2016 House Burglary vs Surveillance Cameras in Taipei City

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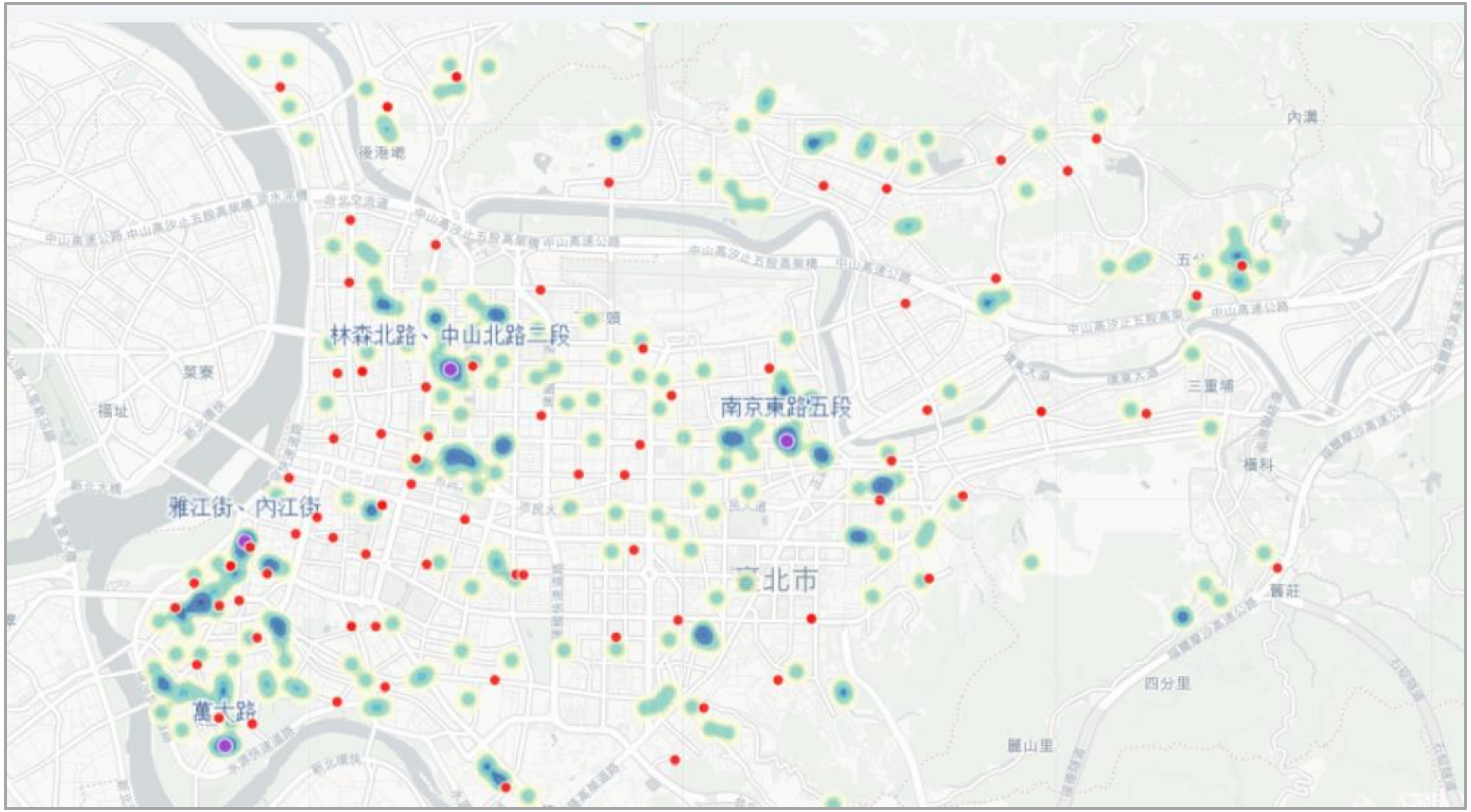
(Econ 4th)

