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The Role of Artificial Intelligence in Financial Market

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Abstract*: The development of AI technology is part of the ongoing solution to the problem of financial traders or agents. Trade prediction in the financial market initially started with the collection and analysis of information. To reduce the risks and understand market volatility, scholars and computer professionals developed a cutting-age tool that collects huge amounts of information from several datasets and combines different types of data collected from diverse sources. The methodology employed is a systematic literature review of the collection and synthesis of previous literature. Our SLR found that automation accelerates the systems and enables the algorithms to respond speedily to market oscillations through observing and data analysis. Even though the methodology suffers from limitations, future research should adopt comparative analysis.*

Keywords*: Artificial intelligence, Financial Market, Prediction, Machine learning, Trader, Stock market, Deep learning, Systematic literature review*

1.0. Introduction

Trade prediction in the financial market initially started with the collection and analysis of information such as macroeconomics, previous trading history, political news, companies, and country level. However, there is overwhelming evidence that adopting A-I or M-L in the system contributes to fast or quick prediction of price movement, market-pattern, or direction. According to Waisi (2020), "artificial intelligence" (A-I) or "machine learning" (M-L) are used interchangeably. Scholars describe AI as the replication of human intelligence processes by machines, particularly "computer systems", "natural language processing", "speech recognition", and "machine vision" as some of the specific "A-I" applications.

Literature on financial markets (Brito, 2014), emphasises the nature, the volatility, and the risk factor as the major concerns for financial traders or agents. To reduce the risks and understand market volatility, scholars and computer professionals developed a cutting-age technique that collects huge amounts of information from several datasets and combines different types of data collected from diverse sources. These techniques utilise the computer's ability to execute trading tasks in a complex environment by learning from previous trading history.

When it comes to algorithm trading, unconventional mathematical tools and techniques are used to execute trades in the financial markets. A-I eliminates human error and the system makes decisions faster and more accurately.

In this paper, we aim to review the literature to identify the benefits of artificial intelligence in the financial markets. The paper was divided into three parts. The first section provides a definition and a literature review. The second section is devoted to methodology as it applies to the purpose of these studies, and the last section is devoted to findings from the literature, conclusion, and future research directions.

2.0. Literature review

The last section is devoted to a review of existing knowledge. The following statements are a brief description of scholarly work-related stock predictions using A-I and machine learning in the financial market.

In regarding trade prediction, (Hameed et al., 2021) proposed two powerful models of prediction strategy based on "Artificial intelligence" (A-I) and "Machine learning" (M-L) using long- & short-term memory to predicts the time period of occurrence and future anticipated event. The proposed models have the tendency to evaluate huge amounts of information and assume future market trends that are similar to previous trends. Based on Artificial Natural Network (ANN) and Convolutional Natural Network (CNN) models, using the models, the authors train the date and evaluate the strategy that test values. Both the models apply algorithms to predict the open value and close low. The ANN evaluates and predicts the market with a score accuracy of 0.987, while CNN evaluates the data with a prediction of market score accuracy of 0.990.

Another study of stock market predictions on EURO indexes (i.e., DAX, EUROSTOXX 50, CDAX, ASE etc) Ketsetsis et al., 2020 use deep learning and NN techniques to contribute to our knowledge. Based on a review of different literature, they figure SLR statistically analyses and predicts the European stock market. Ketsetsis described the LSTM method with a foretaste frequency of 58% of stock market trends. The study confirms the improvement in the EURO index over using traditional machine learning methods with an accurate prediction of the patterns. However, Ketsetsis et al. found LSTM to be the most usable method for predicting patterns globally.

Data were extracted from social media in a similar study (Fataliyev et al., 2021), which used DL and ML to analyse textual content. However, Fataliyev et al. apply stochastic indicators such as (i.e., RSI, MACD, DMI, EMA), technical and fundamental analysts' models. Fataliyev et al. presumed that fundamental analysts focused on analysing the market based on values. For example, fundamentals extract data from government policy, financial statements, company market data, or balance sheets. Using social media news improves the accuracy score of the prediction pattern. While the technical analysts extract both internal and external data by using historical data to predict future trends.

The paper study led by (Srivastava, et al., 2021) Deep neural organization and time series approach for finance frameworks which anticipating the relevant of development "The Indian financial exchange". The DNN predicts the following day pattern in the file costs. Srivastava, et al., (2021) utilize AI calculations to help vector machine, irregular timberland, angle supporting, and profound neural organizations. Utilizing chronicled NSE shutting value information from first June, 2013 to 30th June, 2020. Notwithstanding, Srivastava, et al., (2021) found profound neural organizations forecast exact over other AI procedures.

Yin, et al., 2022 proposed chart based stock relationship and expectation for high-recurrence exchanging frameworks an original AI model named ("GALSTM") to become familiar with connections amount's of " stocks" & "anticipate" the future costs naturally. Yin et al., (2022) observed GALSTM model, items oversaw completely programmed quantitative exchanging framework accomplished a flat out yearly return pace of "44.71%" & the "SD" of every day returns just "0.42%" after 90 days of activity. There is a one "week" decrease for execution contrasted within the past 13 weeks.

