IPAM 2014 RIPS-LAPD Project:

Long-term Crime Forecasting & Setting Crime Reduction Targets

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Description of Project:

Crime in Los Angeles is at the lowest point in decades. The city saw 255 homicides in 2013, a 50% decline from 2003 and a staggering 77% decline from the peak in 1992. Despite these historic lows, crime is still a common occurrence. In 2012 there were 18,547 reported violent crimes and 87,478 reported property crimes in Los Angeles, about 2.75 crimes per 100 people. Many crime types are underreported by as much as 50-60% so the true prevalence of crime is likely much higher.

Continued crime reduction is a priority for the Los Angeles Police Department (LAPD), but the standard practice for setting annual reduction targets needs updating. The best approach to setting reduction targets so must take into account the natural variation in crime rates from location to location as well as seasonal and other secular patterns of temporal variation in crime. Crime is also fundamentally stochastic in nature so that random fluctuations in crime events at different temporal and spatial scales are also important to consider. Finally, it is not sufficient to merely look backwards at past crime trends, but to also attempt to forecast future crime.

The 2014 RIPS-LAPD team will work on two interrelated problems: (1) the development of dynamic models for setting weekly crime reduction targets; and (2) the development of crime forecasting models that target medium-term temporal (i.e., months to years) and intermediate spatial scales (i.e., policing divisions and bureaus). RIPS-LAPD students may also develop a functioning web-based interface deployable by the LAPD to examine crime spatial patterns and time series and the degree of progress in meeting crime reduction targets.

This project will build on mathematical and computational models from several different domains: (1) non-linear time-series modeling; (2) non-linear PDE and stochastic point-process modeling of spatio-temporal crime pattern formation; and (3) unsupervised pattern detection methods such as machine learning. Data for this project will include crime incidents and calls for service records. Police patrol records may also be included.

Computations may be done in Matlab, Mathematica, C, C++, R, Java, or other appropriate computational language. Development of a software tool will require deployment in Java, Javascript, or Ruby on Rails.

Key Milestones:

1. Statistical assessment of LAPD crime patterns in space and time.
2. Review theory of crime spatial and temporal pattern formation.
3. Develop dynamical models for crime reduction target setting.
4. Develop medium-term crime forecasting models.
5. Develop web-based interface.
6. Present to LAPD.

References:

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