Utilization of AI Algorithms and Blockchains on Customer Recommendations and Property Transactions

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ABSTRACT

AI algorithms and blockchains are popular in the technological fields including industries like cryptocurrency, Fintech, etc. The research paper dwells into the integration of these two technology tools to fasten property transactions, while increasing customer engagement through property recommendations. Blockchains have yet to be introduced in the real estate industry, making them an exceptional new tool for safe transactions. The data used is derived from a variety of credible sources and is based on the implications of these tools in the real estate industry.

KEYWORDS: Blockchain, AI, Technology, Real estate, AI Algorithms, Property Transactions, Proptech

I. INTRODUCTION

With more than 250 million people using AI as of 2023, the potential of AI tools continues to heighten (Statista Research Department). Solely in the business realm, over 60% of large-sized companies (with over 10,000 employees) use AI (Cardillo). Though the real estate industry is not ranked high for its AI usage, AI plays a vital role with apps like Zillow and Redfin being popular real estate marketplaces. The incorporation of AI in real estate started in 2014, when “Trulia (a real-estate marketplace) presented the first AI-powered lead generation tool for brokers”, creating an increase in customers (Fadina). Later in 2015, RealScout created the first home search tools for real estate agents that allowed them to locate homes that would likely sell quickly and bring the highest ROI (money made on an investment) (Fadina). Property valuation tools are also a major part of AI’s impact on real estate allowing customers to easily determine the value of an asset.

Amidst the rapid technological changes in our current world, AI is a new tool being fused in the real estate industry and will significantly impact property buyers’ and sellers’ decisions and the housing market. With the world pushing for more advancements, the future of the integration between AI and the real estate sector promises an upward progression for an easier seller and buyer experience. Therefore focusing on the future between this combination is an upstanding choice as it can change the real estate market within the nearest decades.

Although advanced technology is relatively new in the real estate world, tools like AI algorithms and blockchains are powerful mechanics, which can upgrade transactions and client experience by minimizing fraud

transactions and displaying the best property recommendations. AI algorithms are the instructions for AI technology to think and react to data in the way humans process information (Coursera Staff). The purpose of AI is to advance technology to process data and make rational decisions without human assistance (Coursera Staff). AI algorithms are the backbone of personalized client property recommendations. On the other hand, blockchain technology is "an advanced database mechanism that allows transparent information sharing within a business network" (AWS). This helps to minimize false transactions, creating a safe environment. The world needs to understand the importance and usage of AI in real estate as it will be incorporated into the future of this industry. To efficiently assist true clients, AI creates a new improved version of real estate for both customers and sellers.

II. LITERATURE REVIEW

"Global market size of AI in real estate is going to grow up to $737 billion in 2027, while the overall AI spending will be $97.9 billion by 2023 which is 2.5 times more than in 2019." (Yevhen Morozko). With this increase in AI usage for around 50% of real estate businesses, AI helps to cut operation costs, while for around 60% of property companies, it will result in a revenue increase (Yevhen Morozko). According to a 2023 study by Statista, around 28% of companies have lowered their costs by 10% by adopting AI (Zharovskikh). The companies studied for this data came from 8 business industries including manufacturing, service operations, marketing, and sales. Companies have also started to use robots for manufacturing services, similar to how blockchains are used for transactions. Popular companies show us the many advantages of AI in the real estate industry with the help of AI algorithms and blockchains.

A. AI Algorithms

Using AI, operational costs can be decreased by AI algorithms by providing customer recommendations, instant customer service, and more. Airbnb can use artificial intelligence to analyze client behavior, create listing summaries, and provide recommendations for the customer. Its use of chatbots also allows for constant customer service and help with booking services. AI algorithms also allow it to protect its customers from spam by removing fake profiles through analysis and prediction by AI. Airbnb has also created a pricing strategy with AI that allows for smooth changes in pricing due to seasonal demands where the simple algorithm changes the rental costs directly instead of needing human guidance (Zharovskikh). With AI being a never-tiring tool, it is on constant guard and serves as the backbone for Airbnb to function smoothly and has been able to decrease operational costs while maximizing revenue and quality.

