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Revolutionizing Financial Services Through Artificial Intelligence (AI): Evidence from Banking, Insurance, and Mortgage Markets

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Abstract
This study provides a comprehensive overview of the transformative influence of artificial intelligence (AI) in the financial services sector. It examines how AI-driven technologies—such as machine learning, natural language processing, computer vision, and expert systems—are reshaping core financial functions including risk management, fraud detection, customer service, credit scoring, and investment decision-making. It further explores the various theories relating to the application of AI in financial services. This study develops an integrated AI-driven conceptual framework that links AI theories, AI technologies or capabilities, and financial sector outcomes across banking, insurance, and mortgage finance. Additionally, it synthesizes on industry practices to highlight efficiency gains, cost reduction, enhanced decision accuracy, and improved customer personalization enabled by AI adoption. At the same time, it critically evaluates emerging challenges related to data privacy, algorithmic bias, regulatory compliance, and systemic risk. The study concludes that while AI presents significant opportunities for innovation and growth, its sustainable integration into financial services sector requires robust governance frameworks, ethical considerations, and adaptive regulatory policies to ensure stability, transparency, and trust in the financial ecosystem.

Keywords: Artificial Intelligence (AI), Financial Services Sector, Banking, Insurance, Mortgage Finance

1. Introduction
The present-day world is experiencing a digital breakthrough driven by artificial intelligence (AI). Artificial intelligence has created a surprise in the world of the sectors of financial services. In financial services, AI has begun to change the way of life, from financial transactions and share investment to credit facility and insurance. AI is being used in a broad range of applications, including entertainment, finance, healthcare, and transportation. Artificial intelligence (AI) in financial services sector uses system rationalizations such as machine learning to automate tasks, analyze data and enhance decision-making. In financial services sector, AI can help financial intermediaries to process considerable amounts of data, make speedy and sounder decisions, and anticipate and mitigate risk. Nevertheless, with the broad application of AI in financial services sector, we are also starting to encounter some recent problems. One major concern is the issue of data privacy and individual rights. The protection of privacy and security of data has become an urgent ethical issue as a result of AI dealing with vast amounts of personal and sensitive data. Furthermore, algorithmic complexity and ethical risks associated with automated decision making are becoming intrinsic element of the discussion around the use of artificial intelligence in a pecuniary context (Ameri, 2024) [1]. People are also laid off and becoming unemployed because of AI which raises questions about employment and egalitarianism. Irrespective of these fundamental shifts, comprehensive and standardized research have become increasingly important. This article aims to review the influence of artificial intelligence on the financial services sector and propose some recommendations. This research becomes relevant in understanding the worthy and complexity of artificial intelligence in shaping the future of financial services sector that is logical and responsive to evolving financial dynamics.

2. Literature Review
2.1 Artificial Intelligence (AI)
Artificial intelligence is a core technology of the current century which is applied in various domains which include voice

recognition, interactive interpreters and search engines (Russell *et al*. 2016) [19]. Artificial intelligence (AI) refers to the reconstruction of human intelligence in machines, enabling them to carry out tasks that ordinarily require human cognitive functions like reasoning, decision making, problem-solving, and learning. It is anticipated to change society through output-maximizing financial effectiveness and efficiency. There are numerous definitions of artificial intelligence. The originators of AI gave the primary definition as "making a machine behaves in ways that would be called intelligent if humans were so behaving" (McCarthy *et al*. 1955) [17]. Kaplan (2016) [13] describes AI as, "The essence of intelligence which can make suitable generalizations efficiently considering limited data. The broader the scope of application, the quicker the verdicts are drawn with rudimentary information, the more intelligent the behavior." In finance, artificial intelligence refers to the application of technological ensemble or arsenal, particularly machine learning algorithms in the finance industry. AI in finance also involves using algorithms and machine learning to automate processes, analyze data and make well-considered decisions in areas like fraud identification, creditworthiness assessment, and customer service.

2.1.1 The Key Components of Artificial Intelligent (AI)

The key components of AI considered in this study include Machine Learning, Natural Language Processing, Computer Vision, and Expert Systems. These key components are considered to be AI-driven technologies or capabilities in financial services.

Machine Learning (ML) - Machine learning is considered as one of AI's most essential elements, as it allows it to learn from supplied data without needing well-defined programming. On the other hand, it makes use of statistical techniques to evolve with experience and time. The algorithms of ML use complex computer modeling to grasp concepts and gain experience. Machine learning is one of the most preferred and widely applied AI techniques in the field of finance. This branch of AI focuses on developing statistical approaches and mathematical formulas that let computers learn from data without being intentionally scripted. The categories of machine learning algorithms include supervised learning, unsupervised learning, and reinforcement learning. One essential approach that is useful in finance is supervised learning where the machine learning algorithm is trained using annotated data along with equivalent accurate outcome. An example is credit scoring where a model can be trained using retrospective data on clients who default payments on their loans to identify causes and trends of defaults. Another approach is unsupervised learning where the data used in training the ML algorithm is not annotated, leaving it to freely recognize patterns and relationships in the provided data. Unsupervised learning can be applied in portfolio management to find collection of stocks that exhibit corresponding traits. As for reinforcement learning, models are refined through trial and error to achieve a specific objective. In trading approaches, this can be useful because a model can ultimately learn to make decisions hinging on the state of the market and optimize returns.

