PROCESS BOOK

(Linghong Chen, Suhas Watturkar, Peter Gathua)

I. OVERVIEW

(April 3, May 5, 2015, Suhas, Linghong)

Background

Campus safety is of utmost importance to everyone. There are a number of sources from where safety data is available, but these sources do not necessarily provide an integral view of the data, which can be easily correlated. Also, the magnitude of this data is large and the granularity provided by the data is also very diverse, which makes it very difficult (if not impossible) to make informative conclusions from the data.

One prominent sources of campus safety data is The Office of Postsecondary Education, they provide this data at granular level, with different severity levels right from disciplinary actions to criminal offences, on / off campus locations, etc. This data is available for years 2006 to 2013. The goal of this project is to unify this data into a common data semantics, and provide interactive visualizations for this data.

Motivation and Goals

The objectives of this project are to provide visual representation of the campus safety and security data in following two major categories:
a) Map View
The user will be able to interact with the visualization and review the data based on various dimensions, such as location (state, county, city, etc.) or individual college.

b) Crime patterns view
The crime pattern view will enable the user to visualize the possible correlations with college details such as ranking, acceptance rates, gender ratio, size, etc.

Related Work

A century of Corn (http://jbencook.github.io/cs171-ag-viz/src/CountyData.html)

Despite we focus on different items. But our site and their site both want to discover nationwide distribution of a target item and historical data using a map, and we both also want to dig correlations between our target item and the external factors.

Questions to Answer

The visualization should answer the following questions:
a) Which area/state schools have more severe crime fact
b) Which individual schools have more severe crime fact
c) Does one school category (such as two-year colleges) had more violation than another category?
d) Does other factors affect the college campus security(such as the gender ratio, school size, college quality (admission rate and ranking)?

II. DATA SOURCE

(March 27-April 10, 2015, Linghong, Suhas)

Campus safety and security data is available from the Office of Postsecondary Education (http://ope.ed.gov/security/) in excel format. From this data source, following two data set files were used:

File name	**Description**
oncampusarrest	Contains on-campus arrest data for various categories of crime ranging from drugs to weapons related offenses.
oncampuscrime	Contains on-campus crime data for various categories such as murder, robbery, sex offense, burglary, etc.

Each data set covers data from all the United States colleges for a three year period, starting from the earliest (2006-2007) to most recent (2011-2013) periods.

Each dataset has the following common portions: school name, address, and number of students by gender, total student number, school category (public, private, 2 year, 4 year, etc.).

Each dataset also contains security information. The **on-campus arrest** data files have weapons, drugs, and liquor crime categories, while the **on-campus crime** file has nine crime categories.

In our initial plan, we also planned to use other data sets, such as the file sets for oncampusdiscipline which contains discipline data for the categories under on campus arrest dataset, and a .sav file for the college application data from Open ICPSR that includes college name, number of college applicants (male and female), acceptance rate, the college's US NEWS college ranking, and the college's student body size. However, due to various reason, we changed to only focus on the campusarrest and campuscrime data set. (please see the details in the data analysis chapter.)

A US map geo code:

From Scott Murray"s book " Interactive Data Visualization for the Web",
http://chimera.labs.oreilly.com/books/1230000000345/ch12.html

US zip code geo code:

III. DATA CLEANING AND CONVERSION

Choosing the Right Dataset

(April11, 2015, Linghong)

The security and safety data has on campus, residence halls, non-campus and public property four groups of dataset. However, the security data for non-campus and public property have low number, which makes difficult to distinguish whether a change is a random variation or a real pattern. For example, weapon possess is one of the data set that has low crime number. From the four total weapon possess charts (fig1 a-d), we can see three of these charts have somewhat downward trend, but fig 1c has very low crime number and a high random variation, which makes difficult to discover any pattern or trend.

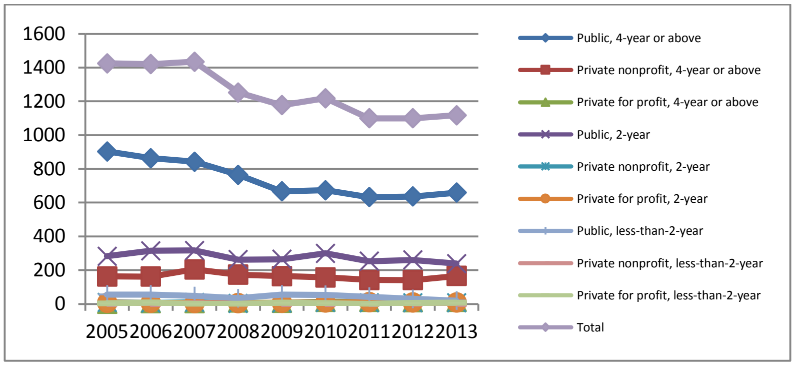


Fig1a total illegal weapon possess happened on campus.

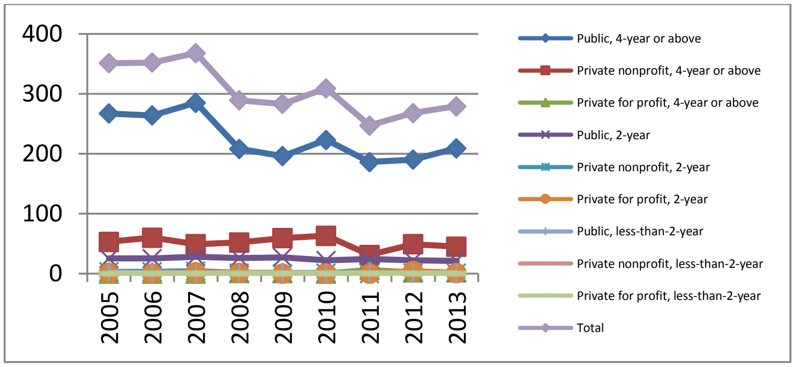


Fig1b total illegal weapon possess found in college residence halls

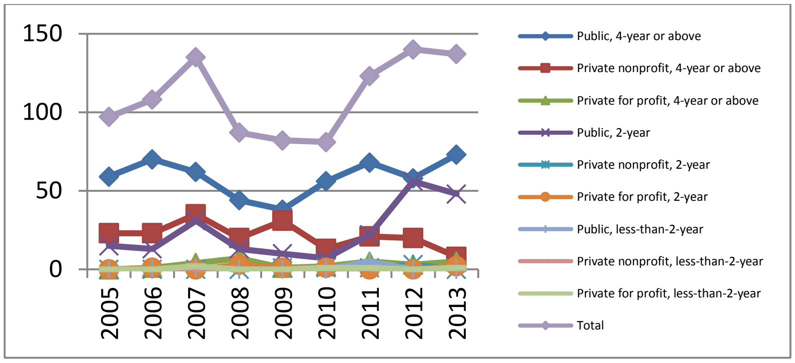


Fig1c total illegal weapon possess found in non campus area

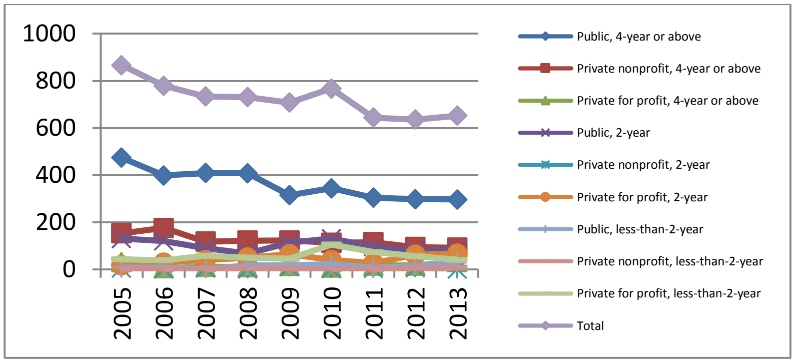


Fig1d total illegal weapon possess found in public property

The above charts also provides a clear indication that compared other groups of dataset, on campus data has relatively high number. Research further of the other data groups that has low numbers gave us similar conclusion. Also considering that in some school categories (such as community colleges), students usually don't live in campus resident halls, thus comparing the data in residence halls could cause bias, hence, we decide to only focus on the on campus security and safety data.

The on campus data has arrest, crime, discipline and hate four degree of violations. Arrest and discipline has three crime categories, while the other two have nine categories with arrest and crime categories have more severe situation than other two categories, thus for a project with limited time frame, we decide to make a site only focusing on campus arrest and crime.

Data Cleaning and Conversion

(April 11, 2015-April 16,2015, Linghong and Suhas)

We first combined on campus arrest and on campus crime data into one file. They were totally 12 categories. Two file covers three year period, the earliest one covers two year period. Then all schools whose state columns are empty were deleted. Those schools are the oversea schools established by US colleges.

Further analyzing the data, we found the data also includes colleges in Puerto Rico and US virgin islands. They have state name, hence, we didn't notice them in the beginning. Those schools thus were deleted from our data set too. About 10% of colleges didn't submit security data. Those schools were also deleted from our list. The clean data were then sorted and linked to geo coding number (see below). The two recent ones use same University ID, were then combined them into one file in Access, and convert it to a JSON file. The 2006-2007 data has different way of naming college ID, we thus didn't combine it to the above file.

Connect Campus Security Data to Geo Data

(4.10-4.17: Peter)

We planned to combine college address to geo coding address, but we encountered some difficulty, thus three college crime data files ranging from 2006-2013 were linked to geo data in the zip code level using sql, and csv files were exported.

IV. DATA ANALYSIS

Data Analysis Find Interesting Patterns and Trends

(4.14-4.17, Linghong)

The initial try of analysis of the data didn't turn into precise result because we didn't notice there were schools belong to Puerto Rico and US Virgin Islands. We use the clean data reanalyze the data again. Since each category has very different number of schools and students, we use total school number or total students number in each school category to normalize the data. The data analysis provides a clear indications of following trends:

I. On Campus Arrest and Crime Number Is School Sector Related

The edu.gov site provides 9 years of security data. To save time, we only did an analysis of the most recent 6 years for 6 school sectors that are generally more interested by students, parents and teachers.

Research of the on campus arrest data showed a clear crime pattern related to school sectors(Fig2a-c). Generally speaking, public 4 year colleges have much higher number of on campus crime issue compared to other 5 college categories. Since the school number between each school category varies significantly, the data shown here are normalized by school number, and listed as crime case number per 100 schools in each school sector. The school sectors are: 1: Public, 4-year or above, 2: Private nonprofit, 4-year or above, 3: Private for-profit, 4-year or above,4: Public, 2-year,5: Private nonprofit, 2-year,6: Private for-profit, 2-year.

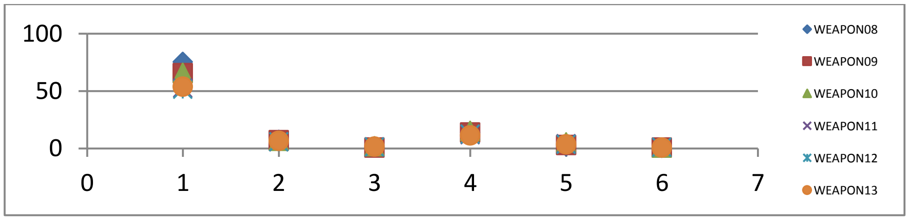


fig2a. On campus arrest for weapon violation during 2008-2013

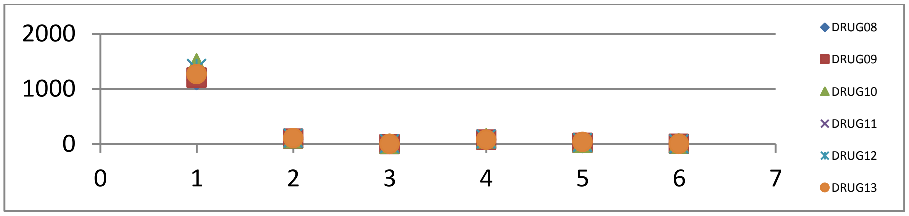


fig2b. On campus arrest for drug violation during 2008-2013.

