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Analyzing Behavioral Trends in Credit Card Fraud Patterns: Leveraging Federated Learning and Privacy-Preserving Artificial Intelligence Frameworks

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As credit card fraud becomes increasingly sophisticated, financial institutions must adopt advanced security measures to detect and prevent fraudulent activities while ensuring user privacy. This study explores the use of Federated Learning (FL) and privacy-preserving Artificial Intelligence (AI) frameworks to analyse behavioural trends in credit card fraud patterns. By leveraging FL, financial institutions can train AI models collaboratively across decentralized datasets without exposing sensitive customer information. Machine learning algorithms detect anomalies, predict fraud attempts, and adapt to emerging attack strategies in real time. Additionally, privacy-preserving AI techniques such as differential privacy and homomorphic encryption enhance data security while maintaining model accuracy. This research also examines challenges related to scalability, computational efficiency, and regulatory compliance in implementing FL-based fraud detection systems. By integrating AI-driven fraud analysis with privacy-preserving technologies, financial institutions can improve fraud prevention strategies, strengthen cybersecurity, and enhance consumer trust in digital transactions.