Natural Language Processing (NLP) - Natural Language Processing is the part of AI that centers on recognizing the connections between machines and humans. The objective of NLP is to peruse, decode and comprehend human language and be able to bring out purposeful communications. There are several financial applications of NLP which include sentiment analysis, news analysis, and financial reporting. Sentiment analysis involves examining text data to establish the general attitude of the writer in relation to a distinct entity such as a stock or business (Kalyani, Bharathi, & Jyothi, 2016) [14]. For instance, considering that sentiment can affect a company's stock price can be used to guide portfolio strategies. News analysis is another use of NLP in finance where algorithms are used to examine news articles and other sources of information to find notable incidents or trends that could have repercussions on financial markets. This use of NLP in finance is useful for choosing investments or creating trading strategies. In the financial reporting industry, NLP is helpful because it can be used to extract crucial data from financial statements. The data from NLP can be used to evaluate the economic stability of a company through which investment choices can be made.

Computer Vision - As for computer vision, it is devoted to examining and comprehending visual media, whether videos or images. This component enables AI algorithms to accurately and reliably recognize objects that the machine observes and responds accordingly. The various applications of computer vision include facial identification, diagnostic imaging, automated and partially automated driving. The applications of AI using this model can be equipped to accurately disclose a certain type of object such as a human face, vehicular movement, or the presence of an illness in a medical scan.

Expert Systems - Expert Systems are also an important component of AI in which the software used has access to an extensive collection of information for the purpose of making decisions on a human level. They are typically outlined to solve intricate issues by reasoning through a vast wealth of knowledge. This component has a variety of applications, particularly in the financial services sector, where accurate and prompt decisions are made based on newly learned information. Expert systems have the interest of being transparent because the decision-making mechanism can be tracked, audited, and trained to correctly carry out specific tasks. This component has been applied to financial activities such as fraud detection, investment recommendation, and credit scoring. An example is Credit card fraud detection systems where unusual financial transactions are identified through these expert systems with a blend of neuro-fuzzy systems.

2.2 Financial Services Sector

The term "financial services sector" refers to the group of industries that provide financial solutions to individuals and businesses. This sector is essential for the efficient operation of the global economy by facilitating financial dealings, risk management, and investment. This segment of the economy is made up of a variety of financial firms including banks, investment houses, finance companies, lenders, insurance companies and real estate brokers. The financial services sector is the fundamental driver of a nation's economy. It provides the freedom of capital and liquidity movements in the marketplace. The economy grows when financial services sector is strong where the companies in this industry are more competent in managing risks. This sector plays an essential role in the economy by mitigating risks where several insurance policies and other financial

products help businesses and individuals soften the financial impact of losses. Furthermore, the spheres of activities of the financial services sector directly influence overall economic stability and health. According to Atobrah (2024) [4], investment is the core driver of financial growth and prosperity for individuals, businesses, and nations, aiming to achieve long-term financial stability and sustained economic development. By way of facilitating investment and growth, the financial services sector provides access to investment and capital opportunities which enables individuals and businesses to invest in the future which enhances the long-term economic development of a country (Atobrah, 2025). Investments, both foreign and domestic, play an essential role in a country's economic advancement (Atobrah, 2025). Hence, the sectors of financial services that were considered in this study include banking, insurance, and mortgage finance.

2.3 Theoretical Review

The theories relating to the application of AI in financial services which are considered in this study include machine learning theory, decision theory, constructivist learning theory, bayesian theory, socio-cultural learning theory, big data analytics theory, and automation and efficiency theory.

Machine Learning Theory - This is the foundational theory behind most of the applications of AI in the financial services sector. This theory focuses on the development of algorithms that learn patterns from historical data and improve their predictive accuracy over time (Goodfellow, Bengio, & Courville, 2016) [12]. In financial services sector, machine learning is widely used for credit scoring, fraud detection, and algorithmic trading. Supervised learning models, such as regression and classification algorithms, are commonly applied to predict loan defaults, while unsupervised learning techniques are used for anomaly detection in fraud prevention systems. The adaptability of this theory and its models make them particularly valuable in dynamic financial markets where patterns frequently change.

