Research Paper: AI, the birth of a new path

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AI is a marvelous tool that has taken the world by storm, with a variety of uses and can act as a compass which can direct individuals into a larger database filled with knowledge and skills beyond previous limitations. Hence we attempt to explore the effects of AI within the finance sector, a sector that has seen these impacts firsthand and has been known to see different displays and uses of AI for the sole purpose of the improvement of the financial sector and personal finance as a whole, the limitations and challenges that come with as well as the overall benefits that AI is able to influence within the realm of finance.

First we must highlight that AI is one that has been used by multiple companies within the finance sector for a varied uses and for a variety of reasons, take for example the global financial symbols of PayPal and JPMorgan implementing AI and machine learning into developing a fraud detection system or Betterment, another financial sector symbol that is using AI in order to help reduce taxes within transactions as well. Within a small span of time, multiple symbols within the finance sector have been seen to adopt ideas of using AI for their growth, with CEO of PayPal Alex Chriss even going so far out as to mention that they plan to spend 2024 as a transition year to build up using AI.

Now the clear aims that this research paper plans to bring onto the table is one full of raw statistics, ideas, changes etc. on the varied usage of AI in the finance sector

Key Ideas:

1) Applications of AI

- Fraud detection and cybersecurity
- Market predictions and algorithmic trading
- Risk evaluations
- Personal finance tools

2) Real world instances

- PayPal on fraud detection
- Wealthfront and Betterment for personal finance
- BlackRock's algorithmic trading platforms

3) Challenges and ethical considerations

- Possibilities of Bias in AI programmes
- Data security and privacy concerns
- Job displacement and economic instability

This paper plans to encapsulate all these ideas using previously made case studies, surveys, and infographics as well as viable news articles and sites in order to portray these ideas.

I. HISTORICAL CONTEXT

Before diving into the key ideas for this research paper, the historical context of AI within the finance sector will first be explored in order to begin our journey into the impact of AI within the finance sector.

Despite it trending impeccably in the modern era, the term AI was first coined within 1956 within the Dartmouth summer research facility, while the surge for competition between AI amongst companies had manifested all the way within the 1980s, where more than 66.6% of fortune 1000 companies had begun their development within AI.

Yet in 1982, that's when AI's presence was first truly felt throughout the finance sector of the world, when James Simons founded a hedge fund, Renaissance technologies. As of November 2024, this has a market cap of 14.86 billion$, with reverberating effects echoing across the finance sector from that point forward. Many more project like so take place 4 years later such as Dupont investing in 100 expert systems, saving him 100 million$ that year or APEX becoming the first system for financial plans.

In the 1990s, the mitigation of fraud detection had suddenly become a fad of sorts, here enters a new financial AI system, the FinCen Artificial Intelligence System or FAIS for short, this system was able to review over 200,000 transactions a week. Being able to check over 400 potential money laundering cases over 1 billion$.

Entering the 21st century, huge developments within AI for the realm of finance were made, such as in 2003 where rule-based system for financial intuitions for corporate loans were made by Hodgkinson and Walker or in 2013 where Janulevicius and Goranin

developed a similar system made specially for small and medium sized companies for data research on security threats. Even though expert systems don't exist within the realm of finance anymore, these are considered as an ignition for AI within finance and the modern world.

AI has become more impactful near the end of the 2010s and the beginning of the 2020s, where a study had been conducted which implies that as of 2020, there were around 52% of financial services having AI implemented processes, within each one to provide quick outputs towards any financial advice that had been requested. In 2023 as well, AI had superseded itself within FinTech, with their AI's market size growing to 11.89 billion$ with the industry's overall AI spending being at 35 billion $.

The future of AI continues to carry heavy expectations with it as Accenture predicts AI augmented technologies to aid in financial services with a value of over 140 billion$ of output, within the financial sector by the year of 2025. Even traditional financial institutions are to soon be shown to have an overall 1 trillion$ cost reduction from AI in 2030. AI's value has also been predicted to enhance from billions to trillions within a decade as Accenture also reports that AI is set to boost the financial industry to 1.2 trillion$ in the year 2035.

AI in finance had been adopted for 3 obvious reasons, their endless abundance of data, their ability to comprehend different problems and to make improvements at rapid speeds.

II. FRAUD DETECTION AND CYBERSECURITY

This research paper commences with the first key topic being about AI's ability to enhance fraud detection and cybersecurity, some examples of AI being used in these ways can be seen with PayPal implementing machine learning into their system in order to improve against potential money laundering attempts from scandals that utilize AI in order to participate in these events. Fraud is considered as a heavy challenge against finance as a whole with 1.08 billion dollars being stolen within the year 2023 itself, proving to be a tedious task for AI to help mitigate.

