

CHAPTER

6

CRIME MAPPING AND PREDICTION

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6.1 INTRODUCTION

Crime is a common social problem involving behaviour or activities that are illegal and prohibited by established laws and regulations. Public awareness of crime-related information, such as crime activities or hot spot locations, is crucial for enhancing community safety and promoting proactive measures to prevent criminal behaviour. Typically, crime information is obtained from news, social media, or word of mouth. The public used this knowledge to avoid places where the risk of becoming a victim is higher. This practice is sometimes ineffective and may not provide a comprehensive understanding of the overall crime situation.

The introduction of big data technology and tools such as geographical information system (GIS) and data mining methods has significantly improved the accessibility, effectiveness, and reliability of crime information. Dashboard facilitates GIS technology to visualise the crime data using colour-coded representation, indicating the density of crime in various geographic locations (Tapia-McClung, 2020). This visualisation approach enhanced the public awareness of crime patterns and trends in specific neighbourhoods and assisted the urban planner in designing safer neighbourhoods and allocating resources for crime

prevention. Data mining, accelerating the data analysis process, proves effective in crime detection and prevention by identifying relationships and patterns within the data (Jabeen & Agarwal, 2021). Predictive analytics, for example, aids in comprehending and foreseeing patterns of criminal activity, enabling the anticipation and forecasting of such incidents. This forecast empowers law enforcement agencies to concentrate their efforts on areas with a higher anticipated crime risk.

This study attempts to provide valuable insights into crime through the development of a crime incident map dashboard and a crime rate prediction model using random forest (RF) regression and XGBoost regression algorithms. The study uses data from the Open Government License v3.0, encompassing crime-related data specific to England. The crime mapping dashboard and crime rate prediction model contribute to well-informed decision-making aimed at preventing crime and enhancing community safety measures.

6.2 CRIME INCIDENT MAPPING

The earliest known use of crime incident mapping dates to 1829, when Adriano Balbi and André Michel Guerry created maps illustrating the link between education levels and various crimes, especially violent and property offences. Fundamentally, Lynn (2021) suggests that maps have long been the standard method for representing physical locations and their changes over time. Additionally, she also argues that crime maps serve as valuable tools for visualising crime management efforts and displaying crime data, supported by criminology literature that emphasises the geographical influence on crime and its movement across different areas and periods.

Set in the 1970s, criminologists began emphasising the importance of place, with Lawrence Cohen and Marcus Felson's routine activities theory (RAT) illustrating how crime is influenced by routine activities. Extending that theory, Paul and Patricia Brantingham's crime pattern theory posits that crime is not a random occurrence throughout space but instead tends to form a cluster, and this cluster behaviour does look to be influenced by

how people move about in areas they travel (Lynn, 2021). Moving along the lines of a cluster, concentrated crime areas are often considered as hot spots, and while no common definition for that term exists, the consensus is that an area with a higher-than-average number of criminal events, or an area where people have a greater-than-average risk of victimisation, can be referred to as hotspots. On the flip side of it, (Eck et al., 2005) also suggest the presence of cool spots, which can be understood as areas having less than the average number of criminal events and the likelihood that some hot spots can be hotter than others.

Kortas et al. (2022), further suggests that placing hot spots on a map produces an effective and quick method to delve into spatial patterns when paired with cold spots. To depict changes in crime, a surface with valleys representing low levels of crime while peaks represent higher levels of occurrence, and this is borrowed from the methodology of a topographic map, as depicted in Figure 6.1. An example is the suggested methods for representing hot spot areas, which are tabulated in Table 6.1 (Hajela et al., 2020).

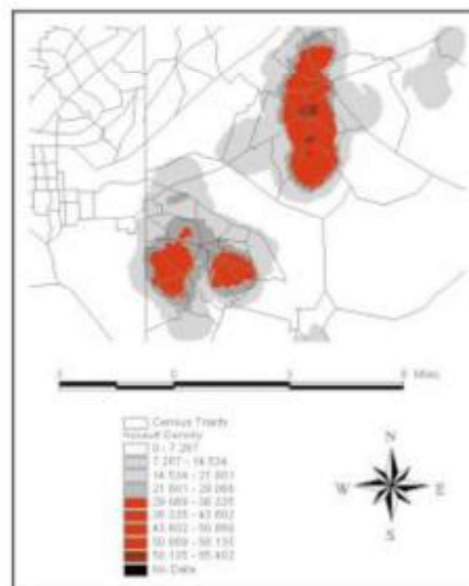


Figure 6.1 Representation of crime as a surface