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Application of artificial intelligence in business management and financial market forecasting

Mohsen Amiri

Amirkabir University of Technology (Tehran Polytechnic)

msnamiri@aut.ac.ir

Abstract

In today's business world, artificial intelligence as a new technology has provided dynamic and flexible capabilities in organizational decision-making processes, considering that organizational decision-making often faces challenges due to the complexity and multiplicity of factors affecting it. The application of artificial intelligence as A powerful tool can be effective in improving the organizational decision-making process and improving the performance of organizational managers. Artificial intelligence is one of the popular and widely used new sciences in almost all aspects of life and can do things faster and more accurately. The numerous advantages of artificial intelligence and its wide applications today are not hidden from anyone. Financial services companies are constantly looking for ways to gain superiority in the capital market and surpass their competitors. To do this, companies are moving away from old systems and models They adopt a more agile business that includes artificial intelligence techniques in capital markets, artificial intelligence in financial markets and machine learning (ML). In capital markets, companies use artificial intelligence and ML projects in coordination with RPA robotic process automation technologies to meet customer requests, speed up financial market analysis, and more accurately identify risk in the business process.

Keywords: artificial intelligence, Business management, Forecasting financial markets, digital currency, Bitcoin

Introduction

Artificial intelligence is one of the popular and widely used new sciences in almost all aspects of life and can do things faster and more accurately. Among the areas where this science has flourished very well are the financial market and the capital market. Organizational companies spend a lot of money on technology to enable employees to quickly analyze data and communicate properly with customers.

Analyzing and processing data is a challenging task for capital market and financial market companies. In today's world, which is a period of unbridled transformations and according to Toffler, it is a period of power transfer. The management of intellectual capital and intangible assets of organizations after re-engineering issues (80s) and comprehensive quality management (90s) as an important phenomenon in an all-round way has affected the horizon

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of management developments. The latest paradigm that covers the above discussion in the management of organizations is the discussion of intellectual capital management. Stewart believes that intellectual capital is a collection of knowledge, intellectual assets, experience of competition and organizational learning that can be used to create wealth. Intellectual capital includes all employees' organizational knowledge and its abilities to create added value and causes continuous competitive benefits (Khilich Lee and Mesh Yake 2015) Therefore, intellectual capital seeks to have intellectual assets, knowledge, experience and organizational learning in organizations. Achieving all-round development should be given more attention than before. So, contrary to the common notions that the mere existence of technology implies the development of knowledge and its sharing in organizations and human capital, intellectual capital management is more than Everything is the management of social phenomena.

In the knowledge-based economy, intellectual capital is used to create value for the organization, and in today's world, the success of any organization depends on the ability to manage these assets. It is necessary to think in order to compare different companies to determine their real value and even improve their controls.

Today, the need to develop and manage intellectual capital has become a serious requirement at the national macro level and in the business field, and by moving towards the basic knowledge economy, it has led to a change in the ruling paradigm of the industrial economy. Intellectual capital is born in the field of science and knowledge, this word is still in its development period. Investment has always been associated with a term called risk. The risk or risk of investment is actually a comparison of the profit and loss of that investment. Today, with the spread of technology and its impact and influence on various fields, new platforms for investment have been created. These investment platforms have different advantages and disadvantages, some of them are low risk and some have high risk for the investor. In general, modern investments have faster returns than traditional investments, but the level of risk is also higher in them. Digital assets, and at the top of that, digital or encrypted currencies, according to the estimates of global financial organizations such as the International Monetary Fund and the United States Federal Reserve Bank, areThey are known as high-risk assets. Recommendations in the field of risk management in such assets have been provided to real people as well as organizations. In the past, in order to predict the prices of this type of asset, several analyzes have been presented and methods have been reviewed. Also, various methods have been offered by researchers and companies active in technology in order to analyze the ups and downs of this market. These methods have been introduced to reduce the risks and language of such investments, and each of them can have advantages and disadvantages. For example, a method can perform very well in the case of Bitcoin, but it does not give good results in the case of Ethereum or Dogecoin. In the case of digital currencies, analyzes are presented based on various things, such as technical analysis on the chart and emotional analysis.

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As an example in emotional analysis, the records of the cases are investigated in which traders' feelings can be deduced about the market situation and price fluctuations of digital currencies. For example, by examining the datasets of users' tweets on Twitter, it is possible to conclude their positive or negative feelings about a digital asset. Using stickers that show emotions. In another case, for example, in the analysis of mental or fundamental news surrounding and related to the market or a specific asset, and taking into account the overall positive impact or impact Its negativity is applied to the analysis of the desired fluctuations. This research tries to investigate the application of a topic called recurrent neural network in the analysis of price fluctuations. This means that in order to predict the price of an asset in the future, in addition to the current price, the price and the previous analysis are also taken into account, which can lead to the improvement of the results of the analysis due to the wide range of analyzes in In recent years, as well as the nature of this method, which has been less discussed, it seems that this method will have a lot of research, and also due to the increasing progress of technology in the field of artificial intelligence, its capabilities can be used in the risk management of financial markets. This will improve accuracy and save time and better manage investment risk.

Cryptocurrencies have experienced a significant increase in quantity and price in the last decade. This issue has caused investors to pay more attention to this market, but despite this progress, the high range of price fluctuations of these assets has also increased the investment risk, and investors enter this so-called high-risk area with great caution, so the issue of development Appropriate methods and models for predicting the price of cryptocurrency products are necessary for both the scientific community and financial analysts, investors and traders.

In this research, a new deep learning model is used to predict the price of cryptocurrency.

On the progress of information and communication technologies, artificial intelligence as one of the advanced and data-based technologies has become one of the most important decision-making tools in organizations in recent years. Artificial intelligence, using complex algorithms and neural networks, helps managers of organizations to make complex decisions that require data analysis by means of countless information and data that exist in the organization. Make the best decision. In this regard, the purpose of this article is to investigate the use of artificial intelligence in organizational decision-making and its impact on the performance of organizational managers and improving the decision-making process in the organization. First, it deals with the concept of artificial intelligence and its applied methods in the organizational decision-making process, and then by examining the research articles done in this field, the effect of the use of artificial intelligence on the performance of organizational managers and the improvement of the decision-making process in the organization is examined. In the continuation of the results and the most important findings of this research Presented and important conclusions obtained about the use of artificial intelligence in organizational decision-making. It is expressed .

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The purpose of the research

Application of artificial intelligence in business management and forecasting of financial results.

The importance and necessity of research

The importance and necessity of conducting research on the application of artificial intelligence in organizational decision-making and its effect on the performance of managers and improving the decision-making process in the organization can be justified for the following reasons:

1.The impact of artificial intelligence on organizational decision-making, considering the complexity and multiplicity of factors affecting organizational decision-making, the use of artificial intelligence as a powerful tool can be effective in improving the decision-making process and improving the performance of organizational managers. By conducting research in this field, the best applied methods can be found. He identified artificial intelligence in organizational decision-making and provided solutions to improve the decision-making process in organizations.

