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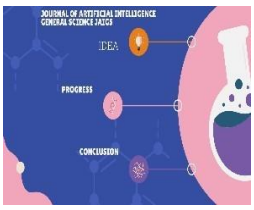

Applications of MachineLearning(ML)-The real situation of the Nigeria Fintech Market

Md.mafiqul Islam[1]
[1]Department of Information Science and Library Management, University of Rajshahi, Bangladesh
*Corresponding Author: **Md.mafiqul Islam**

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ABSTRACT
In the world of technology, machine learning, or ML, is a well recognized word. It is concerning, therefore, when ML models are used in financial institutions. Actually, in order to provide their clients with the greatest experience possible, the Industry 4.0 has pushed them to grow their digital system. The definition and uses of machine learning as well as the current state of the finetech market in Nigeria will be covered in this publication. As aresult, we will forecast how financial institutions will develop in the future and whether or not to employ machine learning.

Introduction

Artificial intelligence, often known as AI, is becoming more and more incorporated into the financial services industry thanks to its subtle capacity to carry out some jobs that humans are not capable of performing, particularly when dealing unstructured raw data. Within the field of artificial intelligence, machine learning focuses on the investigation and development of methods that enable systems to "learn" automatically from data in order to address certain issues (Stojanović et al., 2021).This method's algorithms are computer programs that have the capacity to learn new tasks and gradually enhance performance. Because of its ability to apply automation and data analytics to particular financial activities, machine learning is most commonly utilized in the financial services industry. Machine learning and artificial intelligence (AI) can be used, for instance, in financial analysis and profit margin predictions to increase productivity, lower expenses, and improve overall experience. client encounter. At the moment, research on machine learning (ML), its applications, and its expanding parts of the

Researchers continue to give the economy a lot of attention, since it remains a popular topic. global science (The goal of writing this study is to combine machine learning (ML) models with applications (Kumaret al., 2021). In addition, it provides an outline of Nigeria's Fintech industry, giving the writers the chance to explore the application of ML models in the country.

Review of Literature

Noor et al. (2019) define machine learning in finance as a collection of frameworks and learning algorithms for financial modeling using data, which may be roughly divided into three divisions. One data mining technique for segmenting and lowering the dimension of data is unsupervised machine learning. Principal component analysis and other statistical methods for data reduction are enhanced and expanded upon by unsupervised learning. K-means clustering for portfolio selection is an example of unsupervised learning in the finance industry. Supervised machine learning, on the other hand, refers to either parametric or non-parametric, algorithmic or probabilistic methods of learning the relationship between repressors and regress ands. Statistical approaches like ordinary least squares (OLS) regression and timeseries techniques like auto-regressive models are generalized by supervised machine learning. The premise of supervised machine learning is that the model's choices have no bearing on the input. For non-stationary data, very few supervised machine learning techniques are appropriate; and

A stochastic control technique called reinforcement learning uses feedback to learn a policy based on choices that alter the inputs' state. Stochastic dynamic programming is generalized by reinforcement learning, which is probably the most influential for trading and investment management. Nevertheless, it is the most underutilized approach in finance due to its complexity. The Merton's portfolio problem, optimal trade execution, optimal hedging, and derivative pricing are a few examples of uses in finance.

An increasingly significant factor affecting the financial services sector is machine learning. In this article, we examine the functions and effects of artificial intelligence (AI) and machine learning (ML) in the UK financial services sector. Since 2014, there have been around weekly establishments of new AI start-ups in the UK.4 London is a significant hotspot for AI start-ups, and some of the prominent firms include. According to the Cognition X research, London has twice as many AI suppliers as Berlin and Paris put together.With new supplier formation developing at a pace of 42% yearly (compared with the global rate of 24% annually), London is also exceptionally well-positioned to become an AI and ML leader in banking and insurance (Pramanik & Jana, 2022).