B. Blockchains

Blockchains are a new tool that is getting recognized and used by companies recently. Blockchains are especially popular with cryptocurrency as it was the digital record-keeping technology behind BitCoin allowing for numerous transactions at once. A study done by Lucas, a researcher from IBM explains that the blockchain used for Bitcoin was developed explicitly for cryptocurrencies and had to be changed

for businesses to implement the blockchain (Justinia). In his research, he explains the key differences in blockchain used for Bitcoin versus businesses. Firstly, heexplains that blockchains are not limited to cryptocurrency or money, but can be used to exchange assets like cars and properties, as well as intangible assets like bonds and securities (Justinia). Secondly, Bitcoin's blockchain is focused on keeping a customer's privacy anonymous, while blockchains for businesses need to know the identity of the participant in the transaction. Lastly, for Bitcoin consensus occurs through mining (a process used to finalize transactions while releasing new coins into circulation), while blockchains for business are based on selective endorsement allowing for certain individuals to verify the transactions (Justinia).

C. The Big Debate: For or Not AI

Although AI possesses numerous advantages, it has its fair share of disadvantages as well. AI algorithms have advantages ranging from reducing costs, high data analysis, and 24/7 availability (Tableau). However, AI has no emotion and creativity which can cause customers to receive a bad impression during service, especially with chatbots. AI algorithms also pose concerns for customers' data privacy, as their ability to recognize patterns can allow them to collect data without any personal information from the customer (Tableau). Furthermore, blockchains' advantages include transparency (meaning anyone can verify the transactions), and immutability (impossible to erase or replace recorded data). These advantages allow blockchains to be more trustworthy and safe than humans at times. Nonetheless, blockchains also have disadvantages. Some of these are the hefty implementation costs for this advanced technology and the uneasy process of data modification (requires rewriting of code and in all blocks) (Budhi). Some people say AI is necessary for advancement, while others prefer to continue with traditional methods, and the debate for AI continues without a certain answer.

Research showing the need for AI in industries and how business industries have included AI to their advantage with cost savings creates a definite image of AI being used in real estate in the future. While real estate apps like Zillow are using AI algorithms to enhance customer recommendations, blockchains haven't been yet introduced to this industry. This places a promising future for the real estate industry to use new AI technology and advance further to be effective and safe. By closing the gap between real estate and blockchains, an easier and improved real estate realm is created.

III. METHODOLOGY

In this advanced world, companies have already started using blockchains and AI algorithms to keep up with the fast pace of society. The technology has been introduced to the real estate sector and is slowly navigating through the advantages of this advancement. Numerous research papers and data sets show the implications, this technology can have to generate greater revenue and save quality time. This can be shown through both qualitative and quantitative data with graphs, charts, and statistics. By including both types of data, one can gain a holistic view of

blockchains and AI algorithms and the abundant need for them in real estate.

A. AI Algorithms

An article by Deepgram.com states the use of machine learning algorithms to minimize fraud transactions, this data is derived from two sources, one of them being Deloitte, the largest professional services network by revenue and employees. The other source is Tobias Adrian, a researcher from the International Monetary Fund (IMF). This data consists of research from over the past five years, giving a reasonable scope, as recent data is necessary, especially for technological figures (DeepGram). The data is not only from two international organizations but it also describes algorithms and fraud minimization, making it an ideal data set for the research. Though the article only contains two samples, other organizations like Capital One and JPMorgan Chase underwent similar procedures by using algorithms to cut down fraudulent transactions (HG Insights).

According to two articles by the University of York, an educational institution, and LeewayHertz, a global provider of generative AI development services, Netflix's recommendation algorithms are at the core of its service. The data used by the University of York is derived from McKinsey, a business management consultant, which performed a research study regarding the effect of recommendation algorithms by machine learning on Netflix and Amazon (Akash Takyar). The data was produced by analyzing user activity from 2006 as Netflix has been experimenting with data since 2006 to improve the accuracy of preference algorithms (University of York). This data was collected through viewer history and session data as they analyzed how often the viewer would watch Netflix's recommended content.

B. Blockchains

Similarly, blockchains have also had a growing popularity with technological companies. A chart created by Block Data, a private equity company displays the adoption of blockchains to valuable institutions as of 2021. This data was collected by reviewing the world's top 100 businesses, in which they were categorized into three groups based on their adoption stage of blockchains. The three different stages were research, pilot, or development phases, and in-production services used by customers, partners, and workers. This data shows how blockchains are used widely, especially to prevent fraudulent transactions (Mae). Similar data sets are shown in an article by the National Center for Biotechnology Information (NCBI). Based on Gartner's research, business management consultant blockchains have been the most popular technology in 2018 and 2019. This data was produced as Gartner analyzed the market industry to find the technology tools that have the most impact on the industry (Mae).

