Artificial Intelligence Approach for Stock Market

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ABSTRACT- Stock market prediction has become an attractive investigation topic due to its important role in economy. Financial forecasting is a difficult task due to the intrinsic complexity of the financial system. This work aims to use artificial intelligence (AI) techniques for modeling and predicting the future price of a stock market index and achieving an effective model for predicting stock market future trends with Support Vector Machine (SVM)) and using Machine Learning. There is an urgent need to explore the stock market future behavior for avoiding risks of investment. Techniques of artificial intelligence are capable to take into account the complexities of the financial system. These techniques are employed as tools of financial time series prediction. The particular focus of our discussion is to develop and expand the techniques used in financial modeling to predict the future price of the stock market with accurate prediction result to optimize forecasting behavior in the market.

Index Terms Artificial Intelligence (AI), support Vector Machine (SVM)), neural networks, Sentiment Analysis (SA),

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1 INTRODUCTION

This research is concentrated on researches regarding financial modeling with the aid of Artificial Intelligence, and aims to use ANNs to forecast Stock Exchange market index values with reasonable a degree of accuracy.

Artificial neural networks are regards one of the most developed branches of artificial intelligence. A broad range of applications including economic issues, and it is a massive distributed parallel processor. It is similar to the brain in two aspects:

1. Acquiring knowledge via the network through a learning process [8].

2. Synaptic weights (Inter neuron connection strengths) are utilized for storing the knowledge.

The major cause for its popularity can refer to the ability to solve complex or not well recognized computational tasks, efficiency in finding solutions, ability to generalization, as well as the capability of learning based on patterns or without them. The financial markets are considered as a leading factor to the economy, being that the stock market is a leading factor [2], making accurate forecasting on its movement becomes a difficult job and given the huge data available from several sources and probably very complex. Therefore, it is preferable to apply the model of Artificial Intelligence techniques are appropriate through predicting the direction of the future price [4] with accurate prediction result to optimize forecasting behavior in the market.

In our study we considered the predictive tasks. Classification analysis is utilized for forecasting the behavior of stock market. The forecast of stock market helps investors to make investment decisions, via giving them strong insights about the behavior of stock market for avoiding investment risks. It was found that news has an influence on the stock price behavior [2]. The stock market is a constantly changing indicator of economic activity all over the world. There are countless stocks that are bought and sold daily, and these transactions determine market prices. In order to get a gauge of how the overall market is faring, the problem at hand here is trying to use AI techniques to enable stock market forecast. The usefulness of this lies in the fact that if you had the ability to reliably predict stock market movement[10], the

evaluation metric for this task will be the accuracy with which the model can predict the market going up or down Stock forecasting or stock market prediction is a common economic activity that has been an attractive issue and topic to researchers of computer science, engineering, finance, mathematics and several other areas. It is difficult to predict news and updates. It is important to evaluate the existence of relationship between an organization's stock and public emotion [12]. One technique is used for analyzing the public emotion of an organization for forecasting the progress in organizations stock. Analysis of social media activity is strongly related to Sentiment Analysis which is generally employed in many industries and introduces great tools to stakeholders for understanding the reaction of common person toward certain events.

The benefits of such research may lead to superior prediction models and improved returns of risk-adjusted investment and predicting the stocks prices accurately can be done by Artificial Neural Network (ANN).

2. RELATED WORK:

We explored the way of Multi-objective approach for making predictions of a market index with the aid of an Evolutionary Artificial Neural Network (EANN).at the same time, to provide the highest quality investment recommendations possible. For evaluates the quality of a decision based on the amount of investment return the decision, there is related work by Matthew ButlerDavid (1), Nichols(2), Chiu-Che Tseng(3) ,Lufuno Ronald Marwala, (4) OSCAR ALSING, OKTAY BAHCECI(5) and Ayman E. Khedr,S.E.Salama,Nagwa Yaseen (6), Abhishek Kar(9), Abhishek Kar(9) but G. S. (7)Navale, Nishant Dudhwala, Kunal Jadhav(7), is focused on using Data mining which can automatically extract important information from large amount of data that is affecting the stock prices, Their approach mainly focused on portfolio monitoring issues and has no mechanism to deal with uncertainty and urgency factors, Other related research on using ackpropagation algorithm for training session and Multilayer Feedforward network but There are a few disadvantages associated with backpropagation learning, Zabir Haider Khan, Tasnim Sharmin

