LARCENY/THEFT incident in San Francisco significantly shows a 24 hour periodicity.

In this report we analyzed incident data in San Francisco from 06/01/2014 to 08/31/2014. The number of daily incidents is displayed as a time-series in Figure 1. The mean is ~315 (dashed line in Figure 1) and the standard deviation is ~35.6. We could not observe any trend like a linear increase or decrease from this figure. The values are used to make a box plot (Figure 2), where median 308 is shown as a red solid line. The mean is similar to the median. The second and the third quartiles are not significantly deviated from the median. Thus, we concluded that incidents on each day can represent a sample of describing hourly incident data.
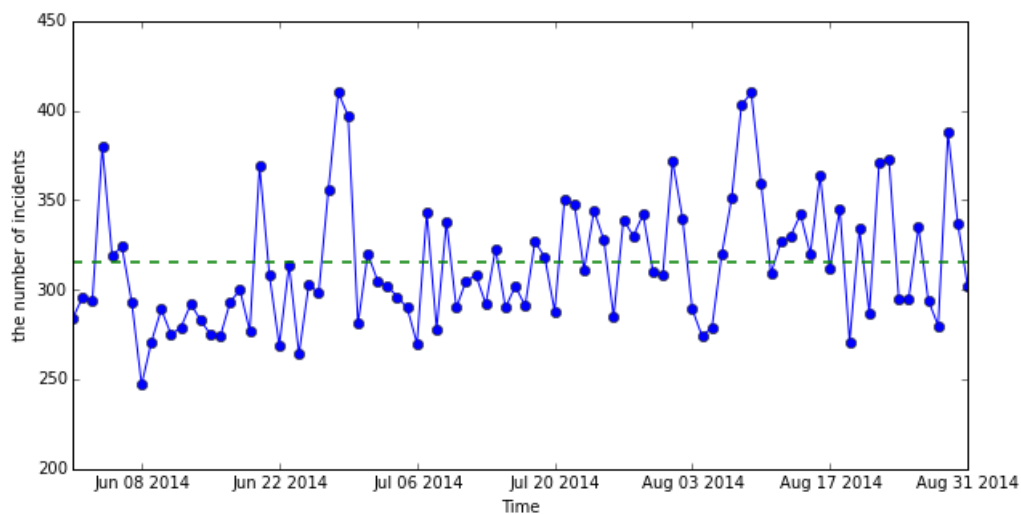

Figure 1. The number of daily incidents in San Francisco from 06/01/2014 to 08/31/2014 (mean value ~315 (dashed line) and standard deviation ~35.6).
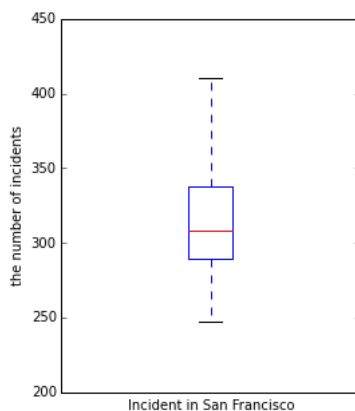

Figure 2. Box plot of daily incidents in San Francisco (Median 308, red solid line)

