The Ethical Implication of Artificial Intelligence in Cryptocurrency

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Introduction

It is unarguable that in the eleven years since Bitcoin's initial launch in 2009, there have been many new technological developments surrounding cryptocurrency. One of these important developments regards artificial intelligence, specifically how it can be tailored to benefit the realm of cryptocurrency. When discussing artificial intelligence in cryptocurrency, predictive pricing and trading bots are leading concepts. The combination of predicting the market and using an artificial intelligence trading bot program to buy and sell cryptocurrency allows an individual to have a passive income. Other ongoing developments in artificial intelligence have improved the overall security of trading, resulting in increased fairness among traders. For example, artificial intelligence programs can detect fraudulent trading activity faster than a human would be able to. The foundation of cryptocurrencies is built upon mining coins. Mining is a mathematical process to digitally receive the currency, adding it to the public blockchain. Artificial intelligence has been implemented in the mining process, showing that AI can be used in every aspect of the cryptocurrency trading cycle. However, the introduction of these new technologies in cryptocurrency also introduces new risks.

Individuals have found loopholes within these developments, harming the cryptocurrency market. Trading bots, which are meant to automate trading, can be used to manipulate and unbalance the market, resulting in financial losses for innocent traders. Fraudulent trades and scams are also possible. As the popularity of cryptocurrency increases, so does the likelihood and inventiveness of cryptocurrency scams. It is even estimated that "$9 million is lost to cryptocurrency scams every day"(Esan). With such large amounts of money at stake, it is no surprise that the ethics regarding cryptocurrency trading developments are being questioned. It is common for professional traders who trade without artificial intelligence to believe that bots are unethical by giving users unregulated and unfair advantages.

Before discussing the ethical views regarding the fairness of artificial intelligence in cryptocurrency trading, it is important to introduce the idea of transhumanism. In *The Transhumanism Handbook,* author and Technology Theorist Melanie Swan defines transhumanism as "the idea that the human race can evolve beyond its current physical and mental limitations, especially by means of science and technology"(Swan 513). Currency, whether fiat or crypto, is used every day by humans, and will continue to be for the foreseeable future. If there is a way to universally evolve our commerce system with the use of modern technology, a transhuman approach should not be immediately discarded as unethical. Two theories will be used to address the ethical argument regarding cryptocurrency and artificial intelligence: Kantianism, based around the idea that an individual should make a moral decision if it can be universalized without treating individuals as a means to an end, and Act Utilitarianism, based on the belief that an action is morally good if it produces more happiness than unhappiness(Quinn). The blockchain model for trading cryptocurrency has inherent attributes where every individual is treated equally, supporting the Kantianism perspective, therefore making it ethical to use artificial intelligence technology for intended financial benefit. Use of the Act Utilitarianism perspective also proves that when following the intended uses, the advantages of artificial intelligence in cryptocurrency trading outweigh the disadvantages.

Related Work

It is important to first understand the specific uses of artificial intelligence in the realm of cryptocurrency. The main focus of this paper is predictive pricing algorithms used in trading bots. However, there are other important implementations of artificial intelligence to be discussed, including cybersecurity and cryptocurrency mining. All of these implementations still

have their own problems and disadvantages, making it evident to discuss them with the perspective of Act Utilitarianism.

Predictive Pricing

Artificial Intelligence algorithms allow for accurate predictions based on the data they are given. Deep learning neural networks are a specific branch of algorithms that make predictions about new data, learning and improving each time they are run. Over time, these predictive algorithms become more accurate, detecting patterns that previously could not be recognized with the human eye.

Trading Bots

A trading bot is a software program to automate trading, legal in both the cryptocurrency and stock markets. When referring to the cryptocurrency market, the software interacts with the exchange's API (application programming interface). Data is obtained from the exchange, then used within a predictive pricing algorithm to buy and sell coins in an automated way.