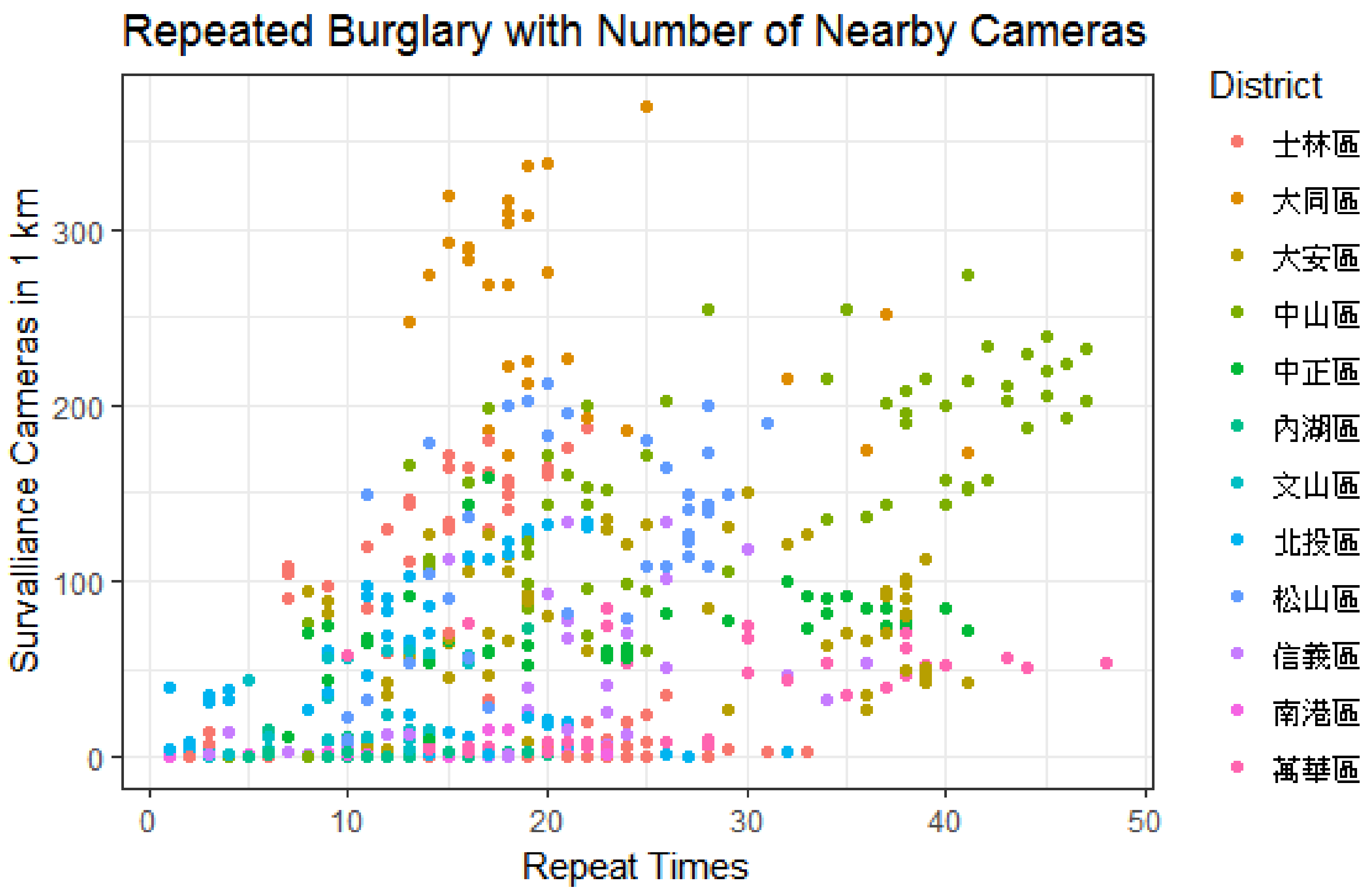
Agenda

- Motivation
- Data
- Model & Result
- Conclusion

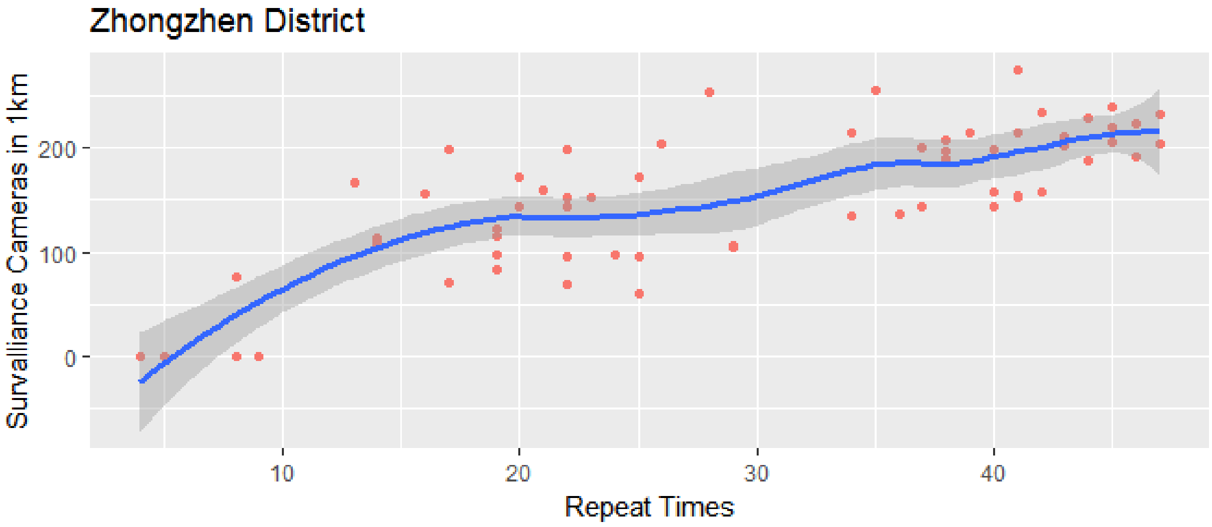
House Burglary Data and Intensity Map

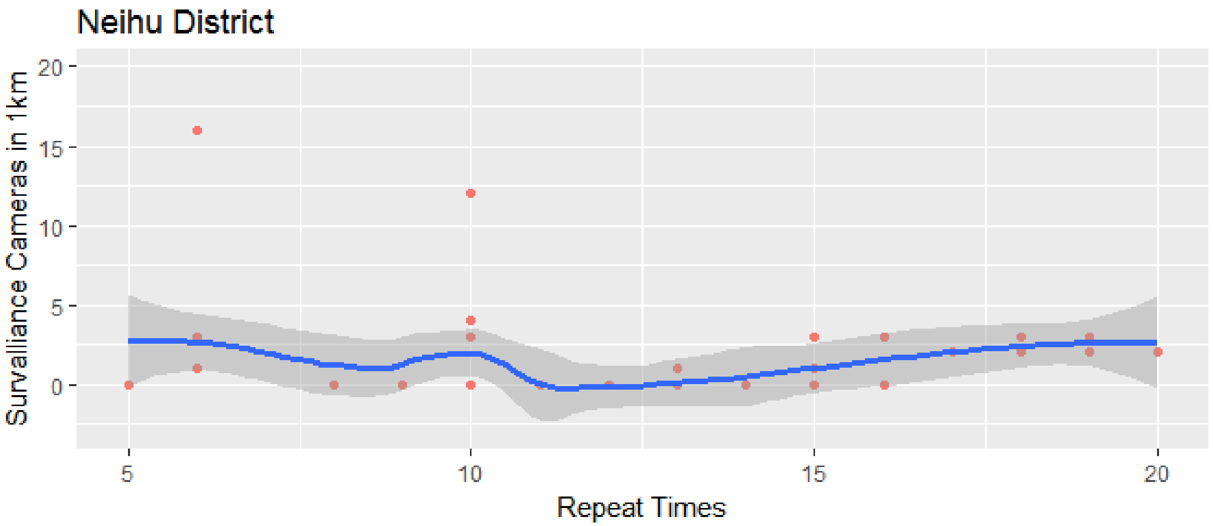


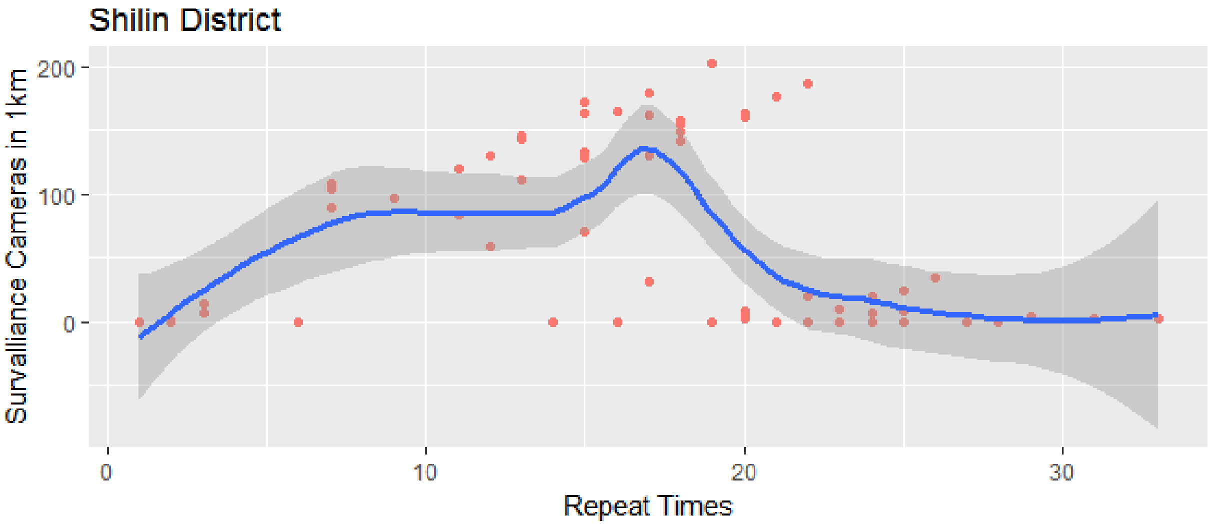
Different Trend on Repeated Times and Nearby Cameras



Different Trend on Repeated Times and Nearby Cameras







- Nearby Surveillance Camera VS Repeated Burglaries
- Burglary Rate Prediction

Data

1. **Nearby Surveillance Cameras VS Repeated Burglaries**

   - Burglary record from Taipei City government
     (includes date, time and address)

- Date Processing:
  - get longitude and latitude
  - count how may cameras and burglaries with 1 km (distm, for-loop)

```
theft105_dis <- distm(theft_105loc)
dim(theft105_dis)[1]

for(i in 1:dim(theft105_dis)[1]){
  under1000 = 0
  for(j in 1:dim(theft105_dis)[1]){
    if (theft105_dis[i,j]<1000){ under1000 = under1000+1}
  }
  theft_105$times[i] = under1000
}
```