2. Increasing the efficiency and productivity of the organization by using artificial intelligence in the organizational price decision maker, it is possible to reduce the time and costs related to complex decisions and increase the productivity of the organization. Conducting research in this field will help managers and decision makers of organizations to find the best solutions. Identify the application of artificial intelligence in organizational decisions and benefit from them.

3. Improving the quality of decision-making and organizational performance. Artificial intelligence improves confidence and certainty in decision-making, reduces errors and mistakes, increases the quality of decision-making and improves organizational performance. Conducting research in this field helps managers and decision-makers of organizations to make better decisions by using artificial intelligence. And improve the performance of the organization. According to the stated content, conducting research on the application of artificial intelligence in organizational decision-making and its impact on the performance of managers and improving the decision-making process can serve as a foundation for improving the performance of organizations and improving organizational decision-making. Also, this research can be used in future research. In the field of artificial intelligence and organizational decision-making, it can be useful as a guide and increase the productivity of organizations by improving the accuracy and quality of price decision-making, for this reason, conducting research in this field is very vital and necessary.

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Theoretical

Investing means spending current funds and resources in order to achieve more funds or resources in the future. The investor hopes that he will be compensated with more receipts in the future and forgoing future consumption and accepting inflation. (Anwari, 1387)

Investment is an action based on renouncing and not enjoying the current benefit in the hope of more profit in the future (often) in the form of receiving cash, which is mainly done as follows:

(1)Buying all kinds of securities or shares

(2)Buying all kinds of capital goods or fixed assets

Sometimes investment is what is obtained during this process, such as shares or fixed assets, and sometimes it is the value of the benefit that has been foregone, such as the amount of cash paid for a share or fixed asset.

Digital currency is a special form of money or digital asset that is built on the basis of cryptography

There is a general and simple answer to this question, and that is that this market is still in its early stages. We all know that less than two decades have passed since the emergence of digital currencies and this market is still in its nascent stage to follow the static curve. People are thinking about investing and giving up in this market every day. This process is generally the same in any new market.

Investors try to earn more money and have easy income by investing in a new market and also check whether they can influence the market by investing and handing over quickly!?

The crypto market as a market that has not yet found a set of logical uses. It is really in its initial stage. Naturally, the result of this newness is the high volatility in this industry, which is mainly caused by the extreme tests that investors do to understand how the price of digital currencies fluctuates.

But the newness of the digital currency market is a general reason that includes some more detailed reasons. In the following, we will examine the more detailed reasons for this issue.

The factor affecting the fluctuation of the price of digital currency

There are various reasons for the fluctuation of the price of digital currency, all of them stem from the emerging nature of this market, but here we will discuss some of the most well-known reasons. They are as follows.

Predicting prices with artificial intelligence

The story of predicting the price of artificially intelligent digital currencies or even predicting the price of artificially intelligent stocks is an active and growing field of research. Artificial

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intelligence can provide algorithms to process and analyze large amounts of data with high speed and accuracy.

As a result of this effort, patterns and trends are identified that can predict the future price movements of the market with an acceptable coefficient.

1-16-2-2 Increasing accuracy in predicting prices and reducing the possibility of mistakes

Artificial intelligence can predict the future behavior of stock prices or currencies with high accuracy by analyzing historical data "price fluctuations in the past of the market", "investigating past trends and developments" of the market, and of course by applying machine learning algorithms and complex neural networks. And provide that information to investors.

Increasing speed and simplifying transaction processes

Automating processes and not needing human intervention is one of the great features of artificial intelligence. When these features enter the capital market, they can take a big burden off the shoulders of investors and help them experience a different trade.

Artificial intelligence can automatically register and execute buy and sell orders at the desired price without the need for the trader's intervention or thinking. Identify profitable opportunities. Also, avoid unnecessary trading costs that include losses as a result of emotional trading.

A trader is a human being, and contrary to what they think, humans make important decisions not with the help of their intellect but with their feelings, the bigger the dimensions of this decision and the more money involved, the more emotionally involved the trader is.

Of course, when we talk about emotion, sometimes we mean its positive meaning, i.e. enthusiasm for trading at higher risk or unnecessary fear, which causes early exit from the transaction and loss of large profits.

Artificial intelligence can help investors make wise decisions by analyzing various factors that each affect stock or currency prices (such as fundamental analysis, technical analysis, and even political and economic news and forex price forecasting). Garcia Mesa and Martinez (2017)

After all, by monitoring transactions, artificial intelligence can extract the trader's trading strengths and weaknesses and lead him to further training to fill these scientific and skill gaps.

.Artificial intelligence works far from subjective assumptions and individual laws

.In this way, assumptions, interest bias or any trader's bias are separated from the story of trading in the crypto market.

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.Artificial intelligence makes calculations much faster and more accurate

.This is one of the demands that every trader has in addition to predicting the prices of digital currencies from artificial intelligence

Disadvantages of using artificial intelligence in predicting the prices of digital currencies

Despite all its advantages, artificial intelligence is not perfect and has some weaknesses.

The constant need for data, both qualitative and quantitative

Artificial intelligence needs a lot of accurate and valid data to learn and predict prices or any other event. If the input data is low and low, incorrect or old, it loses the ability to produce the right answer. After all, maybe the artificial intelligence is incompatible with the new data that it acquires and will eventually make an error.

High cost of development and maintenance of artificial intelligence

Artificial intelligence needs advanced and expensive hardware and software to perform and show its full potential. After all, the process of processing artificial intelligence algorithms and maintaining them requires powerful processors and sufficient storage resources. Needless to say, updating and correcting artificial intelligence errors also requires high expertise and technical knowledge.

Lack of trust and transparency in the results obtained from artificial intelligence

In many cases, artificial intelligence makes its predictions by using complex and incomprehensible methods, which makes traders unable to understand and trust the logic and reason of decisions or predictions of artificial intelligence.

It cannot be ignored that artificial intelligence may not be compatible with market changes or out-of-control conditions and may not respond appropriately to risks or high-risk conditions that have recently been encountered.

Modeling in artificial intelligence

In order to build a good model that can predict the prices of digital currencies, we need accurate and reliable data. After all, unscheduled changes or even unforeseen developments can affect everything and make our model that We worked so hard to make it, they turned it into something useless.

What are the artificial intelligence tools for predicting digital currency prices?

"Deep neural networks", which are a type of artificial neural network with several hidden layers and are capable of estimating complex functions (Clark Singh and Whiting (2021)

"Recurrent neural networks" which are a type of artificial neural network with internal memory and can model data that have a time sequence.

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"Long short-term memory", which is a special type of recurrent neural network, can store information for a longer period of time and delete it when necessary.

"Reinforcement learning" is a type of "machine learning" in which the model is driven to make better decisions using a reward and punishment system.

Predicting prices with artificial intelligence

There are a few steps you need to take to use artificial intelligence to predict cryptocurrency prices

1. .Make developing your own trading strategy your first concern
2. .In this step you have to do these few things:
3. .Determine your trading goals correctly.
4. .Estimate your risk taking capacity correctly.
5. .Set a target for your profit ceiling.
6. .Draw the road map for entering and exiting your trades correctly
7. .Specify your task with capital management.
8. .Choose the right artificial intelligence technology for you

You are free to choose different artificial intelligence methods and you can get help from deep neural networks, recurrent neural networks, reinforcement learning and other methods to start your own project.

