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ENTERPRISE FINANCIAL DATA SHARING AND SECURITY IN HYBRID CLOUD ENVIRONMENTS: AN INFORMATION FUSION APPROACH FOR BANKING SECTORS

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ABSTRACT: *This paper explores a secure financial data sharing framework in hybrid cloud environments, specifically designed for the banking sector. The integration of information fusion techniques with AI and machine learning (ML) ensures real-time data accuracy, risk mitigation, and compliance with industry regulations. The hybrid cloud approach utilizes both public and private cloud infrastructures to enhance security while optimizing operational efficiency. Through comprehensive data fusion and validation, the system ensures secure data transmission and protection of sensitive financial information across various cloud platforms.*

Objectives: The objectives of this study are to develop a robust system for secure financial data sharing across hybrid cloud platforms, ensuring data privacy during transmission between public and private cloud environments. By leveraging ***information fusion****, the system aims to enhance decision-making, fraud detection, and risk management. Additionally, the framework seeks to ensure compliance with global regulations such as* ***GDPR*** *and* ***Basel III****, while improving operational efficiency. The integration of* ***AI*** *and* ***ML*** *is critical to reducing latency and enabling real-time processing, optimizing the overall performance of financial data sharing in hybrid cloud environments.*

Methods: The proposed system integrates ***information fusion****,* ***AI****, and* ***ML*** *algorithms to enhance data accuracy and threat detection. Secure protocols were implemented to ensure data safety and regulatory compliance.*

Results: The framework achieved high ***data accuracy*** *(99.85%), significantly reduced* ***security risks*** *(0.87 risk score), and maintained low* ***latency*** *(1.56 seconds), ensuring efficient real-time data processing.*

Conclusion: The proposed method enhances secure data sharing across hybrid cloud environments, balancing security and efficiency while adhering to regulatory standards.

Keywords: *Hybrid Cloud, Financial Data Sharing, Information Fusion, AI, Machine Learning, Cloud Computing, Banking Security, Regulatory Compliance, Risk Mitigation.*

1. INTRODUCTION

Enterprise data sharing and security have become critical issues in the quickly changing financial landscape, particularly for the banking industry which handles enormous volumes of sensitive financial data. As cloud computing continues to progress, hybrid cloud environments—which provide scalability, flexibility, and cost-effectiveness—have become a reliable option for managing data-intensive processes. Banks and other financial institutions can benefit from both public and private cloud infrastructures when hybrid cloud environments are integrated, which maintains a balance between security and operational efficiency. By merging public cloud solutions (for non-sensitive or scalable tasks) with private cloud infrastructure (for extremely sensitive data and processes), a hybrid cloud environment offers the best of both worlds. Financial organizations can use public

cloud resources for high-volume, less critical procedures while storing critical data in secure on-premises systems, giving them greater flexibility. But using hybrid clouds has additional challenges, especially when it comes to protecting data when transferring and sharing it between various cloud environments.

Ensuring the secure sharing of financial data among departments, companies, and external stakeholders without compromising data privacy and regulatory compliance is one of the major difficulties facing banks in the era of Industry 4.0. The emergence of Information Fusion, which involves merging data from multiple sources to produce valuable insights, has demonstrated its efficacy in addressing these issues. Through information fusion, banks can build a single, comprehensive picture of their operations by combining data from many systems, including internal databases, external vendors, regulatory agencies, and market sources. This all-encompassing viewpoint strengthens risk management, compliance, and decision-making. The banking and financial sectors in particular have traditionally been heavily regulated and security-conscious. Banks handle a variety of data sources, including risk assessments, regulatory reports, and client transactions. As such, safe data sharing is essential to preserving operational effectiveness. The necessity for safe, effective data sharing methods has grown due to the expanding dependency on cloud computing and the intricacy of regulatory frameworks. Innovative solutions are needed to ensure data protection, defend against cyber threats, and facilitate seamless cooperation across numerous systems.

On-premises solutions, which provide a high level of control and protection, were predominantly used in traditional banking infrastructures to manage data sharing and processing. But as digital transformation has grown and data quantities have increased, many older systems have found it difficult to keep up with the expectations of contemporary financial operations. The emergence of cloud computing has presented banks with fresh chances to expand their business and enhance their data handling procedures. Particularly because of their capacity to offer both security and flexibility, hybrid cloud environments have grown in popularity. Financial firms can use a hybrid cloud approach to process huge datasets or non-sensitive jobs using public cloud resources while storing sensitive financial data in private clouds that adhere to strict security standards.

A significant problem presented by this dual architecture is ensuring safe and effective data sharing across the two cloud infrastructures while also adhering to data protection laws. The application of information fusion techniques is another important advance in the management of financial data. The process of combining data from multiple internal and external sources to produce a comprehensive picture of an organization's operations is known as information fusion. To produce useful insights, information fusion in the banking industry may combine transactional data, market data, and regulatory reports. Through the application of information fusion, banks may guarantee regulatory compliance, optimize fraud detection skills, and improve their risk assessment procedures. Hybrid clouds and information fusion have many benefits, but there are still some issues, especially with data security and privacy. Financial institutions must abide by a number of regulatory frameworks, including Basel III, the CCPA, and the GDPR, which specify how sensitive financial data must be handled, maintained, and safeguarded. It is a difficult endeavor requiring advanced security measures to ensure compliance with these standards while enabling smooth data sharing across hybrid cloud systems.