There are four types of trading bots- arbitrage, market making, technical trading, and portfolio automation. An arbitrage trading bot takes advantage of pricing discrepancies between exchanges by buying a coin at a lower price and selling it on another exchange for a higher price. A market making bot will quickly buy and sell tokens in order to determine the market price, which can make a quick profit while preventing large swings in price. Technical trading bots use indicators and signals to foresee price shifts in the market, generating profit by buying and selling at the right time. A portfolio automation bot helps an individual achieve their desired portfolio, allowing them to profit without actively trading. These bots can also be programmed to react to scenarios in different ways. A predictive bot will see a crashing price as a good time to

buy, expecting that the price will soon rebound. A reactive bot, however, will see a crashing price and attempt to sell before the price drops more. Since the market is constantly changing, there are scenarios where a bot should be predictive, as well as times where it is better to be reactive. Using artificial intelligence and deep learning models, these programming methods are combined so that a bot can be trained when to respond in a predictive or reactive manner. This combination approach makes the most sense when trying to keep the market balanced. If all bots were trained to be reactive, for example, the market would immediately crash and go down as soon as one bot detected a price drop and began selling.

Weighing the advantages and disadvantages to individuals, as well as the entire affected population, is important when analyzing trading bots through the act utilitarianism perspective. Beginning with the advantages, the automated nature of trading bots allow them to be reactive twenty four hours a day, seven days a week. Making use of these bots allows individuals to spend their time doing other things, while still earning a passive income through trading. Though bots can run constantly, there is always an option to turn them on or off as needed. Another major advantage comes with the flexibility and ability to customize the software and algorithms that make up bots. There are a variety of trading bots available to buy or rent, as well as open source code. Advanced traders can create their own bots, allowing them to customize their programs with specific implementations. Individuals can increase the security of their digital wallet with these bots, adding many security protocols to their program to meet their needs. All of these advantages come together to ensure a highly customizable and secure way of trading.

When looking at the advantages of trading bots, it is impressive to see how trading decisions and overall profitability have increased. Risk can be decreased by "developing fast, effective and impartial AI trading bots"(Esan). By developing advanced models, "cryptocurrency

traders have avoided slippage and performed accurate technical and fundamental analyses to make better trading decisions" (Esan). Improved trading decisions would not be possible without the use of advanced technological models, supporting transhumanism. It is a common belief that the continued introduction of trading bots in the cryptocurrency market will "reduce the possibility of large-scale failure such as financial contagion and collapse"(Swan). A safer trading economy made possible by artificial intelligence supports act utilitarianism, specifically by increasing the total happiness(in this case financial safety) of affected parties.

The most obvious disadvantage of trading bots is the potential for them to accidentally upset the market. As with any technology, glitches and bugs are possible within the code. An accidental oversight can quickly result in a severe financial loss for an individual. In severe cases, a glitch with one bot can affect the market as a whole. Reconsidering the example of reactive bots, a small upset in the market could cause all reactive bots to immediately sell. Luckily, most professionals make sure to implement fail-safes within their code, such as shutting down when certain market conditions are detected. This idea is similar to the use of circuit breakers in the stock exchange, temporarily stopping trades when considerable drops are observed. It takes time, experience, and an understanding of all aspects of the cryptocurrency and software fields to create a successful trading bot. Though valuable, the addition of advanced artificial intelligence models into programs generates a capacity for more errors. It is a necessary but time consuming process to test models, starting with small amounts of capital. For those individuals who decide to buy or rent trading bots, it is important to take into consideration the financial disadvantages. It is common to pay for the bot up front, as well as having a percentage of overall profit taken. Overall, a trading bot is only as successful as the person who programmed it, and the majority of disadvantages can be addressed with proper coding and testing.