Data collection.

In this step, you have to collect and analyze the data. The data you need to go to are in the market trends, economic and even political news, economic indicators, etc. Of course, in this step, you can use intelligence algorithms. Use artificial intelligence to analyze data and identify patterns that help you make trading decisions.

Test and optimize your trading strategy

You should test your strategy on past and current market data, then evaluate the results using evaluation criteria such as absolute mean error, mean square error, Sharpe ratio, and rate of return.

When working with artificial intelligence, you may program your strategy as a trading bot and connect it to your trading account through an API. If you are not familiar with programming, you can ask artificial intelligence chatbots such as ChatGPT for your strategy. Convert to programming code.

How to create a trading strategy with the help of artificial intelligence and use it to predict the prices of digital currencies?

Although in another article we will explain this topic and its techniques in detail with examples, in this article we want to show you an overview of all the things you have to do.

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As we mentioned a little before, to convert your trading strategy into programming codes, you can enter in two ways, either you go to the keyboard and write code yourself, or you can get help from a "chatbot" to convert your trading strategy into code. (Clark) Singh and Whiting (2021).

Currency analysis methods in the market with artificial intelligence

Most of the financial experts believe that the digital currency market can be a foundation for human progress; But only long-term HODL purchase and maintenance of cryptocurrencies cannot guarantee success and earning money because investing in the cryptocurrency market has many risks.

The science of digital currency analysis includes all types of technical, fundamental and sentimental sentiments, the knowledge you need to reduce the risk of investing in this market.

The analysis of the digital currency market is done by 2 popular methods, Technical and Fundamental, and a lesser-known method, which is sentiment analysis. Technical and fundamental analysis are on two sides of the spectrum of market analysis. Investors and analysts use both methods to predict the price of cryptocurrencies. It is clear that this strategy has its pros and cons, similar to other methods.

Accurate analysis and tracking of the value of cryptocurrencies is called digital currency price analysis. It is said that by reading the market, you can provide a correct analysis of it, and in this regard, learning the science of digital currency market analysis is a good opportunity to find the right strategy to enter or exit the market. It provides traders at the right time.

Investing, earning profit and fluctuating prices have been the main basis of financial markets since the past. This price fluctuation can be found both in traditional financial markets and in their advanced forms such as the stock exchange, and it is very similar to the digital currency market, so that the basic principles have entered the cryptocurrency market with a slight change.

In order to check the price and buy crypto, currencies, it is vital to know the various methods of market analysis. Digital currency market analysis is done in 3 technical methods (fundamental and sentimental).

Detailed analysis and tracking of the value of cryptocurrencies is called digital currency price analysis. In other words, it is said that by reading the market, you can provide a correct analysis of it, and in this regard, learning the science of digital currency market analysis provides a suitable opportunity for traders to find the right strategy to enter or exit the market at the right time.

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market, so that the basic principles have entered the cryptocurrency market with a slight change to check the price and buy crypto, currencies. One of the types of market analysis methods is vital. Digital currency market analysis is done in 3 technical, fundamental and sentimental methods.

Holders and traders all need to acquire knowledge in the field of digital currency analysis in order to reduce investment risk and find suitable opportunities to enter or exit the market. In this article, the types of cryptocurrency price analysis methods and important points in each We define completely.

Technical Analysis

Using real world data to predict the future of the market is called technical analysis. Investigating issues such as trading volumes and currency movements in the past include technical analysis.

What is known today as technical analysis originally dates back to the late 1800s when Charles Dow proposed a theory called the Dow Theory. The current technique includes hundreds of different patterns and signals.

While fundamental analysis examines the intrinsic value of a currency, technical analysts find the strengths and weaknesses of a currency by using patterns and analytical tools of charts and consider them to predict the future of the currency price.

Technical analysis is used by many traders in more traditional markets such as stocks, forex, currency, commodities and futures transactions. The process of using this type of analysis in the mentioned markets is very similar to the process in the cryptocurrency market.

Important and interesting points in technical analysis

Dow theory believes that everything should be considered for market pricing in the digital currency market, this includes demand, past, present and future knowledge of digital currency traders, criteria of traders' expectations and many other things. Technical analysis is what trading is. Appraisers use it to analyze the price based on the supply and demand in the market.

The technical analyst believes that by deeply examining the performance of the market, its future trend can be predicted; Because basically trends and currency prices follow a repeating historical pattern.

The main focus of technical analysis is on the current price of digital currencies and price prediction in the short and long term. To do this, the analyst needs to analyze the process of knowing the trading volume of each currency as well as its price history. Unlike fundamental analysis, this analysis does not depend on the fundamental valuation of the traded currency.

The tool of technical analysts to predict the price and the future is the variable market. Variables that are divided into two categories. Some of these variables focus on the current

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market trend and some others determine the strength of a trend and check the possibility of the desired trend continuing.

Although indicators cannot predict the price of currencies with 100% certainty, they help investors to predict the movement of the market. These indicators can be considered a combination of the price history of cryptocurrencies and complex mathematical formulas.

They process their math to produce an output, this output from the variable formula is drawn on a new graph. The analyst can predict the price trend with this new output data.

Around 20 chart patterns have been introduced all over the internet, and candlestick charts have become the most popular chart for technical analysis in a subtle way, with a lot of detail. A lot of detail means that this chart is not limited to showing only the current price of a digital currency. Because candlesticks put the highest price, the lowest price, the opening price and the closing price in their body.

Since there is a good connection between its structure and the name of this chart, understanding the structure of candlesticks is easier than we think. The body of a candle consists of a rod and two wicks, the upper wick represents the highest price and the lower wick represents the lowest price. (Hicks 2023)

But this is not the only feature of candlestick patterns. In the design of these charts, the two main colors are more prominent. With the green color, the definition is included that the opening price is lower than the closing price, because the opening price is placed in the lower wick, and since The opening price of the digital currency is shown in red color in the upper wick, it shows that the trend of the cryptocurrency in question is downward.

Trend lines and management of sudden changes

The first point for every analyst is to learn the technique of the trend line. Trend lines are what they are named; Tools that allow us to orient the price movement at different times. Trends can be bullish, bearish or neutral.

Even in sudden changes, price trends follow specific patterns. These specific patterns show themselves in changes in the price and volume of currencies. Trends are usually in specific time frames (Time Frame), one minute, one hour, four hours, or eight hours, daily, weekly, monthly, yearly, and Sometimes they go up or down for several years. Identifying trends is one of the best ways to predict prices for analysts, which is done by computer software.

But in this way, various factors and news may cause sudden changes in the price of sharp fluctuations, which is one of the most basic concerns of investors. This concern is the main criticism that fundamental analysts make to technical analysis. They say that this method It is responsible when sharp fluctuations do not occur, but trading history shows that even random changes in the market follow recognizable patterns and trends.

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For example, the Bitcoin cryptocurrency faced a sudden price increase in March 2021, and then experienced a sharp price drop in March and November of the same year. Keeping this price pattern in mind, it can be predicted that Bitcoin will behave similarly in 2022. Have a past and be associated with sudden price changes.