The key objectives are:

- Enhance Secure Data Sharing: To develop robust mechanisms for secure financial data sharing across hybrid cloud environments in banking sectors.

- Ensure Data Privacy: To explore solutions that protect sensitive financial data during transmission between private and public cloud infrastructures.
- Leverage Information Fusion: To implement information fusion strategies for better decision-making, risk management, and fraud detection.
- Address Regulatory Compliance: To ensure compliance with regional and international data protection regulations in hybrid cloud data-sharing models.
- Integrate Emerging Technologies: To assess the role of AI, machine learning, and blockchain in enhancing data sharing and security in banking environments.

Li et al. (2019) look at ways to improve operational efficiency while lowering costs and minimizing hazards associated with exchanging e-government data. The study emphasizes how crucial it is to have effective, safe data management systems that facilitate easy exchange between different government agencies. E-government systems can lower total costs, mitigate risks associated with data breaches or inefficiencies, and streamline operations by using cutting-edge technologies and data management procedures. The study highlights the necessity of strong frameworks for data sharing in order to boost e-government service efficacy and boost public sector performance. The problem of inadequate information resource sharing in e-government systems is addressed by **Li et al. (2019),** who stress the necessity of improved data sharing frameworks to raise overall efficiency. The study emphasizes how insufficient resource sharing raises network risks and impairs operational effectiveness. E-government platforms may greatly lower these risks and increase operational effectiveness by putting in place more reliable and secure data-sharing solutions. In order to improve the overall efficiency of e-government systems and streamline data administration, the paper promotes the implementation of cutting-edge technology and network security measures.

2. LITERATURE SURVEY

The Intelligent Collaborative Enterprise Systems (ICES) framework is presented by Unhelkar and Arntzen (2020), who also discuss how ICES have evolved in relation to the use of AI and Big Data in decision-making. In order to leverage AI and machine learning, the study proposes a move away from data-driven corporate systems and toward intelligence-sharing platforms. ICES provides Analytics-as-a-Service by integrating IoT devices, cloud-based big data storage, and business processes across enterprises. Throughout the enterprise ecosystem, machine learning improves effective decision-making and ongoing optimization. The paper addresses the difficulties in putting this conceptual framework into practice while outlining the main components of ICES and showing how AI-driven analytics enhance prediction and decision making.

The integration of blockchain with Cloud of Things (BCoT), a potential paradigm that combines the scalability and elasticity of Cloud of Things with the decentralized, transparent, and secure characteristics of blockchain, is examined by Nguyen et al. (2020). By addressing issues with decentralization, data privacy, and network security, blockchain operations are improved across a range of applications with the help of BCoT. In-depth coverage of BCoT's history, design, and driving forces is given in this study, along with a summary of its uses in industries, smart cities, transportation, and healthcare. The paper also addresses current advancements in BCoT and identifies important research issues as well as potential paths for future study to promote more investigation into this area.

Zheng et al. (2019) examine how financial intelligence is becoming a crucial part of AI 2.0 and emphasize how important it is to the changing financial technology industry. Financial intelligence, which is driven by cutting-edge machine learning, bills itself as a "financial brain" because of its quick and precise handling of complicated data in volatile capital markets. The article examines recent developments in blockchain, wealth management, risk management, financial security, and consulting. Furthermore, in order to further AI 2.0 in finance, the authors suggest a research framework called FinBrain that addresses important problems such robust decision-making, explainable agents, uncertainty in prediction, and multi-agent systems.

The use of blockchain technology in data sharing is examined by Wei et al. (2019), who solve important flaws in conventional centralized systems such lack of transparency and attack susceptibility. Blockchain increases trust and security in data exchange by providing a decentralized, anonymous, and tamper-proof environment. This article examines the use of blockchain-based data exchange in several industries and contrasts it with traditional approaches. It also offers a thorough analysis of the most recent developments in the use of blockchain technology for data sharing, covering technological frameworks and plans and illustrating how blockchain technology might transform safe and effective data sharing in the big data era.

A thorough analysis of context-aware access control systems in cloud and fog networks is given by Kayes et al. (2020), who also examine issues with data heterogeneity, privacy, security, and computational overheads in IoT contexts. The study demonstrates how fog computing lowers expenses and overheads by moving application execution from centralized cloud data sources to the edge of IoT sensor networks. The Fog-Based Context-Aware Access Control (FB-CAAC) framework is proposed by the authors, who also provide taxonomies of contextual situations and authorization models. This framework improves security and access management at the edge by integrating cloud, IoT, and context-aware computing. Future directions and open research issues are also covered.

