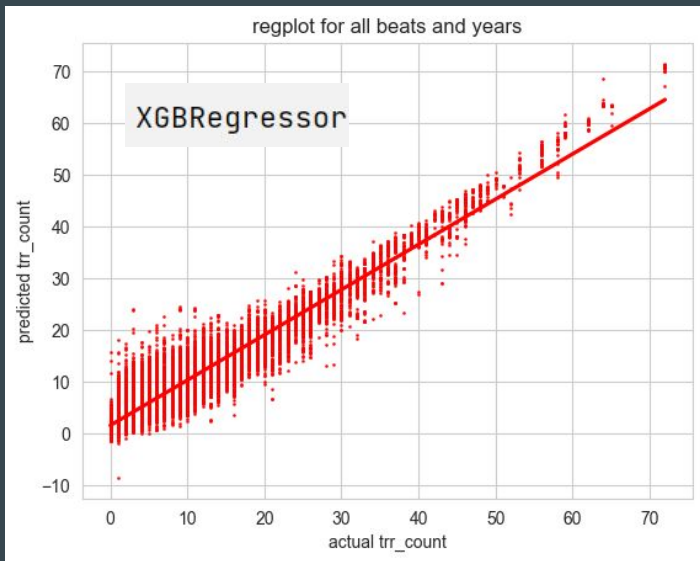
Kernal ridge (without tuning) prediction comparison



	model	best hparams	...
9	KernelRidge()	No tuning	0.86726...
3	Ridge()	No tuning	0.86620...
7	SGDRegressor()	No tuning	0.86540...
1	LinearRegressio...	No tuning	0.86404...
8	KernelRidge()	{'kreg__alpha': 5e-05, 'kreg__kernel': 'rbf'}	0.60424...
0	LinearRegressio...	{'lreg__positive': False}	-0.3751...
4	GammaRegressor()	{'greg__alpha': 0.01, 'greg__warm_start': True}	-0.4646...
2	Ridge()	{'rreg__alpha': 1, 'rreg__positive': False}	-0.5450...
6	SGDRegressor()	{'sgdreg__learning_rate': 'invscaling', 'sgdreg__max_iter': 10000, 'sg...	-0.7350...
5	GammaRegressor()	No tuning	-0.9582...

Later we used XGBoost for good results (99% score) as it operates on a powerful gradient boosting framework

Extra

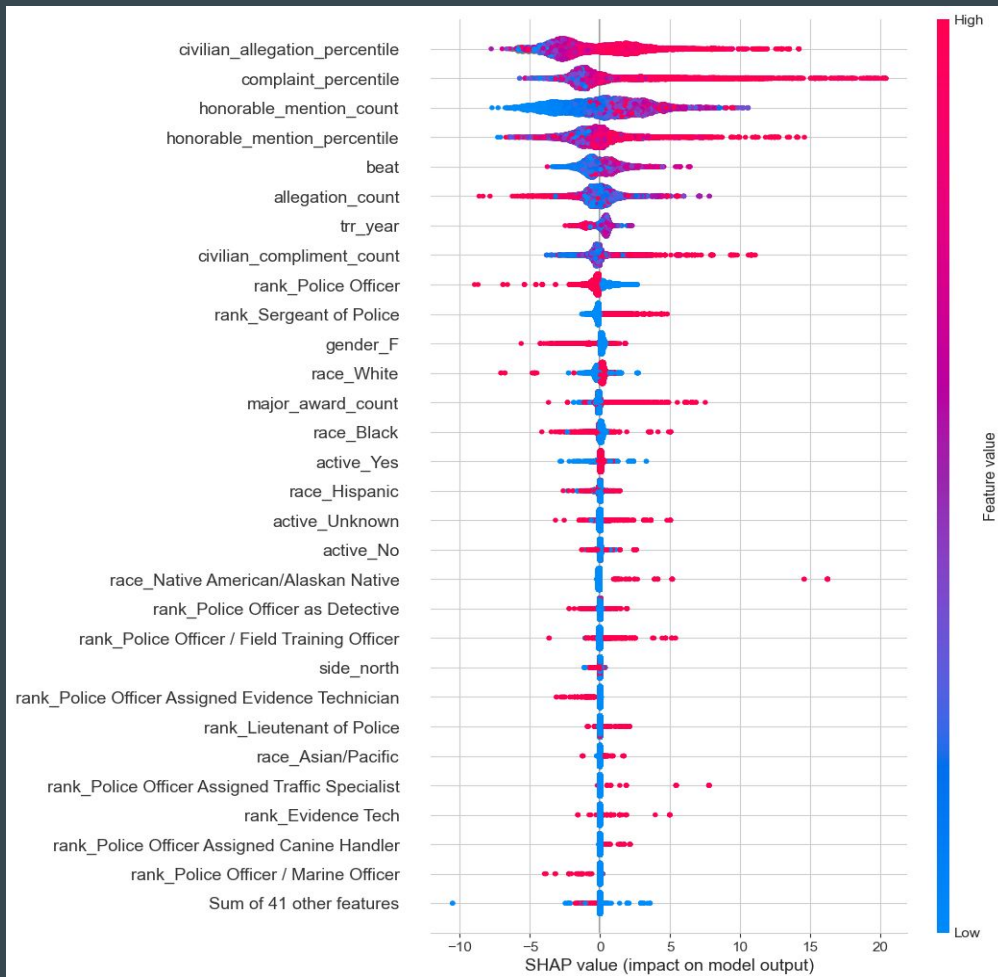


Group by beats + years

0.9201675561188993

Group by sides + years

0.9991692521913963



Conclusions

More alleged police misconduct on the south side per capita

Correlation \neq Causation \Rightarrow More research is needed

**THANK YOU FOR
ATTENTION!**

ANY QUESTIONS?