Therefore, analysts use the experience of the past years and consider the possibility of a 30% drop possible. See the price trend of Bitcoin over the past years here. But the analyst uses assumptions and patterns more cautiously to deal with sudden changes. This approach may lead to failure for a short period of time, but after that, by returning to the previous path, it can become profitable.

Support Level and Resistance Level in the chart

Support lines are areas where digital currencies tend to stop their downward trend. These lines can also reverse the downward trend in the price of digital currencies. Support Level is generally the place where investors check the conditions of entering the market and buying the currency they want when the price of cryptocurrencies reaches it.

On the contrary, the support lines at the resistance level of digital currencies stop in their upward trend and they cannot surpass these lines every time they rise. Investors usually check the conditions of selling the desired currency when the currency price reaches these lines.

Volume of currency transactions The number of coins of a currency that change hands in certain time periods is called the volume of transactions of that currency, for example, the volume of 24-hour transactions of a currency is the record of buying and selling that currency during one day. In other words, Trading Volume can be seen as the amount of trading activity on a certain asset, which helps to reveal the power of a trend.

This variable can be examined in longer periods of several days, weekly and monthly. For example, in a downward trend, the volume of transactions may be higher, which means that the probability of the trend reversing and returning to the upward path is higher.

However, to increase the accuracy of technical analysis, the price trend must first be analyzed in terms of other factors until Trading Volume shows a positive number; At this time, the desired currency is a good option to achieve more profit, but if the trading volume is negative, that currency is not a good option to expand our investment. (Garcia Mesa and Martins ,2017).

Market value Market Cap

From the product of the final price of the digital currency multiplied by the number of coins, a variable called the market value is obtained, which is a suitable measure for the stability of a cryptocurrency, for example, the market value of a cryptocurrency with 20 million coins available from that currency with the unit price of each coin 50 dollars will be equivalent to 1 billion dollars.

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But this index was faced with negative criticism from old analysts that this variable is not suitable for measuring the strength of a digital currency. With the expansion of blockchain technology and the high profitability of the cryptocurrency market, it has rarely happened that the trend of digital currencies is downward for a long time. Which prevents their market cap chart from falling, especially for fundamental cryptocurrencies.

Due to the high correlation of digital currencies, if the price of a coin increases or decreases. Others will probably follow this trend soon. These features show the stability of a digital currency and give investors the ability to compare one currency against another.

Relative Strength Index (RSI)

The result of dividing the average increase in prices in a certain period of time by the average decrease in prices in the same period of time is called RSI. The mathematical formula of the relative strength index is equal to 100RSI – (13 / 100 + (RS)

Old analysts guess the strength of a trend by using this indicator. RSI consists of a formula whose output is a Tousani number between 0% and 100%. What makes this variable work better. It is related to the rest of the indicators. If in the downward trend of a digital currency, this variable shows a low number like 20, the possibility of a reversal of the price trend can be given. Because the desired currency is undervalued. (Silder Hefliger and Proxa 2013).

Moving Averages

Moving averages are among the popular variables in the digital currency market that calculate the average price of a currency in certain intervals. They are calculated based on the previous performance of the cryptocurrency and for hourly, daily, monthly and even longer-term periods. There are two types of variables with There are abbreviations SMA and EMA, the latter gives special points to newer prices by giving a higher coefficient.

Time frames

The purpose of determining the time frame for the digital analyst is to have a structure that is completely compatible with the investor's business style based on the short-term or long-term horizon. It can be said that for short-term investment, the time frame can be between 15 minutes, one hour, and four hours. Or change daily. But for long-term traders, such a factor changes over a longer period of time between weeks, months or even years. (Hicks 2023.20)

Fundamental Analysis

The main focus of fundamental analysis is on determining the intrinsic value of the digital currency, which means that the desired cryptocurrency is not valued more or less than its intrinsic value. In this method, the expected price of the digital currency must first be compared with its current price, and If the current price of the cryptocurrency shows a higher number, it can be said that the coin in question is overvalued, but if the current price is lower than the expected price, it is expected that its value will increase over time.

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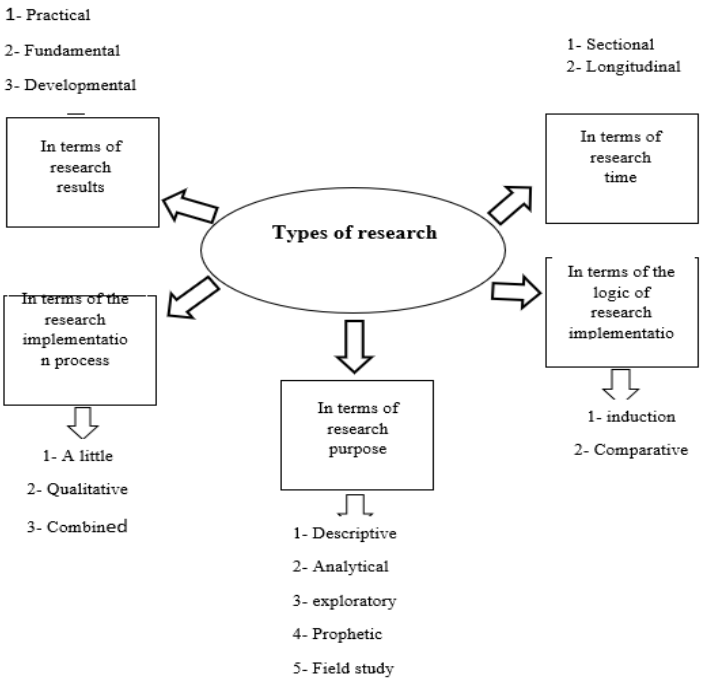
The beginning of the story of fundamental analysis goes back to Benjamin Graham and David Dodd's security analysis book in 1933, after which investors made decisions to invest in securities by considering the criteria introduced in this book.

However, unlike technical analysis, similar approaches cannot be used here in traditional markets because unlike the structure of public companies, the information of digital currency projects are not subject to international regulations and do not require things such as quarterly financial statements or liquidity ratios. Also, in many cases, no company or institution is responsible for the project, and what is known as the coin project works differently from traditional markets in terms of market fluctuations and the buying and selling of coins. (Abiskara ,2021)

Research Methodology

From a methodological point of view, it is a systematic, logical and principled study that guides scientific research. From this point of view, methodology is a branch of logic or even philosophy. Another point of view considers methodology as a branch of science. On the other hand, Talcott Parsons believes that methodology basically deals with experimental research methods such as statistics, case studies, interviews, etc. It doesn't have, but it is the consideration of the general grounds for the validity of scientific work. Methodology is neither exactly a philosophical field nor exactly a scientific field. Various thinkers have made divisions based on various criteria such as purpose, time, depth, scope of application, and the degree of control of the researcher and have presented various types of research in their works (Tabibi et al., 2018, 115-115).



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In terms of the time of cross-sectional research, in terms of the results of the applied research, in terms of the process of implementing the hybrid research, in terms of the purpose of the descriptive research, it is a case study type and in terms of the logic of its implementation, it is inductive.