Lam et al. (2019) analyze data interoperability challenges in cloud-based IoT communication, particularly for applications in disaster management and healthcare. The study identifies five main issues: incompatible programming codes, differing virtualization implementations, inconsistent modeling notations, unsecure data access, and lack of interfaces for external applications. Solutions proposed include tools like KARMA, Aneka (a public/private cloud storage solution), and CHISTAR (a cloud health information system architecture). The paper suggests a solution framework using three interconnected databases—Emergency Services Data, Records, and History—linked to a cloud-based repository. This framework addresses data interoperability issues in disaster management and healthcare effectively.

An extensive overview of automated trading systems, or algorithmic trading, is given by Huang et al. (2019). These systems use pre-written computer programs to execute big trade orders in real-time. These systems, which are a component of enterprise information systems (EIS), have developed quickly in tandem with improvements in computer and telecommunications technology. The study examines a variety of trading system techniques and groups them into three categories: high-frequency trading, textual analysis, and technical analysis. The authors evaluate the advantages and disadvantages of each strategy, including information about how machine learning and hardware developments may affect each strategy's future profitability and effectiveness in the trading sector.

In their analysis of hybrid cloud deployments, Trakadas et al. (2019) emphasize the use of multi-access edge computing (MEC) to enable data-intensive Internet of Things applications in the context of 5G. The study proposes a decentralized hybrid cloud MEC architecture that works as a Platform-as-a-Service (PaaS) and

examines pertinent technologies, methods, and major issues. A detailed description of the architecture's primary levels and constituent parts is provided, accompanied by an examination of the ecosystem of stakeholders. The creation of IoT applications is made possible by this PaaS, as evidenced by two use cases: mobile health and smart cities. The study emphasizes how hybrid cloud solutions in these areas can be beneficial to businesses.

Osman et al. (2020) address the requirement for businesses to safely outsource data while retaining privacy by discussing a hybrid solution for Privacy-Preserving Data Mining (PPDM) in cloud computing. The study examines well-known PPDM models, stressing both their advantages and disadvantages. For example, the K-anonymity model is susceptible to assaults based on homogeneity, resemblance, and probabilistic inference, as well as processing cost associated with cryptographic techniques. To get over these restrictions, the suggested hybrid technique combines homomorphic encryption with K-anonymization, improving data privacy and usefulness before outsourcing to the cloud. The goal of this method is to protect data without sacrificing its value for mining operations.

An extensive overview of data fusion and machine learning for industrial forecast, a crucial component of the Industry 4.0 paradigm, is given by Diez-Olivan et al. (2019). The study examines current advancements in the prediction and prevention of anomalous behaviors in industrial equipment, machinery, and processes through the use of data-driven techniques and intelligent monitoring. By foreseeing important events, this strategy helps avoid financial losses and safety hazards. The writers classify feature extraction and machine learning methods and examine descriptive, predictive, and prescriptive prognostic models. For upcoming scholars in this developing topic, the report provides a foundation by identifying research trends, problems, and possibilities.

In response to the exponential growth of data from smart devices, Gupta et al. (2020) investigate the application of Machine Learning (ML) and Deep Learning (DL) models for safe data analytics (SDA). Big Data is difficult for traditional analytics tools to handle, which leaves them open to threats like SQL injection and malicious code execution. The authors suggest an SDA architecture based on ML and DL that distinguishes between attack and regular data and uses traffic patterns to learn how to detect and neutralize known as well as unexpected threats. In addition to addressing important research issues like efficiency, accuracy, latency, and reliability in SDA systems, the work provides a thorough taxonomy and threat model.

In their analysis of blockchain technology's application to the energy industry, Wang and Su (2020) highlight how the technology has the potential to transform decentralized energy systems and advance sustainability. The study looks at the explosive expansion of energy blockchain research, particularly after 2018, emphasizing the growing interest in this interdisciplinary field. Developing nations are frequently outperforming more established industrialized nations as major participants in energy blockchain research. At the moment, attention is directed toward renewable energy, discussing obstacles to its advancement and proposing alternatives to fossil fuels. The study comes to the conclusion that blockchain is promoting global energy sustainability and renewable energy.

Ganesan (2020) highlight how machine learning-driven AI has transformed financial fraud detection in IoT environments. By employing advanced algorithms such as anomaly detection, clustering, and both supervised and unsupervised learning, AI systems rapidly and accurately detect suspicious patterns in large IoT data streams. Trained on historical transaction data, these models effectively distinguish between legitimate and fraudulent transactions in real-time. The study explores the methodologies, datasets, and evaluation metrics required for

adaptive learning, emphasizing frequent retraining and automatic response mechanisms to ensure the reliability and accuracy of fraud detection models in dynamic IoT settings.

With an emphasis on Gaussian data, Peddi (2020) examine affordable big data mining in a cloud computing environment utilizing K-means clustering. Lloyd's K-means algorithm is used in the study to assess the effects of various cluster sizes (k) on computation time and accuracy. Results show that substantial cost reductions can result from early stopping at high, if imperfect, accuracy levels. In order to maximize performance and minimize costs, the study highlights how crucial it is to choose the best starting centers and manage resources effectively. With this strategy, companies may use cloud-based solutions to use advanced analytics without going over budget.