Decision Theory - Decision theory provides a mathematical framework for making optimal choices under uncertainty. It is particularly relevant in finance, where decisions often involve risk and incomplete information (von Neumann & Morgenstern, 1944) [21]. AI systems leverage decision theory to optimize investment strategies, credit approvals, and portfolio management. By incorporating probabilistic models and utility functions, AI can evaluate multiple scenarios and recommend actions that maximize expected returns while minimizing risks.

Constructivist Learning Theory - This theory posits that human learning is constructed as new knowledge and builds upon the foundations of previous learning (Bada, 2015) [7]. The integration of AI in finance aligns seamlessly with constructivist learning theory, emphasizing the importance of active engagement and knowledge construction by users of financial products and services (Blikstein & Worsley, 2016; Siemens & Long, 2011) [8, 15]. AI technologies can serve as facilitators for users of financial services by providing interactive, problem-solving scenarios and simulations. The application of AI in financial services aligns with the principles of constructivism, where users of financial services and products build their understanding through exploration and collaboration.

Bayesian Theory - Bayesian theory is based on the principle of updating probabilities as new information becomes available (Gelman *et al*., 2013) [11]. This approach is highly relevant in financial environments characterized by uncertainty and continuous data inflow. AI systems use Bayesian methods for dynamic risk assessment, fraud detection, and market forecasting. For example, Bayesian networks can model dependencies between financial variables and update predictions in real time as new data is received.

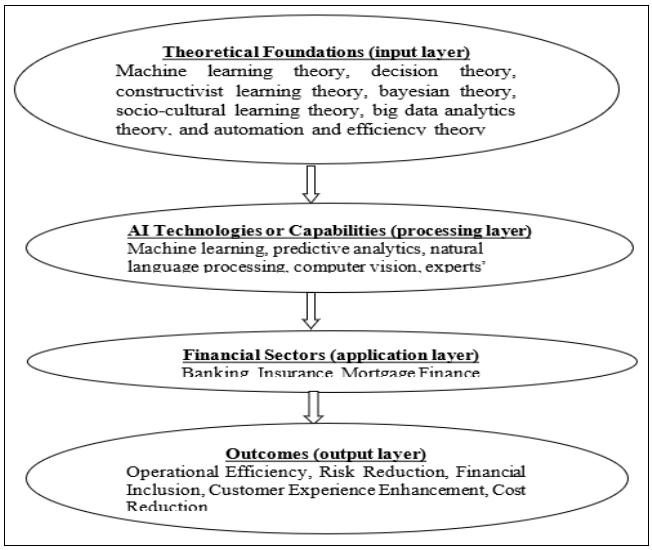
Socio-cultural Learning Theory - This theory, as espoused by Vygotsky, emphasizes the role of social interactions in cognitive development (Vygotsky, 1978) [22]. The application of AI in financial services has the potential to enhance social interactions by providing intelligent agents that facilitate collaborative use of financial products and services (D'Mello & Graesser, 2014). For instance, Chatbots can engage consumers in meaningful conversations, guiding them through problem-solving processes and encouraging collaborative knowledge construction of financial products or services. AI-driven collaborative tools not only enhance communication but also facilitate the exchange of diverse perspectives, leading to the introduction of new financial products and services to meet the needs of the diverse users or consumers within the financial sector.

Big Data Analytics Theory- This theory emphasizes on the extraction of meaningful insights from large, complex, and diverse datasets (Mayer-Schönberger & Cukier, 2013) [16]. Institutions within the financial services sector generate vast amounts of structured and unstructured data, making this theory central to the applications of artificial intelligence. AI systems utilize big data techniques to analyze customer behavior, detect market trends, and deliver personalized financial services. The integration of big data with AI enhances predictive accuracy and supports data-driven decision-making.

Automation and Efficiency Theory - This emphasizes the role of technology in reducing costs and improving productivity. AI-driven automation, including robotic process automation (RPA), has significantly improved operational efficiency in financial institutions. In banking, insurance, and mortgage finance, AI automates repetitive tasks such as data entry, claims processing, and loan underwriting. This leads to faster service delivery, reduced errors, and cost savings.

2.4 Conceptual Framework of the Application of AI in the Financial Services Sector

This study develops an integrated AI-driven conceptual framework that links AI theories, AI technologies or capabilities, and financial sector outcomes across banking, insurance, and mortgage finance. The key components include theoretical foundations as input layer, AI technologies or capabilities as processing layer, financial applications, and outcomes as output layer.



Source: Authors' Developed Conceptual Framework

Fig 1: Conceptual Framework of the Application of Artificial Intelligence

This framework explains how theoretical foundations and technologies of AI influence performance outcomes in banking, insurance, and mortgage finance sectors. The framework posits that AI adoption enhances operational efficiency, risk Reduction, financial Inclusion, customer experience enhancement, and cost reduction.