Research findings

To evaluate the performance of these models, we used a data set containing the past daily prices of digital currencies. We divided the data set into 80 training sets and 20 test sets and trained RNN and LSTM models on the training data, then the predictions made by We compared the models in the test data with real price fluctuations. Finally, we compared the results of RNN and LSTM evaluation criteria to predict Bitcoin and Ethereum. In this section, we present and analyze the results of our tests.

No	Batch Size	Epochs
1	16	100
2	16	200
3	16	400
4	16	600
5	16	800
6	32	100
7	32	200
8	32	400
9	32	600
10	32	800

Table1

The above table shows the variety of batch sizes and periods that we used to evaluate the performance of the models on the experimental data. In the next sections, we present and analyze the results of our 2nd metaparameter optimization test.

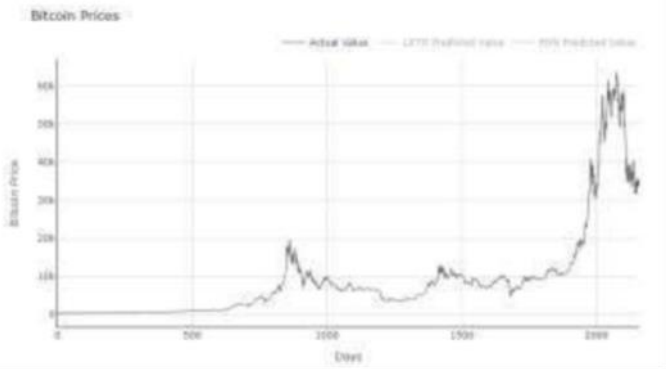

Figure1

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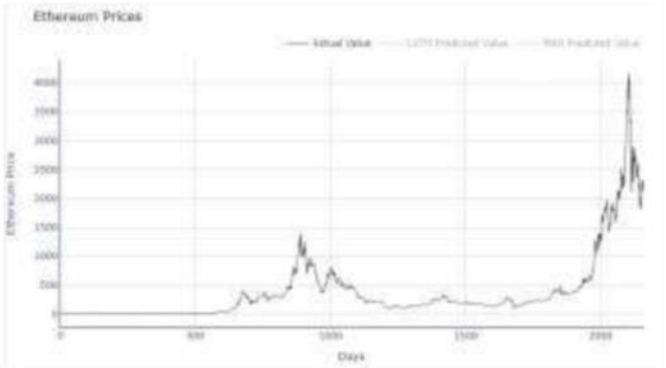

Figure2

To do this, we first collected the past data of the price of digital currencies from the Kegel page, which contains the daily price of Bitcoin and Ethereum [13], then we pre-processed the data by performing normalization. In the next step, we divided the pre-processed data into 80% training data and 20% test data. We trained RNN and LSTM models on training data and evaluated their performance on test data. We compared the performance of two models using different evaluation criteria, MAPE and RMSE. Finally, using RNN and LSTM models, we used the best models to predict the price on the unseen data (meaning the data that was not used to train the model and is actually the new data given to the model). We evaluated both models with MAPE and RMSE, and then compared both the MAPE and RMSE values of each model. Figure 1 shows the flowchart of the proposed study.

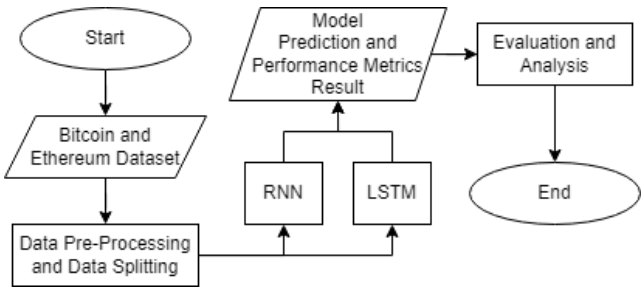

FIGURE 3.

a. Data collection

Our dataset is derived from Kegel's data in [13], which refers to Bitcoin and Ethereum price history information. The Kegel derived dataset includes Bitcoin price with 2,991 daily data between April 29, 2013 and July 6, 2021, and Ethereum price with 2,160 daily data between August 8, 2015 and July 6, 2021. The dataset used in this research is the daily price of Bitcoin and Ethereum from August 8, 2015 to July 6, 2021, and 2160 daily data of both digital currencies. The main data set consists of 10 attributes which are SNo, Name, Symbol, Date, High, Low, Open, Close, Volume, Marketcap.

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Table 1.

SNo	Name	Symbol	Date	High	Low	Open	Close	Volume	Market cap
1	Bitcoin	BTC	8/8/2015 23:59	279.928009	260.7099915	279.7420044	260.9970093	58533000	3778049024
2	Bitcoin	BTC	8/9/2015 23:59	267.0029907	260.4679871	261.1159973	265.0830078	23789600	3838130130
3	Bitcoin	BTC	8/10/2015 23:59	267.0320129	262.5960083	265.4779968	264.4700012	20979400	3830352069
4	Bitcoin	BTC	8/11/2015 23:59	270.3859863	264.0939941	264.3420105	270.3859863	25433900	3917142819
5	Bitcoin	BTC	8/12/2015 23:59	270.6730042	265.4689941	270.5979919	266.3760071	26815400	3859888131

Table 2.

SNo	Name	Symbol	Date	High	Low	Open	Close	Volume	Market cap
1	Ethereum	ETH	8/8/2015 23:59	2.798810005	0.714725018	2.793760061	0.753324986	674188	45486894.24
2	Ethereum	ETH	8/9/2015 23:59	0.879809976	0.629190981	0.706135988	0.701897025	532170	42399573.5
3	Ethereum	ETH	8/10/2015 23:59	0.729853988	0.636546016	0.713989019	0.708447993	405283	42818364.39
4	Ethereum	ETH	8/11/2015 23:59	1.131410003	0.663235009	0.708087027	1.067860007	1463100	64569288.43
5	Ethereum	ETH	8/12/2015 23:59	1.28994	0.883607984	1.058750033	1.217440009	2150620	73645010.99

Table 1 shows 5 data samples from the Bitcoin dataset, and Table 2 contains 5 data samples from the Ethereum dataset, both datasets contain the following columns: column "date" means the date of observation, column "SNo" means the number of daily data "Open" column means the opening price at the beginning of the day, "High" column means the highest price of that day, "Low" column means the lowest price of that day, "Close" column means the closing price of that day, and "Volume" means the trading volume of that day, and the "Marketcap" column means the market value in US dollars.

b. Recurrent Neural Network (RNN)

RNNs are a class of artificial intelligence designed to analyze sequential data 22 . These networks are able to maintain an internal state 2 or memory so that they can exhibit dynamic temporal behavior. RNNs have been widely used in various applications such as handwriting recognition 24 speech recognition 25 and prediction of time series. One of the important advantages of RNNs is their ability to identify patterns in input data sequences [15] In this

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research we We use simple RNN to predict the price of digital currency. Figure 2 shows the simple RNN architecture.

