Behavioral Data and the Future of Predictive Policing

Brian Heaton | November 2, 2012

Using statistics and analytical data to predict criminal activity has become standard practice in many police departments across the United States. Crime forecasting may get more accurate as new computer algorithms are developed, but experts believe that fresh data streams, not technology advancements, will drive innovation in predictive policing during the next 20 years.

Analysts currently identify crime trends using statistical data on arrests and 911 calls. Based on that information, police commanders deploy officers to areas they believe will be hot spots for illegal activities. But while predictive in nature, the effort is largely reactionary based on past events.

In the future, behavioral data and clues from virtual interactions may help cops stop bad guys before they've even drawn up a plan. Think *Minority Report* — the 2002 film where a police unit was able to arrest murderers before they committed a crime — on a more realistic scale.

We're not quite there yet, however. The ability to accurately state that a crime will occur at a specific time in a small area is still very much science fiction. In reality, the process is similar to economic forecasting where different factors are compiled to build a statistical model to predict outcomes.

More sophisticated modeling can be done, but the return on investment is likely marginal as we're close to the limits of accuracy with current data, according to John Hollywood, operations researcher with RAND Corp., a nonprofit organization that helps improve policy and decision-making through research and analysis.

"In order to really get into crystal-ball accuracy, you basically need to get inside peoples' heads," Hollywood said. "That is getting you out of the realm of statistics and computer science and much more into the realm of behavioral and social science."

Behavioral Data

Noah Fritz, past president of the International Association of Crime Analysts and crime analysis manager for the San Diego County, Calif., Sheriff's Department, agreed. He said there is potential for growth in the area of environmental criminology where you examine a person's journey to a life of crime and peoples' routine activities and habits.

Noah Fritz, past president of the International Association of Crime Analysts and crime analysis manager for the San Diego County, Calif., Sheriff's Department, agreed. He said there is potential for growth in the area of environmental criminology where you examine a person's journey to a life of crime and peoples' routine activities and habits.

Some hurdles remain, however. Fritz said privacy rights may impede some behavioral data progress and the U.S. doesn't invest enough in behavioral data research and how it ties with predictive analytics.

But the work isn't being ignored.

Overland Park, Kan., Police Chief John Douglass likened the efforts being made in behavioral data and its relation to predictive policing to cancer research. Just as cancer scientists look back in time through genetics to find common denominators so they can create a cure, Douglass said data scientists are doing the same thing by looking for criminal signatures and those factors that will help better predict criminal behavior.

One potential source for new data could be the Level of Service Inventory-Revised (LSI-R) Assessment. An internationally recognized quantitative survey of offender attributes and offender situations relevant for making decisions about levels of supervision and treatment, the LSI-R results could provide valuable data on what motivates a criminal to commit a crime. The assessment is typically given to those going on parole.

Dawn Clausius, police intelligence analyst with the Olathe, Kan., Police Department, believes that the assessment holds a mountain of untapped data for predictive policing efforts. She said that currently a prisoner's assessment results are used only by parole officers or counselors within specific facilities. But eventually the data could be shared with detectives or police officers.

Local, state and federal government entities must get together with state corrections departments and law enforcement personnel and make an effort to share the information, Clausius said.

Instead of just identifying and arresting the bad guy, Clausius believes that if cops had the resources and ability to sit down with criminals and find out what motivated them, they could acquire data that could help prevent future crimes.

Some work is being done in the U.S. to examine how offenders behave and places they frequent in a community. Applications exist where an algorithm can provide an idea where an offender might live in relation to where crimes are occurring. But Clausius would like to see that work done on a more micro-level.

"I think that it is just a matter of making the offenders' behavior and personality a part of the process," Clausius said. "If you go overseas and see the intelligence being done, they look at a lot of offender behavior and offender profiles."

Douglass agreed. He expects nontraditional information for predictive policing will come from more study of social behaviors. It'll just take some time to make it a reality in the U.S. For example, Douglass said it took years for law enforcement to realize that 80 percent of homicides are done by people who know the victim. That revelation was 25 years ago.

Only recently, police officers have started to realize that many homicides in big cities are connected to others in the same vicinity going back a decade. Douglass said that in Kansas City, investigators were able to trace back a string of 40 or 50 murders over a 15-year period to one specific incident.

"Many of these homicides are located in a geographical area amongst a group of people who are simply retaliating back and forth in a culture where they don't tell the police

what is going on," Douglass said. "That becomes the remedy, and consequently all these homicides are related."

"I think that the social scientist will be able to help us determine social patterns that we will be able to take advantage of," he added.

Virtual Life

Social networks and virtual environments are another source of unexploited data that experts believe will impact predictive policing in the future. Platforms such as Twitter and Facebook are based on the concept of sharing details — information that law enforcement is hoping it can capitalize on.

Leonard Scott, former police chief of Corpus Christi, Texas, thinks the data gleaned from observing social media will fundamentally alter the way commanders assign patrols to certain areas.