3. A Survey of Artificial Intelligence in the Financial Services Sector

The study provides a comprehensive overview of the application of artificial intelligence in the financial services sector. The study first introduces the basic description of the components of the financial sector services. The main components of the financial sector services considered in the study are banking, insurance, and mortgage finance. The study then reviews the applications of artificial intelligence in the financial services sector by examining the impacts, challenges and opportunities using real-world case studies.

3.1 Artificial Intelligence (AI) and Banking

Banking refers to the activities and services rendered by financial institutions licensed to manage deposits, offer loans, and facilitate financial transactions. Banking encompasses all financial dealings a bank provides to its customers. Banking plays a crucial role in the economy by facilitating the flow of money and enabling economic activities. Traditional banking model emphasizes personalized service, with in-person consultations and assistance for transactions. The main characteristics of traditional banking include in-person interaction where the focus is based on building relationships with customers through face-to-face engagement. With traditional banking, there is Brick-and-Mortar presence where physical branches are opened for transactions, customer support, and advisory services. It also involves manual processes where services such as the application of loans require paperwork and human interventions.

Artificial intelligence (AI) is an increasingly important technology for the banking sector. When used as a tool to power internal operations and customer-facing applications, it can help banks improve customer service, fraud detection and money and investment management. In today's world, banks have embraced digital transformation initiatives to stay ahead of technological trends, provide valuable services, and increase their competitive advantage. Artificial Intelligence (AI) is revolutionizing the banking industry in profound ways, fundamentally altering the way financial institutions operate and interact with customers. This transformative technology is reshaping the sector through various applications, each with its unique set of benefits and challenges. Financial technology, as a result of artificial intelligence, is helping banks to streamline complex processes and even automate the entire processes, from first contact to day-to-day banking and other financial solutions to meet the expectations of their clients.

3.1.1 Applications of Artificial Intelligence (AI) in Banking

Cyber security and Fraud Detection: The paramount concerns for banks in this increasingly digitized world are cyber security and fraud detection. Xie (2019) investigated the impact of AI in boosting productivity and lowering costs in the finance sector. It was highlighted that the technologies of AI are proving to be essential in reinforcing defenses against cyber threats and uncovering financial wrongdoing in real- time. Machine learning algorithms can analyze immense volumes of transaction data, detecting unusual patterns that may indicate illicit or scam transactions. This preemptive approach safeguards customer accounts and crucially reduces the financial setbacks associated with fraud. AI continues to be a significant tool for being proactive in the battle for data security as cyber threats continue to evolve. On the issue of combating cyber threats in the banking industry, Soni (2019) [20] discusses the role of artificial intelligence in putting an end to cyber threats. The gravity of cyber security was highlighted in banking where AI can enhance security protocols and defensive measures in combating cyber threats.

Data Collection and Analysis: AI plays an important role in collecting, processing, and analyzing enormous datasets. AI models can sift through an ocean of data to extract notable insights and trends which enable banks to make evidence-based decisions. This data-driven approach surpasses customer profiles, and it also embraces market developments, economic parameters, and statutory requirements. The ability of AI to analyze data on a scale allows banks to gain a competitive edge, offering a deeper understanding of their customers and the financial landscape.

Customer Experience: AI is the catalyst for personalization as the keystone of an extraordinary customer experience. The algorithms of AI analyze customer data to provide customized recommendations, product portfolio and financial strategy tailored to meet the needs of individual customers. Such customers receive services that perfectly correspond with their preferences, needs, and requirements as the level of personalization enhances customer relationship building and satisfaction. AI-driven customer service, which is available around-the-clock guarantees that customers can access aid whenever they need it, further elevating their total experience with the bank.

Risk Management: The contribution of AI to risk management in banking is very crucial. AI has the ability to provide continuous risk assessment and advanced analytics which equips banking institutions with the necessary tools needed to steer a progressively complex and dynamic financial landscape. Mhlanga (2021) [18] explored the use of

machine learning and AI in credit risk assessment to promote financial inclusion in developing economies. The author highlighted that the algorithm of AI has the potential to provide more accurate credit risk assessment to overcome the challenges of traditional credit scoring methods. Beyond credit risk assessment and fraud detection, AI supports banks in complying with intricate regulatory frameworks. This is because it can construct and understand manageable risk profiles, as these AI-based systems can assess the likelihood of default and reduce mistaken indications regarding loan origination. Clearly, human intervention will still be the final holdout against failure, but the digital evolution of repetitive assignments can improve the service of quality immensely. The risk of regulatory fines can be reduced as AI helps in analyzing comprehensive datasets to maintain adherence to Anti-Money Laundering (AML) and Know Your Customer (KYC) regulations.

Chatbots: AI-driven chatbots are transforming the way banks interact with their customers to ensure that great customer service becomes the key to banks' growth and stability. By utilizing the use of natural language processing (NLP) and machine learning, chatbots can engage in human-like conversations to enhance the customer experience. Additionally, they can offer individualized responses based on personally identifiable data to make interactions more significant and efficient. The adoption of chatbots through AI is a strategic move to improve customer satisfaction and engagement.