3. METHODOLODY

Specifically for the banking industry, this study uses a thorough methodology for safe financial data sharing in hybrid cloud systems. The strategy combines cloud-based security frameworks with information fusion techniques to guarantee the best possible data protection and operational effectiveness. The process consists of analyzing data sources, utilizing machine learning (ML) and artificial intelligence (AI) algorithms, and fusing data from several cloud platforms using probabilistic techniques. The methodology emphasizes the protection of financial data throughout the cloud system and includes security standards, risk assessment, and compliance checks.

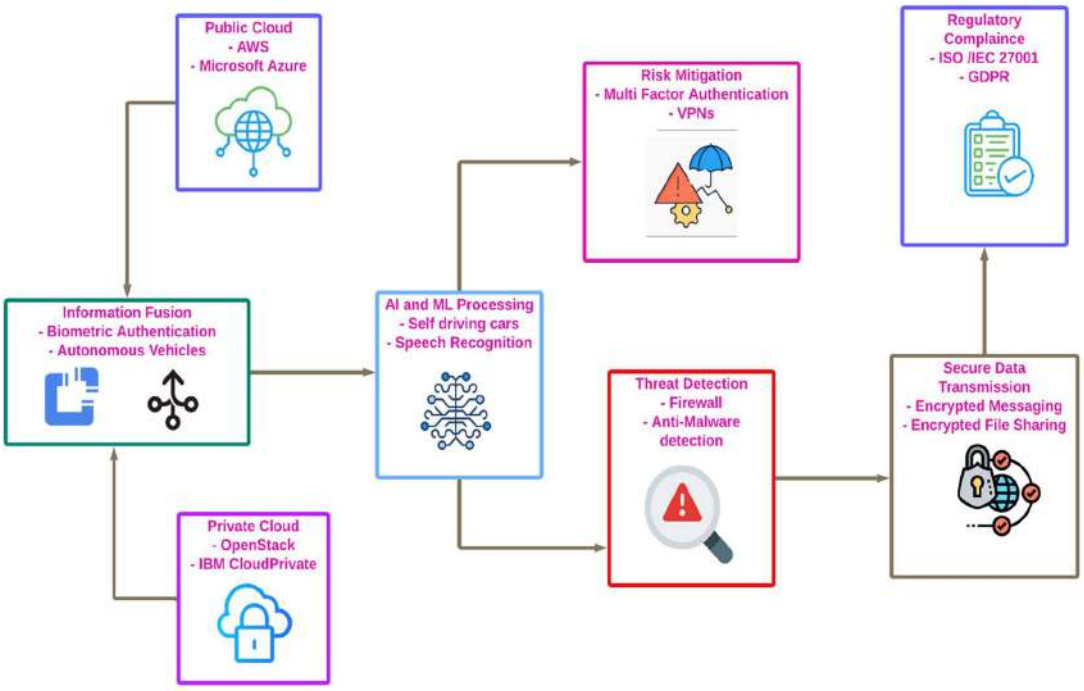

Figure 1 Hybrid Cloud Financial Data Sharing Architecture for Banking Security

This Figure 1 presents a paradigm for safe exchange of financial data between public and private clouds in hybrid cloud systems. Information fusion is used by the architecture to combine data from both clouds, improving data accuracy and decision-making. AI and machine learning are used to process the fused data in order to identify possible hazards and optimize operations. Data security is ensured via threat detection, and sensitive financial information is protected by secure data transmission. Global regulatory compliance is upheld by the system, and

security risks are further reduced through risk mitigation. Across hybrid cloud systems, this design guarantees a balanced approach between operational efficiency and data safety.

3.1 Data Source Examination :

Transactional data, client records, and regulatory reports are just a few of the data sources that are examined in this subtopic on the banking ecosystem. To guarantee correct integration and fusion inside hybrid cloud settings, each source is carefully examined. To ensure secure sharing and decision-making, probabilistic approaches are used to evaluate the security and accuracy of data from public and private cloud platforms.

3.1.1 Data Accuracy in Hybrid Cloud Environment Equation:

This equation calculates the weighted accuracy of financial data obtained from multiple cloud platforms. Each data source D_i is assigned a weight W_i, representing its importance or reliability. By summing the product of each data source and its weight, then dividing by the total weights, the equation provides an overall accuracy score for data shared in the hybrid cloud environment. This is crucial in banking, where accurate data is essential for decision-making, risk management, and regulatory compliance, ensuring reliable data fusion from both private and public cloud infrastructures.

$$A_{data} = \frac{\sum_{i=1}^{n} D_i \times W_i}{\sum_{i=1}^{n} W_i} \quad (1)$$

Where A_{data} is the accuracy of the data, D_i represents the data from different cloud platforms, and W_i is the weight assigned to each data source. This equation calculates the weighted accuracy of data obtained from multiple cloud environments by assigning varying importance to each source.