Addressing the overall advantages and disadvantages brought by artificial intelligence trading bots is a necessary step in proving the bots are ethical by act utilitarianism. The logical way to prove morality with act utilitarianism is to "simply add up, over all affected beings, the change in their happiness" (Quinn 206). The only case where the disadvantages outweigh the advantages among all affected beings is the rare and severe example of reactive bots accidentally crashing the market. This would result in a financial loss for everyone involved. Due to its severity, traders ensure that their trading bots will not react this way by implementing fail-safes and continuously testing and overseeing their models. With this disadvantage out of the way, the overall change in happiness is positive. Ensuring that a community can trade freely, while mitigating financial risk and security breaches, benefits everyone involved.

After discussing the potential advantages and disadvantages regarding trading bots, one should become familiar with historical examples. The Mt. Gox Exchange, operating from 2010 through 2014, was previously the dominating market for trading Bitcoin. In 2013, the price of Bitcoin increased by almost 1000% in a short two month period. There are two specific examples from this time that help explain the rapid increase in price. Within these examples, it is significant to use the Kantianism perspective to understand the possibility of trading bots used in an unethical way.

The first example is described within a 2018 study published in the *Journal of Monetary Economics*. From February to September 2013, a trading bot named "Markus" was active within the Mt. Gox Exchange. Over this time period, Markus fraudulently acquired $76 million of bitcoin, but it was not backed by real coins. In September of 2013, seven hours after Markus became inactive, a new trading bot named "Willy" appeared. For around two months, this bot used 49 separate accounts and rapidly bought $2.5 million of fraudulent Bitcoin. The heavy

trading activity, though fraudulent, still resulted in signals that heavy trading was occurring-causing non-bots to trade heavily as well. Within this study, it was concluded that the heavy trading activity initiated by these bots was "highly correlated with the rise in the price of Bitcoin...daily 4% rise in price…from around $150 to over $1000 in late 2013"(Gandal et al. 10). A second example regards BTC.sx founder Joseph Lee. Between 2011 and 2013, Lee also used the popular Mt. Gox Exchange to buy Bitcoin, selling it within less-established exchanges. This was before the increased popularity of artificial intelligence, so he wrote algorithmic trading bots. Lee claims "to have turned a simple $100 buy order into $200,000 in profits using his private software army"(Bradbury). Looking at these early examples sparks questions as to whether Willy, Markus, and Lee acted ethically. The Kantianism perspective states that an action is ethical so long as all persons are fairly treated as moral equals. In the 2013 events of Markus and Willy causing increases in the Mt. Gox Exchange prices, it is obvious that there was fraudulent activity. When trading became heavy, Mt. Gox profited on the market activity by collecting transaction fees every time Bitcoin was bought or sold. Even though no one was harmed, it is arguable that Mt. Gox used non-bot traders as a means to an end by collecting profits from the fraudulent bot behavior. In regards to Lee using his algorithmic bots for personal profit off the Mt. Gox Exchange, he provided long term financial benefits for himself and other traders. The combined efforts of increasing the price of Bitcoin helped other traders make money, which may not have been possible without the use of bots.

When using the Kantianism perspective to look at trading bots as a whole, it is crucial to determine whether all persons involved are treated equally. Since trading bots are available to buy, rent, or view via open-source, there is no discrimination of an individual being unable to use a trading bot. It is a personal decision to choose whether or not to use a trading bot. There is also

the decision to learn the skills necessary to program a custom trading bot, or to choose from those bots already created. Allowing beginner cryptocurrency traders and those with low technical skills to use publicly available artificial intelligence trading bots evens the playing field, ensuring that anyone can safely trade.

Cryptoyote

A recent and relevant use of artificial intelligence trading bots is seen within the company Cryptoyote, founded in 2019. Cryptoyote uses artificial intelligence to predict price trends and generate trading signals. This is an example of a trading bot available to the public, where the individual keeps 60% of any profit made. The use of artificial intelligence allows the company to adopt deep learning models, giving them a competitive edge against other trading bots. By sorting through "financial news, social media such as twitter, google, telegram, various traders, news, blogs and transactions"(Cryptoyote), the company is able to optimize their program. Currently, they boast a 93% success rate, proving how beneficial the modern use of artificial intelligence models can be in cryptocurrency trading bots.

