TransACT: AI-Driven Anomaly Detection for Bad Actor Identification at Financial Institutes

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Abstract

The increasing sophistication of financial fraud and anomalous transactions necessitates advanced analytical techniques for risk detection and mitigation. TransACT (Transforming Anomalous Customer Tracking through AI) is a machine learning-driven pipeline designed to identify anomalous customer behaviors within financial institutes. The dataset used in this study was provided for the University of Toronto's sixth annual IMI Big Data and Artificial Intelligence Competition, sponsored by Scotiabank. It contained Know Your Customer (KYC) data and multiple transaction records for 16,255 unique customer IDs. Our pipeline identified 169 high-risk customers and 12,931 low-risk/safe customers through an ensemble-based unsupervised learning approach. Given the challenge of no ground truth labels, our methodology relies on model agreement, where multiple models independently assess risk, and customers are labeled as high-risk only when a consensus is reached. The sensitivity of the system can be adjusted based on expert feedback. This approach is reinforced by comprehensive feature engineering, guided by exploratory data analysis (EDA), to extract meaningful insights from the available financial attributes. Additionally, results were manually verified using our proprietary frontend interface, ensuring greater interpretability and reliability of identified risk patterns. This research contributes to improving the identification of bad actors and detection of transaction irregularities, in the financial sector.

Keywords: Financial anomaly detection, unsupervised learning, anti-money laundering, unsupervised learning