We calculated average number of hourly accidents from the data set (total number of incidents for an hour divided by 92 days).The values show a cycle with almost 24 hour periodicity (Figure 3), which needs non-regression fitting or finite Fourier transform for more serious quantitative analysis. The dashed line is the mean for the whole data points (~14). This feature corresponds to a periodicity of human daily activity.
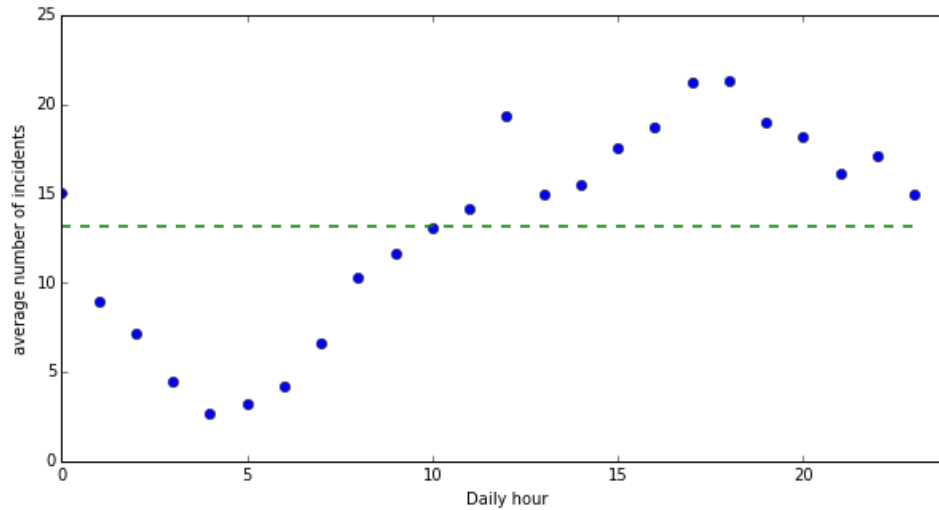

Figure 3. Average number of incidents per hour during a day.

We can guess that most of people act during a half of day from 8 to 20 because most of the average number of hourly incidents is more than the mean ~14. As more people act, uncertainty and complexity of human activity cumulate which is the cause of lots of incidents. Thus, the number of incidents can increase as being correlated with human daily cycle of 24 hours.

Our interest is to observe if this periodic feature is embedded in each incident in the category. For simplicity, we focused on the first degree LARCENY/THEFT and the second degree OTHER OFFENSES of which the total number of incidents is 9466 and 3567, respectively. The LARCENY/THEFT shows a periodic feature with a large variation (blue filled circles in Figure 4) whereas the OTHER OFFENSES is almost constant during a day (stars in Figure 4).
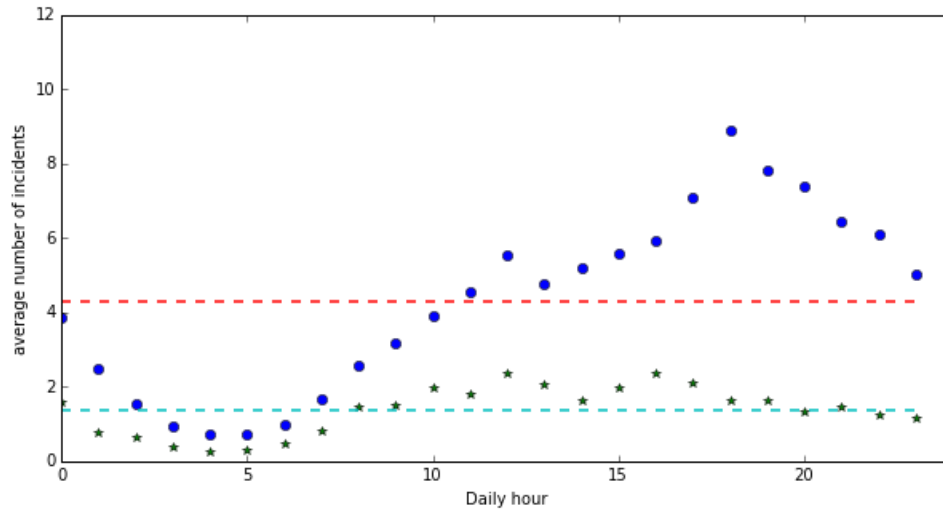
Figure 4. Average number of incidents (filled circle: LARCENCY/THEFT, stars: OTHER OFFENCES) per hour during a day. Dashed lines are mean value for each category.

It is surprising that only LARCENY/THEFT shows a significant periodicity compared to other incidents. Furthermore, this periodicity is very similar to the one of total incidents in Figure 3. The value of LARCENY/THEFT is maximal at 18 when lots of people go out to be exposed to the incident.

This analysis indicates that activity of police officers on street should be adjusted to reduce the number of LARCENY/THEFT incident around 18. For example, the number of police officers on street can be maximal around 18, which cause the reduction of LARCENY/THEFT.