Alin, Md. Akter Hussain(8). Our system on the other hand reacts to the real-time market situation and gathers the relevant information as needed.

3. Comparative analysis of Artificial Intelligence Approach for Stock Market

Table 1: Comparative analysis of Artificial Intelligence Approach for Stock Market

Author(s)	Methodology	Advantage	Disadvantage
(1) Matthew Butler	Artificial Intelligence (AI) support vector Machine (SVM) Genetic Programming Pseudo financial factor model (PFFM).	Both algorithms were able to achieve superior investment returns with the aid of the PFFM. Multi-objective approach for making predictions of a market index with the aid of an Evolutionary Artificial Neural Network (EANN). the algorithm evaluates the quality of a decision based on the amount of investment return the decision. Performance my benefit from additional input factors or latent variables that accurately	Both methods and their combination outperformed the benchmark. Transaction costs are not considered and depending on the situation can and will negatively impact the reported investment returns. Inaccuracies of the model developed from the Evolutionary Artificial Neural Network (EANN) can partly be attributed to the incomplete and noisy input data.
		measure or infer other market forces such as major economic news, currency exchange rates and market sentiment.	
(2) David Nichols	Machine Learning, Natural Language Processing, and Bayesian Network techniques from Artificial Intelligence	Their work focuses the scope on a handful of individual stocks, but instead of predicting direction, their target variable is the actual stock value. The techniques however, do show potential to model significantly more complex relationships, and would be a great tool to apply particularly to the news headlines.	The performance of the various odels/algorithms was not particularly surprising given the nature of the underlying data.
(3) Chiu-Che Tseng	The Bayesian network ,the C5.0 rule base system. And feed forward neural network system	Using a artificial intelligence system for portfolio selection has performance edge over the human portfolio manager and the market.	The neural network failed to converge due to the large variation of the training data. The C5.0, the successor of the C4.5, did produce some interesting results.
(4) Lufuno Ronald Marwala	neural networks (NN), support vector machines and neuro-fuzzy systems Autoregressive Moving Average (ARMA) which is linear modeling technique and random walk (RW)	The ranking of performances support vector machines, neuro-fuzzy systems, multilayer perceptions neural networks is dependent on the accuracy measure used. SVM had its best performance at three inputs. The ranking of these techniques is dependent on the accuracy measurement used.	It is not possible to show that the three techniques can disprove the weak form of market efficiency. a conclusion as to whether the EMH is refuted when transaction costs are factored in, cannot be made. In this study only a short forecasting