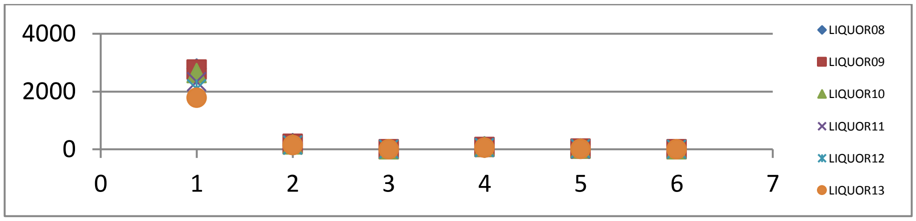


fig2c. On campus arrest for liquor violation during 2008-2013.

To analyze the nine categories of on campus crime data, we selected six categories that have relative large number for analysis. Interestingly, we also see a distinctive pattern that public 4 year schools have much higher crime number compared to other five college sectors(fig2a-f). Same as above, the listed number are shown by cases number per 100 schools in each school sector. The school sectors are as below: 1: Public, 4-year or above, 2: Private nonprofit, 4-year or above, 3: Private for-profit, 4-year or above,4: Public, 2-year,5: Private nonprofit, 2-year,6: Private for-profit, 2-year

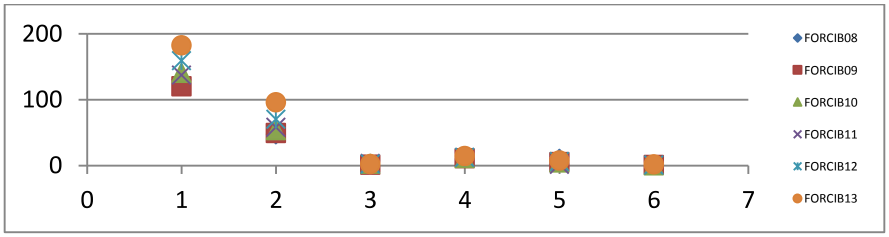


fig3a. On campus crime for forcible sex offense between 2008-2013.

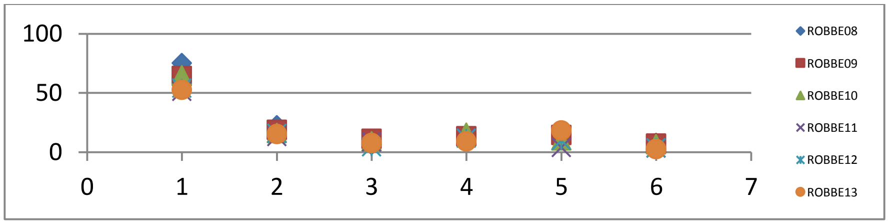


Fig3b On campus crime for robbery violation during 2008-2013.

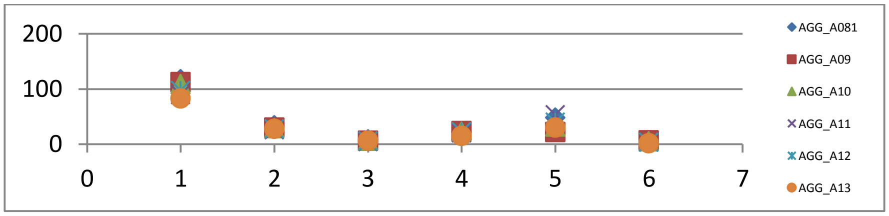


Fig3c On campus crime for Aggravated Assault during 2008-2013.

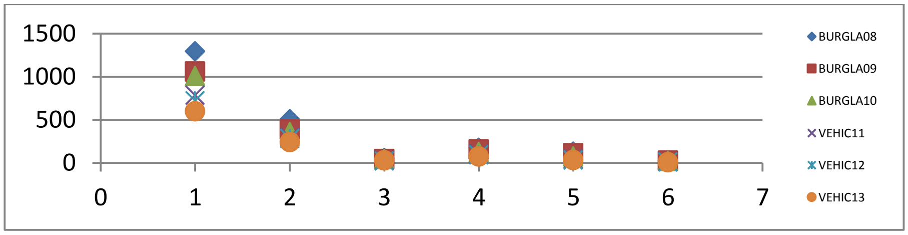


Fig3d On campus crime for burglary during 2008-2013.

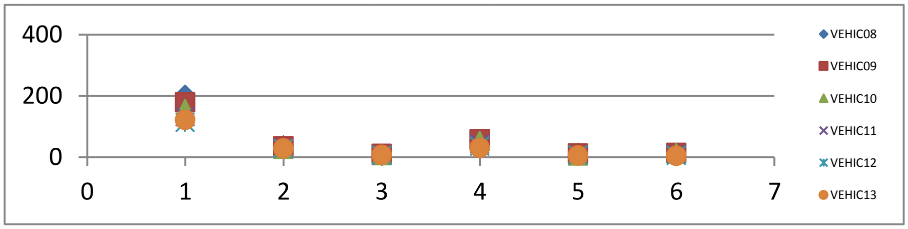


Fig3e On campus crime for vehicle theft during 2008-2013.

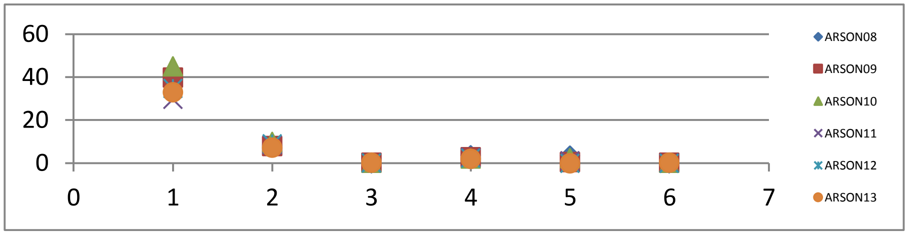


Fig3f On campus crime for arson violation, 2008-2013.

This above school sector related crime pattern is across all the nine on campus crime and arrest categories we have done the analysis, thus we believe our finding is real. We also assumed that the likely same pattern would exist in the state level. **We thus decide one of our box will be used to display the relationship between school sector and crime safety data.**

II. Yearly Trend: Public School Sector Gets Better, Other School Sectors Have No Change

Further analysis also displayed an interesting trend of public school crime data: among nine categories that we did analysis, six categories have a downward trend of crime number in the recent years. In contrast, there is no visible change seen in other school sectors.(Fig4a-i)

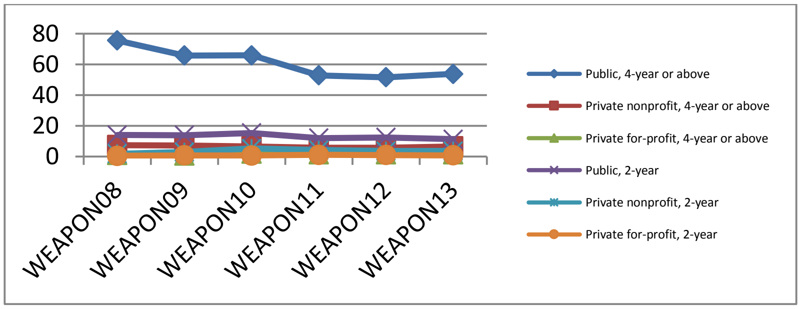


Fig4a On campus arrest for weapon violation during 2008-2013. There is a trend of decrease of crime number in public 4-year colleges.

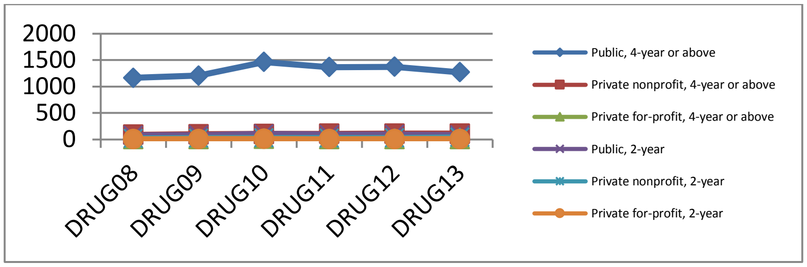


Fig 4b On campus drug violation during 2008-2013. Unlike the other category, public 4-year colleges have no improvement in drug violation.

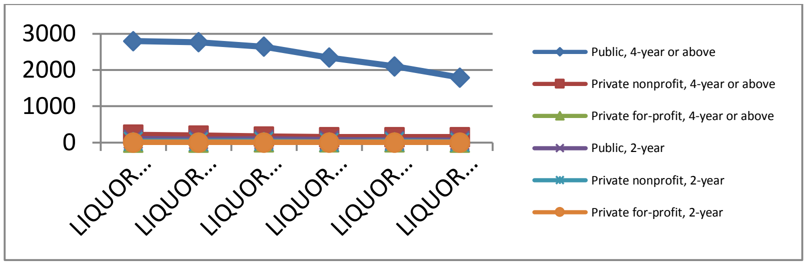


Fig4c On campus liquor violation during 2008-2013. Public four year colleges have a trend of decrease of violation number.

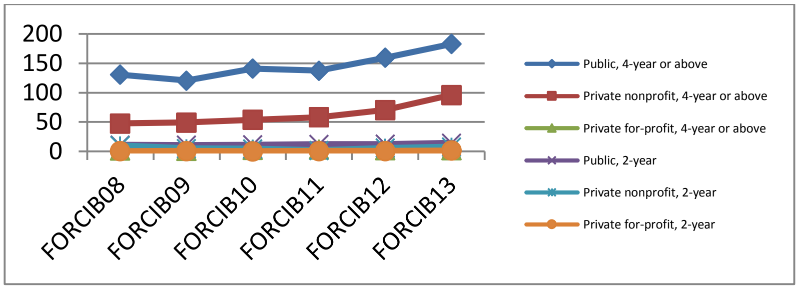


Fig4d On campus forcible sex offense data showed that public four year colleges have a trend of increase of violation number.

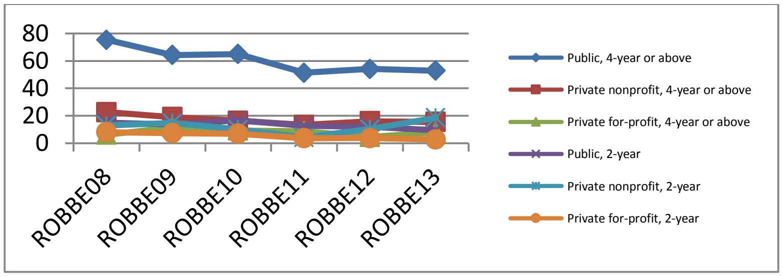


Fig4e On campus robbery violation during 2008-2013. Public four year colleges display a trend of decrease of violation number.

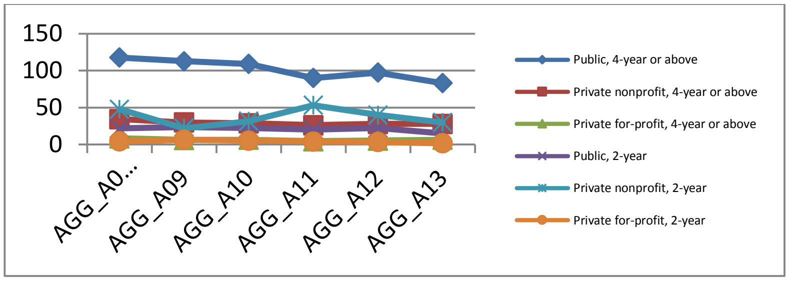


Fig4f On campus agg violation during 2008-2013. Public four year colleges have a trend of decrease of violation number.