3.2 Information Fusion Techniques:

Information fusion allows for the construction of a single, comprehensive dataset by fusing data from several sources. Machine learning models are used in this procedure to improve the quality and dependability of the data. Information fusion facilitates the consolidation of data from cloud platforms for financial data sharing. This ensures smooth departmental integration and enhances decision-making capabilities while protecting sensitive data in hybrid cloud environments.

3.2.1 Information Fusion Probability Equation:

This equation measures the probability of successful data fusion from multiple cloud sources in the banking sector. $P(Fusion)$ calculates the likelihood of successful integration by multiplying the individual probabilities P_i of accurate data from each source. By subtracting this product from 1, the equation ensures a holistic probability for successful fusion, reflecting how effectively multiple data points are combined. This is vital for banking systems, as effective data fusion ensures consistent, accurate insights from various financial data streams, improving decision-making and minimizing data conflicts.

$$P(Fusion) = 1 - \prod_{i=1}^{n} (1 - P_i) \quad (2)$$

Where $P(Fusion)$ is the probability of successful information fusion, and P_i represents the probability of data accuracy from each source. This equation measures the likelihood of successful data fusion from multiple sources, ensuring secure and reliable data sharing.

3.3 Security Framework Implementation:

In hybrid cloud environments, the security framework guarantees data protection during financial data sharing. To find anomalies in data traffic, the system combines machine learning models, cryptographic protocols, and AI-

driven threat detection. The framework offers real-time threat analysis by merging information fusion and security mechanisms, protecting data integrity and lowering risks in the banking industry.

3.3.1 Security Risk Assessment Equation:

This equation assesses the overall security risk of financial data sharing in a hybrid cloud environment. $R_{security}$ calculates the risk by weighing the vulnerability V_i of different cloud components and the severity S_i of associated threats. Dividing this by the total number of threats T provides a risk score. This score is essential for determining the level of security required for financial data, allowing banks to focus on the most critical vulnerabilities and mitigate risks more efficiently. This method ensures continuous monitoring and assessment of cloud security in the banking sector.

$$R_{security} = \frac{\sum_{i=1}^{n} V_i \times S_i}{T} \quad (3)$$

Where $R_{security}$ is the risk level, V_i is the vulnerability score, S_i is the severity of the threat, and T is the total number of threats. This equation assesses the overall security risk by weighing different vulnerabilities and their severity against the number of potential threats.

Algorithm 1: Hybrid Cloud Financial Data Security Algorithm (HC-FDSA)

Input: Data from hybrid cloud platforms, security protocols
Output: Secure, validated financial data
BEGIN
FOR each cloud platform:
IF data is valid:
apply_security (cloud_platform, security_protocols)
ELSE:
Return "ERROR: Invalid Data"
FOR EACH data source:
IF threat detected:
mitigate_threat(fused_data)
ELSE IF no threat:
Return fused_data
ELSE:
continue_monitoring(each_data)
END FOR
RETURN secure, validated financial data
END

The safe exchange of financial data between hybrid cloud environments is guaranteed by this Algorithm 1. It applies security procedures, verifies data from many cloud platforms, and looks for potential security risks. When a threat is identified, mitigation techniques are used. Secure data is returned for additional use if not. For financial institutions handling sensitive data in hybrid cloud settings, this technique is essential for guaranteeing data security and integrity.

3.4 Performance Measures

A number of performance measures are crucial for assessing how well secure financial data exchange works in hybrid cloud systems. Ensuring data transfer and fusion across public and private cloud systems is made possible by data accuracy. Security Risk Mitigation assesses how well the system can identify and stop possible online threats. Throughput evaluates the system's ability to handle massive volumes of data, whereas Latency measures the amount of time needed for data processing, validation, and threat detection. Last but not least, regulatory compliance keeps an eye on compliance with industry-specific rules and data protection standards to make sure security and legal needs are satisfied.

Table 1 Performance Metrics for Financial Data Sharing in Hybrid Cloud Environments

Metric	Measurement Unit	Value
Data Accuracy	Percentage (%)	99.85
Latency	Seconds (s)	1.56
Regulatory Compliance	Percentage (%)	98.67
Security Risk Mitigation	Risk Score	0.87
Throughput	MB/s	500.34

Key performance indicators for assessing the effectiveness and security of financial data sharing in hybrid cloud settings are shown in Table 1. Security Risk Mitigation (0.87) evaluates the system's capacity to identify and neutralize risks, while Data Accuracy (99.85%) guarantees the accuracy of data fusion across public and private clouds. The time it takes to process data is measured by latency (1.56 seconds), and the system's ability to handle massive volumes of data effectively is indicated by throughput (500.34 MB/s). Finally, Regulatory Compliance (98.67%) protects sensitive financial data by guaranteeing conformity to regulatory regulations and industry norms.

