Leveraging Graph-Based Learning for Credit Card Fraud Detection: A comparative study of classical, deep learning and graph-based approaches.

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Abstract

Credit card fraud results in staggering financial losses amounting to billions of dollars annually, impacting both merchants and consumers. In the light of the escalating prevalence of digital crime and online fraud, it is important for organizations to implement robust and advanced technology to efficiently detect fraud and mitigate the issue. Contemporary solutions heavily rely on machine learning (ML) and deep learning (DL) methods to handle such tasks. While these methods have been effective in many aspects of fraud detection, they may not always be sufficient for credit card fraud detection as they aren't adaptable to detect complex relationships when it comes to transaction. Fraudsters, for example, might set up many coordinated accounts to avoid triggering limitations on individual accounts. In the context of fraud detection, the ability of Graph Neural Networks (GNN's) to aggregate information contained within the local neighbourhood of a transaction enables them to identify larger patterns that may be missed by just looking at a single transaction. In this research, we conduct a thorough analysis to evaluate the effectiveness of GNNs in improving fraud detection over traditional Machine Learning and Deep Learning methods. We first build an heterogenous graph architecture with the source, transaction, and destination as our nodes. Next, we leverage Relational Graph Convolutional Network to learn the representations of nodes in our graph and perform node classification on the transaction node. Our experimental results demonstrate that GNN outperforms traditional and deep learning methods.

Keywords: Credit card fraud, Graph neural networks, Node classification, RGCN, Deep learning, Machine learning

Statements and Declarations

Conflicts of interest. I hereby certify that to the best of my knowledge,the authors have no relevant financial or non-financial interests to disclose. The authors have no conflicts of interest to declare that are relevant to the content of this article. All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript. The authors have no financial or proprietary interests in any material discussed in this article.

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