In the review dependent on stock value development (Ronaghi, et al., 2022) proposed two equal ways, for example one depends on the convolutional-neural-organization. On the other hand CNN incorporated with "Bi-directional long short term memory" way. A focal combination community interfaces the layers by consolidating limited elements. Execution assessments are performed dependent on a special COVID-19 related value Movement forecast. Be that as it may, the dataset showing prevalent execution of the proposed structure.

In comparable review, (Egz, et al., 2021) recommended one stock value expectation model for Turkish banks utilizing AI strategies like different straight relapse, edge relapse, rope relapse, support vector machines, choice tree models, irregular woods, XG-Boost technique dependent on a wide dataset which is extended utilizing sliding windows strategy. After the models prepared and tried, it has been seen that the XG-Boost calculation is better than different calculations as per the consequence of the test blunders at foreseeing the stock costs of Turkish banks.

One system is given (Sivri et al.,2022) to consolidate forecasts from news, opinion scores or monetary information utilizing Random Forests, Extreme Gradient Boosting and Light Gradient Boosting Machines of group learning techniques for expectations. Also, accomplished a preferable

exhibition over the two forecasts made by utilizing feeling scores and monetary information as far as week after week return and precision

In the another paper Stock Market Prediction: A Time Series Analysis (Majumder et al., 2022) applied five relapse models specifically straight relapse, irregular timberland, support vector relapse (SVR), vector autoregression (VAR), and long transient memory (LSTM)on recorded stock value information to comprehend future patterns and examples. (Majumder et al., 2022) test every one of the models, Although, LSTM model beat different models.

One more examinations on ML (Mahadik, et al., 2021) looked at LSTM and ARIMA models. Utilizing verifiable information of the company's stock costs which incorporate the open, close, high, low qualities. On which pre-handling is done which includes arranging the information, highlight scaling, auto-connection check, parting it into preparing, and testing informational indexes. These discoveries infer that if the accessibility data is pertinent to the models and top notch models with exact measurement structures are recognized, calculations can perform well. The exactness of the models for each trait is more than 90%. The LSTM model gives better outcomes when the informational collection is huge and has less qualities. Notwithstanding giving preferable exactness over LSTM, the ARIMA model requires additional time.

In summary, many scholars (Ronaghi, et al., 2022; Majumder et al., 2022; Sivri et al.,2022; Yin, et al., 2022; Hameed et al., 2021; Fataliyev et al., 2021; Egüz, et al., 2021; Srivastava, et al., 2021; Mahadik, et al., 2021; Ketsetsis et al., 2020) emphasis the prediction accuracy of AI, the risk in relation with financial market can be recognise. AI technology is a cutting-age tools linked in stock market for prediction, direction market movement and efficiency in fast respond. However, integrating AI in the system needs to go through many training and data test that will ensure proper functioning. It should be noted that financial market is influence by noise and big money entries and this can easily recognise using artificial intelligence.

3.0. Methodology

This section is dedicated to the research method which we deployed for the purpose of this study. The methodology adopted on this paper is a systematic literature review (SLR). Although, many academic scholars often used SLR to collect and synthesis huge research from many spheres (Jesson et al., 2011; Knopf, 2006; Petticrew & Roberts, 2006). The SLR can be categorise as quantitative in nature, where the main objective is to comprehend what "work" previously and "what" have not, why the "certain" methods, and how procedure or interference work. On the other hand, the primary aim of qualitative SLR is to categorise "certain" studies conducted in the field.

Firstly, we develop a searching strategy from the scholar database (i.e. WoS, Google scholars, and Scopus etc), using keywords such as ("Artificial intelligence" AND "Financial Market" AND "Machine learning" AND "CNN" AND "Trade" AND "Deep learning" AND "ANN "etc). Secondly, we read the abstract, if the paper is relevant with our objective we then saved and keep the reference in the excel sheet. On this paper we thoroughly reviewed 40 literatures, but only 10 fit into our paper. The table 1 is the lists of reviewed journals.

Table 1: Journals of review literature

S/N	Journal Lists	No.
1.	*Springer*	*2*
2.	*IEEE Xplore*	*2*
3.	*ArXiv*	*1*
4.	*EAI Endorsed Transactions on Creative Technologies,*	*1*
5.	*Journal of organizational and end user computing*	*1*
6.	*Expert Systems with Applications*	*1*
7.	*Pattern Recognition*	*1*
8.	*Data Mining and Knowledge Discovery*	*1*

4.0. Result

Nowadays, AI influences trade, and prediction processes in a variety of ways. For instance, trend detection using automation. However, automation accelerates the systems that can be automated to established trade entry, and artificial intelligence enabled algorithm to respond speedily to market oscillations through observing and data analysis. Recently, artificial intelligence has opened new opportunities, and it is now being reflected in many industries for instance in medical, manufacturing etc.

The artificial intelligence is trending in the financial area due to its capabilities and time saving. Professionals from finance are no longer devoting days on worksheets, analysing data, and reporting. Most routines are automated using AI and ML. Moreover, artificial intelligence has had a noticeable impact on the financial industry and has improve the prediction accuracy and market trend since its inception.