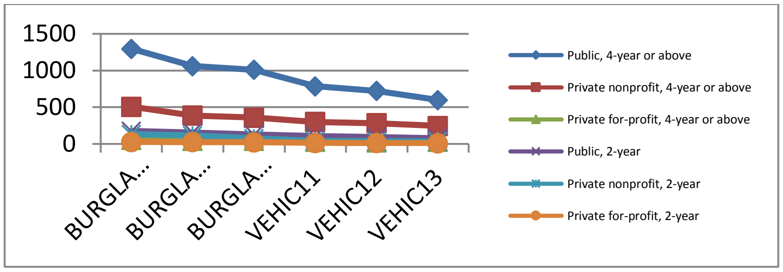


Fig4g On campus burglary during 2008-2013. Public four year colleges have a trend of decrease of crime number.

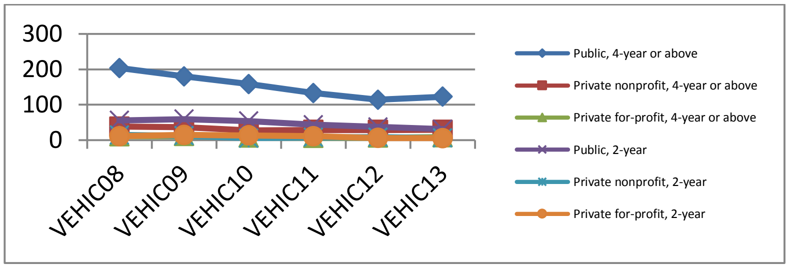


Fig4h On campus vehicle theft during 2008-2013. Public four year colleges have a trend of decrease of theft number.

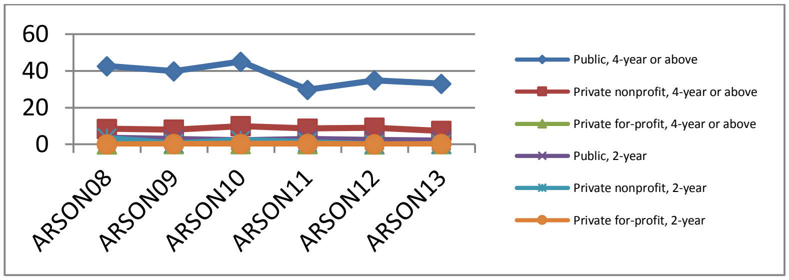


Fig4i On campus arson violation during 2008-2013. Public four year colleges have a trend of decrease of violation number.

Despite we didn't see all on campus security categories have downward trend in public 4 year college sector, we still believe it is an interesting finding , and a nice compensation to the finding that public 4 year colleges have high per campus crime data. **Thus , if time is granted, we may implement the yearly crime trend and display in one of our boxes.**

III. Possible Student Number Related School Sector Pattern

We also did analysis by normalizing the security data with total students in that college category. The results also displayed a distinctive pattern. In short, the three campus arrest groups have a pattern like fig 5a, while various campus crime data have a pattern like fig 5b. More importantly, for all of these patterns, we see a consistent high crime number in category 5 across various crime categories. (1: Public, 4-year or above, 2: Private nonprofit, 4-year or above, 3: Private for-profit, 4-year or above,4: Public, 2-year,5: Private nonprofit, 2-year,6: Private for-profit, 2-year)

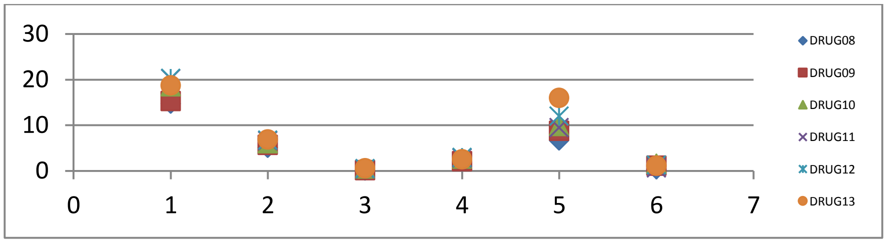


fig5a. on campus drug violation happened during year 2008-2013. Data are listed by crime cases per 10000 students

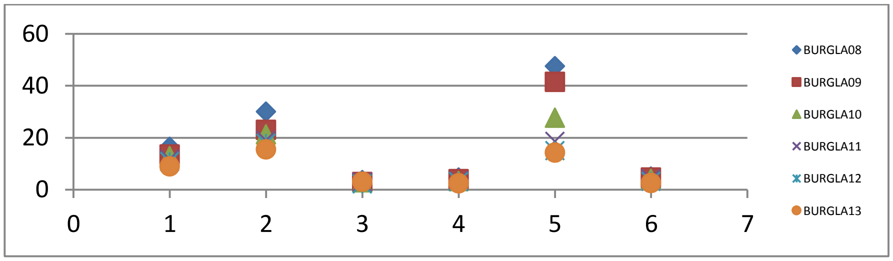


Fig5b on campus burglary during 2008-2013. Data are shown crime cases per 10000 students

One thing we have to mention is that the student number, female and male number listed in the dataset is not for each university campus, instead it is for each university, however, the security data provided is for each campus. Since not all university campus provides security data, the way of normalization by total student number could produce imprecise result. College sectors with more universities campus that didn't submit security data could benefit of this normalization and display artificially lower data. Thus, we think the campus security data do show some possibility of school size related school sector pattern, but have to be implicated with cautious.

Because of that, we won't implement this finding into our site. For the same reason , we also won't research further for the possible relation between the school size/female male ratio and the campus security in our site.

V. EVOLUTION OF THE VIS DESIGN

The First Vis Design

(3.31-4.3 Linghong)

Our first Visualization design were implemented a structure of two portions – Security Map and Visual Analysis of the data. (Fig6a)

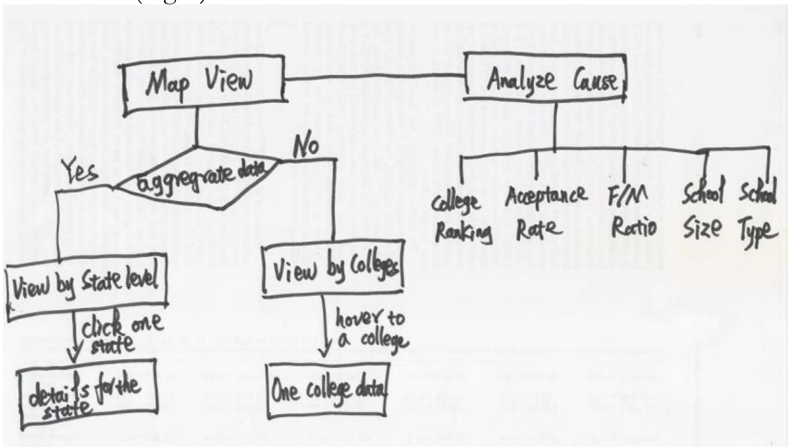
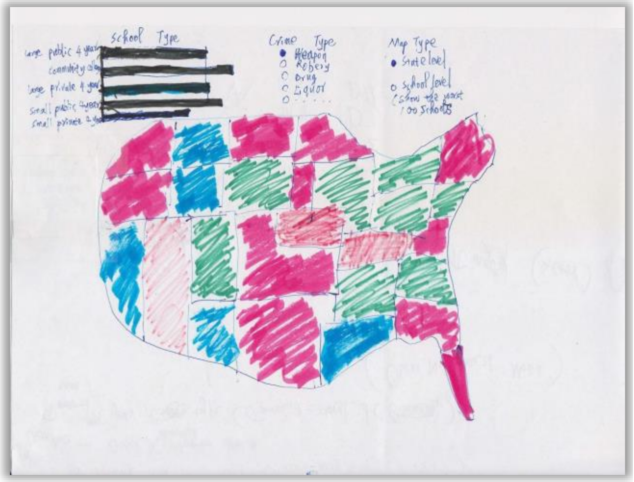


Fig6a

1. Security Map

The map was planned to show college security data to a state level, township level and college level. The former two will be area view and the last will be point view.

On the top of the map, a bar plot were planned to show aggregated data for various categories, which relate to the overall data shown on the map. Hovering on the individual bars will update the map with the data corresponding to the category shown by the bar. Similarly, the other radio buttons on the top side of the map will update the map with the category represented by the radio button. Hovering over the circle will show the number. We may also use other criteria to select colleges to show the security level (Fig6b, Fig6c)



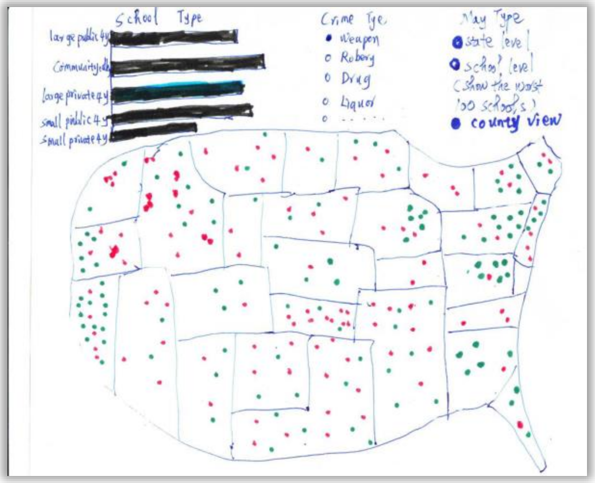


Fig.6 b Map Area view

Fig.6 c Map Point View

Clicking on a state will let the user *drill down* to the state level, showing all colleges within the state either using the zooming method (If we are able to achieve it) or use scatter plot (x as longitude and y as latitude)

2. Pattern Analysis

The visualization planned to discover the following questions:

a) Does college quality (admission rate and ranking) affects campus security?

b) Does one school category (such as two-year colleges) had more violation than another category?

c) Does the gender ratio affect campus security?

d) Does school size affect campus security?