Other sources also list related data. A chart by CB Insights, a private equity company, shows the investment ratios of Sequoia Capital in the Fintech industry, one of the world's oldest and most accomplished venture capital firms. This firm has invested in Instagram, Airbnb, WhatsApp, and Apple. This data is collected from the firm's investment records through public disclosures. Among the sectors, real

estate is a sector they have invested in, showing the combination of technology in real estate (CB Insights). Another source shows the significant use of technology in the healthcare industry. This is derived from NCBI, showing the proportions of research done on blockchains in the healthcare industry. The pie chart is divided based on the years, 2016 to 2020, showing the progressive society with a rise in the usage of technological tools (Zakari et al.). An article produced by SpringerOpen, an academic publisher, shows the review of blockchains for several countries. This data was collected by reviewing historical data for specific countries and also their academic journals (Xu et al.).

Additionally, a source communicates the worldwide spending on blockchains from 2017 to 2020, and predicts for the years, 2021-2024. This data was collected through research by Statista's team regarding the country's access to advanced technology and the budget spent for blockchains for each country. The different investments made by each country are added to find the global spending on blockchains. The graph displays this data for four years and predicts using the previous data set for the next four years (Statista). Another source displays comments on the origins of blockchains to different uses. Previously, blockchains were popular with Bitcoin as they helped transact cryptocurrency efficiently and accurately. Therefore, a huge load of cryptocurrency worth up to 1.5 trillion dollars is transacted monthly using private blockchains to ensure truthful financial transactions. Likewise, large corporations like JPMorgan and Goldman Sachs are using blockchains to transact huge amounts of money within minutes. This data was collected through the data disclosed by both these corporations. This data was provided by Nikhil Sharma, the head of growth at Onyx Digital Assets (Allison).

IV. RESULTS

IMF and Deloitte used past historical fraud data to create machine learning algorithms for the minimization of fraud transactions. The models can easily identify any odd transactions

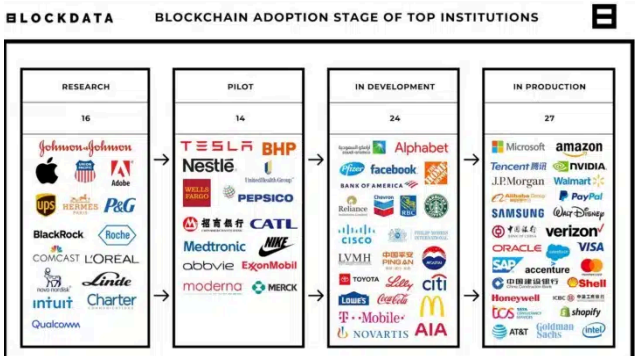
Companies Currently Using XGBoost

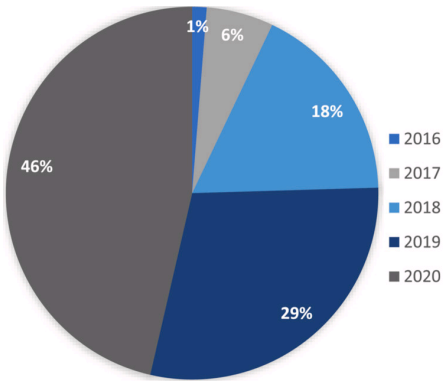
COMPANY NAME	WEBSITE	HQ ADDRESS
Capital One	capitalone.com	1680 Capital One Dr
Cambia Health Solutio...	cambiahealth.com	100 SW. Market St
ADP	adp.com	One ADP Blvd.
Affirm	affirm.com	650 California St
JPMorgan Chase	jpmorganchase.com	383 Madison Ave