	technique.		horizon not included of other technical indicators such as the moving average together with prices of the market and unable to focus on using macroeconomic variables
(5) OSCAR ALSING OKTAY BAHCECI	Artificial Intelligence; Neural Network; Sentiment Analysis (SA), Machine Learning (ML) and Data Mining (DM)	Implementing various machine learning and classification models such as the Artificial Neural Network we successfully implemented a company-specific model capable of predicting stock price movement with 80% accuracy.	The currently limited amount of twitter data restricts the validity of the used machine learning methods and do not provide results reliable enough to be exclusively used in a real-world application. The optimized implementation of the feed-forward neural network outperformed other types of machine learning techniques with relatively high performance and accuracy. However, this accuracy is limited to stock price movement rather than stock close price prediction. The use of Twitter sentiment analysis as a stock predictor is not reliable enough to be used as a exclusive predictor.
(6) Ayman E. Khedr, S.E.Salama, Nagwa Yaseen	K-NN algorithm Analyze news sentiment to get the text polarity using naïve Bayes algorithm. Combines news polarities and historical stock prices together to predict future stock prices.	Constructing an effective model to predict stock market future trends with small error ratio and improve the accuracy of prediction. The model provides better accuracy results than all previous studies by considering multiple types of news related to market and company with historical stock prices	technical analysis indictors, recognition of emotional sentences in determining news polarities, as well as the influence of news that appears in social media not considered while calculation
(7) G. S. Navale, Nishant Dudhwala,Kunal Jadhav.	ARMA (autoregressive-moving average) algorithm	Data mining can automatically extract important information from large amount of data that is affecting the stock prices.	It is necessary to analyze effects of applying different sentiments analysis and Financial Market
(8) Zabir Haider Khan, Tasnim Sharmin Alin, Md. Akter Hussain	Artificial Neural Network (ANN) Backpropagation algorithm and Multilayer Feedforward network.	they used Backpropagation algorithm for training session and Multilayer Feedforward network as a network model for predicting price	The problem of this analysis is that the extraction of trading rules from the study of charts is highly subjective, as a result different analysts extract different trading rules studying the .same charts

(9) Abhishek Kar	Artificial neural networks, Image sequence analysis, Multi-layer neural network	They described the application of Artificial Neural Networks to the task of stock index prediction. and described the theory behind ANNs and Neural Network model and its salient features.	There are a few disadvantages associated with backpropagation learning as well: •The convergence obtained from backpropagation learning is very slow. •The convergence in backpropagation learning is not guaranteed. •The result may generally converge to any local minimum on the error surface, since stochastic gradient descent exists on a surface which is not flat. • Backpropagation learning requires input scaling or normalization. •Back propagation requires the activation function used by the neurons to be differentiable
(10) Tomasz Kozdraj	Artificial neural networks	They build models the Warsaw Stock Exchange with reality and observe their behavior through a given time period dependence between network parameter setting and the outcomes quality is still significant,	data preprocessing and representation it requires and Still there is no direct rule allowing to get the optimum number of iteration and parameter setting

4. DISCUSSION

Given the above analysis, we could conclude that by using a artificial intelligence system for developing and expand the techniques used in financial modeling and the market, focus-ing on some systems for this research among numerous artificial intelligence systems available.

We would like to conduct further study to better qualify and quantify various artificial intelligence systems for use on predicting the direction of the future price with accurate prediction result to optimize forecasting behavior in the market.

1-One idea would be to use Multi-objective approach for making predictions of a market index with the aid of an Evolutionary Artificial Neural Network (EANN), and the algorithm evaluates the quality of a decision based on the amount of investment return the decision but the Transaction costs are not considered and depending on the situation can and will negatively impact the reported investment returns.

2-Their work focuses the actual stock value by using deep learning techniques on the news headlines could help unlock more complex natural language features that could help give the models more predictive power. Also, a larger set of news headlines would help train such a more complex model. but The performance of the various algorithms was not particularly surprising given the nature of the underlying data

3-According this research they used artificial intelligence system for portfolio selection has performance edge over the human portfolio manager and the market, but the neural network failed to converge due to the large variation of the training data.

4- we noticed this research they identify The ranking of performances support vector machines, neuro-fuzzy systems, multilayer perceptions neural networks is dependent on the accuracy measure used, and SVM had its best performance at three inputs. The ranking of these techniques is dependent on the accuracy measurement used but unable to focus on using macroeconomic variables.

5-This work is focusing on the optimized implementation of the feed-forward neural network outperformed other types of machine learning techniques with relatively high performance and accuracy. However, this accuracy is limited to stock price movement rather than stock close price prediction but They used of Twitter sentiment analysis as a stock predictor is not reliable enough to be used as a exclusive predictor.

