ARTIFICIAL INTELLIGENCE MODELS AND TOOLS THAT MONITOR AND MONITOR THE SECURITY OF DIGITAL BANKING DATA

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Abstract. As digital banking becomes ubiquitous in Uzbekistan, ensuring the security of sensitive financial data is paramount. This article explores how artificial intelligence (AI) models and tools are being leveraged to monitor and safeguard digital banking information. A comprehensive literature review was conducted to identify the most promising AI techniques and their applications in the Uzbek banking sector. The results demonstrate that machine learning algorithms, especially anomaly detection models, are highly effective at identifying fraudulent transactions and unauthorized access attempts in real-time. Furthermore, natural language processing tools enable automated analysis of unstructured data like customer service logs to surface potential security issues. Blockchain technology is also being piloted to create tamper-proof audit trails.

Keywords: artificial intelligence, digital banking, cybersecurity, Uzbekistan, machine learning

INTRODUCTION

The rapid digitization of banking services in Uzbekistan has brought tremendous benefits in terms of convenience and access, but has also created new vulnerabilities. As customers increasingly rely on online and mobile banking platforms to manage their finances, vast amounts of sensitive personal and transactional data are being generated and stored digitally. This has made banks prime targets for cyber criminals seeking to steal funds or identities. The statistical data reveals that digital banking security in Uzbekistan, particularly the issue of fraud and theft related to bank cards, is a pressing concern. Out of the 5,500 cybercrimes recorded in the country from January to November 2023, the majority, specifically 70 percent or 3,850 cases, are related to bank card crimes [1]. It is worth noting that this figure has increased significantly compared to the previous year.

Traditional cybersecurity methods, which rely heavily on pre-defined rules and manual review, are struggling to keep pace with the volume and complexity of modern threats. Artificial intelligence has emerged as a powerful tool to automate and scale digital banking security. By leveraging the ability of AI systems to rapidly process massive datasets, identify patterns, and adapt to new situations, banks can detect and respond to security issues with unprecedented speed and accuracy.

METHODS AND LITERATURE REVIEW

To identify relevant literature on the use of AI for digital banking security in Uzbekistan, we conducted searches on Google Scholar, IEEE Xplore, and SpringerLink using the following query: ("artificial intelligence" OR "machine learning") AND ("digital banking" OR "online banking" OR "mobile banking") AND security AND Uzbekistan. The selected literature encompassed a wide range of AI techniques being utilized for banking security, including:

Supervised machine learning models trained on large datasets of historical transactions to identify fraud in real-time [2][3][4]

Unsupervised anomaly detection models that learn normal user and system behavior patterns and flag deviations as potential security breaches [5][6]

Natural language processing (NLP) tools that analyze unstructured text data like customer service chats and emails to surface phishing attempts and social engineering attacks [7][8]

Computer vision algorithms that verify user identities through facial recognition and detect fake identity documents [9]

Blockchain-based systems for creating secure, tamper-evident transaction logs and information sharing between institutions [10][11]

A number of case studies provided concrete implementation details and results from Uzbek banks:

Agrobank reduced fraud losses by 30% after deploying a gradient boosting machine learning model to score transactions in real-time and trigger additional verification steps for high-risk items [12].

Kapitalbank built a hybrid supervised/unsupervised anomaly detection system that monitors user device, location, and behavioral biometrics to identify account takeover attempts, catching breaches 50% faster than previous rules-based heuristics [13].

Ipak Yuli Bank implemented an NLP pipeline to categorize and route incoming customer service queries, successfully identifying 80% of social engineering attacks before reaching human representatives [14].

The Central Bank of Uzbekistan is leading a blockchain consortium to pilot decentralized information sharing between member banks to streamline KYC/AML compliance and enable collective defense against money laundering schemes [15].

RESULTS

The literature review surfaced substantial evidence that AI-based security solutions are delivering meaningful improvements in the speed and accuracy of threat detection for Uzbek banks. Supervised machine learning models, trained on extensive datasets of tagged fraudulent and legitimate transactions, are proving highly effective at identifying transaction anomalies in real-time [3][4]. Models utilizing more sophisticated feature engineering, such as graph embeddings that capture users' transaction network characteristics, show particular promise in catching collusive fraud rings [16].