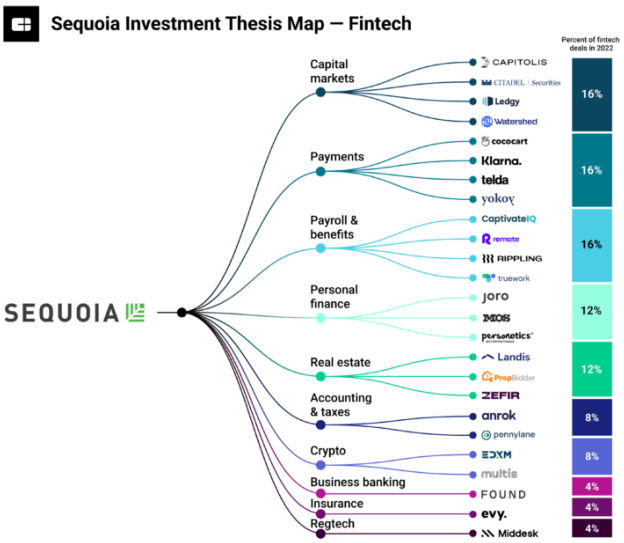
(DeepGram). Many other companies like Capital One and JP Morgan use these types of algorithms. These two companies especially use XGBoost, a machine learning algorithm, that uses decision trees as a base to model generalization. The chart below displays companies using XGBoost, implying that big corporations using algorithms for verified contracts (HG Insights).
In addition, McKinsey data supports the use of algorithms as the company estimates algorithms influence 75 percent of the content watched on Netflix based on personalized recommendations and make up 35%ofr customer purchases on Amazon (Akash Takyar).

Another article displays that 80 percent of viewer activity by personalized recommendations on Netflix. To make this possible, Netflix filters over 3,000 titles at a time using around 1,300 recommendation clusters based on user preferences (University of York).

Blockchains have also progressed a significant amount with numerous companies aadoptingthis technology into their system. The chart below shows the categorization of companies' research in blockchains. With 27 companies in the production stage, it is clear that blockchains are becoming an advanced and a widely used technology (Mae).







The healthcare industry has also used blockchains and the rate of this usage is increasing as time comes. The pie chart beside shows the usage of blockchains from 2016 to 2020. The difference between 2016 and 2020 shows the popularity and heavy usage of this technology (Justinia).

Additionally, Sequoia Capital has invested 12% into the real estate industry, showing how it believes in the integration of Fintech in real estate. As this is a top firm that invested in successful companies like Instagram and Apple, one can predict the success of Fintech in the real estate industry (CB Insights).
Additionally, a researcher confirmed blockchains to be one of the most strategic technologies, ensuring trust between the owner/company and customer through safe transactions (Justinia).

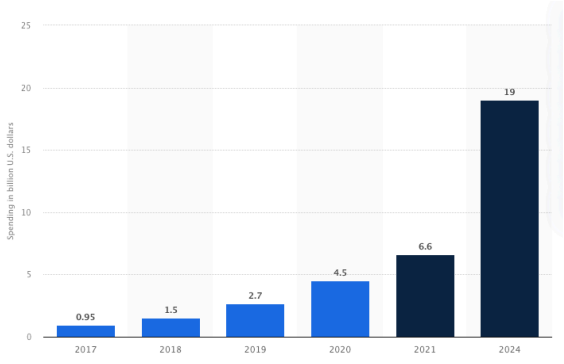
Table 2 Main research countries

From: A systematic review of blockchain

Country	No. of Papers
USA	41
ENGLAND	14
GERMANY	12
PEOPLES R CHINA	11
CANADA	8
FRANCE	8

The chart above presents a source confirming that more countries are aware of blockchains and their potential, showing their use in any industry, including real estate. With the USA in the lead for writing and publishing the most papers on blockchains, one can see the progression and advancement of the USA in terms of technology and the growing knowledge of blockchains worldwide (Xu et al.).

The bar graph above insightfully shows



the spending of the USA on blockchain technology. The sudden predicted growth between 2021 and 2024 is correct with more American companies adopting blockchains and this sudden growth can occur through more knowledge of blockchains (Statista). Additionally, JP Morgan, a multinational American company transacts up to $2 billion using the Onyx blockchain, showing how safe transactions with heavy amounts can be transacted (Allison).

V. DISCUSSION & ANALYSIS

A. Correlation to Research in Field

Based on the results, it is clear that blockchains are not only efficient with fraud detection and prevention, but they can also handle huge transactions. Therefore, the emergence of this technology in the real estate field can cause the potential of this industry to elevate, while also saving time, cost, and energy for both the owner and customer. Especially with around 4 million houses bought in the past year, the value of the real estate industry is evident (Raleigh Realty). As houses range from 100,000 to several million, the transaction value is huge and needs to be safely delivered without any intervention and fraud. Hence, the need for this technology can be highly beneficial to real estate. This technology has also been used in multiple industries like healthcare, finance, retail, and more, showing the widespread use and potential compatibility for its use in real estate.