Five elements make up machine learning systems: an issue, a data source, a model, an optimizationalgorithm, and validation and testing. Situations where pattern extraction from noisy data or sensoryperception is necessary are excellent for machine learning. The shift from physically to electronically stored data, increases in memory and processing speed, the ease with which data can now be accessed thanks to the Internet, and the availability of low-cost, high-resolution digital sensors are the four primary factors driving the expansion of machine learning. (Faisal et al., 2021; Levantesiet al., 2021)

Methods: In addition to qualitative analysis, synthesis, and explanatory techniques, the authors primarily

draw on their experiences, observations, and real-world scenarios with case studies of the Fintech industry in Nigeria. With data and statistics from Nigeria, this study also employs dialectical and historical materialism methodologies.

Findings and Conversation

Utilizing Machine Learning Models in Finance

One of the roles of financial institutions is credit scoring. Several studies have mentioned the use of machine learning models, and CART (Classification and Regression Trees) is one of them. According to Allen and Jagtiani's (2021) research on default predictors and credit scoring models for retail banking, it is employed as a discriminating tool when analyzing CART in credit scoring. They discovered some benefits of employing CART in credit scoring in this publication, including its intuitiveness, management-friendly explanations, and capacity to handle incomplete observations (Thanh, 2021).

They came to the conclusion that CART can generate effective models and distinguish between clients who pose a significant risk and those who do not.However, CART can be utilized for prediction in addition to just classifying credit clients. To anticipate loan approval based on factors like age, salary, credit score, and other variables, we can construct a decision tree.

Supporting Vector Machine, or SVMmodel

Supporting Vector Machines, or SVMs, are linear. It is more well-known than other models since it can handle regression issues with an SVM repressor and classification problems with an SVM classifier. But the core of the SVM model—the best technique for classification problems—is the SVM classifier (Kowalewski & Pisany, 2020).

The fundamentals of SVM are linear algorithms that resemble linear or logistic regressions. To categorize data points that belong to two distinct classes, for instance, an SVM classifier builds a line (or hyper-plane, depending on the dimension of the data) in an N-dimensional space. This objective was included in the original SVM classifier, which was created to address binary classification issues.SVM, on the other hand, usesthe concept of margins to make predictions, in contrast to the assumption that linear regression is the most appropriate and best concept of line, which is the predictive line that gives the minimum Sum of Squared Error (using OLS Regression) or Logistic Regression, which uses Maximum Likelihood Estimation to find the best fitting sigmoid curve.

Utilizing Machine Learning for Credit Scoring in Finance

According to Dang et al. (2021), credit scoring is the method by which financial organizations model a borrower's creditworthiness. In order to assess credit choices, this procedure entails gathering, analyzing, and classifying credit variables. In banks' and financial organizations' risk management processes, credit scoring is a crucial step. A high credit score contributes to improved credit quality, which in turn increases bank and financial institution competition and profitability.

Regarding the conventional credit scoring models, it is necessary for prospective borrowers to possess adequate credit data. This strategy heavily relies on the credit officer's subjective assessment. Banks face

numerous hazards as a result of low employee morale or consumer and employee collusion.Therefore,

without information, a credit score cannot be computed, and a potentially reliable borrower is likely to be unable to obtain credit and establish a bank credit history (Agarwal et al., 2021).

Commercial banks are currently adopting machine learning algorithms to help build creditworthiness and willingness to repay loans; hence, lenders can decide whether to issue or deny credit by using credit score models.to candidates.Specifically, a credit scoring model is a technique that rates the degree of risk by calculating the rating scale, which is used differently for every kind of client.Rating instruments that employ machinery

learning are made to reduce risk and expedite loan decisions. Machine learning algorithms have made it possible for a larger, quicker, and more affordable quality segment of borrowers to be eligible at the same time, which has improved credit availability.

The goal of the credit scoring model is to divide potential credit applicants into two groups: those with "good credit," who are accountable for paying back debts, and those with "bad credit," who are not given credit because of a high likelihood of default. The borrower's sociodemographic traits, including age,education, employment, income, and loan type—as well as their prior loan repayment status—determine this classification.

The study of the value of claims to uncertain future payments is known as asset pricing. The timing and payment risk are the two main components that go into valuing assets. Although the impacts over time are fairly simple to understand, risk adjustments are far more significant. For instance, during the past 50 years, U.S. stocks have averaged a real return of around 9%. Interest rates account for only around 1% of the total; the remaining 8% is a premium for carrying risk. Therefore, understanding the behavior of risk premiums is the primary objective of asset pricing; unfortunately, risk premiums are notoriously hard to quantify. Three key factors explain why investors choose machine learning techniques for asset pricing, according to Botcheyet al. (2020).