Instead of officers being dispatched to a particular location in response to an event, the information taken from virtual existences will be used to assign a "flex unit" that will move into an area within a half mile of a particular location and watch for various disturbances. Those units are an extension of predictive policing based on social media data streams.

Clausius agreed, but said mining social media will be more difficult as time goes on. Many people are locking down their social media accounts so that data isn't as readily accessible, but she says law enforcement still must figure out how to tap deeper into the information that social networks can provide.

One might assume that criminals would be smart enough to vary where they spend their time, particularly if cops are homing in on new sources of information that may pinpoint the likelihood of a crime occurring in an area. But Colleen McCue, senior director of social science and quantitative methods for GeoEye, a geospatial services firm, said it's unlikely.

McCue, author of Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis, explained that humans are aware of a vast majority of their behaviors, but location preferences tend to be subtle and unconscious in many cases.

For example, at a grocery store, next to the bananas, you might see a display of Nilla Wafer cookies, which go well with the fruit. McCue described that type of product placement as a method of optimizing decision-making. Criminals have the same type of decision process that is largely unconscious.

"Even if they are aware of what they are doing, it is very difficult to bypass some of those unconscious decision processes," McCue said. "It is very difficult to engage in truly random behavior, and it is that fact that makes the whole crime analyst thing work."

Virtual gaming is another arena Clausius believes will be a gold mine for data in the next decade or two. From gambling sites to independent virtual identities to trade money for crime, Clausius thinks cyberspace is ripe for the picking when it comes to data to improve predictive policing efforts.

"I don't think law enforcement and public safety have even tapped into that as far as a data source or intelligence," she said. " There are all kinds of games

for all different purposes … and maybe on a federal level they are already gaming and in those worlds, but from a local law enforcement level, we are not in any of that."

Tech Advances

New data may drive the future of predictive policing, but technology won't stand still. Paul Steinberg, CTO of Motorola Solutions, says the ways officers gather data and receive instruction will radically change in the next few decades. Steinberg said he envisions much more mobile technology use — far beyond the laptops and smartphones that cops carry today.

From RFID-based fabrics to advanced hands-free mobile platforms, Steinberg believes technology will become an extension of a person, rather than separate devices he or she carries. For example, Motorola is discussing how to embed display technology into an optical unit that can capture and relay information to a police officer.

It could be something similar to Google Goggles, but specifically designed for cops and emergency personnel. So when first responders arrive on a scene, their reality is augmented with technology that increases situational awareness.

"It is the kind of thing you are going to see a lot more of," Steinberg said. "People are not going to want to carry the devices; they are going to want to wear them and have them be as unobtrusive as possible."

Clausius cautioned that new technology needs to be deployed in ways that don't compromise officer safety. Having been an officer herself for nine years, she said that the job is to respond to a situation and focus on street-level issues.

"We need to provide them the tools that make their job easier, but we also need to keep in mind it is a safety issue," Clausius said. " If they are being thrown so much information that they are taking their eyes off the suspect or off the road, we might actually be causing more problems."

Man Versus Machine

One science fiction element not likely to be a part of predictive policing in the next 20 years is computer-based decision-making. While complex algorithms will be used to evaluate mountains of new data, both police and researchers believe advanced computers and artificial intelligence won't be at a level where they'd feel comfortable trusting machines to make deployment decisions.

Douglass spotlighted WarGames — the 1983 film starring Matthew Broderick where a military computer confused reality with a simulation and almost annihilated the world with nuclear missiles — as a still-viable lesson for future generations.

"We have not been able to automate intuition into computers — they are a binary, two-dimensional look at things," Douglass said. "The human element adds that quality of intuition that I don't think is dispensable. I think [the data] is always going to need some human interpretation."

Clausius and McCue agreed. Clausius said that despite the

likelihood of further artificial intelligence advancements, computers should remain a tool and the human element should always be present.

McCue added that from an operational public safety and national security perspective, she'd be troubled by the automation of police resources and deployment decisions.

"I don't see in my lifetime getting to the point where we can develop a machine-learning algorithm that would be able to select the tactics and strategy that you would use to address a particular scenario," McCue said.

Fritz pointed out that while computers have been shown to make independent decisions, they're usually governed by a defined set of rules. For example, in chess, a computer can make choices and anticipate moves based on those rules.

But in the criminal world, offenders don't always adhere to a plan, necessitating the need for a human's adaptive ability.

Scott concurred that humans need to be a part of the equation when it came to making predictive policing decisions based on data. But he felt it was inevitable that computers would at some point be used for low-level decision-making.

So did Hollywood, but he was confident that actual strategy would always be decided by humans.

"Computer assistance and artificial intelligence in the field is kind of becoming the information technology equivalent of replacing shovels with … bulldozers," Hollywood said. "You have more power and ability to process larger amounts of data and do basic operations faster. At the same time … you still need somebody driving the bulldozer."

http://www.govtech.com/public-safety/Behavioral-Data-and-the-Future-of-Predictive-Policing.html