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Share Market Prediction using Deep Neural Network

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Abstract*: People, due to their complexity and volatile actions, are constantly faced with challenges in understanding the situation in the market share and the forecast for the future. For any financial investment, the stock market is a very important aspect. It is necessary to study while understanding the price fluctuations of the stock market. In this paper, the stock market prediction model using the Recurrent Digital natural Network (RDNN) is described. The model is designed using two important machine learning concepts: the recurrent neural network (RNN), multilayer perceptron (MLP) and reinforcement learning (RL). Deep learning is used to automatically extract important functions of the stock market; reinforcement learning of these functions will be useful for future prediction of the stock market, the system uses historical stock market data to understand the dynamic market behavior when you make decisions in an unknown environment. In this paper, the understanding of the dynamic stock market and the deep learning technology for predicting the price of the future stock market are described.

Keywords*: Deep Neural Network (DNN), Multi-layered Perceptron (MLP), Multilayer Perceptron Model. Deep learning (DL), reinforcement learning (RL)

I. INTRODUCTION

In order to obtain maximum profit, stock investors will always try to predict the Future Movement of the market, which is very difficult in the volatility and unsteady nature of the stock market it is a very complex adaptive system. Researchers in such diverse fields have found that multiple approaches to stock market forecasting have lower accuracy. Stock market forecasts are a very interesting topic for research for many analysts. In addition, the stock market is an important part of every country's economy [1]. Therefore, in order to maximize capital gains and minimize losses, it is urgent to make accurate forecasts for the price trends of the stock market. Such as corporate news and performance, industry performance, investor sentiment, social media sentiment, and the economic situation affect the price of the stock market. There is an existing deep machine learning approach to trading financial markets [2]. However, many of them are trying to predict price movements and trends. In the historical price of all the assets as its input, the neural network can output a prediction vector of the asset price for the next period [3]. Then the exchange agent can act upon this prediction. This idea is easy to implement because it is supervised learning or more specifically a regression problem. However, the performance of these price prediction-based algorithms is highly dependent on the degree of prediction accuracy; it is difficult to predict future market prices.

The system proposes to introduce a new technique known as RDNN (Deep Recurrent Neural Network) system to understand the environment and to predict market condition. In this, the RDNN uses two parts as Deep Neural Network which is used for the key feature learning and the second one is RNN (Recurrent Neural Networks) for the RL (Reinforce Learning). Using the concept of fuzzy learning, the ambiguity of input data is reduced and it boosts the stability of market classification. The actual-time stock market data is used for future predictions of trades. The system uses the MLP algorithm to predict the value of the next day. Fuzzy MLP is will be used to the predicted result.

In this paper study about the Literature Review done, in section II, the Proposed Approach Modules Description, Mathematical Modeling, Algorithm discussed in section III and Experimental setup in section IV and at finally provide a Conclusion in section V.

II. LITERATURE REVIEW

Here, present the literature review of existing techniques:

Benyuan Liu, Jia Wang, Tong Sun, Degang Wang and Yu Cao [1], financial markets are difficult to predict because of their complex system dynamics. Although some recent studies have used machine learning techniques to predict financial markets, they have not produced satisfactory results in terms of financial returns. They propose a new one-dimensional convolutional neural network (CNN) model to predict financial market movements. The configured one-dimensional convolution layers scan financial trading data over time, while different types of data, such as price and volume, share parameters (cores) with each other. The model automatically removes features instead of using traditional technical indicators and thus can avoid displacements caused by the choice of technical indicators and predefined ratios in technical indicators.

David Lu [2], represent possible approaches to the implementation of the trade and introduce the concept of trading robot. To achieve a similar level of performance and community as human traders, agents are used to mature a learning model that leads to long-term rewards at the human level.

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The reliability and practicability of the system implemented in the iterative structure of LSTM (Long Term Short Term Memory) with increased training or the strategy of evolution, which acts as an agent, comparable to the GBPUSD.

Bo-Sheng Lin, Chuin-Mu Wang and Shao-En Gao [3], the author used historical stock information to predict future stock prices and use deep learning to achieve them. This article uses deep learning to predict the future trend of stock prices. Since the stock trend is usually related to the previous stock price, this article proposes a convolutional recurrent neural network (CRNN) based on Conv LSTM architecture, in which long-term and short-term memory are used in RNN architecture. LSTM improves the long-term dependence of traditional RNN and effectively improves prediction accuracy and stability. This article collects a total of ten historical stock data for testing and achieving an average error rate of 3,449 RMSE.

Deng Yue, Kong Youyong, Dai Qionghai, and Bao Feng [4], imagine a real-time high-frequency representation of a financial signal and an optimal trading (Scot) system with sparse coding for trading. SCOT (sparse coding-inspired optimal trading) simultaneously studies trading strategies in dictionaries, sparse functions, and collaborative optimization to obtain optimal representations of functions for specific trading purposes. The learning process is modeled as a two-level optimization and solved by the method of rapid convergence of the gradient online. In this dynamic context, this approach will be tested in real financial markets for trading index futures at the Shanghai stock exchange center.

