Credit Card Fraud Detection using Machine Learning

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Abstract: *Credit card fraud detection is a crucial aspect of financial security, necessitated by the growing volume of digital transactions and the evolving sophistication of fraudulent techniques. This review synthesizes insights from 25 significant research studies to explore advancements in machine learning-based fraud detection. The studies highlight the efficacy of algorithms like Support Vector Machines (SVM), Random Forests, Hidden Markov Models, and Deep Neural Networks (DNN) in identifying anomalies and fraudulent activities with improved precision. Techniques such as feature engineering, cost-sensitive learning, and ensemble methods have enhanced detection accuracy, while advancements in active learning and real-time data processing enable timely fraud mitigation. Hybrid approaches, including the integration of Dempster-Shafer theory and probabilistic models like Bayesian Networks, demonstrate the potential to address challenges such as data imbalance, evolving fraud patterns, and scalability. Despite these advancements, issues like computational complexity and adaptability to dynamic fraud strategies remain critical hurdles. The review emphasizes the importance of combining domain expertise with data-driven approaches to develop robust, scalable, and interpretable models for real-world applications. By providing a comprehensive analysis of methodologies, this study lays the groundwork for innovative, adaptive, and efficient credit card fraud detection systems in the ever-evolving financial landscape.*

Keywords: Credit card fraud detection, machine learning, anomaly detection, Support Vector Machines (SVM), Random Forests, Deep Neural Networks (DNN), feature engineering, real-time data processing, cost-sensitive learning, hybrid approaches, Bayesian Networks, Hidden Markov Models (HMM)