For identifying unauthorized access and account takeovers, unsupervised models that learn individual users' normal behaviors and flag anomalous patterns as potentially suspicious are a leading approach [6]. Fusing data across channels (web, mobile, ATM, etc.) and modalities (device, location, biometric) enables richer behavioral profiles and more robust detections [17]. Leading Uzbek banks are reporting 50-80% faster breach identification compared to traditional rule-based approaches [13].

NLP tools are helping extend security monitoring to unstructured data channels like customer service interactions. Pipelines using pre-trained language models fine-tuned on banking-specific text corpora are able to accurately classify the intent behind incoming messages and surface likely social engineering attacks for further scrutiny [8][14]. Computer vision algorithms are also being applied to visually verify user identities, with top face recognition models achieving over 99% accuracy [18].

Blockchain systems are at an earlier stage of exploration, but show promise for securely logging transactions and sharing information between institutions [10]. The Central Bank of Uzbekistan's blockchain pilot has demonstrated the ability to validate new customers against a collective AML database 3x faster than current manual processes.

ANALYSIS AND DISCUSSION

While the results demonstrate AI's significant potential in digital banking security, challenges and uncertainties remain. One issue is the lack of large, diverse, labeled datasets on which to train supervised models [19]. Data quality and representativeness is critical to building models that perform well across all customer segments, but Uzbek banks have limited historical data that is often skewed towards the banked population. Unsupervised approaches can help address this but may be less precise. Maintaining up-to-date models is also difficult as fraud tactics continuously evolve.

Another challenge is algorithmic bias and fairness. Training data reflects societal biases and blindspots that can inadvertently get baked into model decisions. Left unchecked, this could lead to unfair flagging of underrepresented groups as high-risk [20]. The complexity of AI models makes it difficult to understand the reasoning behind their predictions, creating risks of unjustified actions if humans over-rely on them.

Banks must also consider customer privacy and consent as they aggregate more data to feed AI systems [11]. Storing and processing biometric data, location histories, and detailed behavioral traces raises concerns around data governance and misuse. Customers may feel hesitant to use digital banking if they perceive AI monitoring as overly invasive.

Balancing effective security with a positive user experience is another key tension. Stopping every suspicious transaction can prevent fraud losses, but creates friction for legitimate customers. More adaptive risk scoring models can help calibrate responses, but banks need to empower frontline staff to make nuanced decisions and communicate sensitively with affected customers [12].

Finally, liability and accountability questions loom as AI systems take on greater security decision-making roles. When a model misses a fraudulent transaction or wrongly freezes an account, who is responsible? Clear fallback protocols and human oversight remain essential, as well as ongoing testing and monitoring of model performance.

Based on our analysis, we offer the following recommendations for Uzbek banks looking to implement AI security solutions:

Develop robust data governance frameworks with clear consent protocols, usage limitations, and protection measures. Invest in tools for data quality assessment, bias testing, and de-identification.

Implement human-in-the-loop AI with gradual automation rollout. Keep humans involved in high-stakes decisions while AI systems are proven over time. Maintain active human monitoring and clear escalation paths.

Prioritize model explainability techniques that provide insight into algorithmic decision-making. Avoid overreliance on black-box models for critical security choices.

Establish living model performance tracking with ongoing evaluation on real production data. Monitor for fairness gaps across customer segments.

Invest in AI security domain knowledge on staff, particularly in roles that interface directly with models like fraud analysts, data scientists, and customer service reps. Cultivate appropriate trust and skepticism.

Develop clear protocols for handling false positives and mistaken automated actions. Empower frontline staff with decision frameworks and train them on communicating with affected customers.

Engage in industry collaborations like the Central Bank blockchain consortium to pool data and threat intelligence. Consider publishing anonymized model performance for collective benchmarking.

Stay attentive to emerging security threats that may elude current AI techniques, like deepfake social engineering attacks. Foster a culture of proactive innovation and adaptation.

CONCLUSION

AI is rapidly transforming the landscape of digital banking security in Uzbekistan. Machine learning, NLP, computer vision, and blockchain solutions are demonstrating significant enhancements in the speed and coverage of threat detection compared to legacy approaches. As Uzbek banks expand their deployment of AI security tools, it is critical that they do so in a responsible manner, with strong data governance, human oversight, fairness monitoring, and customer privacy protections. By cultivating the right mix of human and machine intelligence, Uzbek banks can deliver a secure and trustworthy digital banking experience.

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