Furthermore, AI machine learning algorithms can enhance customer property recommendations as these algorithms give recommendations based on the users' preferences. This can be incredibly helpful for real estate agents to find the right property for their customers. Sites like Zillow and Redfin are using these algorithms to provide reasonable properties for their users. While enhancing the users' preferences, the machine learning algorithms adapt to best fit the user, showing the immense capability of algorithms.

B. Comparing Findings with Background Research

The integration of AI is seen in many business sectors, boosting not only the efficiency of the tasks completed but also revising the capability of AI in general. From an overview of the results, it is clear of the immense potential of AI, as well as the progression of AI over the past years. As blockchains are used in other business sectors, they provide a baseline for the usage of this technology in real estate for safe and efficient transactions, shortening the process of these transactions as well.

C. Limitations

However, there are some limitations to the use of AI in real estate as it can never fully replace agents as the emotional connection between the buyer and seller is a strong bond, especially for buyers buying their first home. Additionally, technology is always vulnerable to crashing and hacking by other parties, but it helps with many tasks, saving money and time. AI algorithms also need an abundant amount of high-quality data to present accurate customer recommendations. With poor-quality data or a sparse amount, it can be difficult to demonstrate accurate listings for the user. There have also been ethical concerns regarding the privacy of one's information, and some may not want their personal information to be analyzed by AI.

There are also some limitations to the usage of blockchains. This technology might not be able to handle great amounts of money and might crash due to this. This can also lead to slower transaction times and more financial investment in the blockchain network. The cost to implement this technology is hefty with a high maintenance and initial price due to the advanced software needed. This cannot be affordable by all companies, showing a reason for the possible slow adoption of blockchains.

With the introduction of AI in the real estate industry, there is a high probability of seeing more apps with features like real estate valuation, viewing home listings, and adjusting to match the users' preferences. This will create the use of AI algorithms and blockchain technology, which has yet to be cultivated in this industry. Additionally, other technologies like virtual reality for house tours and 3D printing technology to produce homes can be applied to the real estate industry, which shows the endless potential of AI in this industry.

D. Direction for Future Research

For future research, the use of other technologies in the real estate industry can be studied. As previously mentioned, a continuation of this research can be identifying the use of virtual reality and 3D printing in the real estate realm. In addition, Gen AI can also be researched as it has gained huge popularity with its immense growth potential. Gen AI can be used to predict property values, making different house structures due to its ability to create images.

Research on AI can be applied to other industries as well. As AI is adaptive, each industry has a different use for them, creating new ways to use this technology. Industries like healthcare, pharmaceutical, and manufacturing industries can sufficiently use blockchain and AI algorithms for more efficiency and accuracy in their operations.

VI. CONCLUSION

Due to AI's limitless potential in the real estate world, the integration of tools like AI algorithms and blockchains can be widely used to create a new spectrum in the real estate industry. AI algorithms can be used to efficiently assist customers who are in the process of buying a property. By recommending certain properties through user preferences, these AI algorithms can be tremendously helpful to real estate agents and clients. Blockchains are also tremendously helpful in preventing false transactions and legitimizing the client's transaction for a property. They can be used to fasten the financial transaction between the buyer and seller in the real estate industry. With these numerous advantages of the use of AI algorithms and blockchains, it is evident that AI can create a remarkable journey within the real estate realm, and creativity will only be the limit for AI's use in the world overall.

REFERENCES

[1] Akash Takyar. "How to Build an AI-Powered Recommendation System." *LeewayHertz - Software Development Company*, 7 Apr. 2023, www.leewayhertz.com/build-recommendation-system/.

[2] Allison, Ian. "Don't Tell Anyone, but Private Blockchains Handle over $1.5T of Securities Financing a Month." *Coindesk.com*, CoinDesk, 24 June 2024, www.coindesk.com/business/2024/06/24/dont-tell-anyone-but-private-blockchains-handle-over-15t-of-securities-financing-a-month/. Accessed 16 Aug. 2024.

[3] AWS. "What Is Blockchain? - Blockchaining Explained - AWS." *Amazon Web Services, Inc.*, aws.amazon.com/what-is/blockchain/#:~:text=AWS%20Blockchain%20services%3F-.

[4] Budhi, Veera . "Advantages and Disadvantages of Blockchain Technology." *Forbes*, 20 Oct. 2022, www.forbes.com/sites/forbestechcouncil/2022/10/20/advantages-and-disadvantages-of-blockchain-technology/.

