

팹시600ml 김성창, 김정훈, 유건식

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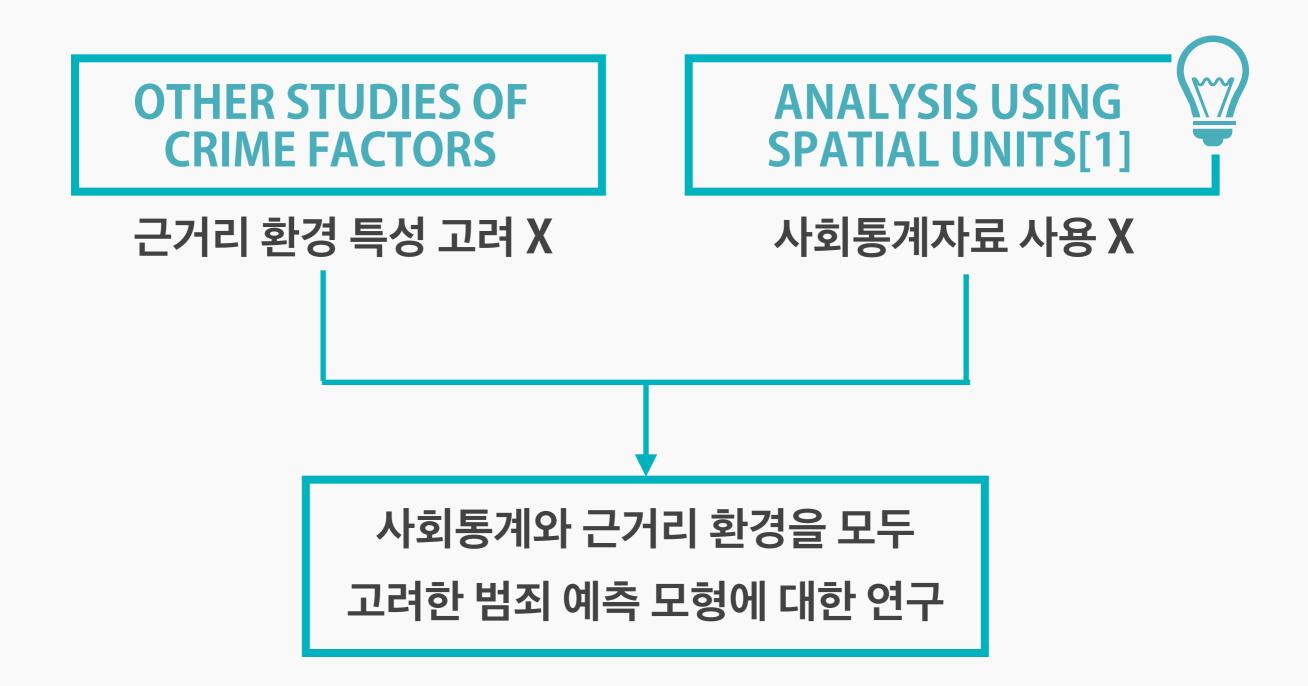


PERFORMANCE

DISCUSSION



PROJECT MOTIVATION



[1] W Bernasco and R Block. Robberies in Chicago: A BlockLevel Analysis of the Influence of Crime Generators, Crime Attractors, and Offender Anchor Points.

DATA: DATASET

data.cityofchicago.org

Crime Record

- · Case Number
- Date
- Block
- · IUCR(범죄 대분류 + 소분류)
- · Location Description
- ·Arrest(체포여부)
- Domestic
- · District(세부지역)
- ·Ward(순찰지역)
- · Community Area(지역)
- · Latitude & Longitude

MAIN DATA

SocioEco Indicators

- · Community Area Number
- · Community Area Name
- · % Housing Crowded
- · % Households Poverty
- · % Aged 16+ Unemployed
- · % Aged 25+ No High School Diploma
- ·% Aged -18 or 64+
- % Capital Income
- Hardship Index

STATISTICAL DATA

SPATIAL DATA

Police Station

- Office Code
- Office Name
- · Latitude & Longitude

Vacant Building

- Docket Number
- Violation Number
- Issued Date
- · Last Hearing Date
- · Property Address
- Violation Type
- · Entity or Person(s)
- · Disposition Description