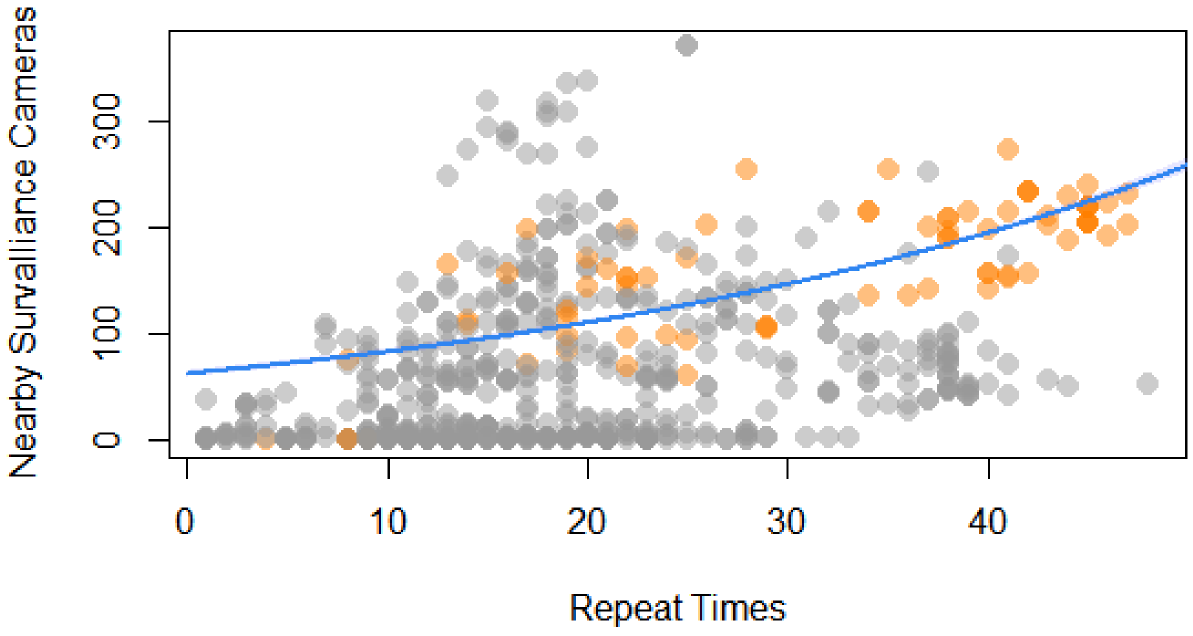
Data

2. **Burglary Rate Prediction**

- includes surveillance cameras density,
  police stations, disposable income ,
  people with mid and low income and
  average cameras within 1 km of burglary location of each district

Nearby Surveillance Camera VS Repeated Burglaries

```r
m.surv.dist5 <- map2stan(
  alist(
    totalSurv ~ dpois(lambda) ,
    log(lambda) <- a[dist] + bT[dist]*times,
    a[dist] ~ dnorm(0,100),
    bT[dist] ~ dnorm(0,10)
  ),
  data=theft_105, iter = 1200, warmup = 600, chains = 2)
```




```
> precis(m.surv.dist5, depth = 2)
        Mean StdDev lower 0.89 upper 0.89 n_eff Rhat
a[1]    4.37   0.03       4.32       4.43  1200    1
a[2]    5.78   0.04       5.73       5.84  1200    1
a[3]    4.34   0.04       4.28       4.40  1200    1
a[4]    4.14   0.03       4.10       4.20  1200    1
a[5]    4.22   0.04       4.16       4.29  1200    1
a[6]   -1.80   0.34      -2.36      -1.28   897    1
a[7]    1.48   0.14       1.27       1.71   787    1
a[8]    3.44   0.04       3.38       3.51  1200    1
a[9]    3.78   0.06       3.70       3.88  1200    1
a[10]   2.29   0.09       2.16       2.45  1200    1
a[11]   0.10   0.31      -0.36       0.61   671    1
a[12]   2.50   0.08       2.37       2.61  1200    1
bT[1]  -0.02   0.00      -0.02      -0.02  1200    1
bT[2]  -0.01   0.00      -0.01      -0.01  1200    1
bT[3]   0.00   0.00       0.00       0.00  1200    1
bT[4]   0.03   0.00       0.03       0.03  1200    1
bT[5]   0.01   0.00       0.00       0.01  1200    1
bT[6]   0.19   0.02       0.15       0.22   868    1
bT[7]   0.14   0.01       0.13       0.16   784    1
bT[8]   0.02   0.00       0.02       0.03  1200    1
bT[9]   0.05   0.00       0.04       0.05  1200    1
bT[10]  0.06   0.00       0.06       0.07  1200    1
bT[11]  0.05   0.02       0.01       0.08   667    1
bT[12]  0.04   0.00       0.03       0.04  1200    1
```