Possible approach 1: Scatter plots may be used. Data will be grouped by several groups by different comparing factors. Within each group, random sampling will be used to reduce samples crowd level (see a example of graph below figure6d)

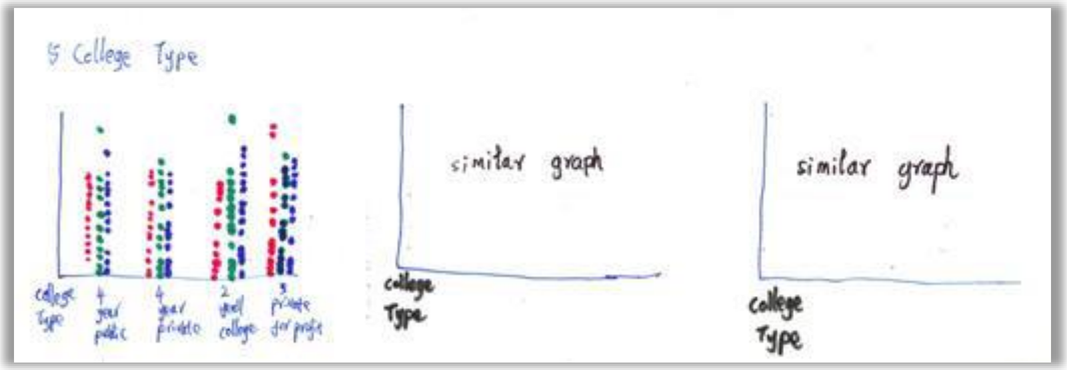


Fig. 6d a scatter plot analysis

Possible approach 2. Parallel Coordinates to show the relationship (Optional)

We will try the parallel coordinate method to see whether a clearer relationship among the above factors is found. (fig 6e)

(See an example at: http://bl.ocks.org/jasondavies/1341281)

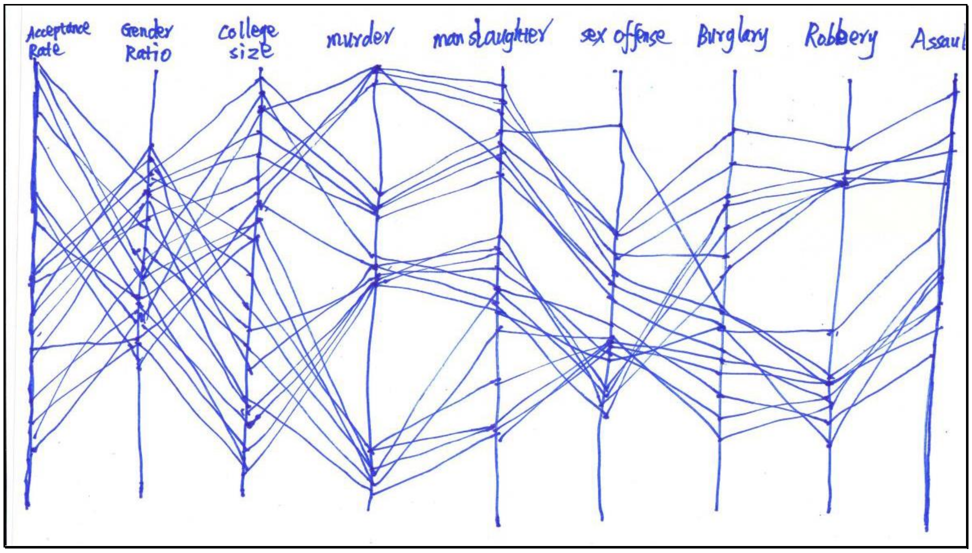


Fig.6eParrell Cordinates

The Second Vis Design

(April 19-21, Linghong)

Two things were going on: we get some distinct college crime trends, we needed to think about how to implement the trends. Also a new area that is for users to engage in was created. This area let users add their own judgment to give different weight on each crime categories, and the system then compute the total crime score.

According to these two facts, the site structure were planned to change in the following way: the map is still in the top center of the area. On the top right side column is a control panel. The rest areas will have three boxes, used for: 1) crime distribution across the 50 states, a multi-series scatter plots to show the school type related crime pattern and a multi-series line charts to show year trends. The map and all these three charts have to be interactive. Clicking one button trigger change in all four vis. (Fig 7a)

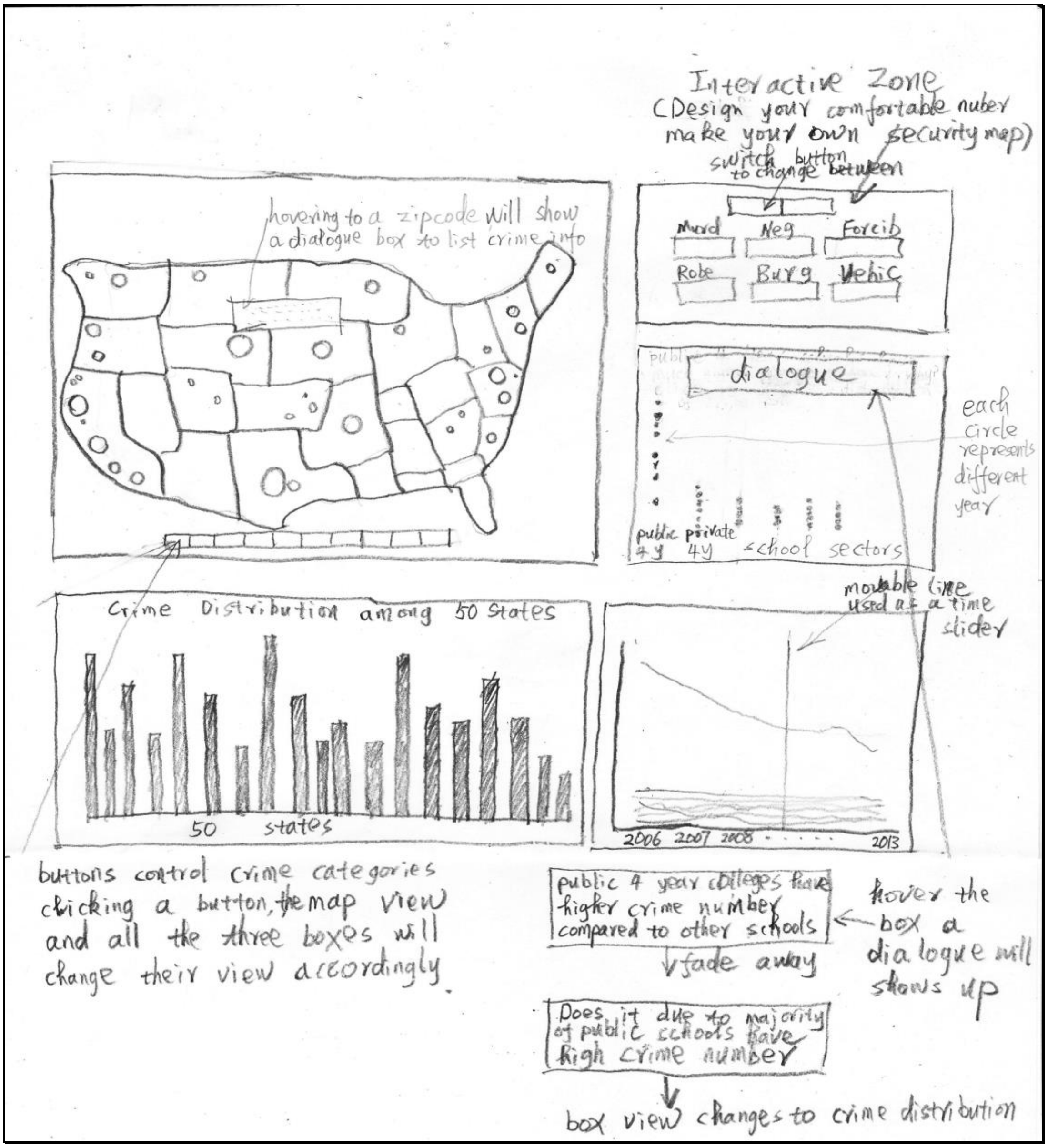
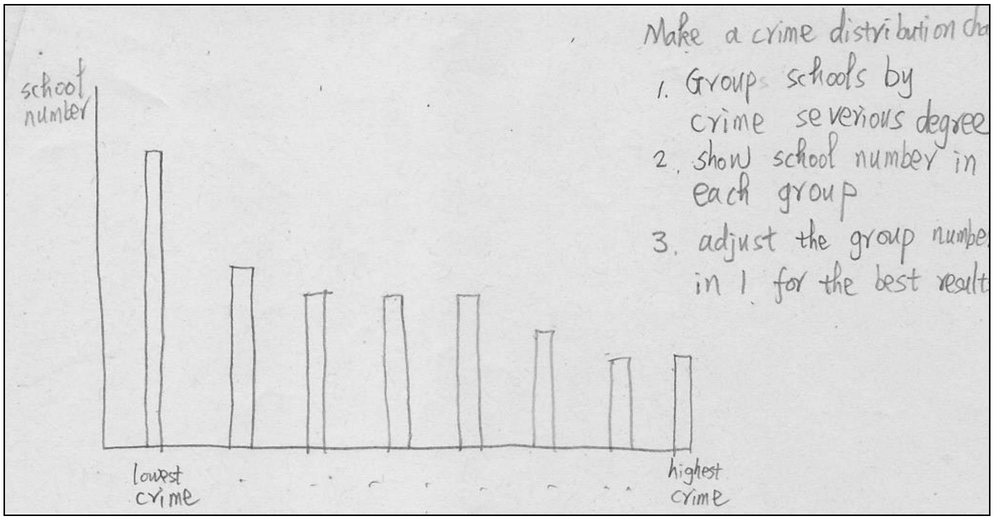

Interactive Zone
(Design your comfortable nuber
make your own security map)
switch button
to change between
Murd
Neg
Forcib
Robe
Burg
Vehic
hovering to a zipcode will show
a dialogue box to list crime info
dialogue
each circle represents different year
public 4y
private 4y
school sectors
movable line
used as a time slider
Crime Distribution among 50 States
50 states
2006 2007 2008 2013
buttons control crime categories
clicking a button, the map view
and all the three boxes will
change their view accordingly
public 4 year colleges have
higher crime number
compared to other schools
hover the box a dialogue will shows up
fade away
Does it due to majority
of public schools have
high crime number
box view changes to crime distribution

Fig7a

Besides, hovering on the scatter plots will also show a legend box to explain what the scatter plots charts mean. The legend should encourage users to click to find the answer why public 4 year colleges have much higher crime rate compared to all other college types.

Considering majority of colleges actually have very low crime rate, one explanation to the high crime rate seen in public four year colleges could be due to the fact that there are a few of public 4 year colleges have very higher crime rate, while in other college categories, those number is lower. For such purpose, a distribution bar charts could be used(Fig 7b). However, considering we don't have much time left, we are not sure whether we will have time to dig it so deeply, but let's first keep that plan in our mind.



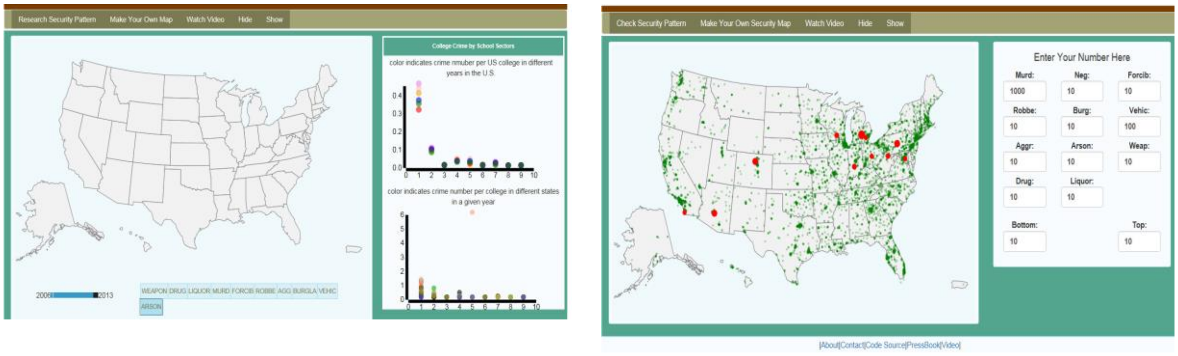
Make a crime distribution cha
1. Group schools by crime severious degree
2. show school number in each group
3. adjust the group numbe in 1 for the best realt

Fig 7b

The Third Vis Design

(April 28, 2015)

Our map will be used for two different purposes: showing crime trend and pattern, vs. let users to engage in making their own security map. We feel put into two different purposes of the work into one page causes confusing, thus we moved the map for purpose 2 to another page. (Fig 8)


Front page

Research Security Pattern
Make Your Own Map
Watch Video
Hide
Show
College Crime by School Sectors
color indicates crime nmuber per US college in different years in the U.S.
0.4
0.3
0.2
0.1
0.0
0 1 2 3 4 5 6 7 8 9 10
color indicates crime number per college in different states in a given year
6
5
4
3
2
1
0
0 1 2 3 4 5 6 7 8 9 10
2006
2013
WEAPON DRUG LIQUOR MURD FORCIB ROBBE AGG BURGLA VEHIC
ARSON

