There are a many conditions that make DL an important architecture for theld of Finance. First, the availability of large data, often streaming in at rates inno other eld. Second, several nance applications depend on speed, and the adventof ecacious hardware in DL makes it possible to achieve response levels that arekey to making trading algorithms viable. Third, much of nance involves pattern recognition using data, where multifarious inputs are modeled to predict outputs.For example, stock market prediction may be based on many variables (streamingdata on stock prices, interest rates, volatilities, etc.). Another case is in consumer banking, where customers are characterized by myriad variables to determine what products to o er them, or to compute their probabilities of retention. We note that this pattern recognition on big data is analogous to the ImageNet problem. Therefore, DL architectures that can learn to recognize an image can be directly used to learn to recognize (for example) signatures in the stock market that predict direction of the index. Or it may be used to train a model to learn how the market prices options, the example we will implement in this paper.

What does DL uncover that is not possible with standard econometric models? The answer is "non linearities". Most econometric models today are linear functions, or simple transformations of linear functions. However, the relationship between inputs and outputs may be hugely nonlinear. This is what a deep learning NN is adept at picking up.

his exercise suggests that deep learning nets may be used to learn option pricing models from the markets, and could be trained to mimic option pricing traders who specialize in a single stock or index.

http://www.bioinf.jku.at/publications/older/2604.pdf

In this paper, instead we utilize it for predicting real-valued quantity, the price of Bitcoin. Based onthis price prediction method, we devise a simplestrategy for trading Bitcoin. The strategy is ableto nearly double the investment in less than 60 dayperiod when run against real data trace.

Bayesian regression and BitcoinDevavrat ShahKang ZhangLaboratory for Information and Decision SystemsDepartment of EECSMassachusetts Institute of Technologydevavrat@mit.edu, zhangkangj@gmail.com

Given live streaming Bitcoin activity, we aim to forecast future Bitcoin prices so as to executeprofitable trades. We show that Bitcoin price data exhibit desirable properties such as stationarityand mixing. Even so, some classical time series prediction methods that exploit this behavior, suchas ARIMA models, produce poor predictions and also lack a probabilistic interpretation. In lightof these limitations, we make two contributions: first, we introduce a theoretical framework forpredicting and trading ternary-state Bitcoin price changes, i.e. increase, decrease or no-change; andsecond, using the framework, we present simple, scalable and real-time algorithms that achieve ahigh return on average Bitcoin investment (e.g. 6-7x, 4-6x and 3-6x return on investments for testsin 2014, 2015 and 2016), while consistently maintaining a high prediction accuracy (> 60-70%) andrespectable Sharpe Ratio (> 2.0). Furthermore, when trained on a period eight months earlier thanthe test peri As an important contribution, we provide a justification for why it makes sense to use classificationalgorithms in settings where the underlying time series is stationary and mixing

Trading Bitcoin and Online Time Series PredictionMuhammad J Amjadmamjad@mit.eduOperations Research CenterMassachusetts Institute of TechnologyCambridge, MA 02139, USADevavrat Shahdevavrat@mit.eduDepartment of Electrical Engineering and Computer ScienceMassachusetts Institute of TechnologCambridge, MA 02139, USA

his research is concerned with predicting the price of Bitcoin using machinelearning. The goal is to ascertain with what accuracy can the direction of Bit-coin price in USD can be predicted. The price data is sourced from the BitcoinPrice Index . The task is achieved with varying degrees of success through theimplementation of a Bayesian optimised recurrent neural network (RNN) and LongShort Term Memory (LSTM) network. The LSTM achieves the highest classic-ation accuracy of 52% and a RMSE of 8%. The popular ARIMA model for timeseries forecasting is implemented as a comparison to the deep learning models. Asexpected, the non-linear deep learning methods outperform the ARIMA forecastwhich performs poorly. Wavelets are explored as part of the time series narrativebut not implemented for prediction purposes. Finally, both deep learning modelsare benchmarked on both a GPU and a CPU with the training time on the GPUoutperforming the CPU implementation by 67.7%

Predicting the price of Bitcoin using Machine LearningSean McNallyx15021581MSc Reseach Project in Data Analytics9th September 2016

As the world's first completely decentralized digitalpayment system, Bitcoin represents a revolutionary phenomenon in financial markets. This study examines predictive relationships between social media and bitcoin returnsby considering the relative effect of different social media platforms(Internet forum vs. microblogging)and the dynamics of theresultingrelationships using vector autoregressive and vector error correction models. The results suggest that more bullish forumshave a positive,statistically significant relationship with future bitcoin returns at a daily level. Internet forum predictive metricsoutperform microblogging ones at a daily frequency, but their effects are opposite at an hourly frequency. The user-generated content contributed by the vocal minority and the silent majority exhibit distinct relationships with bitcoin performance, in terms of both transaction volume and returns. The implications of these results for research and practice are notable with regard to the transformative power of social media analytics in networked business environments subject to the dynamics of bitcoin performance

From Bitcoin to Big Coin:The Impacts of Social Media on Bitcoin Performance Feng Mai Department of Operations, Business Analytics, and Information Systems Carl H. Lindner Collegeof BusinessUniversity of Cincinnati Cincinnati, Ohio 45221-0130, USA