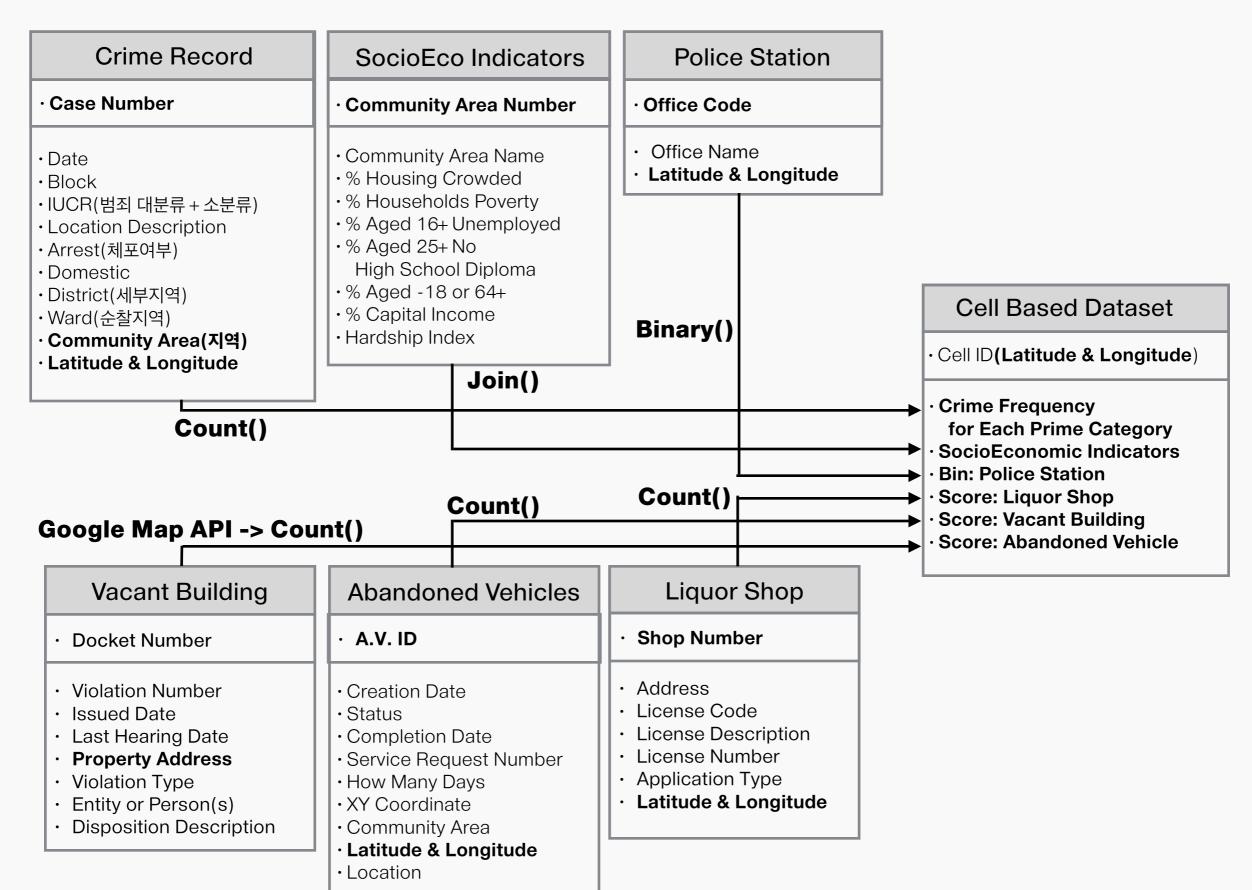
Abandoned Vehicles

- · A.V. ID
- Creation Date
- Status
- · Completion Date
- · Service Request Number
- How Many Days
- · XY Coordinate
- · Community Area
- · Latitude & Longitude
- · Location

Liquor Shop

- · Shop Number
- Address
- · License Code
- · License Description
- · License Number
- Application Type
- · Latitude & Longitude