AI has shown promise in sifting through massive of data. Artificial intelligence demonstrates capabilities to accurately predict market direction, and trend patterns that is better than traditional methods. AI and ML used historical data to predicts and score with more than 90% accuracy, which no other approach has been able to achieve. Sustaining feelings and emotions has not been easy, particularly in stock market trading.

5.0. Conclusion

In conclusion, we study the benefit of AI in financial market, we employ systematic literature review for the collection and synthesisation previous literature. In this paper we investigate artificial intelligence in financial market. The development of AI technology as a part of the ongoing solution to the financial traders or agents

Our study suffers from the limitation, the methodology employs on this paper even we systematically review still there is biased and we suggest performing a comparative analysis with the same topic (Under Progress). The findings may provide insight into how deep AI and ML work and more of it benefit for financial traders.

6.0. Reference:

Brito, P. (2014). Symbolic data analysis: another look at the interaction of data mining and statistics. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, *4*(4), 281-295.

Egüz, B., Çorbacı, F. E., & Kaya, T. (2021, August). Stock Price Prediction of Turkish Banks Using Machine Learning Methods. In *International Conference on Intelligent and Fuzzy Systems* (pp. 222-229). Springer, Cham.

Fataliyev, K., Chivukula, A., Prasad, M., & Liu, W. (2021). Stock Market Analysis with Text Data: A Review. *arXiv preprint arXiv:2106.12985*.

Hameed, M., Iqbal, K., Ghazali, R., Jaskani, F. H., & Saman, Z. (2021). Karachi Stock Exchange Price Prediction using Machine Learning Regression Techniques. EAI Endorsed Transactions on Creative Technologies, 8(28), e5.

JESSON, J., MATHESON, L. and LACEY, F. M., 2011. Doing your literature review: traditional and systematic techniques. London: Sage.

KNOPF, J. W., 2006. Doing a literature review. PS: Political Science & Politics, 39 (1), 127–132.

Ketsetsis, A. P., Kourounis, C., Spanos, G., Giannoutakis, K. M., Pavlidis, P., Vazakidis, D., ... & Tzovaras, D. (2020, December). Deep learning techniques for stock market prediction in the European union: a systematic review. In 2020 International Conference on Computational Science and Computational Intelligence (CSCI) (pp. 605-610). IEEE.

Majumder, A., Rahman, M., Biswas, A. A., Zulfiker, M., & Basak, S. (2022). Stock Market Prediction: A Time Series Analysis. In *Smart Systems: Innovations in Computing* (pp. 389-401). Springer, Singapore.

Mahadik, A., Vaghela, D., & Mhaisgawali, A. (2021, August). Stock Price Prediction using LSTM and ARIMA. In *2021 Second International Conference on Electronics and Sustainable Communication Systems (ICESC)* (pp. 1594-1601). IEEE.

PETTICREW, M. and ROBERTS, H., 2006. Systematic reviews in the social sciences: a practical guide. Malden, Ma: Blackwell.

Ronaghi, F., Salimibeni, M., Naderkhani, F., & Mohammadi, A. (2022). COVID19-HPSMP: COVID-19 adopted Hybrid and Parallel deep information fusion framework for stock price movement prediction. *Expert Systems with Applications*, *187*, 115879.

Srivastava, P. R., Zhang, Z. J., & Eachempati, P. (2021). Deep Neural Network and Time Series Approach for Finance Systems: Predicting the Movement of the Indian Stock Market. *Journal of Organizational and End User Computing (JOEUC)*, *33*(5), 204-226.

Yin, T., Liu, C., Ding, F., Feng, Z., Yuan, B., & Zhang, N. (2022). Graph-based stock correlation and prediction for high-frequency trading systems. *Pattern Recognition*, *122*, 108209.

Sivri, M. S., Ustundag, A., & Korkmaz, B. S. (2021, August). Ensemble Learning Based Stock Market Prediction Enhanced with Sentiment Analysis. In *International Conference on Intelligent and Fuzzy Systems* (pp. 446-454). Springer, Cham.

Waisi, M. (2020). Advantages and disadvantages of AI-based trading and investing versus traditional methods.

Abbreviations

1) *SLR – Systematic literature review*
2) *AI – Artificial intelligence*
3) *ANN – Artificial neutral network*
4) *CNN – Convolutional neutral network*
5) *ML – Machine learning*
6) *DL – Deep learning*
7) *MA – Moving Average*
8) *MACD – Moving average convergent divergent*
9) *EMA – Exponential moving average*
10) *RSI – Relative strength index*
11) *LSTM – Long-short term memory*
12) *ARIMA – Autoregressive integrated moving average*
13) *GALSTM – Graph Attention Long Short-Term Memory*
14) *DNN – Deep neutral network*
15) *DMI – Directional movement index*
16) *DAX – Deutscher aktienindex*
17) *NSE – National stock exchange*
18) *CDAX – Composite Deutscher aktienindex*
19) *ASE – Amman stock exchange*
20) *WOS – Web of Science*
21) *VAR – Vector autoregression relapse*
22) *SVR – Support vector relapse*
23) *SD – Standard deviation*