Cybersecurity

With the growing popularity of digital currency, a new realm of opportunities open up for hackers. Any individual would agree that they want their financial information to be kept as secure as possible. Incorporating artificial intelligence models within the realm of cybersecurity allows for optimized security. The benefit of artificial intelligence is due to its nature "to improve with every threat because of its ability to detect patterns, study them and become better at dealing with them"(Esan). In August 2020, scientists at the Los Alamos National Laboratory developed an artificial intelligence program that finds and identifies users that hijack supercomputers for illegal cryptocurrency mining. This new program identified criminal activity

quicker than versions created without AI, and is composed of models that "catch them in the act by comparing programs based on graphs, which are like fingerprints for software"(Riordan). This recent development prevents the previously used techniques for illegal mining, proving the accuracy of artificial intelligence models When implemented correctly, the only disadvantage to this cybersecurity model is the time and effort required to write and test it.

Mining

Normally, dedicated cryptocurrency miners solve complex mathematical hashing puzzles to earn currency. This requires high levels of energy, computing power, time, and effort. As expected, an artificial intelligence implication of mining cryptocurrency is "faster, more efficient, and more profitable"(Esan). However, this approach comes with more measurable consequences than trading bots and cybersecurity. Stanford University has research on the ethics behind artificial intelligence, and include the example that "AI systems produce waste that is very hard to recycle and they consume vast amounts of energy, especially for the training of machine learning systems…for the "mining" of cryptocurrency"(Müller). Quantitatively studying the energy consumption of artificial intelligence mining models may prove that the environmental and economic costs do not outweigh the given benefits.

Conclusions and Future Work

New Markets

When speaking about artificial intelligence, a common question arises. Will artificial intelligence eliminate lower level jobs? While there is no exact answer, it is obvious that some tasks will be cheaper if done computationally, changing the responsibilities and daily roles of the

human job market in some way. As technologies continue to develop, it is important to mirror the growth by creating new areas of jobs for humans.

Cyber Insurance

One of these new job areas regards risk and insurance. Considering that cryptocurrency has become popular in recent years, it is understandable why a specific sector for cryptocurrency insurance does not exist. Currently, "little to no insurance exists in the broader cryptocurrency space"(Stein), allowing for the opportunity to expand within the new sector. Artificial intelligence trading bots open up a market for actuaries or statisticians to calculate "any counterparty risk generated as a result of implementation"(Stein), in order to construct cyber insurance policies. Cyber insurance can be expanded upon more than just protecting cryptocurrency, such as protecting and financially backing digital rights, code not available to the public, or online databases.

Laws and Regulations

It is common to hire a financial manager or accountant to take care of fiat currency and taxes, so these practitioners may be trained to do the same in regards to cryptocurrency portfolios. When trusting someone to manage a different type of currency, it is expected that they have knowledge pertaining to it. A new responsibility would be creating, overseeing, and helping traders remain "in compliance with new and emerging regulations"(Stein). There are already laws in place regarding cryptocurrency mining and trading, with a growing need for legal professionals within the tech industry.

Conclusion

Weighing and questioning the moral rightness of technological decisions introduces new industries and a need for professionals in the subject matter. When considering an economy composed of both humans and computers, there is a need for humans to share computer networks in order to access shared resources and conduct operations/transactions. The increased communication and coordination means users "all have the incentive to remain in good reputational standing to use the network, and this could enforce good player behavior"(Swan). Though there will always be disagreements and risks regarding an increasingly technological world, analyzing each new element shows that there are many hidden benefits. Incorporating artificial intelligence into the finance and economic sectors by use of cryptocurrency brings around many new developments, as well as many new questions. Until implementing these changes on a large scale, it is impossible to determine the lasting effects of a world increasingly reliant on technology.

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