Loan and Credit Decisions: The loan and credit decision-making process in the banking sector has been revolutionized by AI. The models in terms of traditional credit scoring often become inadequate in capturing the full creditworthiness of applicants. AI, however, employs a vast array of data sources, including eccentric ones like social media engagement in order to accurately assess an applicant's credit risk. This exhaustive analysis empowers banks to make responsible lending decisions in order to optimize their loan portfolios and minimize the risk of bad loans. AI also improves the effectiveness of loan origination, minimizing processing times and optimizing the approval process.

3.1.2 Challenges in Adopting Artificial Intelligence (AI) in Banking

Artificial intelligence technology is complex and often scary. It is known that advanced technologies can fix non-automated processes, improve fraud identification, and even help maintain regulatory requirements automatically. But AI is not always the panacea we want it to be. For instance, with the heightened reliance on driven algorithms of AI, the magnitude of customers' confidential information being processed and filed grows excessively. This greater outreach calls for robust measures of cybersecurity to safeguard against cyber intrusions, unauthorized access, and malevolent programs. While banking technologies thrive on data, the quality and significance of the data are equally important as quantity. Indeed, many banks find it difficult to acquire and maintain high-quality data. Incomplete, conflicting, or outdated datasets can lead to suboptimal outcomes and inaccurate AI predictions. The issue of explainability in AI and machine learning models is a complex problem. As these models become more complicated, they frequently turn into "black boxes," making it incomprehensible to understand and construe their decision-making processes. The concerns relating to customer trust, regulatory compliance, and accountability are raised because of lack of transparency.

3.1.3 Real-Time Case Studies of the Application of Artificial Intelligence (AI) in Banking

In the case of JP Morgan Chase, an advanced AI system has been implemented to automate integral aspects of the loan approval process. The traditional process with regards to loan approval is infamously unwieldy and slow, overly dependent on manual data processing. This results in lengthy delays, leading to substantial customer dissatisfaction and increasing operational expenses due to the urgent need for human supervision and management. As a result of the implementation of the advanced AI system, machine learning is utilized to swiftly and accurately analyze various data points which include applicants' credit history, latest transaction information, and current financial practices. This enhances the speed and accuracy of creditworthiness assessments, improves total customer experience by expediting loan approvals and reduces reliance on human-powered processes.

Customer expectations are evolving as a result of digital banking gaining momentum in today's financial world. Financial users now demand customized services which are easily accessible through digital devices. Due to this, Bank of America responded to this digital transformation by launching Erica, an AI-driven virtual assistant designed to improve mobile banking experience. Erica, which is accessible via mobile apps, offers comprehensive functionalities that cater to the modern banking needs of a customer. These involve updating credit reports, handling transaction queries, and providing preemptive financial advice. The capabilities of Erica are powered by advanced algorithms that analyze user engagement and large datasets, enabling personalized and productive service that meets the strong expectations of today's bank customers.

In today's world, money laundering remains a formidable challenge for financial institutions. Systems which are traditionally designed to detect the activities of money laundering often struggle in terms of the complex nature and heavy volume of modern financial transactions. In response, HSBC has integrated an AI-driven system to bolster its Anti-Money Laundering (AML) efforts. This AI-driven system employs advanced machine learning algorithms to analyze many real-time transactions. This advanced system can far more effectively and efficiently differentiate between suspicious and normal activities than traditional systems in order to detect unusual patterns and potential illegal activities. This AI-enhanced approach allows HSBC to improve compliance to overcome the difficulties of modern financial crime and reduce the risk of oversight.

The rising demand for quality customer service can lead to long waiting times and inconsistent service experiences in today's fast-paced banking world. Such variability and delays often lead to customer dissatisfaction, which can negatively affect customer retention rates in the long run. AI-enhanced chatbots has been implemented by Citibank across its technological platforms to address this problematic issue. These chatbots are effectively arranged to address a spectrum of consumer inquiries, efficiently settle typical issues, and offer real-time support. Citibank now ensures a uniform and agile consumer service experience by deploying these AI-powered chatbots.

The detection of real-time fraud in financial transactions presents a key challenge, as traditional approaches often lag

behind fraudsters' sophisticated techniques. This is real in the case of Wells Fargo where it faced substantial challenges in effectively and efficiently identifying and overcoming fraudulent activities. Wells Fargo has implemented an AI-based fraud detection system which employs deep learning and advanced algorithms to scrutinize real-time transaction patterns to prevent fraudulent activities. This advanced system is designed to compare each transaction against a widespread database of known fraudulent patterns, enhancing its ability to make quality assessments instantly and efficiently.