To begin with, asset valuation is the process by which investors estimate the asset's risk premium.One of the finest methods for predicting an event in general and an asset's risk premium in particular is the machine learning method. Second, the pricing power is diminished by the requirement for a large number of inputs, some of which have a very strong correlation. By choosing important factors to consider when evaluating each asset, machine learning can address this issue and increase the predictability of asset pricing. Third, finding regression models is frequently a challenge for conventional empirical techniques of asset pricing through regression. Machine learning techniques can fix this issue entirely. Specifically, machine learning offers richer functional form requirements and a larger set of possible predictor variables. This resolves the issue of measuring risk premium and makes it possible to conduct more trustworthy studies on the economic principles underlying asset pricing.

Furthermore, the use of machine learning to asset pricing can aid in the valuation of non-fungible and non-identifiable assets (as like assets tend to have similar prices). In this situation, determining asset valuations is challenging because classic valuation techniques like discounted cash flows and comparable frequently have several valuation ranges.

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Fraud Identification

Because machine learning can process enormous volumes of data, including customer methods and transaction trends, it can be excellent for fraud detection. The speed and efficiency of machine learning's analytical process helps to minimize losses and shorten the time it takes to identify anomalous behaviors. Furthermore, since "human error in recording or analysing data is eliminated from the equation," machine learning (ML) helps financial institutions increase accuracy (Morgan, 2022). As long as the model has more data to work with, it will provide more accurate estimates.

Unsupervised machine learning techniques, such clustering and classification, are one type of ML technique that can be used to detect and stop fraud. Email phishing is one form of fraud wherein an individual tries to gain access to accounts containing personal information by tricking recipients into responding to emails containing their details. By analyzing certain elements of an email and classifying them as spam or good, machine learning models can stop this.

Credit card theft and payment fraud are two more scams that ML can stop. The information will be stolen by the thief in order to execute transactions, such as internet transactions.ML models possess the

capacity to spot anomalous activity since they will examine past purchase data from clients, including quantities, locations, and product categories.Financial institutions can fend off cyberattacks by utilizing ML models. Three phases comprise the models: first, unsupervised learning is used to find patterns withclustering models; second, labeling is used to evaluate the patterns to determine the likelihood of cyberattacks; and third, supervised learning is used to train the models to predict assaults in real time.

Executive Summary of Nigeria Fintech Market

Fintech, which is an acronym for financial technology, refers to innovative technology aimed at streamlining and automating the provision of financial services.The finance-banking industry benefits from the favorable conditions that the digital technology with 4.0 Industry has generated to improve financial activities. Since 2008, the State Bank of Nigeria has granted licenses to start Fintech companies, indicating its recognition of the technology sector's potential for growth. The emergence of fintech firms has had a significant positive impact on Nigeria's banking sector and has had a significant impact on the development strategies and business models of established financial service providers.The Nigeriai fintech market has developed throughout the years, and we can list some of its key characteristics here (Mosavi et al., 2020).

Features

The Fintech News Singapore research claims that between 2017 and 2020, Nigeria saw a threefold increase in the number of Fintech businesses.Owing to the remarkable progress and allure of investors, this quantity increased fivefold, rising from 40 organizations in 2016 to approximately 200 companies in 2020. The market for fintech transactions has grown to around $9 billion USD (Nguyen et al., 2021). Nigeria ranked 51st in the world in the 2019 Global Fineable ranking report, which aided in the growth of the Fintech industry in Nigeria as it is a relatively new industry there.Nonetheless, there is a growing trend in the number of Fintech companies and a potential market for Fintech in Nigeria.

