

# A Survey of Data Mining Techniques for Analyzing Crime Patterns

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**Abstract**—In recent years the data mining is data analyzing techniques that used to analyze crime data previously stored from various sources to find patterns and trends in crimes. In additional, it can be applied to increase efficiency in solving the crimes faster and also can be applied to automatically notify the crimes. However, there are many data mining techniques. In order to increase efficiency of crime detection, it is necessary to select the data mining techniques suitably. This paper reviews the literatures on various data mining applications, especially applications that applied to solve the crimes. Survey also throws light on research gaps and challenges of crime data mining. In additional to that, this paper provides insight about the data mining for finding the patterns and trends in crime to be used appropriately and to be a help for beginners in the research of crime data mining.

**Keywords**—*data mining; crime patterns; data analysis*

## I. INTRODUCTION

Crime prevention and detection become an important trend in crime and a very challenging to solve crimes. Several studies have discovered various techniques to solve the crimes that used to many applications. Such studies can help speed up the process of solving crime and help the computerized systems detect the criminals automatically. In addition, the rapidly advancing technologies can help address such issues. However, the crime patterns are always changing and growing [1]. The crime data previously stored from various sources have a tendency to increase steadily. As a consequence, the management and analysis with huge data are very difficult and complex. To solve the problems previously mentioned, data mining techniques employ many learning algorithms to extract hidden knowledge from huge volume of data. Data mining is data analyzing techniques to find patterns and trends in crimes. It can help solve the crimes more speedily and also can help alert the criminal detection automatically.

This paper gives the brief reviews of researches on various implementation of data mining and the guidelines to solve the crimes by using data mining techniques. It also discusses research gaps and challenges in the area of crime data mining. In the next section, the background and the issues of data mining are discussed. Section III elaborately discusses about the uses of data mining techniques to solve the crimes. The research issues and challenges are shown in Section IV. Finally, the study is concluded in Section V.

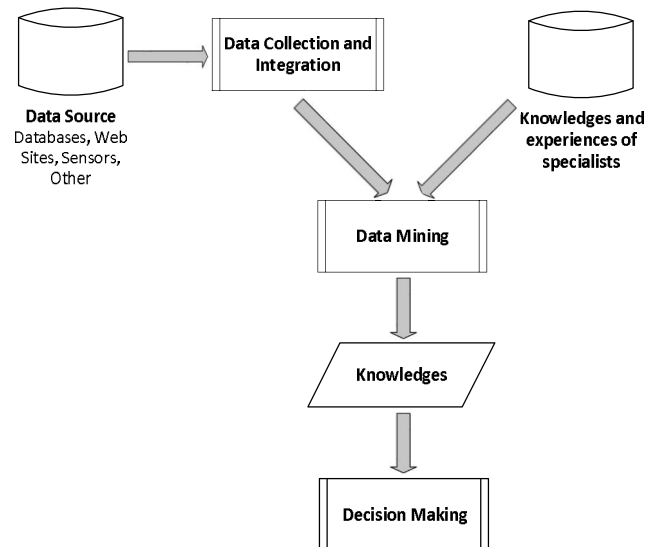


Fig. 1. The background of data mining.

## II. DATA MINING FUNDAMENTALS

Data mining is the analysis process used to analyze the historical data to find trends, patterns and knowledges. To extract the hidden knowledges, there are the initial important factors for analysis as follows: 1) The data used for analysis require the accuracy and sufficiency. 2) Knowledges and experiences of specialists. The knowledge results obtained from data mining processes are used to assist in decision making and to solve the problems. The data mining diagram is shown in Fig. 1. In the data mining, the analyzing techniques are explained in the following sub-sections.

### A. Association Rule Mining

This technique is unsupervised learning method that used to find the hidden knowledges in unlabeled data. It is used to solve the issues if the learners get the unlabeled example data. In additional, association rule can discover the interesting co-occurrences of objects in large data sets. In the basic of association rule, the rule consists of two parts. 1) The antecedent, which is on the left side or called the left hand side (LHS). 2) The consequent, which is on the right side or called the right hand side (RHS). A form of general association rule is  $LHS \rightarrow RHS$ , where LHS and RHS are disjoint item-sets [2].