3.2 Artificial Intelligence (AI) and Insurance

Insurance is a financial protection tool that safeguards against unforeseen losses. It involves a contract between an individual (policyholder) and an insurance company (insurer), where the policyholder pays a premium in exchange for the insurer's promise to cover specific financial losses. AI in insurance is the use of artificial intelligence, automation and other enhanced technologies to improve coverage and service delivery in the insurance industry. The insurance industry has always made extensive use of data and algorithms, such as the calculation of insurance premiums, processing of personal and non-personal data in the underwriting process to assess risks and price insurance policies. But AI enhances those capabilities at increased scale and speed. AI-powered technologies can help organizations that are deploying insurance to individuals and companies alike. As such, insurance providers and other organizations within the insurance ecosystem should consider developing several AI-driven initiatives to realize the benefits of this powerful technology.

3.2.1 Applications of Artificial Intelligence (AI) in Insurance

Claims Processing: This is one of the most labor-intensive aspects of insurance. Conventionally, it requires substantial human engagement, from collecting and verifying customer information to assessing claims and issuing payments. The use of AI-enhanced systems streamlines this huge process. This is because machine learning algorithms can sift through data, analyze the validity of claims, and even assess damage through image recognition technology. For instance, AI-enhanced systems can analyze photos of damaged properties or vehicles, compare them to previous cases, and make fast, accurate decisions on whether a claim is valid. This automation minimizes human error, reduces operational costs, and speeds up the claims process. It also enhances the experience of customers where quicker resolutions are made.

Risk Assessment and Underwriting: The core functions of any insurance company are risk assessment and underwriting. The AI-powered systems can improve these functions by analyzing vast amounts of data to create more accurate risk profiles. The utilization of machine learning algorithms makes it appropriate for insurers to assess a comprehensive range of risk factors than traditional systems, especially from behavioral patterns to real-time data feeds.

Fraud Detection: The fraudulent activities in terms of insurance are a persistent issue that costs the industry billions of dollars annually. The use of AI-enhanced systems plays a key role in identifying and preventing fraudulent activities. AI-powered systems have the capabilities of detecting anomalies and suspicious patterns that human agents might miss in analyzing vast datasets. These same systems can analyze the frequency of claims, the consistency of customer data, or even social media activity to detect red flags. In terms of operating in real-time, these systems are effective in ensuring that fraudulent claims are caught before payouts are made which saves insurers both time and money.

Predictive Analytics for Customer Retention: One major challenge in the insurance industry is customer retention. Predictive analytics, powered by AI, helps insurance companies to develop strategies to identify and retain customers who are at risk of leaving. By analyzing several data such as customer interactions, behavior, and policy history, AI can predict when customers may be likely to cancel their policy or switch to a competitor. Insurance firms can then use this information to take proactive steps such as offering special insurance discounts, personalized insurance offers, and improved services to retain at-risk customers. This predictive capability helps to increase retention rates and improves overall customer satisfaction.

Regulatory Compliance: Compliance with regulatory requirements is a crucial challenge for insurance firms, especially in an environment where regulations are unexpectedly and constantly evolving. The AI-enhanced systems can help insurers stay confident and compliant by automating compliance methods and ensuring that all necessary documentation is in place. For instance, the Natural Language Processing (NLP) algorithms can review policy documents to ensure they meet regulatory requirements, while AI-driven auditing tools can monitor transactions for any signs of non-compliance. The automation of these processes can help insurers to focus on delivering value to their customers and reduce the risk of costly penalties.

3.2.2 Challenges for adopting Artificial Intelligence (AI) in Insurance

Insurance companies should anticipate some challenges whenever they incorporate AI in insurance. This is the usage of AI alone can create some data issues. In this present system, AI technology is still improving. Hence, it is possible for AI to make mistakes, such as making inappropriate assumptions about a request or hallucinating data that is not available. An insertion of phantom data or a miscalculation could have a substantial influence in making poor strategic decisions that could arise from such data. The AI models can discriminate, either overcharging premiums or refusing to offer insurance services to certain groups since AI is trained on human datasets. This may result in regulatory concerns if insurance companies fail to take appropriate steps to control any potential issues with discrimination. It is notable for insurance carriers to take adequate steps to protect customer data. It is real that AI can help protect such data but using it on AI external tools could be a violation of certain regulations.

3.2.3 Real-Time Case Studies of the Application of Artificial Intelligence (AI) in Insurance

Insurance companies use financial and credit history, driving behavior, public records, medical records, and demographics to prepare customized offers in terms of the application of AI in insurance pricing. Due to this, UnitedHealth Group (UNH) and Optum Bank developed a big data system for segmenting customers based on their behavior in 2017. This model enabled the insurance companies to create more flexible insurance service packages to meet the needs of their clients. With the use of

AI in insurance pricing, Anthem Insurance was able to utilize insights from data with regards to medical history and provided cost analysis to optimize the cost of insurance services. Munich Re recounted that it has been able to deliver personalized incentives and offers as a result of the implementation of 45,000 models in order to estimate future spending and customer behavior.