Inner Page

Check Security Pattern
Make Your Own Security Map
Watch Video
Hide
Show
|About|Contact|Code Source|PressBook|Video|

Enter Your Number Here

Murd: 1000
Neg: 10
Forcib: 10
Robbe: 10
Burg: 10
Vehic: 100
Aggr: 10
Arson: 10
Weap: 10
Drug: 10
Liquor: 10
Bottom: 10
Top: 10

Fig 8

The Fourth Vis Design

(Linghong, Peter, Suhas, May4th, 2015)

Listening to our TA, Benjy 's suggestion, we consolidated our two pages' site view back into one page. (Fig9)

The map functions two purposes:

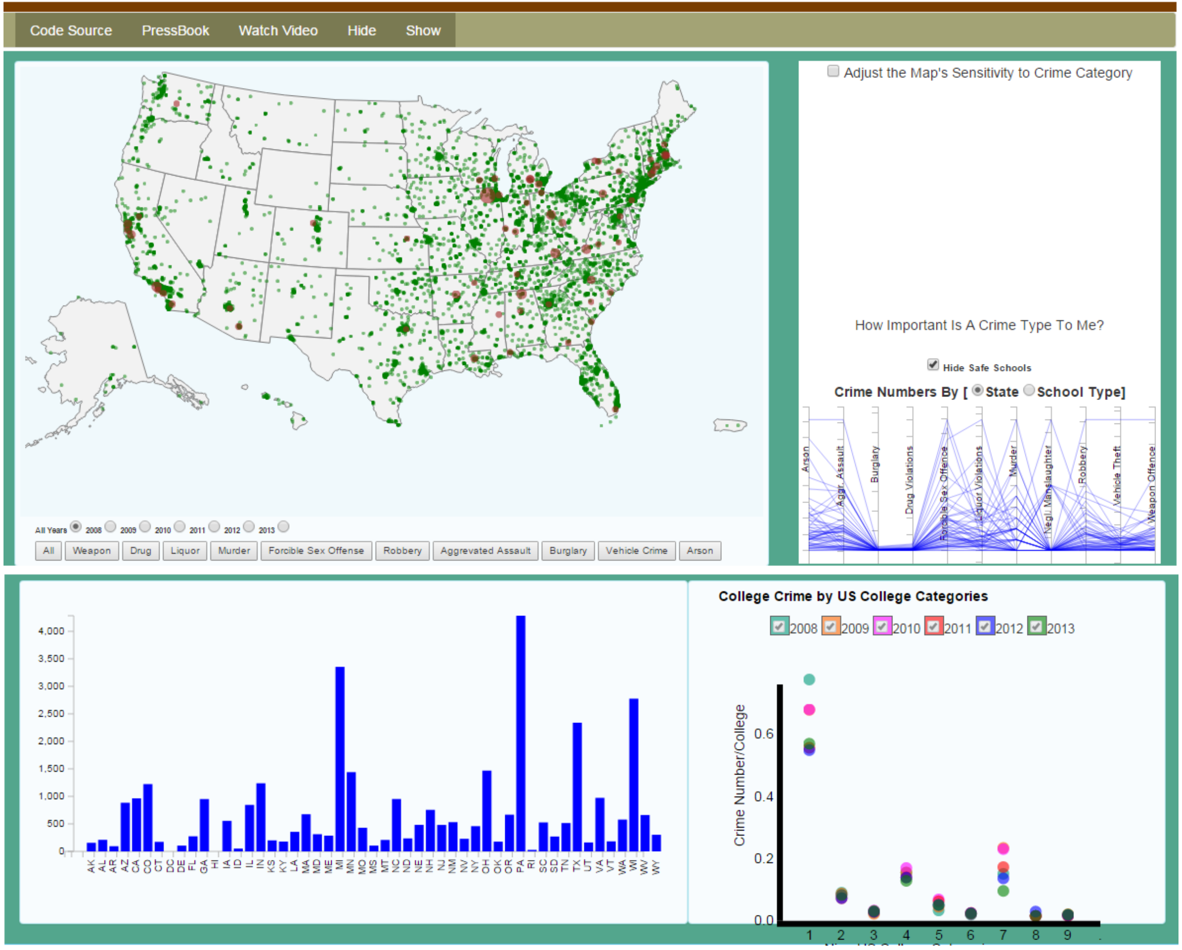
1) Crime pattern map view with users' involvement (The control panel is on the up-right area)

Users can input their judgment about which crime categories are more important to them and give higher weights on these crime categories. The system then calculates a total score for each colleges. This total score will be used to rank the colleges. The system then use the ranking data to calculate the circle size in the map.

2) Map view without users' involvement

The system can also show a single crime category without users' input. The volume is show the circle size. Because we found some colleges reported their schools in different zip codes but close location with same zip code. Also over the time, a zip code for a location could be changed, thus we didn't sum up the data for the same zip code. If the zip code represents the exact location of a school, it is better to show the crime volume in a zip code level, however, in our case, when more than one colleges are located in the same zip code, we made the color of the circle to be darker. This is not a perfect approach, but in our case, we have no other choice.

For the Map purpose 2, clicking a choice button beneath the map will trigger the change of map and other charts' view; For the Map purpose 1, adjusting control panel only changes the map view and the parallel coordinates.



□ Adjust the Map's Sensitivity to Crime Category

☑ Hide Safe Schools

Crime Numbers By [● State ○ School Type]

All Years ● 2008 ○ 2009 ○ 2010 ○ 2011 ○ 2012 ○ 2013 ○

☑ 2008 ☑ 2009 ☑ 2010 ☑ 2011 ☑ 2012 ☑ 2013

Fig 9

VI. Design Implementation

Site Structure and Responsive Design

(April 8-9, April 11 Linghong)

The site main structure is a map that function as visually displaying college on campus security data. Alongside the map, there are a few boxes, which act as either a user interactive area to control the map view, or a place to show the college security patterns or trends. The boxes size, color or position will be changed according to the content size and visualization purpose.

The whole site (including the map) is made responsive to screen size change, and can be viewed in desktop, i-pad and smart phone with a layout suitable to each screen size. Especially, when viewing the site in a smart phone, the menu button will be collapsed. Clicking the button, the menu will show up. Bootstrap are used to organize the site structure, look and the responsive design.

Interactive Control Panel and Weighting Method

(4.22, 5.1-5.5, Suhas)

All visualizations will get the data from data/crimedata.json. This file will have raw crime data in the following structure:

A small json sample is available in data/sample.json.

```
{"type":"crimeData","schools":[
{
  "school": {
   "schoolId":"100654001",
   "name":"Alabama A & M University",
   "branch":"Main Campus",
   "address":"4107 Meridian St",
   "city":"Normal",
   "state":"AL",
   "zip":"35762",
   "latitude":"34.733964",
   "longitude":"-86.522913",
   "sectorCd":"1",
   "yearData":[
    {"yearOfData":"2008",
     "murderCount":"0",
     "negligentManSlaughter":"0",
     "forcibleSexOffense":"1",
     "nonForcibleSexOffense":"0",
     "robbery":"4",
     "aggravatedAssault":"26",
     "burglary":"122",
     "vehicleTheft":"3",
     "arson":"1",
     "weaponOffence":"4",
     "drugViolations":"9",
     "liquorViolations":"1"},
    {"yearOfData":"2009"/* rest of the fields will repeat here*/},
    {"yearOfData":"2010"/* rest of the fields will repeat here*/},
    {"yearOfData":"2011"/* rest of the fields will repeat here*/},
    {"yearOfData":"2012"/* rest of the fields will repeat here*/},
    {"yearOfData":"2013"/* rest of the fields will repeat here*/}
    ]
   }
  }
  ,{"school":
   {"schoolId":"100663001"/*school data will repeat here*/}}}
]}
```

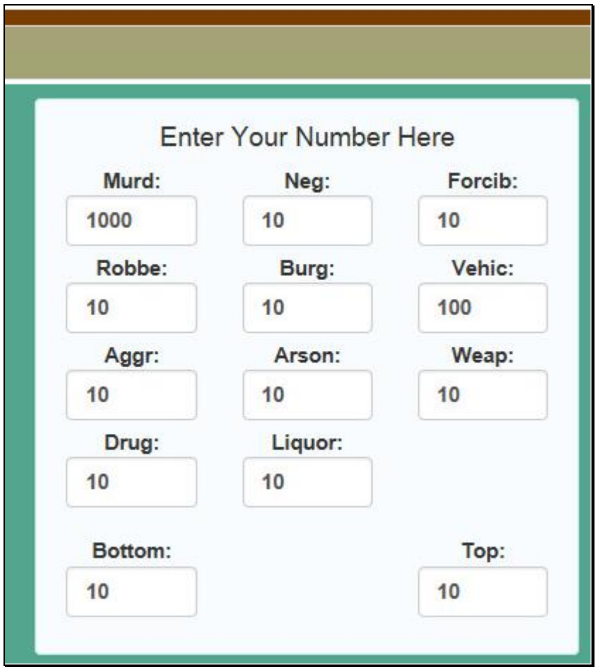
To process this raw data, a new js file crimedataAnalyzer.js is created. The constructor of this file received the raw json data and it is expected to process all “views” of the data for the individual parts of the visualizations.

For example, the map requires the data aggregated by year and data for all years. In the init method, it populates yearCrimeData and allTimeCrimeData.

For the states data, following structure will be used:

```
{
 "type": "stateCrimeData",
 "states": [
   {
    "state":"MD",
    "yearCounts":
    {
     "years":{
      "*":[
        {
         "murder":10,
         "vehicleCrime":50
        }
      ],
      "2006":[
        {
          "murder":10,
          "vehicleCrime":50
         }
      ],
      "2007":[
        {
         "murder":10,
         "vehicleCrime":50
        }
      ]
     }
    }
   },
   {
    "state":"DE",
    "yearCounts":
    {
     "years":{
      "*":[
        {
         "murder":10,
         "vehicleCrime":50
        }
      ],
      "2006":[
        {
          "murder":10,
          "vehicleCrime":50
        }
      ],
      "2007":[
        {
          "murder":10,
          "vehicleCrime":50
        }
      ]
     }
    }
   }
 ]
}
```

This panel is designed for a user to input their opinion about which crime category is important to him/her. The system will calculate total score, and use this score to rank the colleges, the ranking results will show up in the map. The left one is the previous version, we then change to the right version.



