Crime Pattern Detection Using Data Mining

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Abstract

Can crimes be modeled as data mining problems? We will try to answer this question in this paper. Crimes are a social nuisance and cost our society dearly in several ways. Any research that can help in solving crimes faster will pay for itself. Here we look at use of clustering algorithm for a data mining approach to help detect the crimes patterns and speed up the process of solving crime. We will look at k-means clustering with some enhancements to aid in the process of identification of crime patterns. We will apply these techniques to real crime data from a sheriff's office and validate our results. We also use semi-supervised learning technique here for knowledge discovery from the crime records and to help increase the predictive accuracy. We also developed a weighting scheme for attributes here to deal with limitations of various out of the box clustering tools and techniques. This easy to implement machine learning framework works with the geo-spatial plot of crime and helps to improve the productivity of the detectives and other law enforcement officers. It can also be applied for counter terrorism for homeland security.

Keywords: *Crime-patterns, clustering, data mining, k-means, law-enforcement, semi-supervised learning*
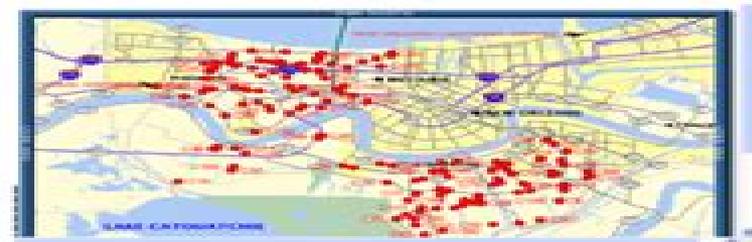
1. Introduction

Historically solving crimes has been the prerogative of the criminal justice and law enforcement specialists. With the increasing use of the computerized systems to track crimes, computer data analysts have started helping the law enforcement officers and detectives to speed up the process of solving crimes. Here we will take an inter-disciplinary approach between computer science and criminal justice to develop a data mining paradigm that can help solve crimes faster. More specifically, we will use clustering based models to help in identification of crime patterns[1].

We will discuss some terminology that is used in criminal justice and police departments and compare and contrast them relative to data mining systems. Suspect refers to the person that is believed to have committed the crime. The suspect may be identified or unidentified. The suspect is not a convict until proved guilty. The victim is the person who is the target of the crime. Most of the time the victim is identifiable and in most cases is the person reporting the crime. Additionally, the crime may have some witnesses. There are other words commonly used such as homicides that refer to manslaughter or killing someone. Within homicides there may be categories like infanticide, eldercide, killing intimates and killing law enforcement officers. For the purposes of our modeling, we will not need to get into the depths of criminal justice but will confine ourselves to the main kinds of crimes.

Cluster (of crime) has a special meaning and refers to a geographical group of crime, i.e. a lot of crimes in a given geographical region. Such clusters can be visually represented using a geo-spatial plot of the crime overlayed on the map of the police jurisdiction. The densely populated group of crime is used to visually locate the 'hot-spots' of crime. However, when we talk of clustering from a data-mining standpoint, we refer to similar kinds of crime in the given geography of interest. Such clusters are useful in identifying a crime pattern or a crime spree. Some well-known examples of crime patterns are the DC sniper, a serial-rapist or a serial killer. These crimes may involve single suspect or may be committed by a group of suspects. The below figure shows the plot of geo-spatial clusters of crime.

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of law enforcement professionals data analysts investigators researchers and graduate level students **Pattern Recognition Algorithms for Data Mining** Sankar K. Pal,Pabitra Mitra,2004-05-27 This valuable text addresses different pattern recognition PR tasks in a unified framework with both theoretical and experimental results Tasks covered include data condensation feature selection case generation clustering classification and rule generation and evaluation Organized into eight chapters the book begins by introducing PR data mining and knowledge discovery concepts The authors proceed to analyze the tasks of multi scale data condensation and dimensionality reduction Then they explore the problem of learning with support vector machine SVM and conclude by highlighting the significance of granular computing for different mining tasks in a soft paradigm **Data Mining for Intelligence, Fraud & Criminal Detection** Christopher Westphal,2008-12-22 In 2004 the Government Accountability Office provided a report detailing approximately 200 government based data mining projects While there is comfort in knowing that there are many effective systems that comfort isn t worth much unless we can determine that these systems are being effectively and responsibly employed Written by one of the most **Crime Pattern Detection Using Multi-Model Data** 陈鹏,2020 *Investigative Data Mining for Security and Criminal Detection* Jesus Mena,2003-04-07 Investigative Data Mining for Security and Criminal Detection is the first book to outline how data mining technologies can be used to combat crime in the 21st century It introduces security managers law enforcement investigators counter intelligence agents fraud specialists and information security analysts to the latest data mining techniques and shows how they can be used as investigative tools Readers will learn how to search public and private databases and networks to flag potential security threats and root out criminal activities even before they occur The groundbreaking book reviews the latest data mining technologies including intelligent agents link analysis text mining decision trees self organizing maps machine learning and neural networks Using clear understandable language it explains the application of these technologies in such areas as computer and network security fraud prevention law enforcement and national defense International case studies throughout the book further illustrate how these technologies can be used to aid in crime prevention Investigative Data Mining for Security and Criminal Detection will also serve as an indispensable resource for software developers and vendors as they design new products for the law enforcement and intelligence communities Key Features Covers cutting edge data mining technologies available to use in evidence gathering and collection Includes numerous case studies diagrams and screen captures to illustrate real world applications of data mining Easy to read format illustrates current and future data mining uses in preventative law enforcement criminal profiling counter terrorist initiatives and forensic science Introduces cutting edge technologies in evidence gathering and collection using clear non technical language Illustrates current and future applications of data mining tools in preventative law enforcement homeland security and other areas of crime detection and prevention Shows how to construct predictive models for detecting criminal activity and for behavioral profiling of perpetrators Features numerous Web links vendor resources

case studies and screen captures illustrating the use of artificial intelligence AI technologies **Pattern Recognition and Data Mining** Sameer Singh,Maneesha Singh,Chid Apte,Petra Perner,2005 **Pattern Recognition and Data Mining** Sameer Singh,Maneesha Singh,Chid Apte,Petra Perner,2005-08-18 The two volume set LNCS 3686 and LNCS 3687 constitutes the refereed proceedings of the Third International Conference on Advances in Pattern Recognition ICAPR 2005 held in Bath UK in August 2005 The papers submitted to ICAPR 2005 were thoroughly reviewed by up to three referees per paper and less than 40% of the submitted papers were accepted The first volume includes 73 contributions related to Pattern Recognition and Data Mining which included papers from the tracks of pattern recognition methods knowledge and learning and data mining topics addressed are pattern recognition data mining signal processing and OCR document analysis The second volume contains 87 contributions related to Pattern Recognition and Image Analysis which included papers from the applications track and deals with security and surveillance biometrics image processing and medical imaging It also contains papers from the Workshop on Pattern Recognition for Crime Prevention

Whispering the Techniques of Language: An Mental Quest through **Crime Pattern Detection Using Data Mining Brown Cs**

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