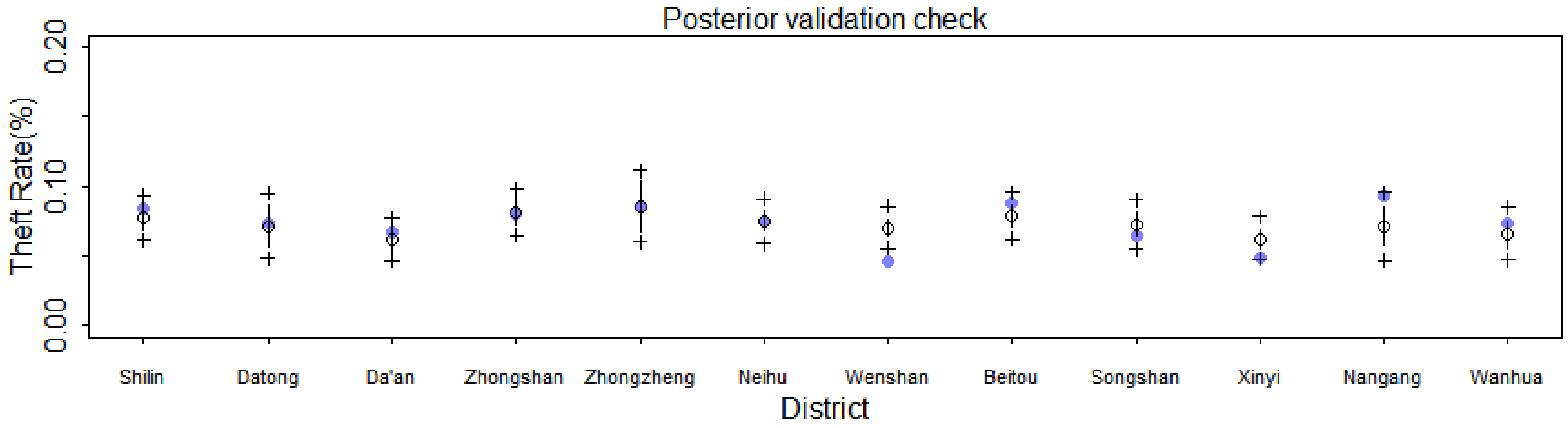
Shilin

Datong

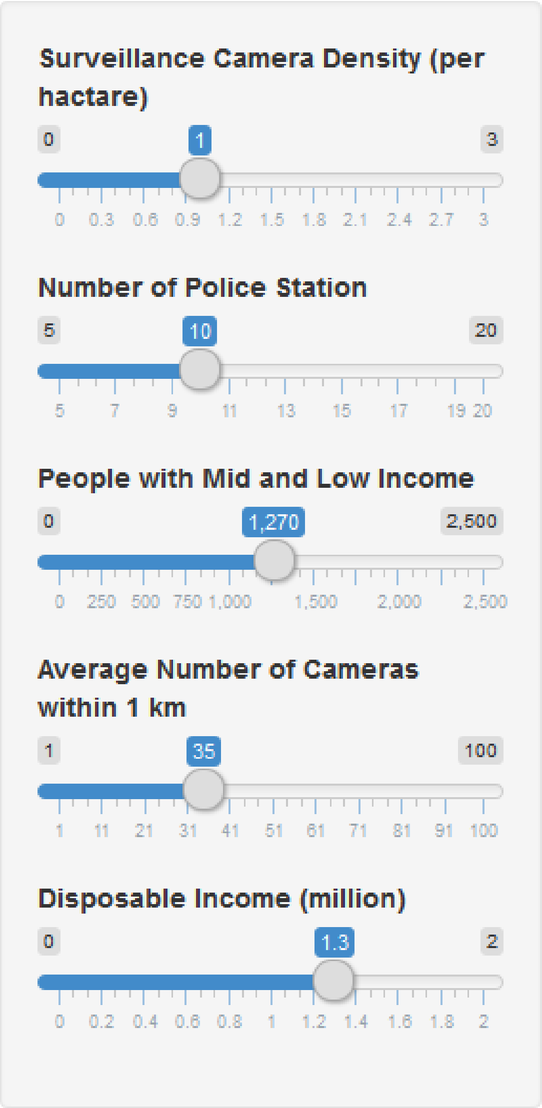
Da’an

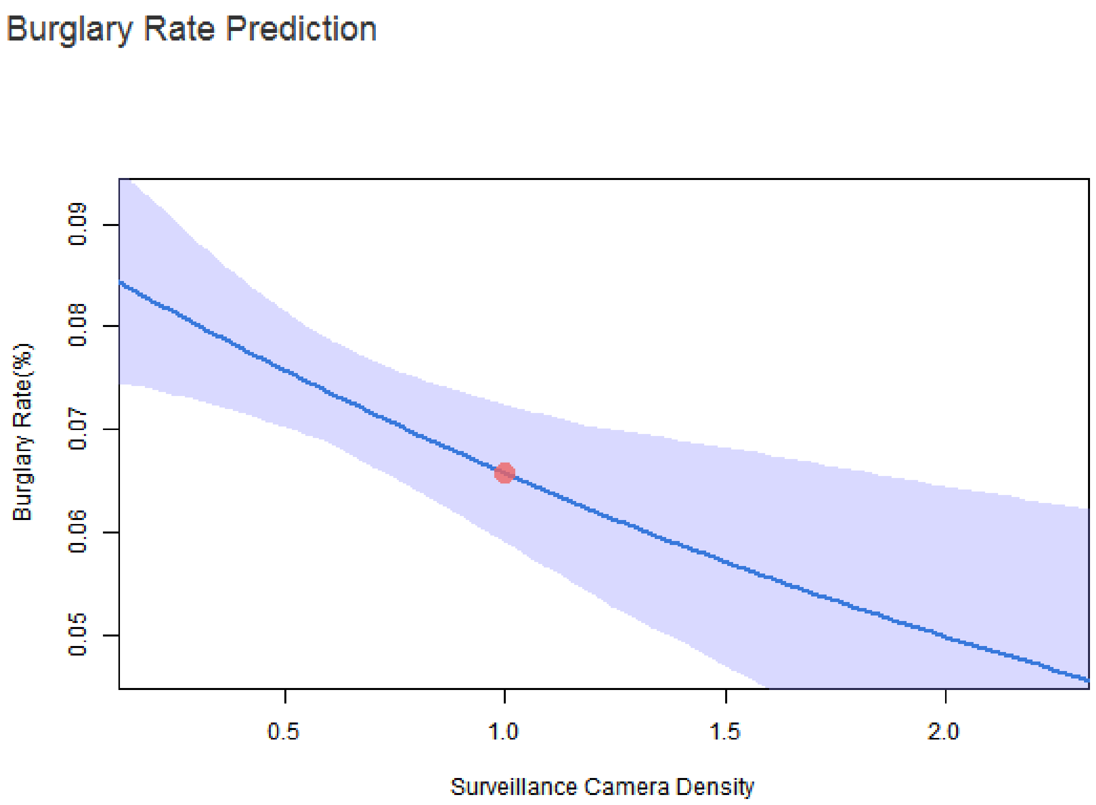
Burglary Rate Prediction

```
m7.2 <- map2stan(
  alist(
    theft105 ~ dbinom(househundred, p) ,
    logit(p) <- a + bC*camDen + bP*policeStation + bM*log(mid.low.income105)
    + bS*surv.avg + bD*DisposableInc,
    a ~ dnorm(0,1),
    c(bC, bP, bM, bS, bD) ~ dnorm(0,0.5)
  ),
  data=d,iter = 5000, warmup = 2500, chains = 2)
```