By doing this, fraud must be understood by the various types they come under and what exactly they do, these three types are sign up fraud, login fraud and payment fraud.

AI's current abilities and progress within fraud detection involve its use of machine learning in order to make timely analysis of the situation where fraud has occurred for a particular user, first through the improvement and increased implementation of AI within fraud detection.

AI is able to make an impact within fraud detection due to the real time transaction monitoring, AI's behavioral analytics towards fraud detection and detection of payment fraud through large amounts of databases. AI is also evolving towards a state where it is able to track consumer spending patterns in order to understand whether fraud is occurring or not in order to take action. Increased use of AI driven financial products has also installed these features in order to mitigate fraud as well, AI also looks forward to seeing a surge of AI involved platforms which consider automated wealth management in order to avoid incidences of fraud as well.

Machine learning technology is hence given great importance when considering the implications it brings onto this task, this is starting to prove itself as 18% of pros count the use of machine learning in anti-fraud fights in their fraud detection tools where a separate 32% plan on using this technology within the span of the next 2 years. These stats show the use of these programs being nearly tripled for fraud detection by the end of the year.

Biometrics and robots have slowly seen a steady rise in their demand for fraud detection from 2019 as the use of physical biometrics had increased to 14% within 2019. Uses of these technologies are often seen within banking and other similar financial services, where 51% uses physical biometrics whereas another 33% use robots.

AI specializes in the following when considering its effectiveness in fraud detection

- Transaction analysis: Where AI is used to analyze the spending methods of consumer behaviour relatively quickly in order to find suspicious behaviour on an account, a study by SAS shows AI being able to find 500 transactions per second in order to implement transaction analysis which later follows into saving significant losses
- Authentication and verification: AI verification processes often undergo instances of reducing payment fraud through ensuring tha the transaction is being done by the account that it is supposed to be done by the account owner. AI is able to process around 95% of biometric verifications within less than 10 seconds

- Data collection: A function of AI used widely, beyond finance as well but in this instance, is used in order to collect multiple sources of behavioral data within transactions and apply it to its other functions
- Machine learning: Algorithms are trained in order to help recognize changes in spending patterns, supervised learning datasets are also used to check the difference between legitimate and fraudulent transactions with increased training by tracking historical data from the account. Machine learning can do this by putting a risk meter for fraud detection as well, with a risk score on a scale of 1-100, where the higher the score, the higher the risk.

The use of AI of fraud detection often lies within different cases that relate heavily to finance, being able to diversify itself as well, fraud detection of AI thrives most in situations such as banking and financial services, within e-commerce for customers as well and within virtual economies. This is due to one common factor that resides amongst all three cases which is that they all require a digital presence, making it easier for the AI to be able to track it as well.

Benefits of AI:

AI in fraud detection also brings a numerous amount of benefits such as its improved efficiency in being able to track down fraud and the accounts that have been affected by it as well as the scale at which it continues to be applicable to as the more transactions that are made, the more the scale that the AI measures it upon grows with it as well.

AI also has the advantage of being able to last 24/7 and track transactions in real time, hence making detection much more efficient and letting the response towards fraud be executed at a faster rate.

AI's capacity to analyze different data also lets there be more accuracy within its responses and reporting it more easily in order to take action against fraud, AI is more likely to make less mistakes due to its wide range of information in comparison to us humans, hence making it much more efficient to track down the different spending patterns and transactions more easily than a human could.

The main benefit with AI being used in order to aid against fraud through fraud detection is its ability to adapt using machine learning, as with each transaction, AI is able to apply new tactics and ideas onto identifying fraud and how it can be mitigated as well, adapting to patterns by scammers.

Challenges:

The efficiency and ability for fraud detection to be worked upon depends on the ability of the AI to collect and store data, if it is unable to then data can remain biased or incomplete when going over fraud detection. The quality of data within AI can also prove to be insufficient in order to track fraud if the spending patterns are similar which is what machine learning is often dependent on. Privacy concerns and different regulations regarding how available data can be also arises, causing different ethical issues when using AI to track spending patterns.

Fraud tactics also improve within the time it takes for an AI to properly analyze the patterns that occur with fraud, fraud detection hence becomes harder with machine learning as it will be forced to adapt to different fraud patterns but not quick enough before fraudsters can change their patterns to other ones in order to avoid fraud detection.

Integrating AI into different fraud detection systems where legacy systems may not be compatible with AI and its machine learning, the integration process in and of itself utilizes a vast range of resources as well while the functionality of the system can be downgraded during this transition period, resulting in fraud becoming more present without being able to track it as efficiently as before.