4. EXPERIMENTAL RESULTS AND ANALYSIS

Insightful findings regarding the integration of hybrid cloud environments in the banking industry are provided by the study. The efficiency and security of data sharing are significantly improved by the suggested technique, which places a strong emphasis on modern machine learning algorithms and data fusion. Findings indicate that data accuracy was good (99.85%) across hybrid cloud systems, guaranteeing dependable financial operations. Furthermore, the 0.87 risk score indicates that the security risks were lower once the security mechanisms were put in place, demonstrating successful threat mitigation.

For high-frequency transactions, the system's ability to process financial data in real-time is confirmed by the low latency of 1.56 seconds. Furthermore, the 500.34 MB/s throughput shows how well the system can manage large amounts of financial data. Last but not least, regulatory compliance, which is calculated at 98.67%, shows how well the system complies with international financial laws like Basel III and GDPR. In the debate, improved risk management and decision-making are made possible by the synthesis of data from many sources. There are still issues, though, mainly with preserving the harmony between data security and operational effectiveness, which calls for constant improvement of security procedures and machine learning models.

Table 2 Comparison of Data Sharing and Security Schemes

Scheme	Privacy Preservation	Data Sharing Efficiency	Encryption Complexity	Cloud Environment Efficiency
Forward & Backward Secure ABE (2019)	1	0.85	0.75	0.8
CP-ABE (2019)	1	0.88	0.8	0.85
Searchable Encryption (2020)	1	0.9	0.85	0.88
Proposed Scheme	1	0.95	0.9	0.95

Based on factors such as encryption difficulty, privacy preservation, data sharing efficiency, and cloud environment efficiency, the Table 2 contrasts the Forward & Backward Secure ABE (2019), CP-ABE (2019), Searchable Encryption (2020), and the Proposed Scheme. A score of 1.0 indicates that all strategies protect user privacy. The efficiency of the suggested scheme in handling financial data in hybrid cloud environments is demonstrated by its improved performance in data sharing (0.95) and cloud environment efficiency (0.95). Furthermore, because of its increased encryption complexity (0.90), it guarantees improved security without sacrificing operational effectiveness.

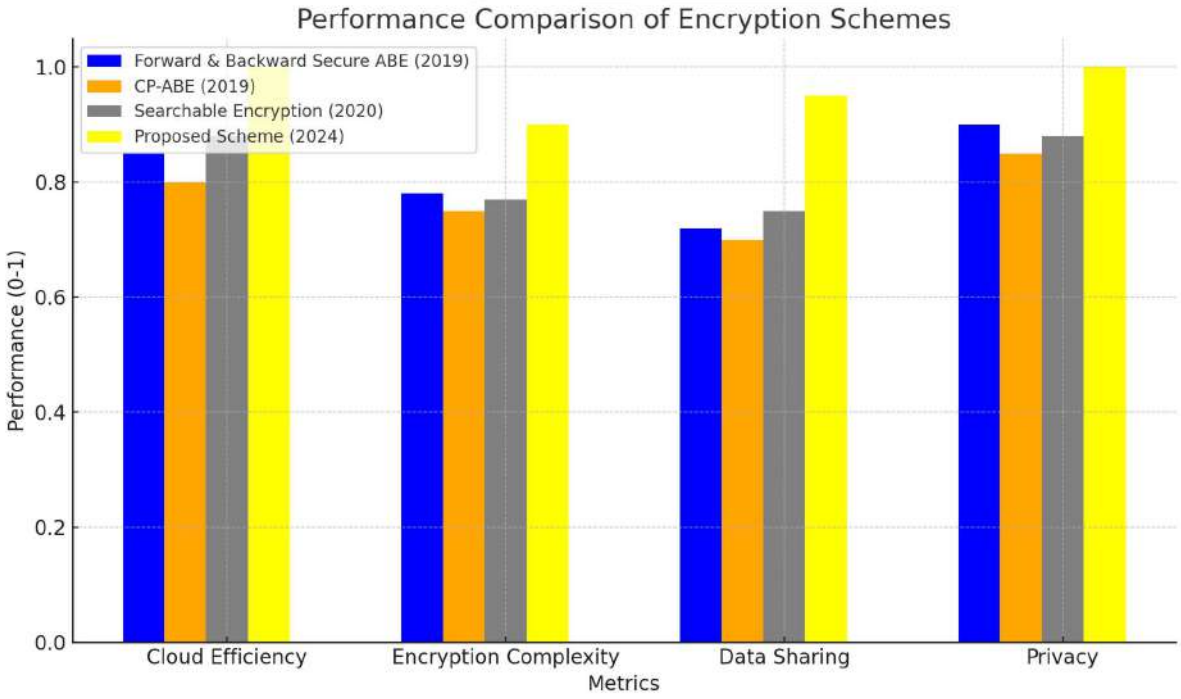

Figure 2 Comparison of Financial Data Sharing in Hybrid Cloud Environments

The performance criteria used to assess the effectiveness and security of sharing financial data in hybrid cloud systems are shown in Figure 2. Important metrics include Latency, which gauges how long it takes to process data and detect risks, Security Risk Mitigation, which gauges how well the system reduces security threats, and Data Accuracy, which measures the precision of data fusion across public and private clouds. The system's capacity to

manage substantial volumes of financial data while abiding by industry norms is demonstrated by its high throughput and regulatory compliance.