DATA: PREPROCESSING



DATA: MAP

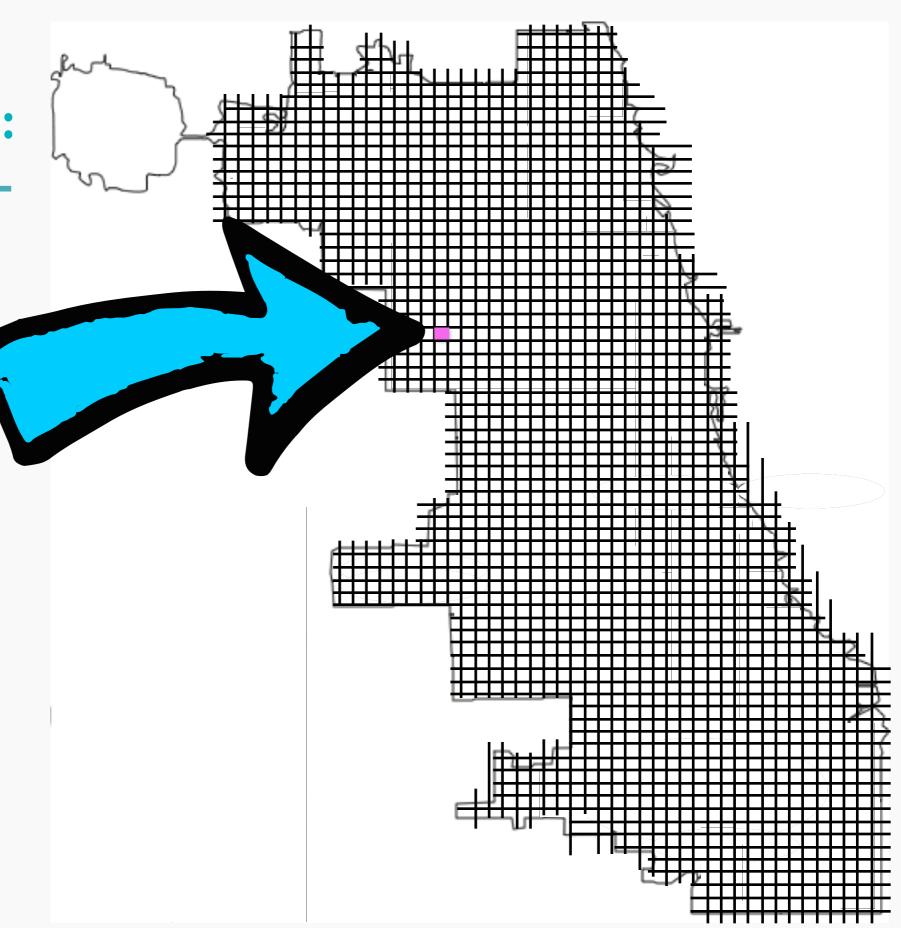
SPATIAL DIVISION: 0.005 x 0.005 CELL

해당구역에서는…

1. 어떤 범죄가 몇건이나 일어났는가?

2. 사회 통계치는 얼마나 되는가?

3. 공간적인 특성은 어떻게 되는가?



DATA: RESPONSE

- 1. CRIMINAL DAMAGE
- 2. BATTERY
- 3. NARCOTICS
- 4. THEFT
- 5. PUBLIC PEACE VIOLATION
- 6. ASSAULT
- 7. WEAPONS VIOLATION
- 8. ARSON

- 11. LIQUOR LAW VIOLATION
- 12. MOTOR VEHICLE THEFT
- 13. CRIM SEXUAL ASSAULT
- 14. BURGLARY
- 15. DECEPTIVE PRACTICE
- 16. CRIMINAL TRESPASS
- 17. OFFENSE INVOLVING CHILDREN
- 18. STALKING
- 19. PROSTITUTION
- 20. GAMBLING
- 21. SEX OFFENSE
- 22. HOMICIDE
- 23. KIDNAPPING
- 24. INTIMIDATION
- 25. OTHER OFFENSE
- 26. OTHER NARCOTIC VIOLATION

