New crime fighting algorithm could predict reoccurring illegal activity

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A new algorithm developed by the University of Surrey and Georgia Tech could give police departments the upper hand in their fight against crime, thanks to its ability to quickly process real-time data and predict where illegal activity could reoccur.

Police departments across the world are facing increasing pressures on their resources, a reality that is fuelling the growth of predictive policing software that helps authorities make decisions on where to focus their

efforts. One popular method is to fit an Epidemic Type Aftershock Sequence (ETAS) model to urban crime data – a grid-map-based approach that has been able to predict two times as much crime as a single dedicated analyst.

In a paper published by Computational Statistics and Data Analysis, researchers from Surrey and Georgia, Atlanta, detail a new approach similar to that used in weather forecasting and the Apollo space missions, which supplements ETAS. Researchers were able to use this approach to develop a novel algorithm—the Ensemble Poisson Kalman Filter (EnPKF) - that is able to combine, in real-time, urban crime data and the ETAS model. EnPKF is able to provide real-time forecasts for the crime rate and give an indication to how likely crime could repeat in a certain area. The algorithm can also give police departments suggestions as to where short-term crime hotspots could arise, and what additional resources are needed to address such a rise.

Mathematicians tested their algorithm against data on more than 1000 violent gang crimes in Los Angeles, from 1999 until 2002 – a dataset that features 33 known gangs.

Researchers believe that the algorithm has a wide range of possible uses as the EnPKF can make forecasts using models other than ETAS. It is thought that EnPKF can be used to monitor train delays, earthquake aftershocks and even insurance claims in sub-Saharan Africa.

Dr. David Lloyd from the University of Surrey's Department of Mathematics said: "We are cautiously excited about the EnsemblePoisson Kalman Filter, an approach that has given us an insight into when crime can be predicted, and has shown us the importance of using real-time data to make the overall system stronger. We are already well on our way to strengthening the algorithm and have event tested it against data from Chicago.

"It is important to remember that EnPKF, and algorithms similar to this, are tools used to help our law enforcement who work hard to keep our communities safe. Their use will ultimately be determined by the needs of individual departments."

More information: N. Santitissadeekorn et al. Sequential data assimilation for 1D self-exciting processes with application to urban crime data, *Computational Statistics & Data Analysis* (2018). DOI: 10.1016/j.csda.2018.06.014

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