Another major drawback about AI is that it is common within being used for fraud as well, being used as deepfakes in order to take over different accounts that require biometrics in order to sign in, AI can also grow in order to combat against AI being used for fraud detection considering that it has been implemented earlier, giving it more time to analyze different possible patterns for fraud detection. Deepfakes regarding AI has shown to have an increase of 2137% in fraud attempts across the past 3 years as well with the implementation of AI in fraud.

III. MARKET PREDICTIONS AND ALGORITHMIC TRADING

The stock market is all the rage when people start considering what to do with their money and income, or rather when discussing the various income sources possible for them to generate money the fastest way they can think of. Stock markets also present themselves as a source of money that can be very versatile or a liquid form of money, acting as a current asset for people and even shares of different companies being able to act as collateral depending on their value.

A combination of two rising giants would hence make a large ripple in the realm of finance as a whole with the effectiveness of AI and the versatility and liquidity of the stock market, yet what are some of the main components that AI plays within influencing stock market predictions and making algorithmic trading more possible for people to learn from as well as for AI to allow people to make a profit out of these predictions and trading. Another thing to mainly discuss is the progress and impact that AI has made onto market predictions and algorithmic trading, hence influencing the direction at which this section of the research paper aims to explore.

Features

AI as of current is able to make long lasting impacts onto the market and through algorithmic trading through features such as the ability to operate in real time and analyze data within that time span. Normal algorithmic trading systems are capable of processing data within the stock market across regulated boundaries and directions. AI enhanced systems on the other hand have the ability to work with encapsulating new data by the minute, trading with AI also allows it to be used as a type of monitoring tool as well in order to view and predict changes in the stock market. AI uses natural language processing in order to determine the best decisions and enable full efficiency in market predictions.

AI also makes trade more efficient by eliminating possibilities of human error within the decision-making process, AI can do this by using natural language processing or NLP for short by eliminating unnecessary information and segregating the useful information from it in order to make these decisions. By doing this, AI is able to minimize the effect of human bias and error when entering the stock market. Algorithmic trading with AI is boosted due to AI powered systems being more efficient by executing more trades, analyzing vast amounts of data rapidly for the traders to make a more informed analysis, mitigating possible risks in portfolios and evolving in different environments as the stock market fluctuates, by evolving into different environments. Algorithmic trading is able to use these features in order to make more efficient and informed decisions for traders to execute.

Scalability in AI is one last feature that truly makes AI within the stock market lethal, using traditional trading as an example, the number of trades that traders can do through monitoring each trade is relatively time taking and inefficient but with AI, traders can extend to numerous markets at a faster rate with a large amount of data when entering those markets, making the level of activity within the market much more efficient and with more execution.

Statistics regarding the impact of AI on the stock market

The AI global market is often the first thought that comes to mind when discussing the impact of AI on the stock market as a whole, yet in this section this paper also aims to tackle how algorithmic trading has developed a progression into the financial sector through various different case studies and statistics in order to determine the effect of AI in such a way.

Now the global AI market for reference is predicted to be at 1.81 trillion$ by 2030, becoming a major factor concerning the increase in AI within algorithmic trading platforms, that started to rise in 2017. Increase in AI within these platforms spiked in 2019 with a 19% increase in AI elements within algorithmic trading platforms and then with a wave striking, showing over 50% increase in these elements from the 2020s, marking the development of AI in algorithmic trading programs. Though they remain smaller compared to other ETFs (exchange traded funds), AI has seen a surge in the increase of their ETFs within March 2020 to be allowed, AI driven ETFs also operate within once a month, contrary to normal ETFs that do so in a year, creating a more liquid market as well.

Institutions with high standing in the financial sector also see reason as to how AI can make an impact into algorithmic trading such as JPMorgan leveraging the use of AI for market segment analysis, portfolio management and optimization as well as risk management.

Goldman Sachs also acts as an investor into the potential AI can bring into algorithmic trading and market predictions by employing different AI algorithms to streamline in a high frequency for quality trading, these systems were deployed to help Goldman Sachs to minimalize their losses when in volatile periods using risk management. Renaissance technologies had also adopted ideas of using AI within the stock market by relying on its Medallion fund, a fund run by AI in order to analyze complex data and process it at high speeds, by using machine learning, the fund now identifies different patterns within the financial markets to contribute to a more sustained ROI (return on investment) by reducing human error.