CRIMINAL DAMAGE NARCOTICS

9. ROBBERY
10. INTERFERENCE WITH PUBLIC OFFICE LOUGH LAW VIOLATION
11. LIQUOR LAW VIOLATION

PROSTITUTION GAMBLING

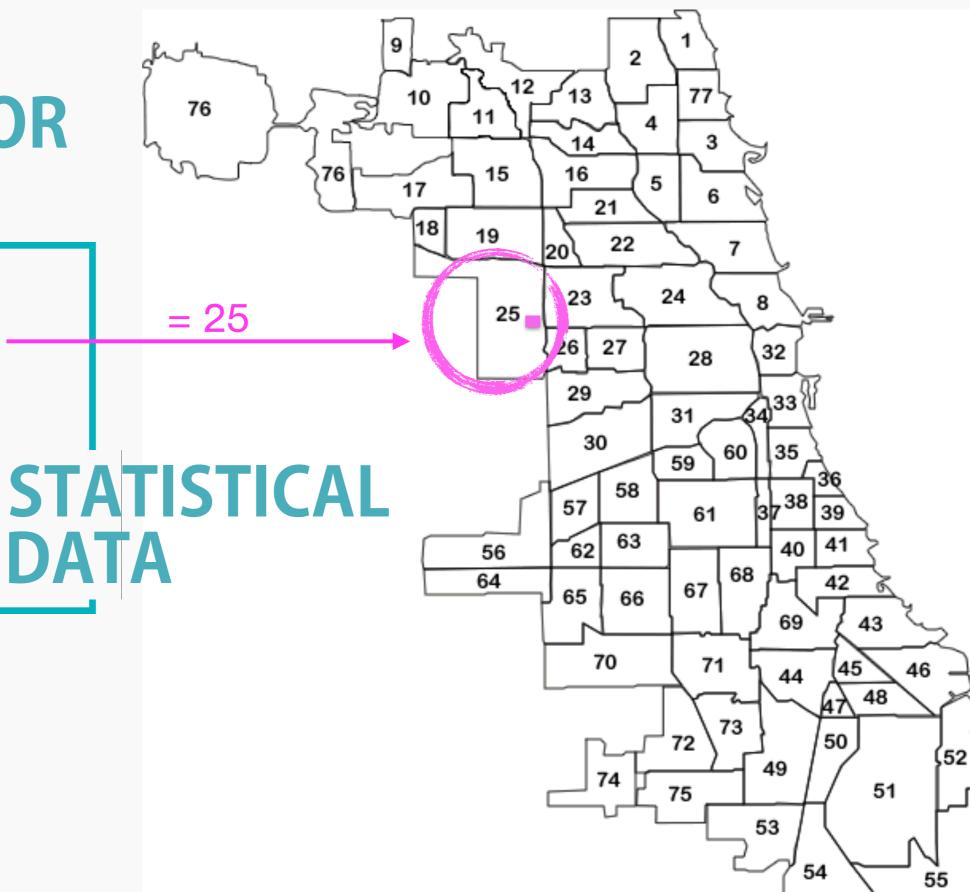
HOMICIDE

DATA: PREDICTOR

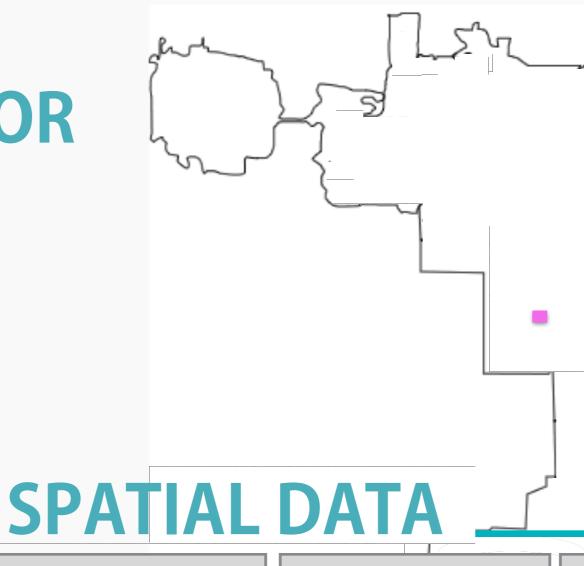
SocioEco Indicators

· Community Area Number

- · Community Area Name
- · % Housing Crowded
- % Households Poverty
- · % Aged 16+ Unemployed
- · % Aged 25+ No High School Diploma
- •% Aged -18 or 64+
- · % Capital Income
- Hardship Index



DATA: PREDICTOR



Police Station

- · Office Code
- Office Name
- · Latitude & Longitude

Vacant Building

- Docket Number
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- · A.V. ID
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Liquor Shop

- Shop Number
- · Address
- · License Code
- · License Description
- · License Number
- Application Type
- Latitude & Longitude