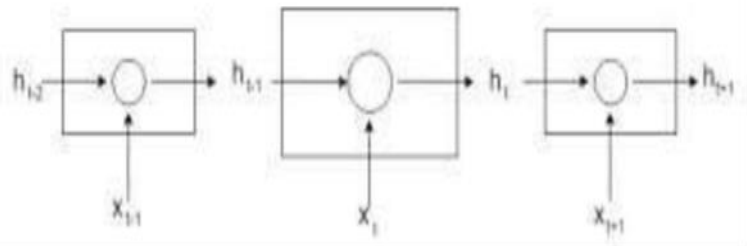

figure 4.

A simple RNN is basically a group of individual neural networks connected to each other, with each network passing a message to the next. In other words, these networks have a short-term memory that stores the information about the observed data, but they are not able to maintain the long-term time series information [16]. The simple RNN equation is shown in equation (1):

$$h_t = g\left(Wx_t + U_f h_{t-1} + b\right) \quad (1)$$

In the above equation $g(x)$, denotes the tangent hyperbolic activation function $g(x) = \tanh(x)$, usually used as the activation function. U and W are the weight matrices that can be set for the h layer, b means the bias, and x is the input vector.
(x) usually in the above equation (x) represents the hyperbolic activation function of tangent 27. Tanh (x) is used as the activation function. U and W are weight matrices that can be set for layer 28. B means bias 2 and x is the input vector.

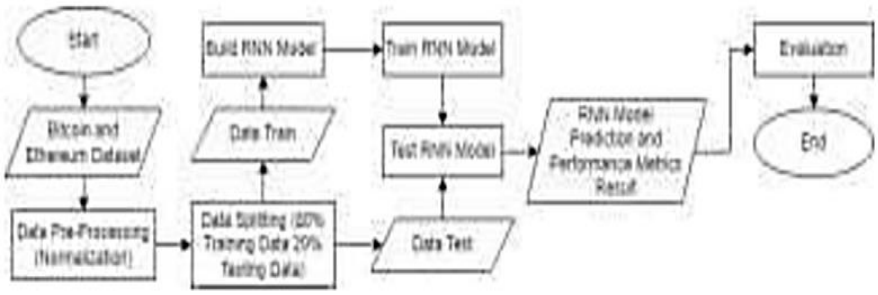

Figure 5.

Figure 5 shows the flowchart of RNN. First, we start by collecting Bitcoin and Ethereum daily price data from the Kegel page [13] Then, we preprocess the data by performing

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normalization. After normalization, we split the data into 80% training data and 20% testing data. In the next step, we build an RNN model, and train the RNN model with the previously segmented training data. We evaluated the performance of the RNN model on the test data, then, the prediction results and evaluation criteria of the RNN model were obtained, the evaluation criteria of the model used in this research are MAPE and RMSE. Finally, we analyze the result and performance of our RNN model.

J. Long Short Term Memory (LSTM)

The LSTM model is an advanced recurrent neural network, designed to deal with gradient bursting and fading problems, which often occur when learning long-term dependencies and very long time delays. As a result, the LSTM model is efficient for handling data with complex temporal dependencies [17]. In LSTM architecture, hidden layers are replaced by LSTM cells. These cells contain various gates that control the flow of incoming data.

The LSTM cell consists of an input gate, state cell, forget gate, output gate, as well as a sigmoid layer, tanh layer (hyperbolic tangent function), and point multiplication operation. In the input gate, the input is received, the state cell goes through the entire network, and can add or remove information with the help of gates, the forget gate determines which parts of the information should be allowed, and the output gate determines the output produced by the LSTM. produces. The sigmoid layer produces numbers between 0 and 1 to indicate how much of each component should be allowed through, and the tanh layer produces a new vector that is added to the mode. The state cell is updated based on the outputs of the gates, and this process is represented mathematically by certain equations [18].

In other words, the LSTM architecture consists of memory blocks that are recursively connected. These blocks were designed to maintain their state over time and control the flow of information through non-linear gate units [19]. The purpose of this section is to describe the mechanisms of the LSTM model. Consider a network with N processing blocks and M inputs. The forward transition of this recurrent neural network can be described as follows. The LSTM architecture is shown in Figure 6.

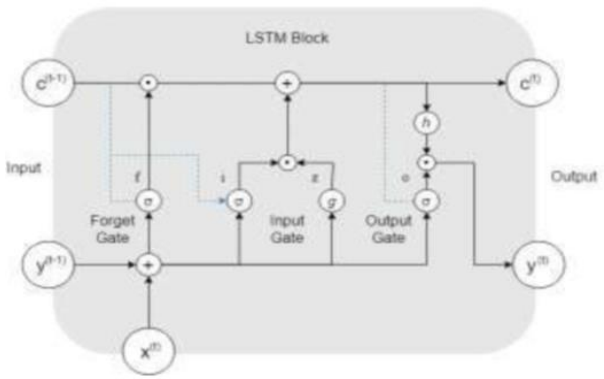

Figure 6.

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The block input stage consists of combining the current input $x^{(t)}$ with the output of the previous LSTM unit $y^{(t-1)}$ with the aim of updating the input block component. This is done through the following equation:

$$z^{(t)} = g\left(W_z x^{(t)} + R_z y^{(t-1)} + b_z\right) \quad (2)$$

In this equation, the process of combining the current input $x^{(t)}$ and the output of the previous iteration $y^{(t-1)}$ is described for the purpose of updating the input component of the block. The weights associated with $x^{(t)}$ and $y^{(t-1)}$ are denoted by W_z and R_z, respectively, and the bias weight vector is denoted by b_z.

The input gate of the LSTM model is a combination of the current input $x^{(t)}$ and the output of the previous LSTM unit $y^{(t-1)}$ and the cell value $c^{(t-1)}$from the previous iteration. The input gate is updated using the following equation:

$$i^{(t)} = \sigma\left(W_i x^{(t)} + R i^{(t-1)} + p_i \odot c^{(t-1)} + b_i\right) \quad (3)$$

In this equation, $\odot$ represents the dot product of two vectors, W_i, R_i and p_i, respectively, the weights associated with the current input $x^{(t)}$ the previous output $y^{(t-1)}$ ،and the previous state cell $c^{(t-1)}$ are The bias vector $b_i$is also a part of this component. In the previous step, the LSTM layer determines which information should be stored in the state cells $c^{(t)}$of the grid. This process consists of selecting candidate values $Z^{(t)}$ that can be added to the state cells, and activation values $i^{(t)}$ determine the input gates.

In the forget gate, the LSTM unit determines which information should be removed from the cells of the previous state $c^{(t-1)}$ Activation values of forgetting gates at time step t using current input $x^{(t)}$,previous output $y^{(t-1)}$, previous state cell $c^{(t-1)}$, aperture connections, and The bias terms b_f of the forgetting gates are calculated. These calculations are performed to determine which information should be removed from previous cell states.

$$f^{(t)} = \sigma\left(W_f x^{(t)} + R_f y^{(t-1)} + p_f \odot c^{(t-1)} + b_f\right) \quad (4)$$

According to the above equation, p_f, R_f, w_f respectively are the weights associated with the current input $x^{(t)}$, the previous output $y^{(t-1)}$ and the previous state cell $c^{(t-1)}$ are. The bias vector $b_f$is also a part of this component.