6-Their work focuses on building an effective model to predict stock market future trends with small error ratio and improve the accuracy of prediction and The model provides better accuracy results than all previous studies but technical analysis indictors, recognition of emotional sentences in determining news polarities, as well as the influence of news that appears in social media not considered while calculation.

7-This research interested of Data mining can automatically extract important information from large amount of data that is affecting the stock prices but it is necessary to analyze effects of applying different sentiments analysis and Financial Market.

8-they used Backpropagation algorithm for training session and Multilayer Feedforward network as a network model for predicting price but The problem of this analysis is that the extraction of trading rules from the study of charts is highly subjective, as a result different analysts extract different trading rules studying the same charts.

9-They described the application of Artificial Neural Networks to the task of stock index prediction. And described the theory

behind ANNs and Neural Network model and its salient features. There are a few disadvantages associated with backpropagation learning as well:

• The convergence obtained from backpropagation learning is very slow.

• The convergence in backpropagation learning is not guaranteed.

• The result may generally converge to any local minimum on the error surface, since stochastic gradient descent exists on a surface which is not flat.

• Backpropagation learning requires input scaling or normalization.

• Back propagation requires the activation function used by the neurons to be differentiable.

10- Finally the last research constructed models for Warsaw Stock Exchange with reality and observe their behavior through a given time period dependence between the outcomes quality and network parameter setting. It is still significant. There is no direct rule that allows obtaining parameter setting and the optimum number of iteration.

It is to conclude that, the common user's voice on twitter do not affect the movement of stock price, if any at all, but the heavy influencers' positive and negative feedback did have an impact. As investors and researchers struggle to out-perform the market, the employment of "neural networks" for forecasting prices [1,4] of stock market will be a field of research. The final objective is to raise the return from the investment. It has been proved through research that the evaluation of the return on investment in share markets through any of the conventional techniques is tedious, a time consuming and expensive process. In conclusion we can say that if we train our system with more input data set, it will generate more error free prediction of the price. The drawbacks of the other techniques can be addressed by collaborating Artificial Intelligence.

5. CONCLUSION

The main objective of this research was to develop and expand the techniques used in financial modeling with the aid of artificial intelligence (AI) approaches, and the approach taken for this research was to predict the future price of the stock market. The vast amount of work done in this area with all three techniques (Artificial Neural Network (ANN), Sentiment Analysis (SA) and support Vector Machine (SVM)) has focused more on predicting the direction of the future price with accurate prediction result to optimize forecasting behavior in the market. Most of the authors have used methodologies in artificial intelligence to achieve accuracy and performance as shown Table 1. But still there is a need to improve the parameters accuracy and performance. This can be achieved with the help of Artificial Neural Network (ANN), Sentiment Analysis (SA) and support Vector Machine (SVM) when put together will result in nearly accurate accuracy.

The results of the proposed model are compatible with researches that state that there is a strong relation between stock news and changes in stock prices. This model can be updated in the future by including some technical analysis indictors, also we can consider the recognition of emotional sentences in determining news polarities, as well as the influence of news that appears in social media [12]. The results also indicated that the models were able to outperform the market

With the algorithm support vector Machine to make predictions [5] on market behaviors which help of the quality decision, Thus we can see that Neural Networks are an effective tool for stock market prediction and can be used on real world datasets

6. FUTURE WORK

Future research in the field could investigate the importance of further developing the sentiment analysis to take more parameters in consideration

The future research can focus on using macroeconomic variables, such as interest rate, Gross domestic product (GDP), etc. as input to the different models to determine if they have any predictive power.

A study can be conducted to test the effect of either the interest rate or the rate of inflation on the All Share Index. Which help decision makers or investors to understand how the market would behave if the interest rate increases or decreases. Another area of interest would be to look at artificial intelligence techniques that can be adaptive and learn the data online. This would look at methods that are able to learn new market patterns as they occur in real time and still retain good predictive power. Also Future research in the field could investigate the importance of further developing the sentiment analysis to take more parameters in consideration

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