Chapter 10
Machine Learning for Fraud Detection and Financial Crimes

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ABSTRACT

Personal, commercial, and economic impacts of financial fraud are significant. Traditional rule-based fraud detection systems often generate false positives and struggle to adapt to new fraud methods. ML algorithms are examined as an alternative to traditional financial fraud detection methods in this chapter. It explores how supervised, unsupervised, and hybrid models may identify financial data abnormalities and fraud patterns. Money laundering, payments fraud, and other financial crimes are covered in this chapter. Fraud detection is complicated by data imbalance, privacy concerns, and model scalability. It also shows how AI, blockchain, and predictive analytics will fight fraud and secure financial institutions. This chapter reviews how new technology is changing financial crime prevention, using

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examples from credit card and online retail fraud.

1 INTRODUCTION

As a problem with far-reaching effects, financial fraud affects more than just the financial sector. Businesses lose trust in each other, economies become unstable, and people's cost of living is impacted by fraud. Because the problem is so complex, traditional methods that rely on manual procedures, like auditing, are both inefficient and prone to error. Methods based on data mining have proven effective due to their capacity to spot inconsistencies in massive datasets (Ngai et al., 2011). Researchers are always looking into new forms of fraud and data mining techniques to determine which ones work best in specific situations. For our purposes, we can define financial fraud as the deliberate employment of illegal procedures or practices to obtain financial advantage (Zhou & Kapoor, 2011). This is a broad phrase with several potential interpretations. Businesses and society as a whole suffer greatly as a result of fraud. Credit card fraud, for example, is responsible for billions of dollars in lost revenue annually, and some estimates put the total cost to the United States at more than $400 billion (Kirkos et al., 2007). In the United Kingdom, insurers lose 1.6 billion pounds annually as a result of fraudulent claims. One of the more far-reaching effects of financial fraud on the sector is the money it gives to criminal organisations and the drug trade. Typically, retailers bear the brunt of credit card fraud. Not only do they have to pay for shipping, chargebacks, and administrative expenses, but they also risk losing customer confidence following a fraudulent purchase (West & Bhattacharya, 2016). This highlights the significance of reducing fraud and its far-reaching effects.By analysing large volumes of behavioural and transactional data, machine learning algorithms can detect patterns and outliers that indicate potential fraudulent activity. The ever-changing nature of financial fraud is well-handled by these adaptive models, which enhance their detection accuracy over time. This chapter delves into the topic of machine learning and its function in fraud detection, covering topics such as different algorithms, their uses, and the difficulties of implementing them in practical settings.

2 UNDERSTANDING FINANCIAL CRIMES

From small-scale acts of theft and fraud to massive public sector undertakings orchestrated by criminal organisations with international influence and political affiliations, financial crime encompasses a wide range of illicit activities. The gravity of these illicit practices should not be disregarded, as they are frequently associated