Enter Your Number Here

Murd: 1000
Neg: 10
Forcib: 10
Robbe: 10
Burg: 10
Vehic: 100
Aggr: 10
Arson: 10
Weap: 10
Drug: 10
Liquor: 10
Bottom: 10
Top: 10

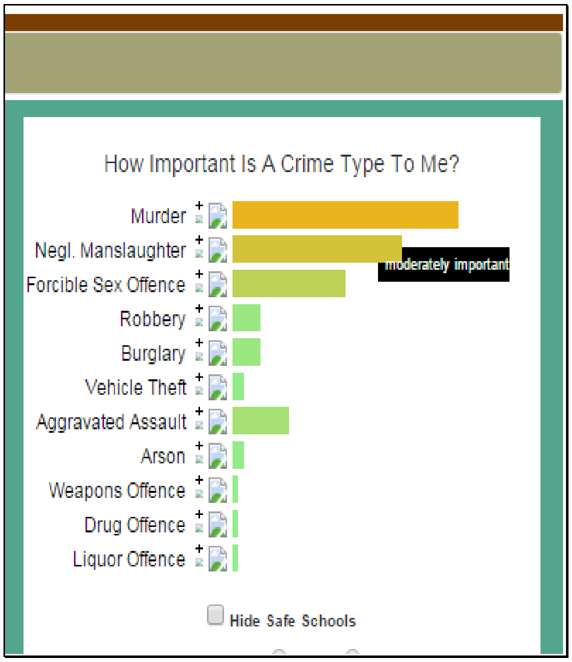


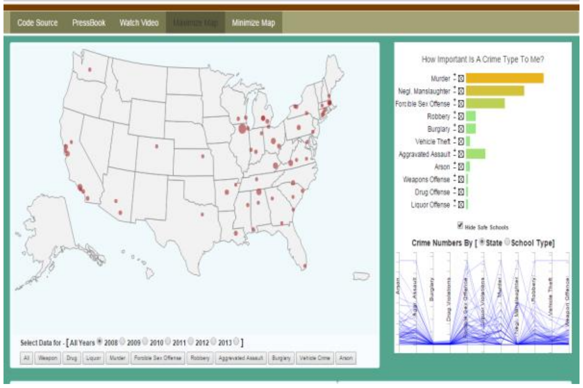
Fig a Previous Design

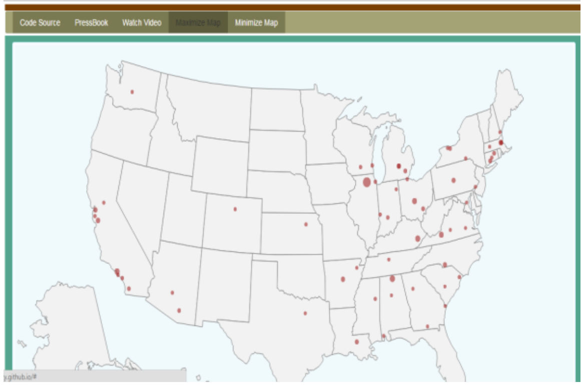
Fig b Current Design

Show and Hide Button

(5.3, Linghong)

A slider panel is made to show the full screen view of map, and the regular screen view of the map. Just clicking the button to switch it.

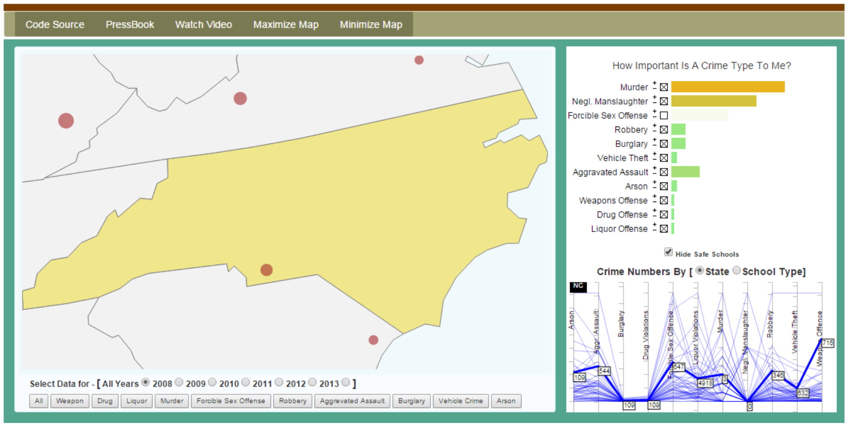


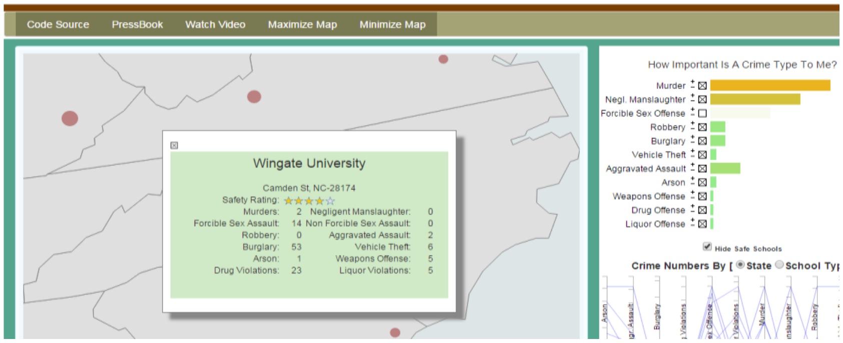


Map View

(April-May 5th Suhas)

The map has two views, a full map view, or zoom to just one state. Hovering to that cycle, a college information panel will show up.





Wingate University

Camden St, NC-28174

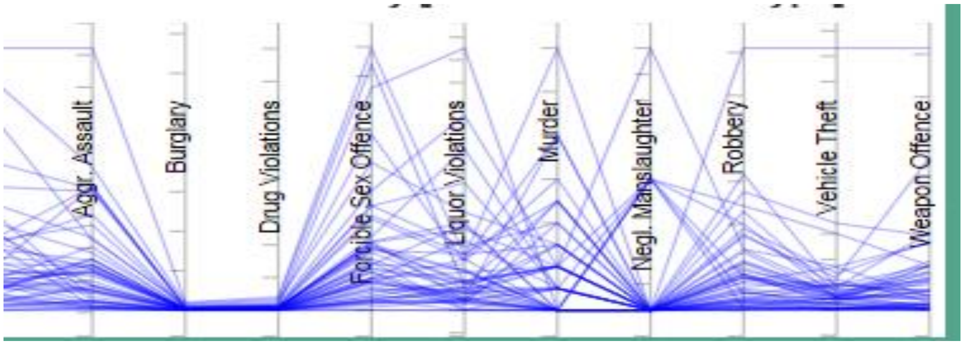
Safety Rating: ★★★★☆

Murders:	2	Negligent Manslaughter:	0
Forcible Sex Assault:	14	Non Forcible Sex Assault:	0
Robbery:	0	Aggravated Assault:	2
Burglary:	53	Vehicle Theft:	6
Arson:	1	Weapons Offense:	5
Drug Violations:	23	Liquor Violations:	5

Parallel Coordinates

(May1- 5th, 2015, Suhas)

A Parallel Coordinates is used to show the crime volume in each state or each school type. The Parallel Coordinates in the state level also serves as a control panel. Hovering to a state in the parallel coordinate will make the map to zoom to that state.



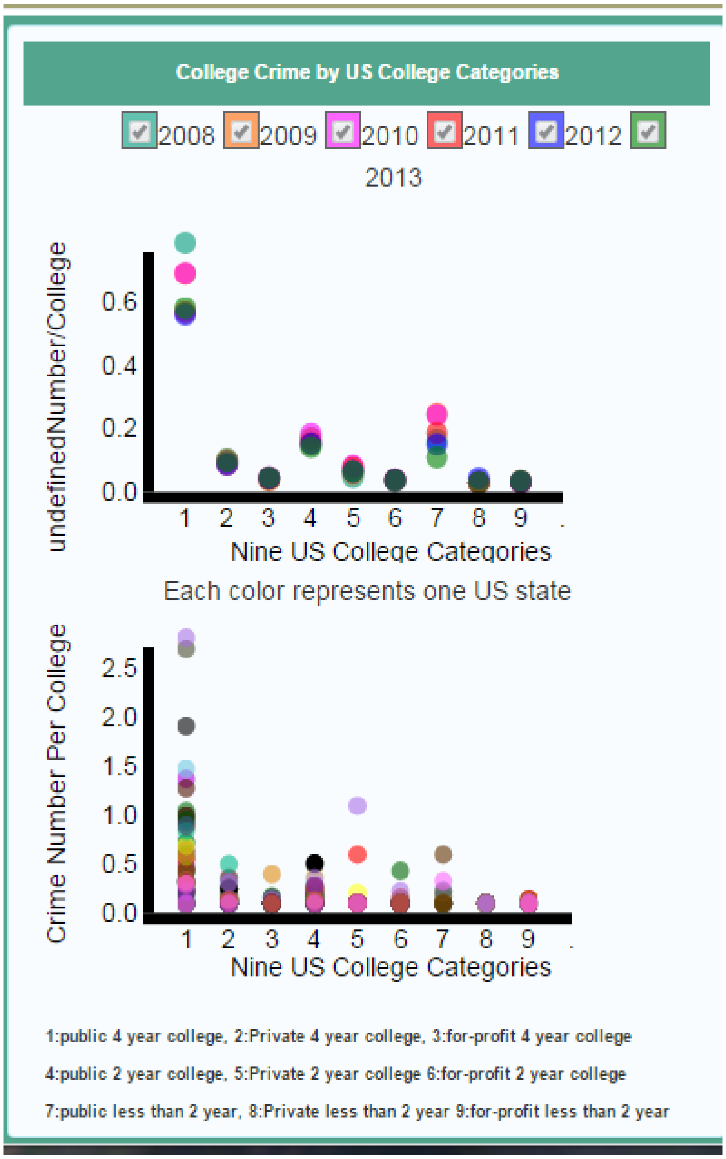
Multi-Series Scatter Plots

(May 5, 2015, Linghong)

To show users that the on campus school crime is college type related, two multi-series scatter plots were made. The x-axis indicates nine college categories, while the y-axis indicates the crime ratio(cases/per college). From the fig, we can see public four year colleges has much higher crime ratio, and these patterns are consistent across different years. While for other college types those crime number are almost same each year, meaning it is a predictable reaction. Finding a pattern is much more meaningful than showing individual data. You will quickly forget the number of a particular crime, but you can easily remember the fact that public four year colleges have much higher crime rate than other colleges types.

Form the state level graph(the lower panel), we see the same distinct college type related crime pattern, which is reassure us that the trend is real. However, in the state level, higher variation of the crime ratio are seen among different states. In the public 4 year college categories, we have large range of variation across different states, but in other college categories, we see some ridiculous high crime rate outlays.

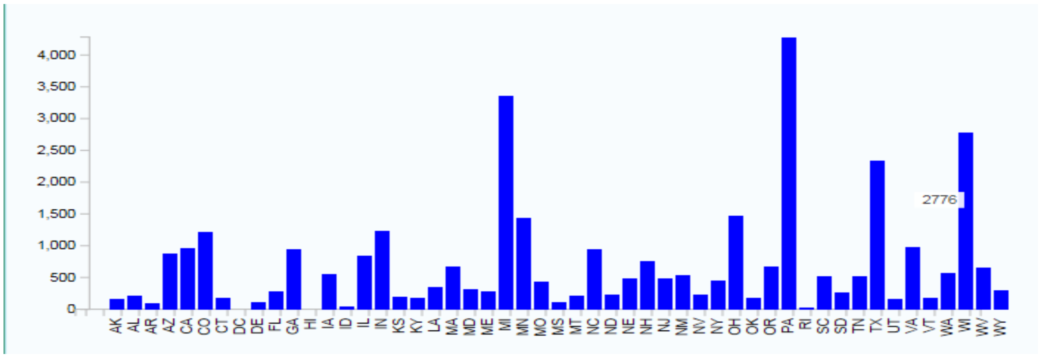
Clicking crime category buttons and the time radio buttons beneath the map will trigger the changes in both scatter plots. The colored check boxes is used to select various years. However, the final map doesn't include the scatter plot charts of the lower charts to avoid bringing confuse to users.