Thomas Fischer, Christopher Krauss [5], the authors are applied a hierarchical conceptual (HC) and artificial neural network-a quantitative (ANN-Q) model for monthly forecasting of oil prices for each barrel in us dollars. The results of the simulation study show the effectiveness of the data selection process for the HC model, which can successfully obtain a list of key features that affect the price of crude oil.

George Dahl, Li Deng, and Dong Yu [6], represent a context-dependent (CD) methods for LVSR (speech recognition with a large vocabulary), which use the latest achievements with the use of deep belief networks for phone recognition. They also pre-trained the DNN-HMM (Deep Neural Network Hidden Markov Model) hybrid architecture, which trains DNN to produce hay distribution as its output. Experimental results show that the business search dataset demonstrates that CD-DNN-HMMs is significantly superior to the usual context-sensitive and the accuracy of this improvement is 5.8% and 9.2%.

Alex Graves, Geoffrey Hinton and Abdel-rahman [7], there is RNNs (recurrent neural network)on neural networks for relapse progression. With end-to-end training methods such as connectionist time classification, RNNs can be trained for sequence marking tasks where I/O alignments are unknown. The combination of these methods the RNN architecture with long-term short-term memory provides the most up-to-date results in handwriting recognition and has proved particularly fruitful. But the performance of the RNNs is speech recognition-a deep network of direct connections, which returns the best results. The flexible use of long-distance contexts, which extend the capabilities of RNN and the ability to combine multiple levels of expression, has proven to be highly effective in deep networks.

Dongbin Zhao and Yuanheng Zhu [8], the author proposes a PAC algorithm for solving the on-line RL (reinforcement learning) of continuous state systems for this deterministic transition function. In this, they firstly used PAC for continuous deterministic systems without being dependent on System Dynamics. They combine the efficient survey principle with state aggregation technology to analyze the high utilization of the observed samples online. To save the sample values, they used the grid part. Compare this algorithm to the one source PAC algorithm.

Aakanksha Sharaff and Meenakshi Choudhary in [9], they studied and compared different models for stock market predictions such as ARIMA, artificial NN, recurrent NN, etc. According to the authors, the neural network gives more accurate predictions than other models. They also suggested using hybrid models to improve prediction accuracy.

D. Wierstra, J. Hunt and D. Silver [10], the author deep Q learning is used for an algorithm without an actor-critique model based on a deterministic policy gradient that can operate on a continuous action space. The same learning algorithm, network architecture hyper parameters, this algorithm has a powerful solution to more than 20 simulated physical problems, including classic problems such as trolley pole swing up, manual dexterity operation, carrying feet, driving a car. In addition, many tasks demonstrate that the algorithm can learn end-to-end policy directly from the original pixel input.

Yinghao Chu ,Chen Huang, Xiaodan Xie, Bohai Tan, Shyam Kamal and Xiaogang Xiong [11], proposes an multilayer hybrid deep-learning system (MHS) model to sort the waste in public urban area. The proposed system uses camera to capture the waste images and sensor to detect other useful features. The author uses CNN and MLP classifiers to classify the waste.

Foroogh Sharifzadeh, Gholamreza Akbarizadeh, Yousef Seifi, Kavian [12], the SAR technology is used abundantly to better monitor the target area without taking into account the air conditions, image shooting. The neural network For image classification, a hybrid algorithm of CNN and multilayer perceptron (CNN–MLP) is proposed. In this proposal, the algorithm is trained in the actual SAR image from the Sentinel-1 and RADARSAT-2 satellites and is better at classifying objects than the state of the art

III. METHODOLOGY

The system proposes to introduce a new technique known as RDNN (Deep Recurrent Neural Network) system to understand the environment and to predict market condition. In this, the RDNN uses two parts as Deep Neural Network which is used for the key feature learning and the second one is RNN (Recurrent Neural Networks) for the RL (Reinforce Learning). Using the concept of fuzzy learning, the ambiguity of input data is reduced and it boosts the stability of market classification. The actual-time stock market data is used for future predictions of trades.

The DDR trading system uses real financial market data for future contract transactions. In detail, the stock index accumulates historical prices for both futures and Commodity Futures. These actual market data are used directly for performance verification. The Deep RL system is compared to other trading systems under various testing conditions.

The DDR system and its fuzzy extension are very robust for different market conditions, and it is shown that reliable profit can be obtained in various future markets. Figure 1 shows the proposed system architecture.

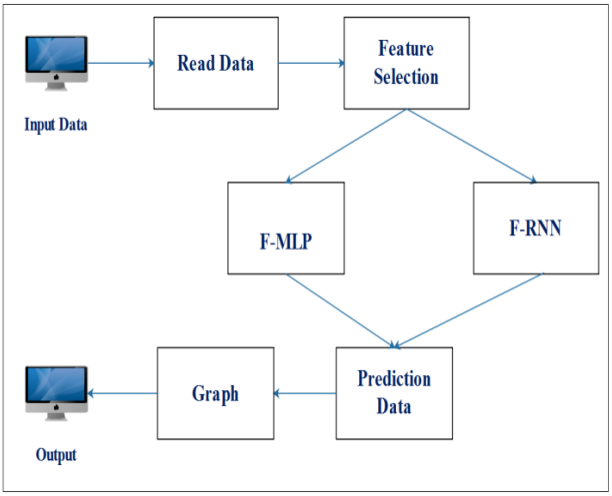

Fig.1. System Architecture

In the proposed system, historical financial data is used and to assemble the prices of stocks and commodity futures. This historical stock market data is used for performance verification. The proposed system is compared with other methodologies. The comparison shows the accuracy and performance of the system in different market conditions and reliable profits can be predicted for different trades.