[5] Cardillo, Anthony. "How Many Companies Use AI? (New Data)." *Exploding Topics*, 24 July 2023, explodingtopics.com/blog/companies-using-ai#:~:text=Larger%20companies%20are%20twice%20as.

[6] CB Insights. "Analyzing Sequoia Capital's Investment Strategy: How the vc Is Keeping Its Faith in Fintech." *CB Insights Research*, 21 Feb. 2023, www.cbinsights.com/research/sequoia-capital-fintech-investment-strategy/.

[7] Coursera Staff. "What Are AI Algorithms?" *Coursera*, 15 Mar. 2024, www.coursera.org/articles/ai-algorithms.

[8] DeepGram. "AI and Finance | Deepgram." *Deepgram*, AI and Finance | Deepgram, 2024, deepgram.com/ai-glossary/ai-and-finance. Accessed 16 Aug. 2024.

[9] Fadina, Tetiana. "AI for Dummies: Introduction to Artificial Intelligence in Real Estate." *Ascendix*, 26 June 2024, ascendixtech.com/artificial-intelligence-real-estate-intro/#:~:text=In%202014%2C%20Trulia%20presented%20the,and%20bring%20the%20highest%20ROI. Accessed 10 Aug. 2024.

[10] HG Insights. "Companies Using XGBoost, Market Share, Customers and Competitors." *Hgdata.com*, 2024, discovery.hgdata.com/product/xgboost. Accessed 15 Aug. 2024.
[11] Justinia, Taghreed. "Blockchain Technologies: Opportunities for Solving Real-World Problems in Healthcare and Biomedical Sciences." *Acta Informatica Medica*, vol. 27, no. 4, 2019, p. 284, www.ncbi.nlm.nih.gov/pmc/articles/PMC7004292/, https://doi.org/10.5455/aim.2019.27.284-291.
[12] Mae, Zifa. "Blockchain Adoption – Public Companies That Use Blockchain Technology." *Changelly.com*, 3 Nov. 2022, changelly.com/blog/companies-that-use-blockchain/.
[13] Raleigh Realty. "How Many Homes Are Sold Each Year? 2023 Data." *Raleighrealtyhomes.com*, 2023, raleighrealtyhomes.com/blog/homes-sold-each-year/. Accessed 18 Aug. 2024.
[14] Statista. "Global Spending on Blockchain Solutions 2023 | Statista." *Statista*, Statista, 2023, www.statista.com/statistics/800426/worldwide-blockchain-solutions-spending/.
[15] Statista Research Department. "Worldwide AI Tool Users 2030." *Statista*, 13 Feb. 2024, www.statista.com/forecasts/1449844/ai-tool-users-worldwide#:~:text=People%20using%20AI%20tools%20globally.
[16] Tableau. "What Are the Advantages and Disadvantages of Artificial Intelligence (AI)?" *Tableau*, 2023, www.tableau.com/data-insights/ai/advantages-disadvantages#:~:text=The%20advantages%20range%20from%20streamlining.
[17] University of York. "AI Search and Recommendation Algorithms." *University of York*, 15 June 2022, online.york.ac.uk/ai-search-and-recommendation-algorithms/.
[18] Xu, Min, et al. "A Systematic Review of Blockchain." *Financial Innovation*, vol. 5, no. 1, 4 July 2019, pp. 1–14, link.springer.com/article/10.1186/s40854-019-0147-z, https://doi.org/10.1186/s40854-019-0147-z.
[19] Yevhen Morozko. "AI in Real Estate: How Property Businesses Are Using It." *JatApp*, JatApp, 11 Mar. 2022, jatapp.co/blog/ai-in-real-estate/#:~:text=Global%20market%20size%20of%20AI. Accessed 10 Aug. 2024.
[20] Zakari, Nazik, et al. "Blockchain Technology in the Pharmaceutical Industry: A Systematic Review." *PeerJ Computer Science*, vol. 8, 11 Mar. 2022, p. e840, https://doi.org/10.7717/peerj-cs.840.
[21] Zharovskikh, Anastasiya. "AI in Business: Enhancing Efficiency and Reducing Costs." *InData Labs*, 21 May 2024, indatalabs.com/blog/ai-cost-reduction#:~:text=Around%204%25%20of%20all%20companies.