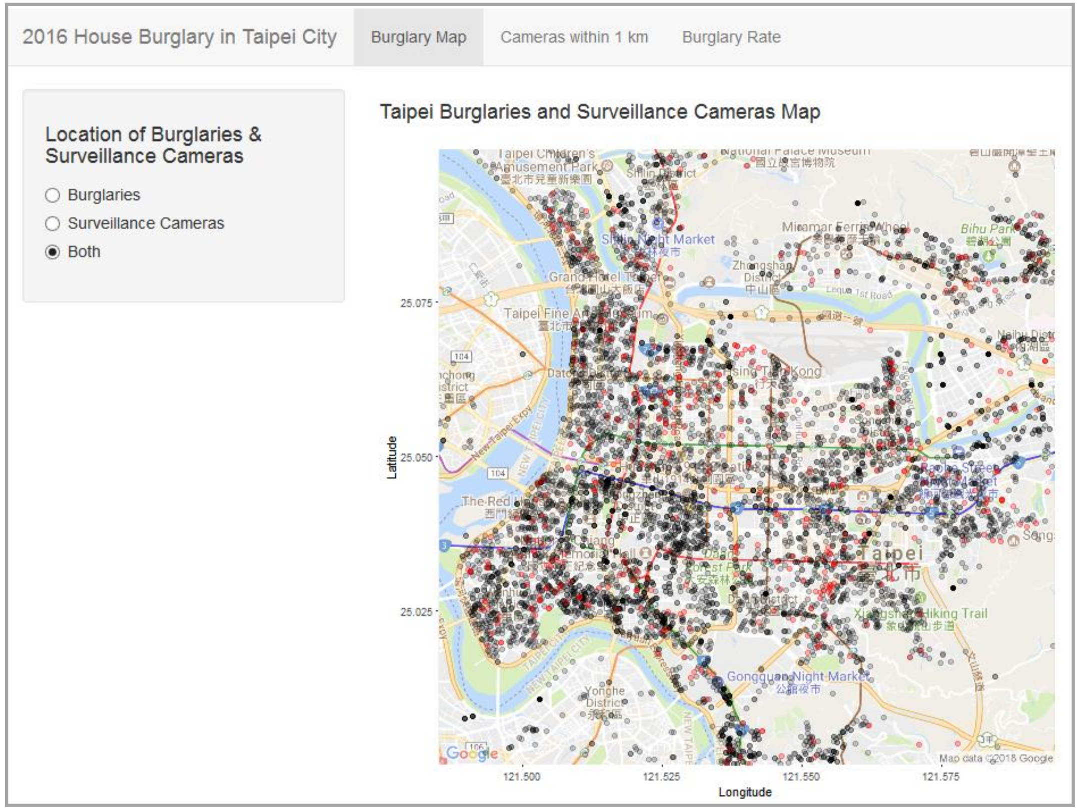
Burglary Rate Prediction





	Mean	StdDev	lower 0.89	upper 0.89	n_eff	Rhat	
a	0.09	0.82	-1.20	1.43	1509	1	
bC	-0.31	0.14	-0.52	-0.09	1674	1	[Camera density]
bP	0.06	0.03	0.02	0.10	1791	1	[Police station]
bM	-0.37	0.12	-0.56	-0.18	1460	1	[People with mid and low income]
bS	0.00	0.00	0.00	0.00	3237	1	[Nearby cameras (within 1km)]
bD	-0.32	0.30	-0.80	0.13	1991	1	[Disposable income]

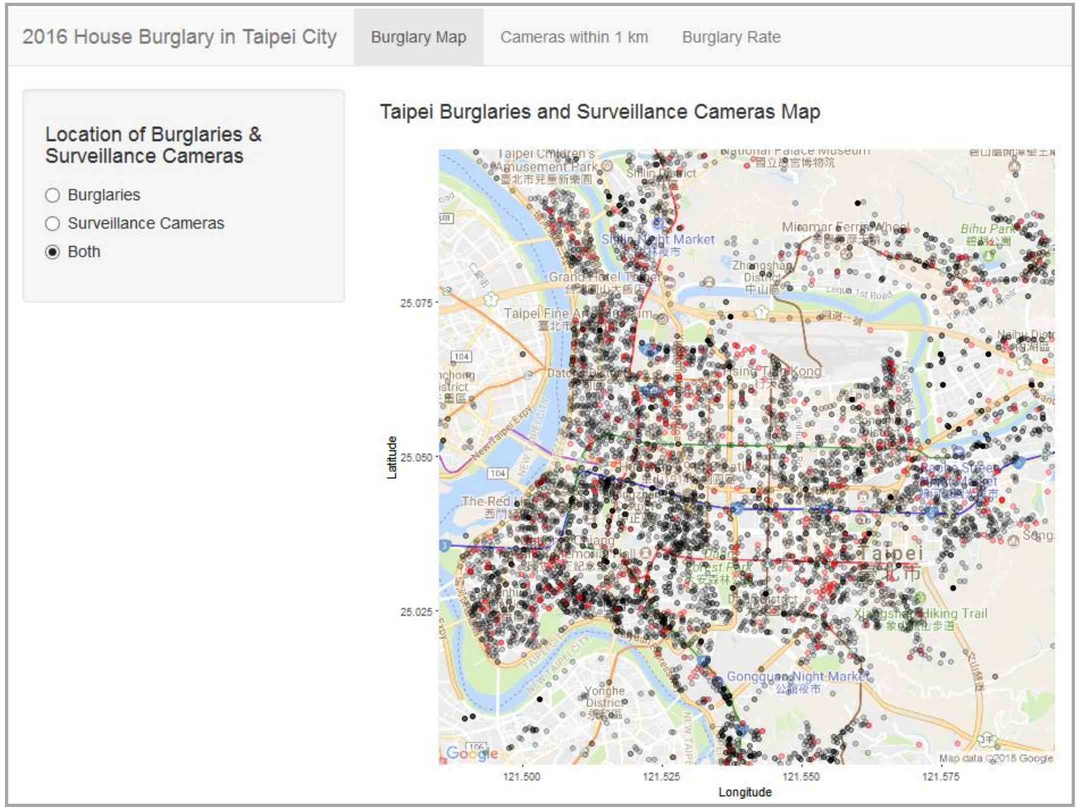
Shiny



2016 House Burglary in Taipei City
Burglary Map
Cameras within 1 km
Burglary Rate
Location of Burglaries & Surveillance Cameras
Burglaries
Surveillance Cameras
Both
Taipei Burglaries and Surveillance Cameras Map
Latitude
25.075
25.050
25.025
Longitude
121.500
121.525
121.550
121.575

2016 House Burglary in Taipei City
Burglary Map
Cameras within 1 km
Burglary Rate
District
Shilin
Datong
Da'an
Zhongshan
Zhongzhen
Neihu
Wenshan
Beitou
Songshan
Xinyi
Nangang
Wanhua
Repeated Burglaries with Number of Nearby Cameras
Surveillance Cameras in 1 km
Repeat Times
District
士林區
大同區
大安區
中山區
中正區
內湖區
文山區
北投區
松山區
信義區
南港區
萬華區
In Certain District
Nearby Surveillance Cameras
Repeat Times

Shiny


2016 House Burglary in Taipei City
Burglary Map
Cameras within 1 km
Burglary Rate
Location of Burglaries & Surveillance Cameras
Burglaries
Surveillance Cameras
Both
Taipei Burglaries and Surveillance Cameras Map
Latitude
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121.500
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Map data ©2018 Google