For the LSTM cell, the cell value is calculated by combining the block input $Z^{(t)}$, the input gate values $i^{(t)}$, and the forget gate values $f^{(t)}$ with the previous cell value. This process is shown in the following relation:

$$c^{(t)} = z^{(t)} \odot i^{(t)} + c^{(t-1)} \odot f^{(t)} \quad (5)$$

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The output gate is calculated by combining the current input $x^{(t)}$, and the previous output of the LSTM unit $y^{(t-1)}$ and the previous cell value $c^{(t-1)}$ These calculations are shown in the following relation:

$$o^{(t)} = \sigma\left(W_o x^{(t)} + R_o y^{(t-1)} + p_o \odot c^{(t)} + b_o\right) \quad (6)$$

According to the above equation, p_o R_o And W_o and respectively the weights associated with the current input $x^{(t)}$ previous output $y^{(t-1)}$ and the previous state cell $c^{(t-1)}$ are. Bias vectorb_o is also part of this component.

Finally, the output of the block by combining the current value of the cell $c^{(t)}$ With the current value of the output gate, it is calculated as follows:

$$y^{(t)} = g\left(c^{(t)}\right) \odot o^{(t)} \quad (7)$$

In previous stages σ , g and h represent pointwise nonlinear activation functions. Sigmoid/logistic function $\sigma(x) = \frac{1}{1+e^{1-x}}$ as activation function for gates, and hyperbolic tangent function $g(x) = h(x) = \tanh(x)$ They are often used as activation functions for input and output blocks.

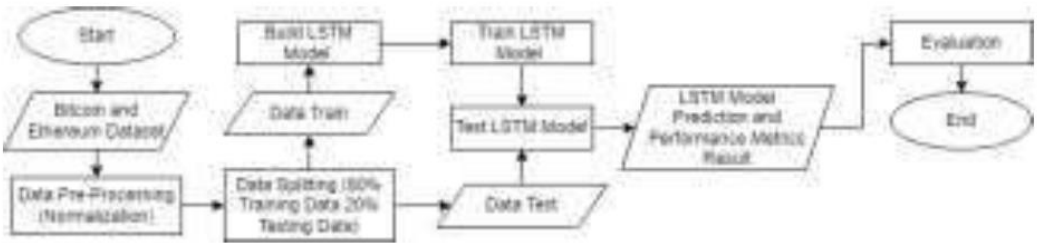

Figure 7.

Figure 7 shows the LSTM flowchart, we first start by collecting the daily price data of Bitcoin and Ethereum from the Kegel page [13]. After the initial steps, the data is pre-processed through normalization. After the normalization is finished, the data is divided into 80% for training and 20% for testing. LSTM models are built and trained using pre-partitioned training data. The performance of the LSTM model is evaluated using experimental data, and the predictions and evaluation measures, such as MAPE and RMSE, are analyzed. Finally, the results and performance of the LSTM model are reviewed.

d. evaluation criteria

There are different evaluation criteria that can be used to evaluate the accuracy of the prediction model. RMSE and MAPE are two commonly used measures for this purpose.

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These criteria include comparing the original value y_i with the predicted amount $\hat{y}$ for each data point, and averaging these differences over the entire data set is n [20]. RMSE is defined as follows:

$$RMSE = \sqrt{\frac{\sum_{i=1}^{n}(\gamma - y_i)^2}{n}} \quad (8)$$

MAPE is a measure used to evaluate forecast accuracy. MAPE is calculated by taking the absolute error of each period and dividing it by the observed value of that period, then the average of these percentages is calculated. This method is useful when the size of the predictor variable is important in assessing the accuracy of the prediction. MAPE represents the prediction error as a percentage of the true value [21]. MAPE is a common evaluation measure for predicting accuracy that has several desirable properties, such as a reliable, unitless measurement that is easily interpretable and supports statistical evaluation. It's also clear and easy to display, and uses all available information about the error. The MAPE formula is defined in the following relation.

$$\text{MAPE} = \frac{1}{n}\sum_{i=1}^{n}\frac{|y - y_i|}{y_i} \times 100\% \quad (9)$$

MAPE by finding the absolute difference between the predicted value $\hat{y}$ And the actual amount y_i For each time point i in the sample, dividing this difference by the true value, and then averaging these values over all time points in the sample n is calculated.

In the past years, artificial intelligence has become a popular topic due to various price prediction studies. The use of RNN and LSTM networks has shown promising results. However, there is still much room for further research in this area. In addition, comparing the performance of RNN and LSTM in other time series domains, such as stock prices, weather forecasting, and energy consumption can be beneficial for model generalization. Overall, there is still a lot to learn about using RNN and LSTM for cryptocurrency prediction, and the results of this research could have a tremendous impact on finance and investment.

RNN networks are very useful, but they also have problems. One of the problems of RNNs is gradient fading when learning from long-term sequences, which reduces the learning ability of the algorithm.

Simple recurrent neural networks (RNN) cannot learn long-term sequences, and this problem led to the creation of recurrent neural networks with long short-term memory (LSTM).

LSTM networks are actually a type of RNNs that have had a change in their block (RNN Unit). This change makes LSTM recurrent neural networks able to manage long-term memory and not have the problem of fading or gradient explosion.

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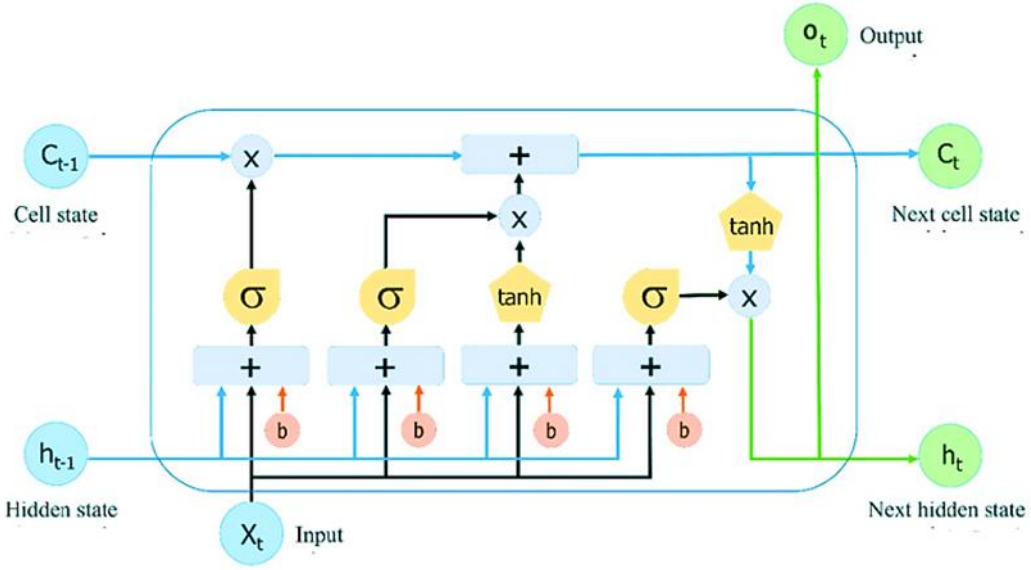