Challenges of using AI in algorithmic trading

Certain challenges that arise when inputting the capabilities of AI into algorithmic trading systems involve the following

- Risks of investing and overlifting: This occurs due to losing money potentially due to investments within securities and other financial products and a loss of generality which can contribute to a poor performance and a decrease in decision making due to being unable to respond to rapid fluctuations in the stock market
- Hacking: Algorithmic trading programs that use AI are susceptible to hacking, manipulating these programs to cause for unprofitable trades and losses for investors and traders alike
- The Black Box: This process involves the opening of complex algorithms, making it difficult for traders to comprehend the reasons behind a particular decision, a lack of transparency with AI causes traders to trust it less, by not being able to understand it, traders won't be able to trust AI.
- Insufficient or the quality of data is lacking: When AI encounters poor quality of data, this can affect the decision-making process for an AI within the stock market, causing it to make bad decisions that ultimately end up in a loss.

IV. RISK EVALUATIONS

Even in previous sections, a key factor about the ability of AI to prove its efficiency within aspects of finance often involve AI being able to thrive within analyzing the different risks that may occur within different situations and plans as well.

Risk evaluation often takes up personas that involve to oversee details that the normal human wouldn't be able to do when using AI, such as minor trends and shifts in patterns within the stock market. AI is able to achieve this by using machine learning models yet again to assess and enhance the accuracy of predicting risks, such as those with credit, and the ability of financial institutions to assess credit.

Studies have even displayed a 40% increase in organizations within increasing their investment in AI in order to continue with advances in gen AI, by employing different AI for risk evaluation, they are able to showcase their ability to analyze the financial market and predict market volatility much more efficiently compared to that by humans, with a large and vast database, AI can easily respond to any changes within the market and develop new patterns for it. Services regarding AI hold around 39.64% of AI market share within 2022, increased investment into AI makes it much more of a necessity in order to increase efficiency in risk evaluation.

Tools

Some tools regarding AI's ability for risk evaluation involve the following

- Anti money laundering compliance (AML): This AI application is used in order to scrutinize and detect any suspicious transaction patterns, AML is used in order to improve the speed and detection towards assessing client databases globally. By using AML, banks improve their ability to check for suspicious activity by 40%.

- Risk management in insurance: AI uses its large database in order to assess the risks that a client portfolio may have and assesses the possible write-offs and decisions it might be able to give to customers and clients. AI is able to assess risks more easily due to this process. AI is now able to reduce the time to assess risk within insurance by 90% and is reported to have a 25% increase in the accuracy of their predictions. AI underwriting techniques also decrease costs by 50%

- Portfolio risk optimization: A clear feature that AI is able to use in order to control the risk management within portfolios is through asset allocations by judging different trends, economic indicators and the company's performance. AI can hence shift from safer to more profitable yet risky assets by analyzing these market trends. 91% of managers already consider (54%) or plan to (37%) utilize AI within their asset plans. A study in 2023 finds that a use in AI for portfolio management reduces portfolio illiquidity by 10%.

V. PERSONAL FINANCE TOOLS

Finance, the first thing that arises to ones' mind with this word is their capability and capacity to earn and store money, whether it be for a company or for a local man on the street, finance always boils down to the ability of an individual to maintain their own personal finance. With the growing prospect of AI becoming more inclined within completely managing financial burdens that take too long to check manually.

When considering the ability of AI to utilize and manage personal finances, talking about personal finance brings up two key topics to discuss about,

regardless of AI involvement or not which are the ability for an individual or individuals within budgeting and the same ability within investments. After analyzing these key factors, the ability for AI to execute these requirements to the fullest, truly display the ability for AI to act as efficient personal finance tools. So far, it seems that the adoption of AI within financial functions have increased from the past year with 58% using technology from a previous 21%.

Budgeting

AI tools that involve budgeting are of different varieties such as automated budgeting, predictive analysis, rocket money etc. The three tools that will be explored when considering the ability and efficiency of AI within personal finance and within budgeting will be automated budgeting, personalized budgeting and credit monitoring tools to tackle different aspects of budgeting and determining the ability of AI to satisfy such requirements.

- Automated budgeting: Automated budgeting with AI is the ability to make personalized spending and saving patterns and tailor them to the income that is generated, AI is able to do this by analyzing different consumer patterns and linking it with their income which is done through machine learning algorithms, used to inform customers about their spending and saving habits to help give a complete overview about their financial situation.

- Personalized budgeting: AI can enhance the personalized budgeting of an individual by controlling the data from the individual's spending patterns and their income streams, this form of budgeting allows AI to make more empowered decisions after taking these factors into account. Using AI for personalized budgeting allows an individual to make a more informed decision rather than that of a more proactive one. This tool also allows AI to make different savings plans and decisions for the individual based on their income and help make informed decisions about the amount of income that is to be saved. This tool has been predicted to accumulate 2.16 billion$ in 2028 at the current annual compound rate (9.99%)

- Credit monitoring tools: Like many other financial applications of AI, credit monitoring tools install machine learning in order to evaluate an applicant's database against the other patterns that the AI has learnt over training, this occurs when a credit application is received by the AI system. This helps to generate a score that can make the customer notified about their credit and their credit worthiness, giving customers new ideas about how credit scoring may work for them as well.