Nation	Point	Rank
America	31.789	1
England	23.262	2

Singapore	19.176	3
SouthKorea	11.543	18

China	11.143	21
Japan	11.114	22
Malaysia	9.692	36
Thailand	9.415	39
Philippines	8.831	46
Indonesia	8.658	47
Taiwan	8.321	50
Nigeria	8.118	51

Currently, peer-to-peer (P2P) lending and payments are the two main areas of concentration for Nigeria's Fintech industry. Furthermore, a lot of industries, like securities, insurance services, and soon, are still in their infancy.Payment activities make up the largest share of Fintech services in Nigeria (33%), followed by P2P (15.5%), according to statistics data from FintechNews 2020. To promote the growth of a cashless economy, the government of Nigeria encourages people to switch from cash to electronic payments, which draws Fintech companies to online payment methods. The Covid-19 outbreak is also leading to a growth in electronic payments, and Nigeria is a highly populated country where many people use cellphones and the

Online resources (Soni et al., 2022). According to the SBV for the year 2016, this trend is predicted to continue, with the value of mobile payments in Nigeria predicted to reach 70.9 billion USD in 2020—a four- fold increase over the previous year (ISEV 2020).

At now, MoMo, Payoo, Moca, ZaloPay, and Viettel Pay are the top five cryptocurrencies in Nigeria (Saka et al., 2021). Viettel has specifically introduced the "4.0 Market" in Da Nang. Viettel Money allows buyers and sellers to exchange things without using cash or the internet. This is a new model market where all of the participants are Viettel members who are progressively using Viettel Money to access digital financial services. Viettel Money, a complete digital banking and commerce ecosystem built around MobileMoney, enables users to conduct purchases, sales, money transfers, payments, and other transactions without using cash. swiftly and securely. Viettel has made a significant advancement in digital payments with this (Abbasi etal., 2021).

In addition to payments, the peer-to-peer lending industry is seeing a sharp rise in the quantity of service providers. In 2019, the State Bank of Nigeria performed a survey which revealed that over 40 companies in Nigeria offer peer-to-peer lending services. A significant number of these companies have their origins in China, Indonesia, and Malaysia. A sign of Nigeria's growing Fintech industry is the rise in P2P lending companies in the nation. Unfortunately, there is currently very little reliable information available regarding the loan size, total loan amount, or growth rate of this kind of Fintech company.

The 2010 State Bank Law, non-cash payment decrees, and payment intermediary services guiding circulars regulate fintech's activities in the payment industry. Fintech's payment operations—such as e-wallet and e-payment gateway services, among others—are therefore categorized as providing intermediate payment services and need a State Bank license to operate. Furthermore, Decision 1928/QD-NHNN dated October 5, 2018 on the mode of payment using QR Code states the essential standard "QR Code technical specification shown from the acceptor's side" for receiving payments in Nigeria.

Additionally, the Government/SBV leaves plenty of space for the advancement of financial technology initiatives generally. For instance, Circular 09 of the State Bank, dated October 21, 2020, permits third parties

to offer cloud computing services starting on January 1, 2021; Circular No. 16 of the SBV, dated December 4, 2021, permits people to open payment accounts through electronic means (eKYC), starting on March 5, 2021; Decree 37 of the Government, dated March 29, 2021, permits credit institutions to connect to the national population database, starting on May 14, 2021; Decision No. 810/QDNHNN, dated 11/5/2021 promulgating the Plan on Digital Transformation of the Banking Sector up to 2025, with orientation to 2030; Decision 942/QD-TTg, dated June 15, 2021 designates the State Bank as the primary entity responsible for investigating, developing, and implementing the use of virtual money based on block chain technology.

Limitations

With 141 Fintech companies in 2020, Nigeria will have the fewest among the ASEAN-6 nations (Indonesia: 557, Malaysia: 407, Philippines: 212, Singapore: 1200, Thailand: 227). The bulk of Fintech businesses in Nigeria are tiny, recently founded enterprises, according to the State Bank of Nigeria's 2019 survey report. To be more precise, 44.2% of Fintech companies in Nigeria are in the process of launching their businesses, but they have not yet reached the break- even point.2.94% are in the proof-of-concept stage with no revenue yet, 11.76% have reached the breakeven point, and 26.4% are in the minimum viable product launch (MVP) stage and have revenues in the last six months as of thesurvey's date. 5.88% are in the process of developing a business plan, whilst 8.82% have made a profit.