2016 House Burglary in Taipei City
Burglary Map
Cameras within 1 km
Burglary Rate
District
Shilin
Datong
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Wenshan
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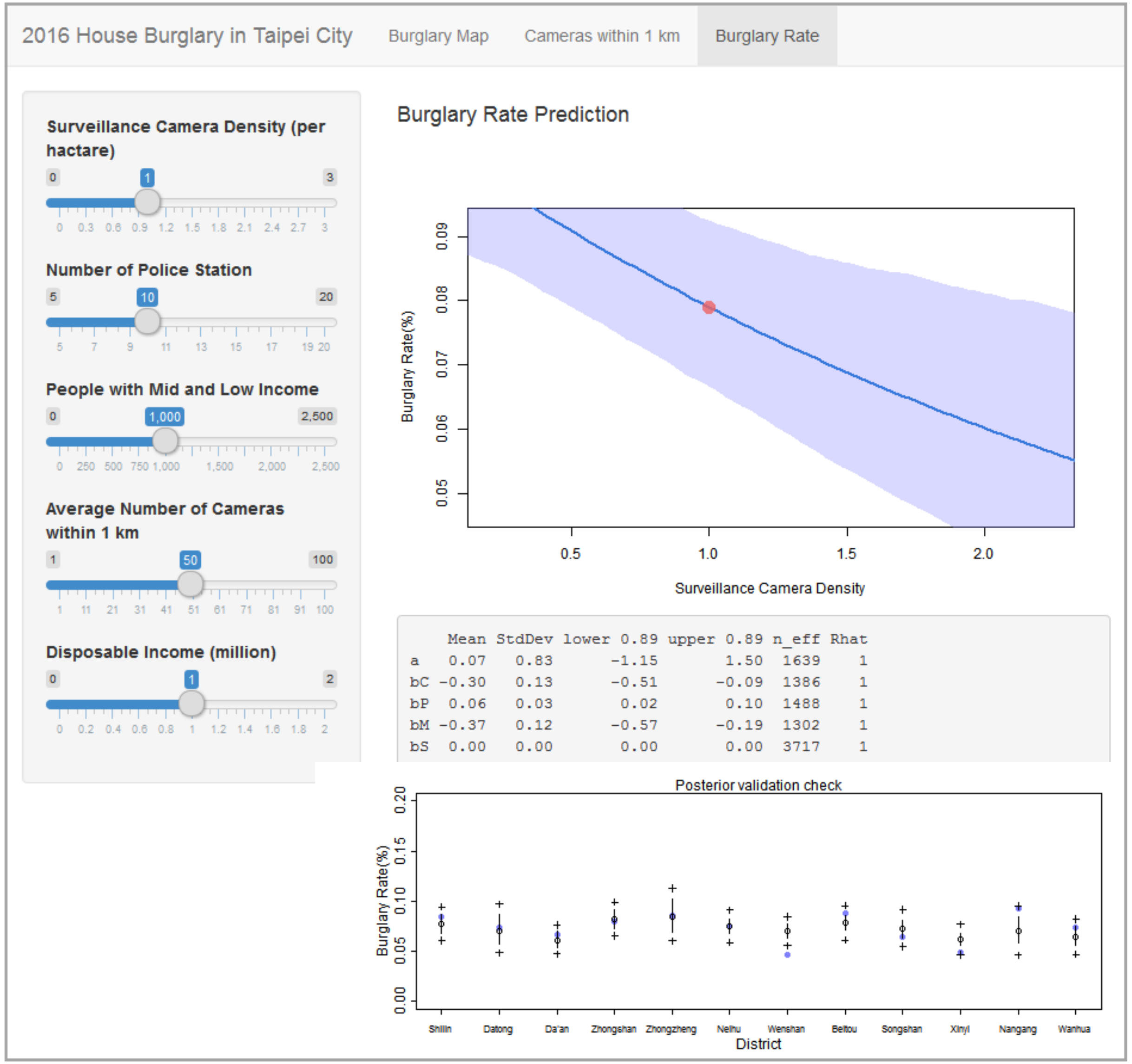
Nangang
Wanhua
Repeated Burglaries with Number of Nearby Cameras
Surveillance Cameras in 1 km
Repeat Times
District
In Certain District
Nearby Surveillance Cameras
Repeat Times

Shiny


2016 House Burglary in Taipei City
Burglary Map
Cameras within 1 km
Burglary Rate
Surveillance Camera Density (per hactare)
Number of Police Station
People with Mid and Low Income
Average Number of Cameras within 1 km
Disposable Income (million)
Burglary Rate Prediction
Burglary Rate(%)
Surveillance Camera Density
Mean StdDev lower 0.89 upper 0.89 n_eff Rhat
a 0.07 0.83 -1.15 1.50 1639 1
bC -0.30 0.13 -0.51 -0.09 1386 1
bP 0.06 0.03 0.02 0.10 1488 1
bM -0.37 0.12 -0.57 -0.19 1302 1
bS 0.00 0.00 0.00 0.00 3717 1
Posterior validation check
District
Shilin
Datong
Da'an
Zhongshan
Zhongzheng
Neihu
Wenshan
Beitou
Songshan
Xinyi
Nangang
Wanhua

Thanks for your listening!