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(57) Abstract :
Criminals employ money laundering as a critical method to introduce the proceeds of their criminal activities into the financial system. The financial institutions are responsible for the primary responsibility of detecting suspicious activity related to money laundering. The majority of the existing systems in these institutions are rule-based and ineffective, with over 90% of them resulting in false positives. Data science-based anti-money laundering (AML) models that are currently available to replace existing rule-based systems are based on the time characteristics of transaction behaviour and customer relationship management (CRM) features. Feature engineering is a difficult task due to the thousands of potential account features, customer features, and their combinations, which make it difficult to achieve realistic accuracy. In order to enhance the detection performance of suspicious transaction monitoring systems for AML systems, this article introduces a new feature set that is based on time-frequency analysis and employs 2-D representations of financial transactions. Simulated annealing is implemented for hyper parameter tuning, while random forest is implemented as a machine learning technique. The algorithm's efficacy in practically relevant environments is demonstrated through testing on real banking data. It has been demonstrated that the time frequency characteristics are discriminatory features for suspicious and non-suspicious entities. Consequently, these features significantly enhance the area under the curve results (over 1%) of the current data science-based transaction monitoring systems. A false positive rate of 14.9% has been achieved with an F-score of 59.05% using only time-frequency features. Upon integration with transaction and CRM features, the F-Score is enhanced to 74.06%, and the false positive rate is 11.85%.

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