Chapter 7
Time Series Analysis for Crime Forecasting Using ARIMA (Autoregressive Integrated Moving Average) Model

Neetu Faujdar
Amity University, Noida, India

Anant Joshi
Amity University, Noida, India

ABSTRACT

With massive advancements in the fields of data analysis and data mining, a new importance has been gained by data visualization. Data visualization focuses on visualizing and abstracting complex data to make it comprehensible and easy to understand using visual representation of information. Analysis of crime and crime-related data has been steadily popularizing over the last decade, and this chapter aims at visualizing such data. Crime data for several different types of crime for many countries in the world has been collected, compiled, processed, analyzed, and visualized in this chapter. Predictive analysis of this data has also been performed using time series analysis. This chapter aims to create a hub where internet users can easily view and interpret this data.

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INTRODUCTION

The field of Data Visualization has developed comparatively slower to its sibling fields of data analysis and mining. Improvements and advancements in the field of data mining, data analysis and KDD (Knowledge discovery in databases) have been rapid and enormous, expanding the limits of effective data utilization. Data Mining is a part of the KDD process that has seen considerable growth (Ott, 2015).

Improvements in data storage technology have been helping companies, corporations and governments store incredibly large amounts of data. Previously, analyzing this amount of data was far too expensive for most corporations and companies aside from the largest such Google. But with advancements in data distribution technology and the invention of algorithms such as MapReduce by Google and its implementations such as Hadoop which was funded by Yahoo, analyzing massive amounts of data has become easy and affordable (Flaxman, 2014). The field of Data Mining and Analysis has emerged from this new age of information technology and has quickly become one of the most important assets for corporations. Corporations around the world are looking for a data analysts and data scientists to dig for novel patterns and knowledge in the large data banks they collect from their users (Shrivastav, 2012).

Data Visualization has experienced much slower growth in comparison to Data Analysis and Mining. A great gap still exists between the capability of finding answers and patterns in data and visualizing that information to be more comprehensible (Z. Zhan, 2015). With the ever-growing size of data, and equally increasing complexity of data analysis algorithms and their results, what is going to make this complex information comprehensible? What is going to bridge the gap and allow end users to easily understand the results of advanced mathematical and statistical techniques? Data Visualization is the answer to these questions. Using charts, graphs and maps, it makes incomprehensible information understandable to the layman. Although this field has lagged behind the fields of Data Analysis and Mining, it is quickly catching up as people realize the importance of visualizing the results and findings of analysis and mining (J. Z. Bakdash, 2017).

Enforcement of laws is one of the most important jobs in the current world and has been for many hundreds of years since the dawn of human civilization. Crimes have been occurring since the beginning, and before, of recorded history and we as a civilization have been recording and storing such data for ages. This data is valuable in finding any rises and falls in crime rates and finding what kind of crime is being committed the most. The amount of data being collected has aggressively accelerated in the past few decades and data of all kinds is now available for analysis. This general increase in the ability to utilize data and find interesting patterns has