The inside of an LSTM block is changed as follows compared to a simple RNN block:
In the figure above, it can be seen that unlike the simple RNN that had two inputs (x and h), here we have three inputs (x, h and c). x is the input at time (sequence) t, and h, like simple RNN, is the "hidden state" that receives from the output of the previous time (previous sequence) as memory. The input c is a "cell state" that controls how much information from the previous long sequences and which ones are affected in the block.
Intuitively, the "cell state (c)" input and output added in the LSTM relative to the simple RNN acts as a highway that allows information to pass across the network (sequences) without interfering with more complex elements and fading gradients. do not In fact, simple RNN is like a city, and when this city gets big, there is a lot of traffic in it and problems arise. Hence, LSTM creates a freeway along this city, allowing easier information flow for longer paths (longer sequences).
Note that like simple RNN, in LSTM networks, the input h and the same input c are a vector whose number is created by the user parameter. For example, the number of vector elements of h and c may be equal to 64, which means that these two situations are a 64-number vector each. The larger the number of elements of the h and c vectors, the higher the probability of discovering these more complex patterns.
Because the LSTM network is a branch of RNN that has more parameters and fewer defects, price predictions are made based on this network in most cases. It seems that researchers are less inclined towards prediction with RNN method knowing this issue. Therefore, there are much more limited resources in this field.
Knowing about this issue, this research has also introduced the RNN method and due to problems such as the lack of resources in this regard, to show how it works, it has described this method in comparison with the LSTM method.

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To determine the optimal meta-parameters of these models and to find the lowest value of RMSE and MAPE of both methods, we conducted experiments using the data set containing the past daily prices of Bitcoin and Ethereum.

Summary and Conclusion

The use of artificial intelligence in organizational decision-making can have a significant effect on the performance of managers and improve the decision-making process in the organization. By using artificial intelligence methods, organizations will be able to make more accurate and faster decisions and use more information to make decisions. Also, the use of artificial intelligence can reduce decision making errors and improve the quality of decisions. However, for the effective use of artificial intelligence in organizational decision-making, knowledge and expertise in the field of artificial intelligence and data analysis are needed, as well as compliance with ethical and legal issues related to the use of artificial intelligence and data.

Finally, in order to take full advantage of the use of artificial intelligence in organizational decision-making and improve the performance of the organization, it is necessary to design and implement appropriate approaches and strategies for this purpose, as well as training managers and employees of the organization in the field of artificial intelligence and data analysis.

According to a report on the future of artificial intelligence in business, banks and investment managers can earn trillions of dollars in the coming years by integrating A1 tools into their business operations. Companies should study all the cases of using A1 in the capital markets and design a comprehensive solution to benefit from its benefits and maximize their investment. An organization can get the most profit if it uses new methods and always learns new sciences. Learn and implement it in your company. In the past years, because of the various studies of predicting the prices of digital currencies, these currencies became a popular topic. The use of RNN and LSTM networks has shown promising results. However, there is still a lot of room for further research in this field. In addition, comparing the performance of RNN and LSTM in other areas of the series, such as stock prices, weather forecasting and energy consumption can be beneficial for the generalization of the model. There is a lot to learn about using RNN and LSTM to predict digital currencies, and the results of this research can have a tremendous impact on finance and investment.

Offers

Some suggestions can be made for research on the application of artificial intelligence in organizational decision-making and its effect on the performance of managers and the improvement of the decision-making process in the organization:

.1Investigating methods of using artificial intelligence in organizational decision-making. This research can include the study of different methods of using artificial intelligence in

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organizational decision-making. For example: big data analysis, natural language processing and analysis of images and videos. In this research, it is possible to compare different methods and their effect on the performance of the organization and improve the decision-making process.

.2Investigating the effect of artificial intelligence on the performance of managers. In this research, it is possible to compare the performance of managers who use artificial intelligence in decision-making with managers who use traditional methods. Also, the effect of artificial intelligence training on the performance of managers can also be investigated.

.3Investigating the effect of artificial intelligence on the decision-making process in the organization In this research, it is possible to compare the quality of decisions made using artificial intelligence with the decisions made using traditional methods. Contract.

.4Examining the barriers to using artificial intelligence in organizational decision-making: in this research, it is possible to determine the barriers to using artificial intelligence in organizational decision-making and provide solutions to overcome these barriers.

.5Suggesting solutions to improve the use of artificial intelligence in organizational decision-making. In this research, solutions can be provided to improve the use of artificial intelligence in organizational decision-making. For example, designing solutions to increase the acceptance of artificial intelligence by managers and employees of the organization or developing artificial intelligence-based systems to improve the organizational decision-making process.

In general, for research on the application of artificial intelligence in organizational decision-making and its impact on the performance of managers and improving the decision-making process in the organization, challenges such as data quality, privacy problems, ethical and legal issues, comparing different artificial intelligence methods, designing predictive models, etc. .. noticed.

Suggestions for future research

Based on the limitations faced by the researcher, the author has several suggestions that can be considered for further research, namely:

It is suggested that in the future researches, the present issue will be re-examined by measuring the quality of financial reporting with other variables and the result will be compared with the results of this research.

Measuring the quality of financial reporting in a crisis period by separating industries is one of the appropriate topics for future research.

According to the mutual effect of quality components; It is suggested to use the system of simultaneous equations to estimate the models related to researches.

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Due to the fact that the companies in the same industry due to their different position and market share do not necessarily suffer from the same intensity of competition, so that pioneer companies usually face less competition compared to other competitors (follower companies), conducting this research separately Pioneer and follower companies and comparing it with industry results can be another research topic.

To increase the validity of the results of such research, a larger sample can be used in future research.

Due to the fact that no comprehensive research has been done in this case, it is suggested that this research be examined and tested in a longer period of time.

In legal industries such as banks, insurance and leasing, due to the different financial tools of profit management, the effect of the legal characteristics of the audit committee on the quality of financial reporting of such industries can be specifically reviewed.

Research limitations

Some of the limitations faced in this research are:

(1)Its data sources are obtained through the data of the annual report. The measurement of the legal expert audit variable only checks through the annual report whether the profile of the audit committee has an educational or professional background in the legal field, so it cannot be known that the committee Does auditing really work in the legal field or not?

(2)The lack of required and reliable data for the calculation of research variables in the case of some companies caused them to be removed from the statistical sample, which affects the ability to generalize the results to the statistical population. If this limitation did not exist, it would have been possible to investigate more companies, and the results obtained could be generalized to the entire society with greater confidence.

(3)Some data needed to be adjusted due to inflation, and their lack of adjustment could be considered a major limitation for the research.

(4)The selection of sample companies from among the companies admitted to the Tehran Stock Exchange has made it impossible to extend the results to non-stock companies.

(5)According to the type of model in this research, if more information is obtained both in terms of year and number, the results of the research would probably be different.

(6)Regarding this research, there are other factors such as economic and political macro-publics and behavioral trends of real investors that were beyond the reach of the researcher. These factors can affect the results of the research; However, the effect of these factors is not considered in this research.

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