College Crime by US College Categories
☑2008 ☑2009 ☑2010 ☑2011 ☑2012 ☑
2013
undefinedNumber/College
0.6
0.4
0.2
0.0
1 2 3 4 5 6 7 8 9 .
Nine US College Categories
Each color represents one US state
Crime Number Per College
2.5
2.0
1.5
1.0
0.5
0.0
1 2 3 4 5 6 7 8 9 .
Nine US College Categories
1:public 4 year college, 2:Private 4 year college, 3:for-profit 4 year college
4:public 2 year college, 5:Private 2 year college 6:for-profit 2 year college
7:public less than 2 year, 8:Private less than 2 year 9:for-profit less than 2 year

Barcharts

(May 5, 2015, Peter)

A barcharts is used to show crime volume in 50 states. The bar charts show clear large variation across different states.



VII. EVALUATION

(May 5th, Linghong)

- What did you learn about the data by using your visualizations?

From the work we have done, we unexpectedly found the public colleges have much higher crime number. However, we also see in majority of crime categories, the crime number for public 4 year colleges goes down year by year. This view is not shown in the site due to time limit. Please view it in the data analysis section.

From the site, we can also view a college, a state or any college type's crime level. We also get general picture how are the crime pattern distributed across US.

- How did you answer your questions?

For the questions we asked in the beginning, we are happy about what we have achieved. However, due to the time limitation, several of the questions leave unanswered. For example, the college application and college ranking data file has only less than two hundreds of colleges, and they are also all stays in the very top of the college ranking. We think it is probably unlikely we will see a pattern with crime correlation by only using schools in the top categories. A data set spreading across different college quality levels would potentially be more useful.

Another issue is after analyzing our data we realized that the student number, the gender ratio and the total students from the original data set were only provided in a university basis, not the campus basis. Since about 10% of colleges didn't submit the crime data. This made analyzing of the data using any students number impossible.

- How well does your visualization work, and how could you further improve it?

We have achieved our initial goals. Now we have a map view with two very different purposes of the usage. Those different views are nicely connected and interact well with the three Visualization boxes. We also have some analysis for crime patterns. Especially, we found a distinctive college -type-related crime patterns, which is unexpected and exciting. Also thinking about the large crime variation across various locations disclosed through our map, the 50 states bar chart, and the scatter plot we didn't show, all of these indicate the same point.

Since 4 year public college has large variation across different states, we did a quick analysis of using the tool of parallel coordinates. We compared states level 4 year public colleges' 2013 crime data with the median household income, and the state unemployment ratio. However, only those drug and weapon levels seemed slightly correlated to those crime data, but for other crime categories, we didn't find very obvious relation. If we have more time, the cause of the high crime ratio in 4 year public is certainly something we want to dig further , and show in our vis..