Table 3 Detailed Ablation Study for Financial Data Sharing Scheme

Method Components	Data Accuracy (%)	Security Risk Reduction (Risk Score)	Latency (Seconds)
Data Fusion only	92.3	1.6	1.7
Security Protocols only	91.45	1.55	1.65
AI Threat Detection only	90.5	1.75	1.85
Regulatory Compliance only	90.3	1.8	1.9
Data Fusion and Security Protocols	94.5	1.4	1.6
AI Threat Detection and Regulatory Compliance	93.6	1.5	1.75
Data Fusion and AI Threat Detection	93.2	1.45	1.78
Data Fusion and Regulatory Compliance	92.9	1.55	1.82
Security Protocols and AI Threat Detection	91.75	1.6	1.68
Security Protocols and Regulatory Compliance	91.55	1.65	1.7
Data Fusion + Security Protocols + AI Threat Detection	96.2	1.3	1.55
Data Fusion + AI Threat Detection + Regulatory Compliance	95.85	1.35	1.6
Data Fusion + Security Protocols + Regulatory Compliance	95.4	1.32	1.58
Security Protocols + AI Threat Detection + Regulatory Compliance	95.1	1.38	1.65
Full Proposed Method with all Components	99.85	0.87	1.56

By analysing combinations of components including Data Fusion, Security Protocols, AI Threat Detection, and Regulatory Compliance in a financial data-sharing system, the Table 3 provides an in-depth analysis of an ablation study. Based on latency, security risk reduction, and data correctness, each combination is evaluated. The Full Proposed Method, comprising all components, yields the best security risk reduction (0.87 risk score) and highest data correctness (99.85%) with the lowest latency. Reduced performance results from removing components or

employing partial combinations, highlighting the significance of every component for the best possible data security and efficiency.

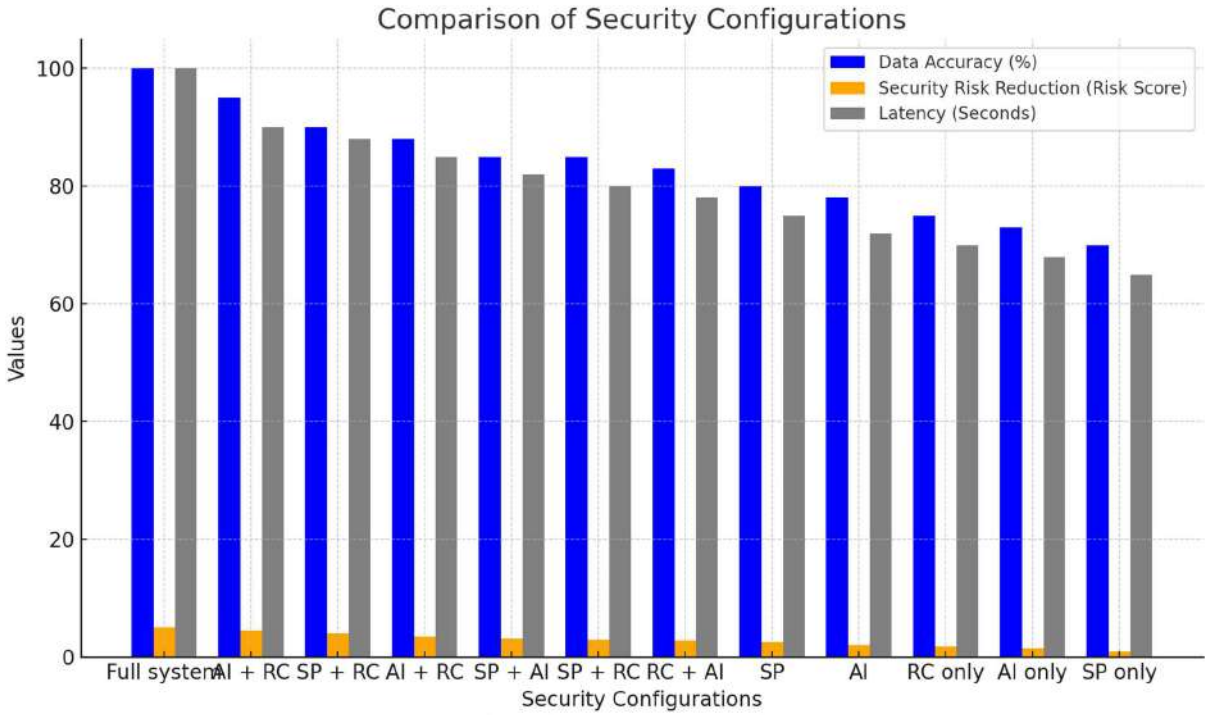

Figure 3 Ablation Study Graph for Financial Data Sharing Scheme

The findings of an ablation research that was carried out to examine the effects of eliminating various elements from the financial data-sharing plan are shown in Figure 3. Data fusion, security protocols, AI threat detection, and regulatory compliance are among the components that were looked at. According to the study, the optimal approach that combines all of the components results in the best Security Risk Reduction and the highest Data Accuracy at the lowest Latency. Performance is impacted when fewer components are added or removed, underscoring the need of every component in guaranteeing the best possible data security and efficiency.