As per the survey report by Zabala & Ślusarczyk (2020), the majority of Fintech companies in Nigeria are small, recently established enterprises. Regarding the development stage of Fintech companies in Nigeria, 44.2 percent are in the process of starting up operations but have not yet reached break-even; 26.4 percent are in the MVP stage and had sales in the six months before the survey; 11.76 percent have achieved break-even; 2.94 percent are in the proof-of- concept stage but have not yet produced revenue; 8.82 percent have turned a profit; and 5.88 percent are in the stage of developing a business model.

Few suitable institutions exist in Nigeria that provide training in both technology and finance (Hoang et al., 2021). As a result, knowledge of cutting-edge technologies like big data, blockchain, artificial intelligence, application programming, and so on is not extensively distributed in Nigeria. Consequently, foreigners will receive a greater numberof jobs and titles than Nigeriai human resources. Nigeria would lack over 80,000 IT workers by the end of 2019 compared to demand, predicts Nigeriaworks ITECH. By 2020, Nigeria would lack more than 400,000 IT workers, the Ministry of Information and Communications projects.

The pattern of collaboration in Nigeria between Fintech and Banks

A recent industry in Nigeria is fintech. Despite its technological advantages, innovative ideas, and organizational flexibility, it lacks experience in the finance and banking industry, and its reputation and brand are not strong enough to allow it to readily grow into Nigeria. On the other hand, traditional banks are today facing numerous problems as a result of the remarkable innovation of Fintech companies. They won't be able to fully replace banks in the future, but they have had a big impact on their business models, particularly in the payment sector (Moro, 2021). The quick spread and intricate growth of COVID-19 has altered how consumers make payments.

Many specialists believe that coronaviruses can spread infections through the surface of money paper. The World Health Organization (WHO) advises customers to switch from using cash to cashless or non-cash payments, which hasencouraged individuals to use electronic payment systems.Furthermore, Fintech companies are also offering electronic payment services in addition to banks, giving consumers a wider range of options and enticing incentives. The amount and value of non-cash payment transactions increased significantly in the first nine months of 2020, rising by 75.2% and 30%, respectively, over the same period in 2019, according to data from the State Bank of Nigeria. In particular, the amount and value of transactions made through mobile phone channels increased significantly, rising by nearly 125% and 130%, respectively, over the same period in 2019.

In addition, the banking industry in Nigeria is advancing the worldwide movement toward developing a digital banking model, which improves the process of modernizing core institutions, cutting-edge technology tools, and asset digitization (Nguyen et al., 2021). Therefore, collaboration with Fintech businesses is crucial to putting this concept into practice so that traditional banks and Fintech firms can work together to develop banking products and services. As per the State Bank's data, 72% of Fintech companies in Nigeria have collaborated with banks to offer products and services, but just 14% are developing new services and the remaining 14% are prepared to face competition from banks.Reality inNigeria

reveals that the majority of banks now collaborate with a few Fintech businesses to offer their clients payment and money transfer options, including mobile money transfer (smartphones).

Military Telecommunications Group - Viettel collaborates with Military Joint Stock Commercial Bank - MB to execute; Vietcombank collaborates with M-Service Online Mobile ServicesJointStock Company will launch a low-cost money transfer service based on

the MoMo electronic wallet. At the moment, the majority of banks work with Momo Wallet to create e-wallets; VPBank collaborates with Bankplu and VnPay to encourage online banking and payments; VietinBank works with seven Fintech businesses to provide clients with exceptional financial technology solutions (Nguyen, 2020). Along with partnerships between banks and Fintech, the Nigeriai market saw a number of partnerships inside the Fintech sector between 2018 and 2020, including Grab. The most recent announcement of a relationship between Grab Nigeria and Lazada Nigeria was made in November 2020, with the aim of integrating both firms' services on their respective platforms.

