

# FOREX Trend Classification using Machine Learning Techniques

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**Abstract :-** Foreign Currency Exchange market (Forex) is a highly volatile complex time series for which predicting the daily trend is a challenging problem. In this paper, we investigate the prediction of the High exchange rate daily trend as a binary classification problem, with uptrend and downtrend outcomes. A large number of basic features driven from the time series data, including technical analysis features are generated using multiple history time windows. Various feature selection and feature extraction techniques are used to find best subsets for the classification problem. Machine learning systems are tested for each feature subset and results are analyzed. Four important Forex currency pairs are investigated and the results show consistent success in the daily prediction and in the expected profit.

**Keywords:** - Technical analysis, Feature selection, Feature extraction, Machine-learning techniques, Bagging Trees, SVM, Forex prediction.

## 1 Introduction

This paper is about predicting the Foreign Exchange (Forex) market trend using classification and machine learning techniques for the sake of gaining long-term profits. Our trading strategy is to take one action per day, where this action is either buy or sell based on the prediction we have. We view the prediction problem as a binary classification task, thus we are not trying to predict the actual exchange rate value between two currencies, but rather, if that exchange rate is going to rise or fall. Each day there are four observed rates, namely, the "Open", "Close", "Low" and "High". In this work, we focus on predicting the direction of the "High".

Forex daily exchange rate values can be seen as a time series data and all time series data forecasting and data mining techniques can be used to do the required classification task.

In time series analysis, it is always a challenge to determine the required history window used by the classification or forecasting system to do its prediction. In this paper, we have taken an approach of providing features from multiple time windows ranging from one day up to 30 days. This of course results in a number of features larger than using a single time window. Processing of the raw time domain daily values is done to produce the basic features used in the feature selection and extraction steps. This processing involves calculation of technical analysis and other time and frequency domain features over multiple time windows with a total of 81 basic features. Our approach is to let feature selection and feature extraction techniques find the best set of features for the classification task. Feature selection techniques choose a subset of the basic features while feature extraction techniques find features in new projected spaces. In this paper, two feature selection and six feature extraction techniques are used which all aim at finding feature subsets to enhance the classification performance.

For each feature subset, three supervised machine learning classifiers are used, namely, radial basis function neural network (RBF), multilayer perceptron neural network (MLP) and support vector machine (SVM). This gives a large array of different feature subsets and different classifiers. Comparison between these different systems is done based on two factors. The first is the percentage classification performance on the test data. The second is a novel function we call the percentage normalized profit (PNP), which represents the ratio between the accumulated profits using the predicted trends versus the accumulated profit using perfect predictions along the duration of the test period. We have selected four Forex pairs which are namely the USD/YEN, USD/EGP, EURO/EGP and EURO/SAR (where EGP is the Egyptian pound and SAR is the Saudi Riyal). The remaining of this paper is organized as follows. Section 2 discusses the nature of the Forex data, and the most prominent approaches used in the literature

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## **Forex Trend Classification Using Machine Learning Techniques:**

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**3rd IEEE International Conference on Data Mining** Xindong Wu, 2003. ICDM 03 brings together researchers and practitioners who describe their original research results and practical development experiences in Data Mining technology. The papers explore subjects in many related data mining areas such as machine learning, automated scientific discovery, statistics, pattern recognition, knowledge acquisition, soft computing, databases, data warehousing, data visualization, and knowledge-based systems. Data mining is an emerging and highly interdisciplinary field. The ICDM 03 proceedings cover a broad and diverse range of topics related to data mining theory, systems, and applications.

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knowledge and tools needed to navigate the markets identify trends and most importantly maximize profit potential in their pursuit of success in the ever evolving Forex landscape

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### **Table of Contents Forex Trend Classification Using Machine Learning Techniques**

1. Understanding the eBook Forex Trend Classification Using Machine Learning Techniques
  - The Rise of Digital Reading Forex Trend Classification Using Machine Learning Techniques
  - Advantages of eBooks Over Traditional Books
2. Identifying Forex Trend Classification Using Machine Learning Techniques
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Forex Trend Classification Using Machine Learning Techniques
  - User-Friendly Interface
4. Exploring eBook Recommendations from Forex Trend Classification Using Machine Learning Techniques

- Personalized Recommendations
  - Forex Trend Classification Using Machine Learning Techniques User Reviews and Ratings
  - Forex Trend Classification Using Machine Learning Techniques and Bestseller Lists
5. Accessing Forex Trend Classification Using Machine Learning Techniques Free and Paid eBooks
    - Forex Trend Classification Using Machine Learning Techniques Public Domain eBooks
    - Forex Trend Classification Using Machine Learning Techniques eBook Subscription Services
    - Forex Trend Classification Using Machine Learning Techniques Budget-Friendly Options
  6. Navigating Forex Trend Classification Using Machine Learning Techniques eBook Formats
    - ePub, PDF, MOBI, and More
    - Forex Trend Classification Using Machine Learning Techniques Compatibility with Devices
    - Forex Trend Classification Using Machine Learning Techniques Enhanced eBook Features
  7. Enhancing Your Reading Experience
    - Adjustable Fonts and Text Sizes of Forex Trend Classification Using Machine Learning Techniques
    - Highlighting and Note-Taking Forex Trend Classification Using Machine Learning Techniques
    - Interactive Elements Forex Trend Classification Using Machine Learning Techniques
  8. Staying Engaged with Forex Trend Classification Using Machine Learning Techniques
    - Joining Online Reading Communities
    - Participating in Virtual Book Clubs
    - Following Authors and Publishers Forex Trend Classification Using Machine Learning Techniques
  9. Balancing eBooks and Physical Books Forex Trend Classification Using Machine Learning Techniques
    - Benefits of a Digital Library
    - Creating a Diverse Reading Collection Forex Trend Classification Using Machine Learning Techniques
  10. Overcoming Reading Challenges
    - Dealing with Digital Eye Strain
    - Minimizing Distractions
    - Managing Screen Time
  11. Cultivating a Reading Routine Forex Trend Classification Using Machine Learning Techniques
    - Setting Reading Goals Forex Trend Classification Using Machine Learning Techniques
    - Carving Out Dedicated Reading Time
  12. Sourcing Reliable Information of Forex Trend Classification Using Machine Learning Techniques

- Fact-Checking eBook Content of Forex Trend Classification Using Machine Learning Techniques
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning
- Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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