In relation to the application of AI in risk management, Elevance Health and the Cigna Group (CI) implemented AI prognostic models for persistent medical conditions to better manage pricing and notify customers of the need for early detection. Insurance firms such as Allstate**,** AXA XL**,** Farmers**,** MetDirect, Berkshire and Hathaway have all introduced advanced analytics of wildfires using geospatial imagery and risk factors which include topography and the proximity of electrical cables to buildings. Additionally, AXA XL implemented the AI Digital Risk Engineer to capture and intelligently process data from connected systems such as ventilation, heating, and air conditioning for the purpose of monitoring the health of assets and buildings.

Allianz introduced the 'Incognito' system for fraud detection in motor claims and home insurance claims in terms of the application of AI in underwriting. The model analyzes distortions in real-life videos, images, and documents. Firms such as Aviva, in collaboration with Tractable**,** announced the use of photos to assess the damage to automobiles and housing in order to acquire accurate remote assessment of repair estimates and increased consistency in diagnosis.

3.3 Artificial Intelligence (AI) and Mortgage Finance

Mortgage finance refers to the process of obtaining a loan, typically from a financial institution, to purchase a property such as a house or commercial building. This loan is secured by the property itself, meaning the lender has the right to seize the property if the borrower defaults on the loan payments. In the mortgage industry, there are AI mortgage services which are manifested through advanced algorithms and machine learning models that power automated decision-making processes. These services ensure faster and more accurate lending decisions as they streamline and optimize tasks such as risk assessment and underwriting. The integration of AI in mortgage lending expedites processes and also enhances the overall efficiency of loan origination. The mortgage industry has embraced AI where it positions itself at the forefront of technological advancement. AI in the mortgage industry is a transformative force which is shaping the future of lending by integrating effectiveness, efficiency, intelligence, and a customer-centric approach. The synergy between AI and mortgages emerges as a catalyst for a more secure, responsive, and personalized mortgage experience as a result of navigating this evolving technological landscape.

3.3.1 Application of Artificial Intelligence (AI) in Mortgage Finance

Automated Document Verification: There are several prominent applications of AI in the mortgage industry and one of them is automating the document verification process. AI-powered models, equipped with Optical Character Recognition (OCR) technology, can swiftly analyze and verify large volumes of documents, including bank statements, pay stubs, and identification records. This speeds up the whole application process and minimizes the risk of human errors associated with manual and other non-automated document reviews. Furthermore, the integration of AI in document verification enhances accuracy by ensuring that the data extracted aligns with the appropriate criteria. This is crucial in evaluating applicants' financial stability and determining their eligibility for a mortgage.

Borrower Risk Assessment: AI instantly quantifies credit risks in relation to a borrower, based on the analysis of their income sustainability, credit worthiness, spending behaviors, and other facts. AI leverages data from all available sources, including non-traditional ones like social media and other platforms to get a comprehensive picture of a borrower credit history.

Intelligent Mortgage Decisioning: AI matches the mortgage requirements requested by a borrower to the pre-estimated optimal price thresholds and coverage limits. This helps in making mortgage decisions as it provides intelligent recommendations with regards to mortgage loan approval or rejection.

Debt Collection Planning and Execution: AI suggests optimal debt recovery approaches based on the analysis of debtor behavior. Personalized reminders on demand letters, due payments, and notices of default (in a textual or voice format) are drafted and submitted to debtors via their preferred communication channels. This makes it effective and efficient in planning and executing debt collection.

Mortgage Task Triaging and Assignment: Mortgage tasks are prioritized by AI based on their expected value, urgency and financial losses associated with non-completion of task. As a result of this, AI-powered models can automatically assign mortgage origination, servicing, and debt collection tasks to the relevant employees based on their qualifications, availability, location, etc. to provide accurate services to meet the needs of individual borrowers.

Dynamic Interest Rate Adjustments: AI enables dynamic interest rate adjustments based on individual borrower profiles and real-time market conditions. Traditional mortgage systems often offer non-flexible interest rates, which may not always reflect the evolving financial situation of borrowers or the prevailing market conditions. AI-driven systems continuously monitor interest rate trends, borrower financial data, and other economic indicators. This allows for real-time adjustments to interest rates, which ensures that borrowers receive rates that are appropriate and reflective of the current market conditions and their financial standings.

Mortgage Analytics: The use of AI-driven models accurately predicts default rates, mortgage demand, mortgage-related revenue, and expenses. The models analyze historical data on mortgage applications, borrower payment patterns, and market-available data on property prices and projected mortgage rates.