Investments

During managing the income that is generated by an individual, ideas that often come to mind are the amount that they need to spend, save, and invest and the need for that individual to spend, save and invest. After covering the ability of AI to manage the spending and saving of income by an individual, specific tools that can cover the ability and the amount that can judge the ability of an individual to invest will now be looked upon. Like with budgeting, a lot of common tools arise when considering AI tools that are capable for investing, yet the three that will be used in order to determine the efficiency of AI within personal investments will be through sentiment analysis, factor investing and debt management.

- Sentiment analysis: This refers to the ability of an AI to evaluate and identify large trades and high-speed trades within the market using natural language processing (NLP), based on the personality of the trader, where the AI is able to develop new patterns and stocks that the trader can invest in based on the type of trader that they are. By evaluating the sentiments that traders go with into the stock market, an AI can help mitigate the human error possible when investing in certain stocks by making more informed decisions.

- Factor investing: This refers to the quantitative and quantifiable investment approaches, AI can do this through assimilating different risks whilst product complexity continues to rise, with this AI can hence make different counteractive trades in order to attack different market scenarios to take care of losses and gain advantages within the market. Different products and strategies are tied to the strategic analysis that an LLM (large language model) can decipher.

- Debt management: The application of AI across personal finance extends towards debt management and credit optimization through

analyzing user financial transactions, their debts and their spending habits that are used in order to reduce debt. AI repayment using debt depends on strategies by AI such as personalized payment recommendations to tackle with the most effective payment strategies, debt consolidation options in order to transfer loans and balance credit card transfers to mitigate extra interest payments. By prioritizing debts with high interest rates, this tool then suggests the different payment strategies after identifying these debts, to save on users' interest money as well.

VI. REAL WORLD INSTANCES

This portion of the paper will aim incorporate areas where financial tools discussed previously are being used as of current in order to make AI improve the financial sector in the most efficient way it can, the ability of different financial institutions to implement these tools for the benefit of global finance and their customers as well as address how the market share of AI increase as these real world examples that utilize these financial tools are taken into account by different financial institutions.

VII. PAYPAL ON FRAUD DETECTION

PayPal is a large financial institution which rules over the financial sector, acting a s a key symbol on what it means to be able to display the ability to control and utilize finance, when considering the applications that can be done with AI, a very popular case study within the financial sector about PayPal in fraud detection arises with PayPal's ability to enhance the capabilities of AI within fraud detection by analyzing the following and how AI has increased fraud detection against AI and with AI.

- Believing that common protection methods may not suffice, PayPal has made the idea of implementing robust authentication center against any fraud detection that has been using AI.
- PayPal has also implemented a new type of algorithm, known as PayPal's Fraud Protection Advanced, in order to help merchants with their fraud analysis to protect their business
- PayPal has shown their belief in the efficiency of AI for risk management by teaming up with the StepStone group to invest $30 million in a generative AI start-up company known as Rasa to help control the level of risk management
- PayPal is now using machine learning, a subset of AI, that uses algorithms to scan for large amounts of data for different spending patterns and insights in them, to then apply into making better decisions for the programmer towards better perception and decision-making ability of the computer system, in the context of e-commerce, machine learning is a type of AI that is used for payment detection fraud.
- Some types of AI that have proved especially help against fraud, these are supervised learning, unsupervised learning, semi supervised learning, and reinforcement learning.
- Supervised learning describes AI which are programmed for the purpose of running through predictive analysis with previous data that is labeled as good or bad.
- Unsupervised learning uses an AI which analyze untagged data and identify any anomalies within customer spending patterns
- Semi supervised learning is using models to split the differences between approaches of supervised and unsupervised machine learning, using fraud detection algorithms to carry out this process, removes human error from the process as well.
- Reinforcement learning allows the AI to learn all optimal behaviors within the environment around from various interactions to then detect such fraudulent anomalies.
- Examples of finding such fraud with machine learning would be sign up fraud: when a scammer creates a new bank account with a stolen identity, login fraud: taking over an existing account, payment fraud: when scammers utilize a credit card without the owner's knowledge.
- Machine learning is able to aid this way by analyzing third party information, monitor devices, IP, phone transaction and any data which may suggest any anomalies or fraud, machine learning is also able to rapidly assess whether the individual is a verified user

PayPal implements machine learning mainly into their usage for determining fraud detection at a more efficient rate, by doing so, PayPal can also ensure that their customers are able to make transactions with a higher sense of security in comparison to other financial services from other large financial institutions resulting in PayPal gaining more customers by implementing these factors.

