Chapter 34
Digital Investigation of Cybercrimes Based on Big Data Analytics Using Deep Learning

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ABSTRACT

Big Data Analytics has become an important paradigm that can help digital investigators to investigate cybercrimes as well as provide solutions to malware and threat prediction, detection and prevention at an early stage. Big Data Analytics techniques can use to analysis enormous amount of generated data from new technologies such as Social Networks, Cloud Computing and Internet of Things to understand the committed crimes in addition to predict the new coming severe attacks and crimes in the future. This chapter introduce principles of Digital Forensics and Big Data as well as exploring Big Data Analytics and Deep Learning benefits and advantages that can help the digital investigators to develop and propose new techniques and methods based on Big Data Analytics using Deep Learning techniques that can be adapted to the unique context of Digital Forensics as well as support performing digital investigation process in forensically sound and timely fashion manner.

INTRODUCTION

Big Data Analytics and Deep Learning are two important topics in data science. Big Data has become important for several organizations and companies because they have been collecting huge amounts of data, which can contain useful and vital information about certain problems in many areas like banks, cyber security, fraud detection, marketing, and medical and healthcare. Many companies such as Google and Microsoft are analyzing massive volumes of data for business analysis and making decisions for future plans. Deep Learning is a set of machine-learning techniques based on neural networking, is still

developing gradually but shows great potential for solving several problems. Deep Learning enables computers to recognize items of interest in large quantities of unstructured and binary data, and to deduce relationships without needing specific models or programming instructions. A key benefit of deep learning for big data analytics is the analysis and learning of massive amounts of unsupervised data, making it a valuable tool for big data analytics where raw data is largely unlabeled and un-categorized.

Cyber criminals and terrorists are highly trained persons and experts in computer, network, digital systems and new technologies. Massive amounts of data is gathered about criminals and their behavior from different data sources in the Internet for monitoring and tracing them in real-time and online using analytics techniques. These enormous amount of data need new fast and efficient processing tools and techniques for extracting and analyzing in less period of time. Big Data can be used to leverage predictive analytics. Digital investigators and experts can use various innovative data visualization analysis and mining technologies to identify data patterns from the massive collected data to find any digital evidence about attackers or detect and trace them through their activities by identifying suspicious behavior patterns to identify threats that are likely to happen. One important benefit of Big Data Mining for large set of data to look for key information that can be used in forensics investigation and help refute or support a claim or put together a missing piece, this has seen rapid increase in the field of digital investigation. Big Data Analytics using Deep Learning algorithms can support and improve the process of digital investigation in forensically sound and timely fashion manner.

Researchers and scientists can contribute by harnessing the power of Big Data Analytics with digital investigation to provide more effective ways to obtain useful and vital information from available digital evidence about attackers. By apprehending data thieves and disrupting attacks, digital investigations and data science can help reinforce privacy, safety, and financial security in modern society. Employing Big Data Analytics techniques to help digital investigation has various benefits and advantages such as:

- Reduce system and human processing time for huge amount of data.
- Improve the analysis of evidential data which extracting from crime scene.
- Reduce costs of digital investigation.
- Better utilization of available computing, processing and storage resources.

This chapter introduces a study based on using of Big Data Analytics using Deep Learning in the digital forensics domain to help digital practitioners and experts to design and develop new techniques and methods to cope with new technologies such as Cloud Computing and Internet of Things that generating huge and massive amount of data.

The rest of this chapter is organized as follows: firstly, provides digital forensic definition and digital forensic investigation process. Secondly, introduces cybercrime definition and categories while Big Data concepts, techniques and tools are presented thirdly. Fourthly, describes Deep Learning concepts, techniques and applications while Digital Investigation based on Big Data Analytics using Deep Learning is discussed fifthly. Finally, the chapter conclusion is presented.

DIGITAL FORENSICS

Digital forensics is a branch of forensic science that concern with finding and collecting digital evidence then analysis and examine them to find any traces related to crimes against digital systems. Digital fo-

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