Cooperationmodel	**Organization**	**Description**
Banks and Fintechs provideacertaintype of service	VPBankandTimo	Providee-bankingservices
	VPBankandMoca	Providedigitalpaymentservices
	VIBand Weezi	Applicationfortransferringmoneyviasocialnetworks (MyVIB Keyboard)
	TechcombankandFastacash	MoneytransferfeatureviaFacebookandGoogle+on F@st Mobile app
	Vietcombankand M_Service	Remittancepayment
	VietinBankandOpportunity Network	Providingaplatformforconnectingbusinessesascustomers of VietinBank with more than 15,000 businesses in 113 countriesthataremembersofON, creatingeffectivemarket expansion opportunities for domestic businesses with partners. foreign.
	MBandViettel	AllowsuserstomaketransactionsinFacebook'sMessenger app
	CIMBandToss	IssuingprepaidvirtualcardsonTossapp (Customerscan apply for cards on non-bank platforms)
Fintechacquiresa bank subsidiary	LotteCardbuysTechcom Finance (belonging to Techcombank)	ExpandingconsumerlendingactivitiesinNigeria
FintechInvestme nt Bank	UOBVentureManagement (UOB) and TheBank	TheBank,Nigeria'sfinancialcomparisonplatform,received a $5 million investment in UOB's Series A funding round.

Suggesting ways for Fintech and credit institutions to collaborate

Platform as a Service (PaaS): The PaaS concept is presently evolving. Rather than investing, banks might share revenue with Fintech startups by renting out their platform solutions for their clients. This methodology can lower risks, promote long-term growth, and provide win-win outcomes. PaaS systems including mPoS/SmartPos, Merchant Platform, Online/Offline Bank Instalment Conversion Portal, and Next360 All-Inclusive Digital Conversion Platform are available from Nexttech. On the other hand, banks can also offer some PaaS services to Fintech firms, like finance for micro SMEs to grow together and improve customer care, and credit score service systems.

Growing the user base: expanding the range of services offered to end customers via the bank's mobile banking system, including top-up phone, utilities, power, and financial bill payment, tuition collecting, securities, and more. Providing banking services to Fintech's Mobile App and Superapp Platforms at the same time, including online account opening, online savings, loyalty point accumulation, and card opening.

Make the development of information infrastructure a top priority. Revenue and profit will be reallocated to banks that successfully use digital technology to automate processes, develop new products, improve regulatory compliance, improve customer experience, and create new value chains, according to Eggert et al. (2014).The bank's primary goal in the digital transformation process is to build digital capabilities in order to stay ahead of emerging trends.The following six areas show digital competency:(i) Data-driven policymaking

Digital marketing; (iv) streamlining and digitizing banking procedures; (v) applying new generations of technology; (vi) restructuring the organization and altering the decision-making process to support the digital environment. (ii, iii, and

iv). Personalization of the customer experience.A shared data center is necessary to take advantage of the banking system's strengths, foster the efficacy of Fintech banks working together, and preserve the country's financial security.
Customer credit history data that has ever been transacted at commercial banks has been compiled and disseminated by the National Credit Information Centre (CIC).Nevertheless, the bank offers more than simply credit; it also handles other financial services. particularly when the bank links with a third party that offers services and converts from a traditional banking model to an open banking model and a digital banking model. financial services to businesses and private citizens. Thus, in order to properly utilize information sources and, on the other hand, make sources transparent to minimize risks, banks and Fintech companies in the financial industry must share a shared database center. Risks resulting from knowledge asymmetry for banks and fintech while selecting partners and organizing financial transactions. When establishing a project to construct a common data center, it is also necessary to issue an open data standard in order for the common data center to have a dependable and rich source of data (in addition to the current CIC consumer credit data). Through self-development of digital systems or collaboration with Fintechs, information from the open data centerwould level the playing field for banks in accessing digital technology 4.0 while maintaining financial security. the federal government.

Conclusion

Bill Gates is credited with a well-known statement regarding banks from the 1990s: "We need banking, but we don't need banks anymore." In contrast to the above summary of the Nigeriai fintech market, it is evident that Fintech companies are expanding rapidly and making significant strides because they are able to offer a wide range of financial services, potentially dispensing with the need for financial institutions in the future. As a result, Fintech companies will become more competitive than banks and other institutions, encouraging financial institutions to alter their operations through the use of technology. They can select machine learning as one of their effective tools. Financial institutions must thus take into account the adoption of ML models since it affects their ability to continue operating in the future.

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