DATA: CELL BASED DATASET

```
CELL ID
                                                   (Integer)
                                                   (Integer, Integer)
Longitude/Latitude Range
                                                   (Integer Array)
Crime Frequency for Each Prime Category
    - Total # of Crime
    - Homicide(살인)
    - Prostitution(매춘)
    - Criminal Damage(재물 손괴)
    - Gambling(불법 도박)
    - Liquor Law Violation(주류법 위반)
    - Narcotics(마약사범)
SocioEconomic Indicators
                                                   (Float Array)
    - Percent Households below Poverty(빈곤 가구 비율)
    - Percent of Housing Crowded(밀집 거주 가옥 비율)
    - Hardship index(곤궁도 지수)
    - Per Capita Income(1인당 소득)
    - Percent Aged 18- or 64+(18세 이하 64세 이상 인구 비율)
    - Percent Aged 25+, No High School Diploma(고등학교 졸업 미만 학력, 25세 이상)
    - Percent Aged 16+ Unemployed(16세 이상 미취업 인구)
Existence of Police Station
                                                   (Binary)
Number of Liquor Shop
                                                   (Integer)
Number of Vacant Building
                                                   (Integer)
Score of Abandoned Vehicle
                                                   (Integer)
```

ANALYSIS: MLR-ALL CRIME

Regression Model

| Input Variables | Coefficient | Std. Error | t-Statistic | P-Value | CI Lower | CI Upper | RSS Reduction |
|--------------------|-------------|------------|-------------|------------|----------|----------|------------------|
| Intercept | 461.3153 | 8.70707785 | 52.9816397 | 0 | 444.236 | 478.3945 | 221763405 |
| norm_PERCENT | 198.1377 | 26.4324778 | 7.49599264 | 1.1148E-13 | 146.2895 | 249.9858 | 88571233.7 |
| norm_PERCENT | 5.570373 | 20.0193897 | 0.27824887 | 0.78085934 | -33.6983 | 44.83907 | 3442222.28 |
| norm_HARDSH | 137.7268 | 67.9499814 | 2.02688525 | 0.04284922 | 4.440674 | 271.013 | 646667.267 |
| norm_PER CAPI | 15.0713 | 23.6475788 | 0.63732969 | 0.52400654 | -31.3142 | 61.45681 | 192113.022 |
| norm_PERCENT | -16.9577 | 18.7514738 | -0.9043402 | 0.36595903 | -53.7393 | 19.82393 | 1884674.97 |
| norm_PERCENT | -141.761 | 32.1549063 | -4.4087038 | 1.1133E-05 | -204.834 | -78.6885 | 2429353.44 |
| norm_PERCENT | 40.37423 | 24.9403907 | 1.6188291 | 0.10569245 | -8.54717 | 89.29563 | 234845.503 |
| norm_vehicle | 96.5487 | 7.41076871 | 13.0281629 | 7.5022E-37 | 82.01223 | 111.0852 | 17606581.5 |
| norm_vehicle_v | 33.44344 | 55.2270956 | 0.60556215 | 0.54489637 | -74.8863 | 141.7732 | 3017.45917 |
| norm_Liquor | 185.1364 | 16.7100139 | 11.0793656 | 1.7444E-27 | 152.3591 | 217.9136 | 9581019.91 |
| norm_abandon | 25.4382 | 6.08961096 | 4.17731098 | 3.1183E-05 | 13.49323 | 37.38317 | 1346676.2 |
| police | 17.2948 | 80.960011 | 0.21362151 | 0.83087101 | -141.511 | 176.1005 | 3524.43525 |