VIII. WEALTHFRONT AND BETTERMENT ON PERSONAL FINANCE

Wealthfront is an investment services company which is situated in Palo Alto, California and was first founded by Andy Rachleff and Dan Caroll in 2008. Betterment is a separate American advisory firm that provides digital investment and cash management services, this firm was based in New York and is registered with the securities and exchange commission.

These companies specialize within financial services regarding personal finance of their customers and providing these services tailored with expert efficiency in order to make the necessary decisions required for their customers through the increased use of AI in order to avoid human error. These are achieved by the following features and uses of AI within aiding their customers with efficient ideas regarding personal finance.

- Hyper-personalization: Algorithms where AI can analyze a large amount of data about the consumer's financial situation and the risk that they are put at, Wealthfront has obtained a robot adviser, made to create personalized investment portfolios for clients who require to track their risk tolerance and their financial situation. Betterment is also able to achieve the same by using similar robot advisors in order to offer different investment strategies to their customers, their AI algorithms are made in order to monitor portfolios and balance investments by overseeing the market and individual goals.

- Behavioral coaching: Using AI in a similar way to that of sentiment analysis where the AI is made to provide personalized nudges towards investors and individuals towards the decisions that they will be guided towards more emotional yet safer decisions for investors.

- Methodology: AI is used in order to manage different portfolios by managing the clients' assets, their investment vehicles etc. An AI is able to achieve to this by using a variety of factors as mentioned previously in order to determine the priorities within different portfolios and what is needed most within each portfolio, using the different sections to make a methodology to follow in order to execute this. Wealthfront does this by incorporating a Black Litterman model which is for assets which a model made in order to match their risk tolerance with the expected outcomes. Betterment also achieves similar results using a similar model in order to track these assets, tailoring mainly in personalized investment strategies.

- Personalized investment strategies: This is where an AI drafts a portfolio and strategies for investors towards personalized investment management, Betterment is able to achieve this by incorporating their AI system with tailored investment strategies regarding possibilities of loss and rebalancing. Wealthfront is able to achieve similar results using robot advisors in order to draft portfolios in such a way.

Wealthfront is a company that incorporates AI into its system for personal finance management through the use of robot advisors to oversee the primary concerns within a portfolio and how to mitigate them as well as use the AI in order to develop different algorithms and systems that are tailored to match the priorities for a customer within the financial portfolio. This involves their use of the Black Litterman model and their use of algorithms in order to provide advice about rebalancing investment and developing different strategies as such.

Betterment is a company that incorporates AI into its system for personal finance management by developing AI systems which are tailored towards sentiment analysis and to create personalized financial strategies and nudge investors towards stocks and shares that benefit their portfolio best while taking into consideration of the market situation and the type of investor.

IX. BLACKROCK'S ALGORITHMIC TRADING PLATFORMS

BlackRock is a global provider of investment services, advisory services and risk management, BlackRock acts as an asset management in order to provide insights to their customers about the different risks and benefits that come with investing in a particular stock, BlackRock mainly specializes in investments, hence developing an AI algorithmic trading platform for this reason.

With a rise in large language models (LLM), BlackRock uses these language models for the purpose of creating different chatbots in order to be used for security analysis and trained within different datasets for investment tasks at a high degree.

BlackRock also utilizes a thematic robot tool in order to blend in with human insight and using LLM's to build up a larger database with equity baskets that are seen with a greater efficiency. LLM's and the thematic robot model will be crucial in going over BlackRock's algorithmic trading platforms and determining how AI is used in it.

- Large language models (LLM): These play an important role within the algorithmic trading platform made by BlackRock by efficiently analyzing and synthesizing information from various sources, LLMs are trained to process large elements when accounting for different contextual relationships. LLMs in the algorithmic trading platform made by BlackRock are used to contextualize the potential for more accurate differentiated investments. LLMs are often integrated this way through chatbots, these are used in order to tune the investment processes and perform different investment tasks based on the market forecast and how the LLMs are able to interpret it. LLMs are often trained for more specific datasets in order to carry out these tasks with high levels of accuracy.