Scripts used to clean up and correlate data.

```
CREATE TABLE HW4_ON_CAMPUS_CRIME_111213
(
  UNITID_P NUMBER(*, 0)
, INSTNM VARCHAR2(500 BYTE)
, BRANCH VARCHAR2(500 BYTE)
, ADDRESS VARCHAR2(1000 BYTE)
, CITY VARCHAR2(250 BYTE)
, STATE VARCHAR2(250 BYTE)
, ZIP VARCHAR2(20 BYTE)
, SECTOR_CD NUMBER(*, 0)
, SECTOR_DESC VARCHAR2(250 BYTE)
, MEN_TOTAL NUMBER(*, 0)
, WOMEN_TOTAL NUMBER(*, 0)
, TOTAL NUMBER(*, 0)
, MURD11 NUMBER(*, 0)
, NEG_M11 VARCHAR2(20 BYTE)
, FORCIB11 VARCHAR2(20 BYTE)
, NONFOR11 VARCHAR2(20 BYTE)
, ROBBE11 VARCHAR2(20 BYTE)

, AGG_A11 VARCHAR2(20 BYTE)

, BURGLA11 VARCHAR2(20 BYTE)

, VEHIC11 VARCHAR2(20 BYTE)

, ARSON11 VARCHAR2(20 BYTE)

, MURD12 VARCHAR2(20 BYTE)

, NEG_M12 VARCHAR2(20 BYTE)

, FORCIB12 VARCHAR2(20 BYTE)

, NONFOR12 VARCHAR2(20 BYTE)

, ROBBE12 VARCHAR2(20 BYTE)

, AGG_A12 VARCHAR2(20 BYTE)

, BURGLA12 VARCHAR2(20 BYTE)

, VEHIC12 VARCHAR2(20 BYTE)

, ARSON12 VARCHAR2(20 BYTE)

, MURD13 VARCHAR2(20 BYTE)

, NEG_M13 VARCHAR2(20 BYTE)

, FORCIB13 VARCHAR2(20 BYTE)

, NONFOR13 VARCHAR2(20 BYTE)

, ROBBE13 VARCHAR2(20 BYTE)

, AGG_A13 VARCHAR2(20 BYTE)

, BURGLA13 VARCHAR2(20 BYTE)
, VEHIC13 VARCHAR2(20 BYTE)
, ARSON13 VARCHAR2(20 BYTE)
, FILTER11 VARCHAR2(20 BYTE)
, FILTER12 VARCHAR2(20 BYTE)
, FILTER13 VARCHAR2(20 BYTE)
)
LOGGING
TABLESPACE QTZ
PCTFREE 10
INITRANS 1
STORAGE
(
  INITIAL 65536
  NEXT 1048576
  MINEXTENTS 1
  MAXEXTENTS UNLIMITED
  BUFFER_POOL DEFAULT
)
NOCOMPRESS
NOPARALLEL;
```

```
------------------ on_campus_c_arrest08091 --
------------------------------------

CREATE TABLE HW4_ON_CAMPUS_CRIME_08091

(

  UNITID_P NUMBER(*, 0)

, INSTNM VARCHAR2(500 BYTE)

, BRANCH VARCHAR2(500 BYTE)

, ADDRESS VARCHAR2(1000 BYTE)

, CITY VARCHAR2(250 BYTE)

, STATE VARCHAR2(250 BYTE)

, ZIP VARCHAR2(20 BYTE)

, SECTOR_CD NUMBER(*, 0)

, SECTOR_DESC VARCHAR2(250 BYTE)

, MEN_TOTAL NUMBER(*, 0)

, WOMEN_TOTAL NUMBER(*, 0)

, TOTAL NUMBER(*, 0)

, MURD8 VARCHAR2(20 BYTE)

, NEG_M8 VARCHAR2(20 BYTE)

, FORCIB8 VARCHAR2(20 BYTE)

, NONFOR8 VARCHAR2(20 BYTE)
, ROBBE8 VARCHAR2(20 BYTE)

, AGG_A8 VARCHAR2(20 BYTE)

, BURGLA8 VARCHAR2(20 BYTE)

, VEHIC8 VARCHAR2(20 BYTE)

, ARSON8 VARCHAR2(20 BYTE)

, MURD9 VARCHAR2(20 BYTE)

, NEG_M9 VARCHAR2(20 BYTE)

, FORCIB9 VARCHAR2(20 BYTE)

, NONFOR9 VARCHAR2(20 BYTE)

, ROBBE9 VARCHAR2(20 BYTE)

, AGG_A9 VARCHAR2(20 BYTE)

, BURGLA9 VARCHAR2(20 BYTE)

, VEHIC9 VARCHAR2(20 BYTE)

, ARSON9 VARCHAR2(20 BYTE)

, MURD10 VARCHAR2(20 BYTE)

, NEG_M10 VARCHAR2(20 BYTE)

, FORCIB10 VARCHAR2(20 BYTE)

, NONFOR10 VARCHAR2(20 BYTE)

, ROBBE10 VARCHAR2(20 BYTE)

, AGG_A10 VARCHAR2(20 BYTE)

, BURGLA10 VARCHAR2(20 BYTE)
, VEHIC10 VARCHAR2(20 BYTE)

, ARSON10 VARCHAR2(20 BYTE)

, FILTER8 VARCHAR2(20 BYTE)

, FILTER9 VARCHAR2(20 BYTE)

, FILTER10 VARCHAR2(20 BYTE)

, WEAPON8 VARCHAR2(20 BYTE)

, WEAPON9 VARCHAR2(20 BYTE)

, WEAPON10 VARCHAR2(20 BYTE)

, DRUG8 VARCHAR2(20 BYTE)

, DRUG9 VARCHAR2(20 BYTE)

, DRUG10 VARCHAR2(20 BYTE)

, LIQUOR8 VARCHAR2(20 BYTE)

, LIQUOR9 VARCHAR2(20 BYTE)

, LIQUOR10 VARCHAR2(20 BYTE)

)

LOGGING

TABLESPACE QTZ

PCTFREE 10

INITRANS 1

STORAGE

(
  INITIAL 65536
  NEXT 1048576
  MINEXTENTS 1
  MAXEXTENTS UNLIMITED
  BUFFER_POOL DEFAULT
)
NOCOMPRESS
NOPARALLEL;


--------------------------
on_campus_c_arrest111211 ---------------------
------


CREATE TABLE HW4_ON_CAMPUS_CRIME_111211
(
  UNITID_P NUMBER(*, 0)
, INSTNM VARCHAR2(500 BYTE)
, BRANCH VARCHAR2(500 BYTE)
, ADDRESS VARCHAR2(1000 BYTE)
, CITY VARCHAR2(250 BYTE)
, STATE VARCHAR2(250 BYTE)
, ZIP VARCHAR2(20 BYTE)

, SECTOR_CD NUMBER(*, 0)

, SECTOR_DESC VARCHAR2(250 BYTE)

, MEN_TOTAL NUMBER(*, 0)

, WOMEN_TOTAL NUMBER(*, 0)

, TOTAL NUMBER(*, 0)

, MURD11 VARCHAR2(20 BYTE)

, NEG_M11 VARCHAR2(20 BYTE)

, FORCIB11 VARCHAR2(20 BYTE)

, NONFOR11 VARCHAR2(20 BYTE)

, ROBBE11 VARCHAR2(20 BYTE)

, AGG_A11 VARCHAR2(20 BYTE)

, BURGLA11 VARCHAR2(20 BYTE)

, VEHIC11 VARCHAR2(20 BYTE)

, ARSON11 VARCHAR2(20 BYTE)

, MURD12 VARCHAR2(20 BYTE)

, NEG_M12 VARCHAR2(20 BYTE)

, FORCIB12 VARCHAR2(20 BYTE)

, NONFOR12 VARCHAR2(20 BYTE)

, ROBBE12 VARCHAR2(20 BYTE)

, AGG_A12 VARCHAR2(20 BYTE)
, BURGLA12 VARCHAR2(20 BYTE)
, VEHIC12 VARCHAR2(20 BYTE)
, ARSON12 VARCHAR2(20 BYTE)
, MURD13 VARCHAR2(20 BYTE)
, NEG_M13 VARCHAR2(20 BYTE)
, FORCIB13 VARCHAR2(20 BYTE)
, NONFOR13 VARCHAR2(20 BYTE)
, ROBBE13 VARCHAR2(20 BYTE)
, AGG_A13 VARCHAR2(20 BYTE)
, BURGLA13 VARCHAR2(20 BYTE)
, VEHIC13 VARCHAR2(20 BYTE)
, ARSON13 VARCHAR2(20 BYTE)
, FILTER11 VARCHAR2(20 BYTE)
, FILTER12 VARCHAR2(20 BYTE)
, FILTER13 VARCHAR2(20 BYTE)
, WEAPON11 VARCHAR2(20 BYTE)
, WEAPON12 VARCHAR2(20 BYTE)
, WEAPON13 VARCHAR2(20 BYTE)
, DRUG11 VARCHAR2(20 BYTE)
, DRUG12 VARCHAR2(20 BYTE)
, DRUG13 VARCHAR2(20 BYTE)
, LIQUOR11 VARCHAR2(20 BYTE)
, LIQUOR12 VARCHAR2(20 BYTE)
, LIQUOR13 VARCHAR2(20 BYTE)
)
LOGGING
TABLESPACE QTZ
PCTFREE 10
INITRANS 1
STORAGE
(
  INITIAL 65536
  NEXT 1048576
  MINEXTENTS 1
  MAXEXTENTS UNLIMITED
  BUFFER_POOL DEFAULT
)
NOCOMPRESS
NOPARALLEL;

---------------------------------------------
-----------------------
```

```
CREATE TABLE HW4_ON_CAMPUS_CRIME_0607
(
  UNITID_P NUMBER(*, 0)
, INSTNM VARCHAR2(500 BYTE)
, BRANCH VARCHAR2(500 BYTE)
, ADDRESS VARCHAR2(1000 BYTE)
, CITY VARCHAR2(250 BYTE)
, STATE VARCHAR2(250 BYTE)
, ZIP VARCHAR2(20 BYTE)
, SECTOR_CD NUMBER(*, 0)
, SECTOR_DESC VARCHAR2(250 BYTE)
, MEN_TOTAL NUMBER(*, 0)
, WOMEN_TOTAL NUMBER(*, 0)
, TOTAL NUMBER(*, 0)
, MURD6 VARCHAR2(20 BYTE)
, NEG_M6 VARCHAR2(20 BYTE)
, FORCIB6 VARCHAR2(20 BYTE)
, NONFOR6 VARCHAR2(20 BYTE)
, ROBBE6 VARCHAR2(20 BYTE)
, AGG_A6 VARCHAR2(20 BYTE)
, BURGLA6 VARCHAR2(20 BYTE)

, VEHIC6 VARCHAR2(20 BYTE)

, ARSON6 VARCHAR2(20 BYTE)

, MURD7 VARCHAR2(20 BYTE)

, NEG_M7 VARCHAR2(20 BYTE)

, FORCIB7 VARCHAR2(20 BYTE)

, NONFOR7 VARCHAR2(20 BYTE)

, ROBBE7 VARCHAR2(20 BYTE)

, AGG_A7 VARCHAR2(20 BYTE)

, BURGLA7 VARCHAR2(20 BYTE)

, VEHIC7 VARCHAR2(20 BYTE)

, ARSON7 VARCHAR2(20 BYTE)

, FILTER6 VARCHAR2(20 BYTE)

, FILTER7 VARCHAR2(20 BYTE)

, WEAPON6 VARCHAR2(20 BYTE)

, WEAPON7 VARCHAR2(20 BYTE)

, DRUG6 VARCHAR2(20 BYTE)

, DRUG7 VARCHAR2(20 BYTE)

, LIQUOR6 VARCHAR2(20 BYTE)

, LIQUOR7 VARCHAR2(20 BYTE)

)
```

```
LOGGING

TABLESPACE QTZ

PCTFREE 10

INITRANS 1

STORAGE

(

  INITIAL 65536

  NEXT 1048576

  MINEXTENTS 1

  MAXEXTENTS UNLIMITED

  BUFFER_POOL DEFAULT

)

NOCOMPRESS

NOPARALLEL;




------------------- comments start hw 4
crime_111213 data conversion. ---------------
----------


select count(*)
```

```
from hw4_on_campus_crime_111213

select LPAD(TRIM(OC.ZIP),5,'0') as ZIP_CODE
from HW4_ON_CAMPUS_CRIME_111213 OC
where LENGTH(TRIM(OC.ZIP)) < 5


UPDATE HW4_ON_CAMPUS_CRIME_111213
SET ZIP = (TRIM(ZIP))
Commit;

UPDATE US_ZIP_CODES
SET ZIP = (TRIM(ZIP))
Commit;

SELECT *
FROM HW4_ON_CAMPUS_CRIME_111213
WHERE city = 'BOSTON'

SELECT LPAD(TRIM(ZIP),5,'0') as ZIP_CODE
FROM US_ZIP_CODES
```

```
WHERE city = 'Boston'

UPDATE HW4_ON_CAMPUS_CRIME_111213
SET ZIP = LPAD(TRIM(ZIP),5,'0')
WHERE LENGTH(TRIM(ZIP)) < 5

select initcap('BOSTON') FROM DUAL;

UPDATE HW4_ON_CAMPUS_CRIME_111213
SET CITY = INITCAP(CITY);

UPDATE HW4_ON_CAMPUS_CRIME_111213
SET ADDRESS = INITCAP(ADDRESS);

UPDATE HW4_ON_CAMPUS_CRIME_111213
SET BRANCH = INITCAP(BRANCH);

commit;

SELECT COUNT(*)
FROM HW4_ON_CAMPUS_CRIME_111213;
```

```
SELECT COUNT(*)

FROM V_HW4_CAMPUS_ARREST_111213;


SELECT ZIP

FROM V_HW4_CAMPUS_ARREST_111213

WHERE LATITUDE is NULL;


------------------- comments start hw 4
crime_08091 data conversion. -----------------
---------


select count(*)

from hw4_on_campus_crime_08091


select LPAD(TRIM(OC.ZIP),5,'0') as ZIP_CODE

from HW4_ON_CAMPUS_CRIME_08091 OC

where LENGTH(TRIM(OC.ZIP)) < 5



UPDATE HW4_ON_CAMPUS_CRIME_08091

SET ZIP = (TRIM(ZIP))
```

```
Commit;

UPDATE HW4_ON_CAMPUS_CRIME_08091
SET ZIP = LPAD(TRIM(ZIP),5,'0')
WHERE LENGTH(TRIM(ZIP)) < 5

UPDATE HW4_ON_CAMPUS_CRIME_08091
SET CITY = INITCAP(CITY);

UPDATE HW4_ON_CAMPUS_CRIME_08091
SET ADDRESS = INITCAP(ADDRESS);

UPDATE HW4_ON_CAMPUS_CRIME_08091
SET BRANCH = INITCAP(BRANCH);

commit;

SELECT COUNT(*)
FROM HW4_ON_CAMPUS_CRIME_08091;

SELECT COUNT(*)
```

```
FROM V_HW4_CAMPUS_C_ARREST_08091;


SELECT ZIP

FROM V_HW4_CAMPUS_C_ARREST_08091

WHERE LATITUDE is NULL;


--------------------------  start hw 4
crime_111211 data conversion  ---------------
-------------------------

select count(*)

from hw4_on_campus_crime_111211


select LPAD(TRIM(OC.ZIP),5,'0') as ZIP_CODE

from HW4_ON_CAMPUS_CRIME_111211 OC

where LENGTH(TRIM(OC.ZIP)) < 5




UPDATE HW4_ON_CAMPUS_CRIME_111211

SET ZIP = (TRIM(ZIP))

Commit;
```

```
SELECT *
FROM HW4_ON_CAMPUS_CRIME_111211
WHERE city = 'BOSTON'

SELECT LPAD(TRIM(ZIP),5,'0') as ZIP_CODE
FROM US_ZIP_CODES
WHERE city = 'Boston'

UPDATE HW4_ON_CAMPUS_CRIME_111211
SET ZIP = LPAD(TRIM(ZIP),5,'0')
WHERE LENGTH(TRIM(ZIP)) < 5

select initcap('BOSTON') FROM DUAL;

UPDATE HW4_ON_CAMPUS_CRIME_111211
SET CITY = INITCAP(CITY);

UPDATE HW4_ON_CAMPUS_CRIME_111211
SET ADDRESS = INITCAP(ADDRESS);

UPDATE HW4_ON_CAMPUS_CRIME_111211
```

```
SET BRANCH = INITCAP(BRANCH);

commit;

SELECT COUNT(*)
FROM HW4_ON_CAMPUS_CRIME_111211;

SELECT COUNT(*)
FROM V_HW4_CAMPUS_ARREST_111211;

SELECT ZIP
FROM V_HW4_CAMPUS_C_ARREST_111211
WHERE LATITUDE is NULL;

-------------------- comments start hw 4
crime_0607 data conversion. -----------------
--------

select count(*)
from hw4_on_campus_crime_0607

select LPAD(TRIM(OC.ZIP),5,'0') as ZIP_CODE
```

```
from HW4_ON_CAMPUS_CRIME_0607 OC
where LENGTH(TRIM(OC.ZIP)) < 5


UPDATE HW4_ON_CAMPUS_CRIME_0607
SET ZIP = (TRIM(ZIP))
Commit;

UPDATE HW4_ON_CAMPUS_CRIME_0607
SET ZIP = LPAD(TRIM(ZIP),5,'0')
WHERE LENGTH(TRIM(ZIP)) < 5

UPDATE HW4_ON_CAMPUS_CRIME_0607
SET CITY = INITCAP(CITY);

UPDATE HW4_ON_CAMPUS_CRIME_0607
SET ADDRESS = INITCAP(ADDRESS);

UPDATE HW4_ON_CAMPUS_CRIME_0607
SET BRANCH = INITCAP(BRANCH);
```

```
commit;

SELECT COUNT(*)
FROM HW4_ON_CAMPUS_CRIME_0607;

SELECT COUNT(*)
FROM V_HW4_CAMPUS_C_ARREST_0607;

SELECT COUNT(*)
FROM V_HW4_CAMPUS_C_ARREST_0607
WHERE Total = 0;



SELECT ZIP
FROM V_HW4_CAMPUS_C_ARREST_0607
WHERE LATITUDE is NULL;

------------ GEOID table ----------------

CREATE TABLE Gaz_zcta_national_2014
(
  GEOID NUMBER
, ALAND VARCHAR2(20 BYTE)
, AWATER VARCHAR2(20 BYTE)
, ALAND_SQMI VARCHAR2(20 BYTE)
, AWATER_SQMI VARCHAR2(20 BYTE)
, INTPTLAT VARCHAR2(20 BYTE)
, INTPTLONG VARCHAR2(20 BYTE)
)
LOGGING
TABLESPACE QTZ
PCTFREE 10
INITRANS 1
STORAGE
(
  INITIAL 65536
  NEXT 1048576
  MINEXTENTS 1
  MAXEXTENTS UNLIMITED
  BUFFER_POOL DEFAULT
)
NOCOMPRESS
```

```
NOPARALLEL;


SELECT COUNT(*)

SELECT *

FROM Gaz_zcta_national_2014

WHERE LENGTH(ALAND) = 9;



------------ fix data mismatch --------------
-------------------


select count(distinct address) from
hw4_on_campus_crime_0607 a;

select count(distinct address) from
hw4_on_campus_crime_08091 b;

select count(distinct address) from
HW4_ON_CAMPUS_CRIME_111213 c;



select count(*) from hw4_on_campus_crime_0607
a,

hw4_on_campus_crime_08091 b

where
```

```
--a.INSTNM = b.INSTNM
   a.BRANCH = b.BRANCH;
--where a.UNITID_P = b.UNITID_P;

select count(*) from hw4_on_campus_crime_0607
a,
hw4_on_campus_crime_111213 c
where a.INSTNM = c.INSTNM
  and a.BRANCH = c.BRANCH;

update hw4_on_campus_crime_111211
set
instnm = trim(instnm)
--branch = trim(branch)
;

select unitid_p, instnm, branch, address
from HW4_ON_CAMPUS_CRIME_111213 c
group by c.address, c.branch, c.instnm,
c.UNITID_P;
--order by 2, 1
having count(address) > 1;
```

```
select count(*) from hw4_on_campus_crime_0607
a

inner join

hw4_on_campus_crime_111213 c

on a.zip = c.zip;
```

```
select count(zip), zip from
hw4_on_campus_crime_0607 a

group by zip

order by count(zip) desc;
```

```
select count(*) from
hw4_on_campus_crime_08091 b;

select count(*) from HW4_ON_CAMPUS_CRIME_111213
c;
```