% Households below Poverty # of Liquor Shop # of Vehicles Abandoned

% Aged 25+ without
High School Diploma
of Abandoned Building

ANALYSIS: LIQUOR LAW VIOLATION / CRIMINAL DAMAGE

MLR: Liquor Law Violation

of liquor shop

| Input Variables | Coefficient | Std. Error | t-Statistic | P-Value | CI Lower | CI Upper | RSS Reduction |
|--|-------------|------------|-------------|------------|----------|----------|------------------|
| Intercept | 0.908111 | 0.04201271 | 21.6151524 | 1.6215E-90 | 0.825702 | 0.990521 | 1147.005 |
| norm_PERCENT HOUSEHOLDS BELOW POVERTY | 0.343184 | 0.12753993 | 2.69079933 | 0.00720657 | 0.093011 | 0.593358 | 133.1723 |
| norm_PERCENT OF HOUSING CROWDED | 0.11712 | 0.096596 | 1.21247128 | 0.22552132 | -0.07236 | 0.306596 | 72.29709 |
| norm_HARDSHIP INDEX | -0.41329 | 0.32786696 | -1.2605457 | 0.20766693 | -1.05641 | 0.229831 | 99.02064 |
| norm_PER CAPITA INCOME | 0.063596 | 0.11410246 | 0.55736196 | 0.57736259 | -0.16022 | 0.287412 | 8.670817 |
| norm_PERCENT AGED UNDER 18 OR OVER 64 | -0.04137 | 0.09047815 | -0.4572874 | 0.64753012 | -0.21885 | 0.136101 | 132.8592 |
| norm_PERCENT AGED 25+ WITHOUT HIGH SCHOOL DIPL | 0.374982 | 0.15515135 | 2.4168776 | 0.01577193 | 0.070647 | 0.679316 | 16.53779 |
| norm_PERCENT AGED 16+ UNEMPLOYED | 0.081626 | 0.12034043 | 0.67829533 | 0.49768818 | -0.15443 | 0.317678 | 0.041257 |
| norm_vehicle | 0.213055 | 0.03575786 | 5.95825624 | 3.1657E-09 | 0.142914 | 0.283195 | 107.9409 |
| norm_vehicle_weight | -0.17856 | 0.26647748 | -0.6700894 | 0.50290303 | -0.70127 | 0.344141 | 2.591596 |
| norm_Liquor | 1.146709 | 0.08062786 | 14.2222408 | 3.5419E-43 | 0.988555 | 1.304863 | 359.7923 |
| norm_abandoned_building | 0.000483 | 0.02938312 | 0.01643918 | 0.98688619 | -0.05715 | 0.058119 | 0.001537 |
| police | -0.62004 | 0.39064194 | -1.5872208 | 0.11267159 | -1.38629 | 0.146222 | 4.529924 |

% Households below Poverty # of Vehicles Abandoned # of Liquor Shop # of Abandoned Building

... "Broken Window Effect"

MLR: Criminal Damage

| Coefficient | Std. Error | t-Statistic | P-Value | CI Lower | CI Upper | RSS Reduction |
|-------------|------------|-------------|------------|----------|----------|------------------|
| 48.10027 | 0.79959066 | 60.1561168 | 0 | 46.53185 | 49.66869 | 2875406 |
| 18.18161 | 2.42735423 | 7.49029885 | 1.1624E-13 | 13.42027 | 22.94294 | 586261.7 |
| -1.06531 | 1.83842584 | -0.5794694 | 0.56235877 | -4.67144 | 2.540822 | 1932.942 |
| -1.07149 | 6.2400005 | -0.1717138 | 0.86368546 | -13.3115 | 11.16847 | 12166.91 |
| 1.111301 | 2.17161066 | 0.51174049 | 0.60890732 | -3.14839 | 5.370987 | 931.6052 |
| -1.029 | 1.72199025 | -0.5975627 | 0.55022119 | -4.40674 | 2.348744 | 65067.75 |
| -1.1998 | 2.95285779 | -0.4063173 | 0.68456696 | -6.99193 | 4.592331 | 2078.591 |
| 6.413649 | 2.2903325 | 2.80031364 | 0.0051702 | 1.921086 | 10.90621 | 5376.666 |
| 13.88546 | 0.68054765 | 20.4033546 | 6.133F-82 | 12.55054 | 15.22037 | 337754 |
| 2.434372 | 5.07162912 | 0.479998 | 0.6312982 | -7.5138 | 12.38254 | 2.656403 |
| 17.37381 | 1.53451838 | 11.3219934 | 1.3907E-28 | 14.3638 | 20.38382 | 85017.48 |
| 3.050526 | 0.55922275 | 5.45493905 | 5./14/E-08 | 1.953592 | 4.14746 | 19338.2 |
| 5.68401 | 7.43474095 | 0.7645202 | 0.44467652 | -8.89948 | 20.2675 | 380.687 |