- Thematic Robot: By integrating LLMs into different equity baskets, a "robot" is used to blend in the ability of LLMs towards data that is able to build up longer or shorter equity baskets. This is done as investors are often in need of building up security baskets which can be time-consuming for broker baskets that aren't built well enough. These thematic insights are often used in order to build up a portfolio, these insights often involve using an LLM in order to measure the risk of current portfolios to more emerging themes and to give an insight towards companies that are directly linked with this thematic basket as the main objective for this tool is to be able to bring speed and accuracy to the construction of the thematic basket.

- Accuracy: BlackRock's main objective within their AI algorithmic platform is to be able to utilize LLMs in order to bring out accurate insights towards earnings and portfolio development. BlackRock has proved to do this with their proprietary model that is made to be trained on 400,000 different earning transcripts that span over 17,000 public firms. BlackRock has also compared their model's accuracy to that of OpenAI's GPT models, with the BlackRock systematic coming out on top with more than 0.6 accuracy in comparison to GPT's 0.55.

BlackRock's algorithmic system overall looks at the ability of their system to analyze quantitative information after collecting data from nearly 2 decades, this is used in order to create more precise yet differentiated investment outcomes and ideas. BlackRock aims to do this mainly with the usage of LLMs to analyze large amounts of data and to build thematic robots for different equity baskets in order to look for better investment outcomes or ideas with a key highlight on their LLM's accuracy.

X. CHALLENGES AND ETHICAL CONSIDERATIONS

Often with every gift and miracle that is bestowed upon the world, so comes an equivalent bane to accompany it, throughout this research paper, the consideration of the ability of AI to aid the financial world within a versatile range had been considered yet with those come challenges that present great distress at a global scale, some that can be mitigated, some that cannot.

The ability to perceive AI as the ability to utilize humanity's creations to its fullest potential is what truly determines how one can overcome these arduous challenges, job displacements are often discussed when considering the repercussions that occur with using AI. Others that come to mind is the use of AI against personal data and on problems that may occur such as the Black Box problem. Others consider the use of AI in fraud and hacking.

All of these problems are to be explored further down this segment with key ideas regarding the challenges that AI presents within the realm of finance as well after going over the benefits that AI brings withing finance as a whole.

Key Ideas

- Discovering any ideas towards possibilities of bias in AI programmes, possibly due to the developers of these AI
- Data security and privacy concerns regarding AI, with a vast database, it becomes concerning on how much AI knows and what ethical concerns it raises
- Job displacement and economic instability, a huge determinant on the utility of AI when moving forward with it in the financial sector

XI. POSSIBILITIES OF BIAS IN AI PROGRAMMES

Bias refers to the systematic errors and inaccurate decisions regarding a personal feeling that is what makes algorithms and models be considered as biased, these biases can be done within development and training, often leading to outcomes which may not be too favorable, impacting the decision-making process that comes within correcting the overall integrity of different financial systems.

Different types of bias can arise within Ais amongst the development of the AI or within the data that the AI interprets and bases its views upon, those types of bias arise especially when incorporating a vast range of information into the algorithms. These types of bias that can occur within AI are data bias, algorithmic bias and human bias, these biases incorporate mainly problems that arise within the developing bias, with special emphasis on human bias as a whole.

- Data bias: When the training model of the AI with the training data to build up the AI model consists of bias that could be present from the developer or from the source of information used. An AI then amplifies these biases which can lead to more inaccurate and depreciating errors in finance. USC researchers recently found that bias is present in 38.6% of 'AI facts'.

- Algorithmic bias: Different algorithms and models that incorporate AI can lead to heavy biases if not treated carefully at the developing stage of the AI model, AI algorithms like these rely on data as well, algorithms will be influenced by information that occurs within a particular set of data and makes their judgement about another set of data in the same way. Out of 555 AI models, it is found that 83.1% of them contain a high proportion for risk to bias.

- Human bias: This type of bias is very self-explanatory, it talks about the human bias that occurs during the development stage of the AI model even when considering the data and algorithms the AI containing being free from bias themselves.

XII. DATA SECURITY AND PRIVACY CONCERNS

AI has multiple different concerns regarding privacy and data security overall, this can occur through different financial mediums such as banking and misusing financial data of a consumer of a financial service that is run by an AI.

Different kinds of privacy concerns and risks that are to be considered when using an AI for financial services and mediums are data misuse, data discrimination and data loss, these involve AI's making biased outcomes or using the data stored for purposes that aren't tailored towards the desired outcome that is needed by the owner of that data. These occur often in financial services regarding accounting and finance as a whole.

Potential financial fraud with AI also raises different risks and questions on AI's misinformation within the market and AI not being able to collaborate with regulations and legal boundaries that the AI is required to act within, this kind of behaviour often challenges how AI is able to harm the financial stability of an individual with the potential of committing financial fraud.