Machine Learning in Stock Price Trend ForecastingYuqing Dai, Yuning Zhangyuqingd@stanford.edu, zyn@stanford.eduI.INTRODUCTIONPredicting the stock price trend by interpretingthe seemly chaotic market data has always been an attractive topic to both investors and researchers.Among those popular methods that have been employed, Machine Learning techniques are very popular due to the capacity of identifying stock trendfrommassive amounts of data that capture the underlying stock price dynamics.In this project, we applied supervised learning methods to stock price trend forecasting.According to market efficiency theory, US stock market is semi-strong efficient market, which means all public information is calculated into a stock's current share price, meaning that neither fundamental nor technical analysis can be used to achieve superior gainsin a short-term (a day or a week). Indeed, our initial next-day predication has very low accuracyaround 50%. However, as we tried topredictlong-term stock price trend, our models achievedahigh accuracy (79%). Based onour prediction result, we builta trading strategy on the stock,whichsignificantly outran the stock performance itself

Equity forecast: Predicting long term stock price movement usingmachine learningNikola MilosevicSchool of Computer Science, University of Manchester, UKNikola.milosevic@manchester.ac.uk

In this paper is presented a machine learning aided methodology for equity movement prediction over the long time. With all 28 selected financial indicators, the methodology performs with F-score of 75.1%, however, by doing a feature selection the number of features can be reduced to 11, while performance can be increased to F-score of 76.5%. Although the increase is not large, the algorithm is more efficient and faster with smaller set of features.

https://mail.google.com/mail/u/0/#inbox

MACHINE LEARNING APPROACH IN STOCK MARKETPREDICTIONRaut Sushrut Deepak 1, Shinde Isha Uday 2,Dr. D. Malathi 31,2B.Tech Student, 3ProfessorDepartment of Computer Science and Engineering SRM University, Kattankulathur, Chennai. sushrutraut94@gmail.com1,eshashinde31@gmail.com2, malathi.d@ktr.srmuniv.ac.in3

Abstract: High level of accuracy and precision is the key factor in predicting a stock market. The technical, fundamental or the time series analysis is used by most of the stockbrokers while making the predictions. Nevertheless, these methods cannot be trusted fully, so there is a necessity to provide the supportive method for stock market prediction. In this paper, we propose a Machine Learning (ML) approach that will be trained from available stocks data, gain intelligence and then uses the acquired knowledge for accurate prediction. After the through research of various algorithms and their fitness for different problem domains, Artificial Neural Network(ANN) was found to be the most practical consideration. Neural network models having the features and customisable parameters makes it possible to implement wide number of features along with the crossvalidation sets. The main significant approach, used in this paper for the predicting result is a concept of machine learning and result tested on the Bombay Stock Exchange (BSE) index data set.

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A neural networks based model has been used in

predicting of the stock market for an NASDAQ's stock

value with a given input parameters of share market[1].

The value of NASDAQ Stock Market index has been

used in Real exchange rate. Mizuno and friends had

i

mplemented the Tokyo stock exchange to forecast

buying and selling signals with an overall accuracy rate

of 63% by using ANN. Sexton and friends initiated with

learning at random points that notify in the training

process. Phua and friends had implemented

ANNs with

the genetic algorithm to the stock market value of

Singapore and forecast the market value with an

forecasting rate of 81%.

Deep Learning for Event-Driven Stock Prediction Xiao Ding†∗, Yue Zhang‡ , Ting Liu† , Junwen Duan† †Research Center for Social Computing and Information Retrieval Harbin Institute of Technology, China {xding, tliu, jwduan}@ir.hit.edu.cn ‡Singapore University of Technology and Design yue zhang@sutd.edu.sg Abstract We propose a deep learning method for eventdriven stock market prediction. First, events are extracted from news text, and represented as dense vectors, trained using a novel neural tensor network. Second, a deep convolutional neural network is used to model both short-term and long-term influences of events on stock price movements. Experimental results show that our model can achieve nearly 6% improvements on S&P 500 index prediction and individual stock prediction, respectively, compared to state-of-the-art baseline methods. In addition, market simulation results show that our system is more capable of making profits than previously reported systems trained on S&P 500 stock historical data.

A Stock Market Trading System Using Deep Neural Network

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The stock market prediction is a lucrative field of interest with promising profit and covered with landmines for the unprecedented. The markets are complex, non-linear and chaotic in nature which poses huge difficulties to predict the prices accurately. In this paper, a stock trading system utilizing feed-forward deep neural network (DNN) to forecast index price of Singapore stock market using the FTSE Straits Time Index (STI) in t days ahead is proposed and tested through market simulations on historical daily prices. There are 40 input nodes of DNN which are the past 10 days’ opening, closing, minimum and maximum prices and consist of 3 hidden layers with 10 neurons per layer. The training algorithm used is stochastic gradient descent with back-propagation and is accelerated with multi-core processing. A trading system is proposed which utilizes the DNN forecasting results with defined entry and exit rules to enter a trade. DNN performance is evaluated using RMSE and MAPE. The overall trading system shows promising results with a profit factor of 18.67, 70.83% profitable trades and Sharpe ratio of 5.34 based on market simulation on test data.

Automated Bitcoin Trading via Machine Learning Algorithms

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