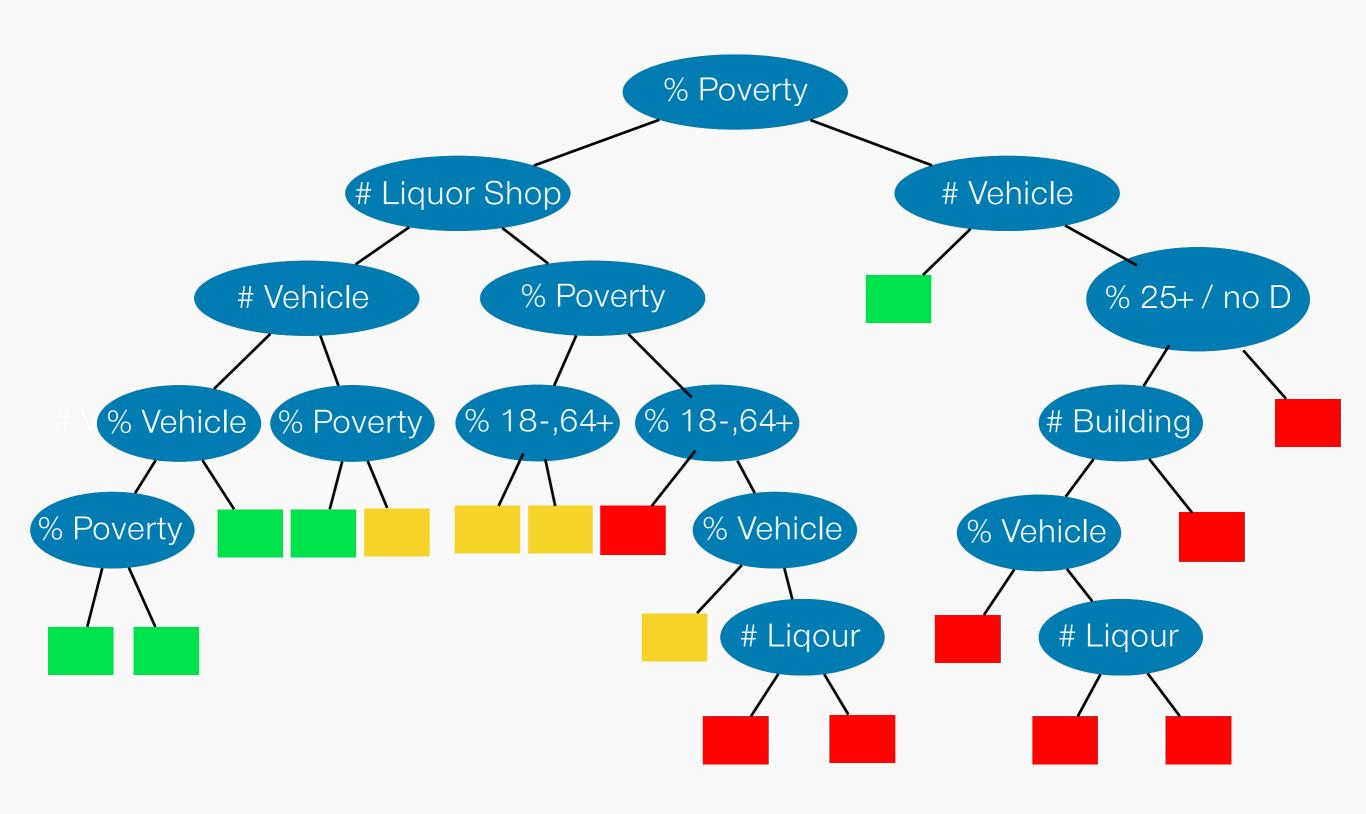
ANALYSIS: MLR-OTHERS

HOMICIDE

NARCOTICS



ANALYSIS: REGRESSION TREE



PREDICTION PERFORMANCE

: 전체 범죄 유형에 대해 구획별 발생 예측에 대한 성능측정 결과(RMSE)

| | Training Score(RMSE) | Validation Score(RMSE) |
|-----------------|-------------------------|---------------------------|
| MLR Prediction | 276.72091 | 438.15855 |
| kNN Prediction* | 33.420757 | 425.98757 |
| RT Prediction** | 255.55 | 452.18962 |
| NN Prediction | 253.96514 | 403.93 |

^{*} kNN(k = 14), **RT(Best Pruned Tree)

DISCUSSION



VISUIALIZATION(←)

- 1. 지역 내 치안 정보
- 2. 여행객 정보

LIMITATION / FURTHER STUDY

- 1. 계획범죄에 사용 우려.
- 2. 상관관계 (O), 인과관계 (X)
- 3. 다른 도시 / 지역 데이터

THANK YOU