3.3.2 Challenges of adopting Artificial Intelligence (AI) in Mortgage Finance

Many real estate financing providers doubt the ability of AI to handle mortgage tasks in an efficient, effective, ethical, and compliant manner, despite the proven advantages of AI in the mortgage industry. This is evident as mortgage lenders must clearly provide an explanation of their loan rejection or granting decisions to borrowers and regulators to ensure fair business practices. The ethical and legal concerns associated with the poor explainability of AI-supported underwriting decisions are raised as a result of sophisticated logic of AI models which can be challenging to break down. In the case of analyzing vast volumes of multi-format mortgage data in real time, AI solutions need

considerable processing power, scalability, and sufficient storage space to seamlessly do so. As a result of this, most mortgage IT infrastructures fail to provide the required capacities.

3.3.3 Real-Time Case Studies of the Application of Artificial Intelligence (AI) in Mortgage Finance

GreenState Credit Union**,** the largest independent financial institution in Iowa, launched an intelligent mortgage solution by Zest. AI for the purpose of enhancing the effectiveness, efficiency and accuracy of its mortgage underwriting processes. This AI-driven solution automates the application processing, borrower risk assessment, and decisioning in relation to mortgage. Additionally, it leverages average borrower data points from various avenues to ensure accurate evaluation of borrower creditworthiness.

Cloudvirga**,** a Californian fintech startup, implemented an AI-powered digital mortgage lending platform for brokers, buyers, and credit officers. The solution offers fully automated mortgage application processing and generation of mortgage underwriting to offer quality services to their clients.

4. Conclusion

In conclusion, artificial intelligence has had an impact on the financial services sector especially banking, insurance, and mortgage finance. Indeed, this financial technology enables financial services sector to improve efficiency, accuracy, and speed of tasks such as data analytics, forecasting, investment management, risk management, fraud detection, customer service and more. AI is modernizing the financial services sector by automating traditionally manual financial processes which enables a better understanding of financial sectors and creates ways to engage customers that mimic human intelligence and interaction. Despite the benefits of applying AI in the various financial service sectors, each of the sectors examined in the study faces the challenges of adopting AI in its processes. The banking sector has employed several banking technologies which thrive on data but the quality and relevance of the data as well as the quantity has been questionable. This is because many banks find it difficult in acquiring and maintaining high-quality data. Incomplete, inconsistent, or outdated datasets can lead to inaccurate AI predictions and suboptimal outcomes. The lack of explainability in AI and machine learning models is a multifaceted challenge in the banking sector. Incorporating AI models in insurance carries its own challenges. For instance, AI is trained on human data sets and these models can discriminate, either refusing to offer insurance to certain groups or overcharging premiums. There may be regulatory concerns if companies do not take adequate steps to curtail any potential issues with discrimination. In the case of mortgage financing, many financing providers still doubt the ability of AI to handle mortgage tasks in an efficient, effective, ethical, and compliant manner.

5. Recommendations

All the financial services sector must invest heavily in cutting-edge security solutions, engage in regular security audits, and make sure that their AI systems adhere to the strictest data protection standards. As the landscape of financial services sector continues to evolve, it is key to maintaining the trust of customers by making sure that the security and privacy of their financial data remain a top priority. Investment is the intended act of any entity or an individual that entails the allocation of money in assets or securities issued by any organization with the objective of obtaining the target returns over a stated time frame (Atobrah *et al*, 2021). Hence, financial services sector must invest in data quality assessment, cleansing, and enrichment processes to provide accurate services to meet the needs of their customers within an appropriate timeframe. Collaborating with data providers and leveraging emerging data sources can also help make sure that AI models have access to the most relevant and up-to-date data for accurate decision-making.

It must be noted that the adoption of AI in the financial services sector is a transformative journey fraught with challenges. Data security, encompassing both privacy and cybersecurity concerns, should remain a top priority, by demanding constant vigilance and investment. Addressing the challenge of explainability will require a combination of regulatory guidance, technological innovation, and a commitment to maintaining customer trust. As the financial services sectors continue to navigate this complex terrain, they must strike a balance between embracing the potential of AI and effectively mitigating the risks and challenges it presents. Only through a thoughtful and strategic approach can the financial services sector fully harness the power of AI to create a more efficient, secure, and customer-centric future. Additionally, the sectors within the financial services must employ ethical frameworks and guidelines when designing and building AI models, with a focus on fairness, transparency, and accountability. For financial service sectors to implement AI in their services successfully, a thoughtful approach that integrates robust data governance with the right tools and clear objectives must be applied. In order to successfully confront the challenges of adopting AI, the sectors within the financial services must embrace collaboration, interdisciplinary research, and stay clued into the ongoing work on academics, policymakers, and industry trends and developments.

6. Scope for Further Studies

The work on this study is limited to only three sectors of the financial services that are experiencing a technological revolution driven by artificial intelligence (AI). It does not account for other sectors of the financial services like venture capital, securities market, pension funds, mutual funds, asset management, portfolio management, etc. Therefore, future research and analysis may be expanded to other financial service sectors not captured by this study for subsequent studies.

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