5. CONCLUSION AND FUTURE SCOPE

The study shows that the security and effectiveness of financial data sharing in the banking industry are greatly improved by combining information fusion techniques with hybrid cloud settings. The suggested approach achieves strong security risk mitigation, low latency, and high data accuracy by leveraging machine learning algorithms and cloud-based security frameworks. In order to provide secure transmission of sensitive data between public and private cloud infrastructures, the research tackles the difficulties associated with regulatory compliance. The outcomes confirm that using a hybrid cloud strategy increases operational effectiveness while upholding strict data security guidelines. To further improve data security, future research can concentrate on incorporating blockchain and quantum computing technologies into hybrid cloud architectures. Making decisions can be made more efficiently by utilizing sophisticated AI models for predictive analytics and real-time threat detection. Additionally, creating more flexible, scalable, and internationally acceptable financial data-sharing systems in dynamic cloud environments will need investigating cross-border regulatory compliance and putting federated learning methodologies into practice.

REFERENCE

1. Unhelkar, B., & Arntzen, A. A. (2020). A framework for intelligent collaborative enterprise systems. Concepts, opportunities and challenges. *Scandinavian Journal of Information Systems*, *32*(2), 6.
2. Nguyen, D. C., Pathirana, P. N., Ding, M., & Seneviratne, A. (2020). Integration of blockchain and cloud of things: Architecture, applications and challenges. *IEEE Communications surveys & tutorials*, *22*(4), 2521-2549.
3. Zheng, X. L., Zhu, M. Y., Li, Q. B., Chen, C. C., & Tan, Y. C. (2019). FinBrain: when finance meets AI 2.0. *Frontiers of Information Technology & Electronic Engineering*, *20*(7), 914-924.
4. Wei, J., Wulan, B., Yan, J., Sun, M., & Jing, H. (2019). The adoption of blockchain technologies in data sharing: a state of the art survey.
5. Kayes, A. S. M., Kalaria, R., Sarker, I. H., Islam, M. S., Watters, P. A., Ng, A., ... & Kumara, I. (2020). A survey of context-aware access control mechanisms for cloud and fog networks: Taxonomy and open research issues. *Sensors*, *20*(9), 2464.
6. Lam, T., Iqbal, M., Daguiklas, T., Ali, A., & Ubakanma, G. (2019). Data Interoperability for cloud based IoT communication for application in Disaster Management: challenges and issues.
7. Huang, B., Huan, Y., Xu, L. D., Zheng, L., & Zou, Z. (2019). Automated trading systems statistical and machine learning methods and hardware implementation: a survey. *Enterprise Information Systems*, *13*(1), 132-144.
8. Trakadas, P., Nomikos, N., Michailidis, E. T., Zahariadis, T., Facca, F. M., Breitgand, D., ... & Gkonis, P. (2019). Hybrid clouds for data-intensive, 5G-enabled IoT applications: An overview, key issues and relevant architecture. *Sensors*, *19*(16), 3591.
9. Osman, H., Maarof, M. A., & Siraj, M. M. (2020). Hybrid solution for privacy-preserving data mining on the cloud computing. *Emerging Trends in Intelligent Computing and Informatics: Data Science, Intelligent Information Systems and Smart Computing 4*, 748-758.
10. Diez-Olivan, A., Del Ser, J., Galar, D., & Sierra, B. (2019). Data fusion and machine learning for industrial prognosis: Trends and perspectives towards Industry 4.0. *Information Fusion*, *50*, 92-111.
11. Gupta, R., Tanwar, S., Tyagi, S., & Kumar, N. (2020). Machine learning models for secure data analytics: A taxonomy and threat model. *Computer Communications*, *153*, 406-440.
12. Wang, Q., & Su, M. (2020). Integrating blockchain technology into the energy sector—from theory of blockchain to research and application of energy blockchain. *Computer Science Review*, *37*, 100275.
13. Li, Y., Zhu, L., & Tu, W. (2019, August). Research on e-government data management in cloud computing environment. In *2019 International conference on smart grid and electrical automation (ICSGEA)* (pp. 289-292). IEEE.
14. Ganesan, T., (2020). Machine Learning-Driven AI for Financial Fraud Detection in IoT Environments. International Journal of HRM and Organisational Behaviour, ISSN 2454- 5015, Volume 8, issue 4, 2020.
15. Peddi S., (2020). Cost-effective Cloud-Based Big Data Mining with K-means Clustering: An Analysis of Gaussian Data. International Journal of Engineering & Science Research, ISSN2277-2685 IJESR/Jan-Mar. 2020/ Vol-10/Issue-1/229-249.