Concerns regarding AI's ability to function within the finance sector and its system is also a heavy determining factor on the types of danger that AI is susceptible to and what it may cause with the data at its hands. This involves AI's possibilities of algorithmic bias, vulnerability to data quality issues and accuracy of AI predictions when considering AI's capabilities under financial advisory systems such as Betterment and Wealthfront. Financial institutions tha use AI in similar ways to these firms can be victim to faulty decisions that are made by the AI and lead to a loss economically, AI's complexity as a whole is considered to be a factor for these challenges and risks as well.

The overall loss of the average short term in abnormal returns made by AI's in banks and other such financial services is around -21.04% and the overall negative repercussions that follow it through the financial industry is -0.13% as well. This data was collected in the year 2024, stating as well that financial institutions such as banks and other such financial services are more suspect to AI incidents with high bankruptcy and operating at lower cash flows. A similar internal AI incident within calculation errors for mortgages under a modification and underwriting tool were made, this incident resulted in 500 people lose their homes and increase the number of loans required to mitigate it by 100s in 2023.

AI incidents have lead to losses within profitability, the ability of the AI to capitalize on the market, within calculation errors for loans and mortgages and overall proving to be a threat through the privacy concerns that it creates with its large database as well as other debates on whether AI must be used for financial services such as banking after such incidents, considering the vulnerability of AI as learning models or through the bias that is input within AI during its developing process that will steer individuals into more risky or less secure decisions regarding their personal finance. After such incidents, questions about AI's ability to store and manage such a large amount of data is also to be discussed upon with such frequent and significant errors being made.

XIII. JOB DISPLACEMENT AND ECONOMIC INSTABILITY

AI's main concern that it brings when introducing its capabilities in the finance sector and the job market as a whole involves AI replacing jobs that firms may find to be trivial or rather unnecessary for them to maintain wages for employees that have jobs that can easily be filled by the abilities that AI is able to do at a diverse range with a higher level of efficiency. Economic instabilities follow suite as unemployment rises within these sectors, resulting in an uneconomic use of resources through the form of labour.

Through historic rates regarding labour shedding, 1 to 3 million jobs could be potentially lost to AI, regardless of the significance of these jobs, though these displacements will occur gradually they will increasingly grow as AI adoption amongst different sectors and companies increases. On an annual basis, this results in job displacements occurring at a rate of 60,000 to 275,000 job displacements a year.

When discussing about AI's affects on economic stability, the thought of AI's ability to affect unemployment and the labour force is what comes in mind, with AI being more frequently used in firms, this is seen as within the next 20 years, around 54% of the jobs within the European Union are at risk of being victim to job displacement. This involves routine jobs that can easily be displaced by AI within larger companies that store a huge database of information and resources.

AI also affects economic stability through potentially influencing wages, the income distribution amongst workers and increases in economic inequality, the international monetary fund has also made statements and predictions on AI's ability on jobs, stating that at least 40% of jobs throughout the world will be affected by AI. AI has also been seen to complement higher income workers, leading to increased inequalities in income as AI is more so forecasted to displace jobs within the lower wage class, such as jobs that are considered as routine jobs, though resulting in a gain through the form of productivity, economic inequalities are increased with the introduction of AI towards different job displacements, causing increased redundancy amongst companies.

Economic instability and job displacement are severely affected through AI's displacement of jobs that are considered more routine or rather less skilled, AI through this way causes for wages to not be properly determined and increasing inequalities by taking more lower income jobs.

Jobs around the world within the lower paid is seen to have around a 55% exposure towards these jobs within more advanced economies as AI is more likely to replace these routine jobs as a form of factor substitution for the sake of productivity, yet this in turn leads to more resources becoming an uneconomic use of resources due to increased unemployment as advances in technology increase.

XIV. CONCLUSION

Finance as a whole incorporates the ability of an individual or institution to manage, utilize and continue with the circulation of money through assets or through cash flow, the ability of AI to accomplish these tasks on a numerous and versatile scale with increased efficiency in comparison to completing these tasks that are highly susceptible to human error. AI has been able to demonstrate its abilities in finance by being able to act for financial institutions and for personal finance as well by incorporating its large and vast database into multiple algorithms.

Examples of AI being used frequently for these purposes involve PayPal's integration of AI within fraud detection for improving their services for their consumers, and the use of AI within investment algorithms by Betterment. AI has been shown to have a diverse range as such by stretching across the security within finance towards the applications of certain decisions based on a large base of data where decisions are made through market patterns.

Even though AI has come with numerous amount of challenges that range the same way, AI's benefits through its growth with machine learning and large language models can help to mitigate and correct

these negative externalities that AI causes when introduced into the finance sector.

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