- **Dataset:** The system use real-time financial historical data such as NSE, BSE, and Bajaj data from Yahoo Finance.
- **Feature Selection:** The system performs the feature selection on data. Trading with unpredictable ambiguities in time-series data of financial data. Other than this, there are various external variables that affect the current market fluctuations, such as government policy, supply and demand, and the latest news in the industry. Such uncertainties are accounted for by expanding the fuzzy logic in the input data to improve the accuracy of financial data analysis and future forecasts.

F-MLP: F-MLP runs a fuzzy function and recovers the missing data. Create a separate training and testing file.

F-RNN: F-RNN runs a fuzzy function and removes null values. Create a separate training and testing file.

- **Prediction Data:** Prediction of the next Working-day. The MLP algorithm is used to predict the value of the next day. Fuzzy MLP is used to predict the result. The graph results show that F-MLP is more accurate than F-RNN.

A. Algorithm

- Algorithm 1: RNN Algorithm

Step 1: Initialize input dataset
Step 2: Remove entry which contains missing values
Step 3: Repeat step-2 until reach end of file
Step 4: Create new .csv file removes missing values from the dataset
Step 5: Generate training and testing file from.csv
Step 6: Train RNN on Training file
Step 7: Prediction of next Working-day

- Algorithm 2: Fuzzy-Multi-Layer perceptron

Step 1: Initialize input dataset
Step 2: Remove entry which contains missing values
Step 3: Repeat step-2 until reach end of file.
Step 4: Create new .csv file Removes missing values from dataset
Step 5: Generate training and testing file from .csv
Step 6: Train MLP on Training file
Step 7: Prediction of next Working-day

IV. RESULT AND DISCUSSION

A. Experimental Setup

The system is built by using the Java framework and Net beans IDE on windows platform. The system doesn't require any specific hardware to run; any standard machine is capable of running the application.

B. Dataset

The system uses three different datasets. 1) BSE SENSEX dataset from Yahoo finance, 2) The National Stock Exchange (NSE) of India Limited (NSE) is the leading stock exchange of India, located in Mumbai, 3) Bajaj auto ltd dataset. For the experiment, the recent 1 year of data is considered.

C. Results

The proposed architecture is capable of processing unsuitable input data. It is also able to predict the value of stock prices for various industries. The author uses the recent 1 year of data for prediction and analysis. Here the author is predicting the day-wise share market price. The accuracy of MLP is calculated by using the following formulas:

Change = Actual Value – Predicted Value (1)
Error (%) = (Change/Actual Value) * 100 (2)
Accuracy (%) = 100% - Error (3)

Table I shows that the comparison between the existing system algorithm F-RNN and the proposed system algorithm F-MLP. The table shows that the proposed method is more accurate than the existing methods.

Table- I: Accuracy Comparison Table

Algorithm	Accuracy in %
F-RNN	80
F-MLP	92

Figure 2 shows that the graph of the accuracy comparison between existing system algorithm F-RNN and proposed system algorithm F-MLP. We consider 1.5 % tolerance for actual values. The resulting graph shows that the accuracy of MLP is 92 % and the RNN is 80 %. The proposed MLP is more accurate than the RNN.

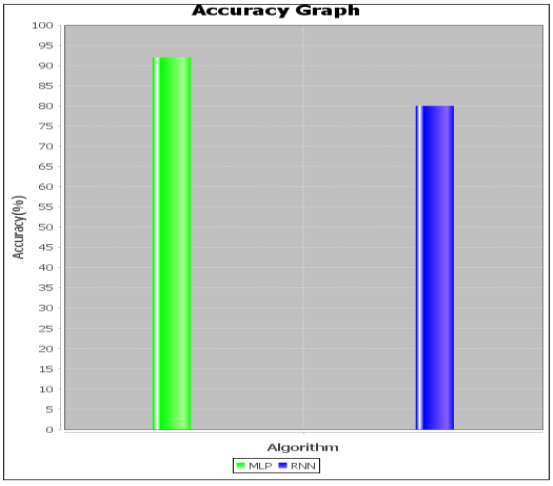

Fig. 2. Accuracy Comparison Graph

V. CONCLUSION

This paper analyzes the work done carried out by various researchers for the prediction of the share market. The authors also use a recurrent deep neural network (RDNN) and multi-layer perceptron (MLP) to increase the accuracy of previous models, an understanding of the stock market and a pre-proposed model to predict the date wise stock prices of the commodity markets. According to the results, F-MLP is better than F-RNN for market forecasting.

In future scope, incorporating the impact of specific events:

- Domestic monitory policy changes
- Impact of other global indices
- Sector-specific trends

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