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Paper Authors

Dr.V.Uma Rani ,A.Sai Vivek

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Detection of Fake Bank Currency Using Machine LearningAlgorithms

Dr.V.Uma Rani , Professor, MTech, P.h.D, Department of CSE

A.Sai Vivek, MTech, Data Sciences

ABSTRACT: The most precious asset in our nation is our bank money, therefore it's no surprise that thieves want to disrupt the economy by spreading counterfeit bills. When currency is withdrawn from circulation, counterfeit banknotes flood the market. Many characteristics of a counterfeit note are the same as those of a genuine note, making it very difficult for a human to tell them apart without the application of specialist criteria designed for detection. Distinguishing a fake banknote from a real one is a difficult task. Therefore, banks and ATMs should provide access to a computerized system. It would be excellent to automate the process of identifying whether or not a particular banknote is authentic considering the high degree of precision with which counterfeit banknotes may be created. With the aim of distinguishing genuine Bank cash, we apply six supervised machine learning algorithms on a dataset obtained from the UCI machine learning repository. Several different quantitative analysis parameters were used to evaluate the performance of several different machine learning techniques, including Support Vector Machines, Random Forests, Logistic Regressions, Naive Bayes, Decision Trees, and K-Nearest Neighbors, with train test ratios of 80:20, 70:30, and 60:40. In addition to several SML Some percentage of test trains are being correctly predicted by the algorithms

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1. INTRODUCTION

The nation's banknotes are used in countless financial transactions every second [3]. Despite their resemblance to genuine notes, counterfeits are supplied to the market to disrupt the stability of the currency exchange rate. Their primary role is to serve a range of purposes, and they are often produced illegally [12]. Counterfeiting has been on the increase since the late 19th century [13], but it was not a significant issue in 1990. Forgers may soon be able to make counterfeit notes that are almost indistinguishable from genuine ones [1] due to the tremendous technical improvement of the 20th century. This will undoubtedly lead to a precipitous drop in the stock market. It is crucial to reduce the availability of counterfeit currency for this reason [16]. A human being cannot easily tell the difference between a genuine banknote and a fake one. The government has issued banknotes that can be checked for legitimacy based on their unique design features [9]. Criminals, however, are printing counterfeit notes with almost similar features, making differentiation between the two nearly difficult [5]. As a result, authenticity verification technology is now required in all automated teller machines [12] and other banking infrastructure. To test the legitimacy of the banknote Artificial intelligence and machine learning (ML) might be quite effective when designing a system to detect fake banknotes from real ones[6,7,12]. Nowadays, classification problems are often solved using supervised machine learning (SML) techniques. \

Moreover, the therapy of medical disorders has shown even promising results [2]. The use of SML algorithms for authenticating bank notes is a relatively unexplored field of study, with just a handful of writers having done so [6, 9, 12]. We need a machine-based method of authenticating currency. To begin, we take in an image of interest and use several image processing techniques to draw out its salient features. In addition, these images are sent into SML algorithms to help verify the genuineness of a certain banknote. Everything we've observed so far suggests that things are moving quite slowly over here.

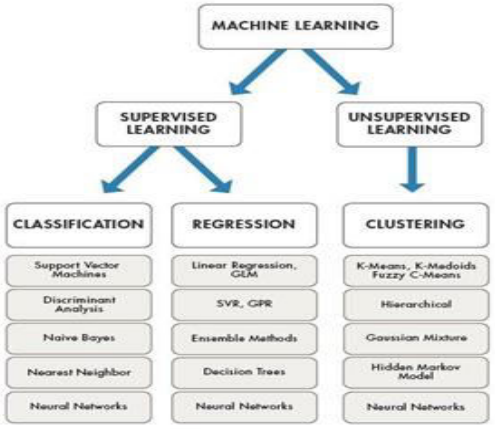

Fig.1: ML algorithms

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2. LITERATURE REVIEW

Implementation of Multiple Kernel Support Vector Machine for Automatic Recognition and

Classification of Counterfeit Notes

Color scanners and laser printers have made it simple to produce convincing fake banknotes, even at a high level of detail. Every country has a serious problem with the circulation of counterfeit currency. ATMs, vending machines, and even voting booths have all been reported as sources of counterfeit currency. It is essential to develop a method for identifying counterfeit bills. This study proposes utilizing multiple-kernel support vector machines to identify counterfeit currency. The method uses the brightness histograms of the individual bills' sections as input. Combining many kernels into a single matrix is achieved by use linear weighted combination. Two methods are used to lessen the time and space demands of the semidefinite programming (SDP) method. For instance, in one method, the kernel weights are presumed to be positive, whereas in another method, the weights are summed and then made equal to one.

Making classifier performance comparisons when ROC curves intersect

The ROC curve is a common statistical method used to measure the performance of a classifier. It's not easy to choose the best classifier when their ROC curves overlap. New criteria for assessing models are offered when ROC curves exhibit crossings. In particular, we provide a class of indicators that continues to be compatible with dominance criteria even when ROC curves cross, and we build a theoretical framework to investigate the relationship between ROC rankings and stochastic dominance. In addition, there was a research using simulations, and In order to prove the new method's worth, we apply it to many examples of credit risk data.

Using Hidden Markov Models for Feature Extraction in Paper Currency Recognition

To help distinguish between different types of paper currency, we provide a new feature extraction method in this research. Here, the distinctive qualities of a texture are used for its identification. Because of the unique texture of paper currency, it has been represented as a stochastic process using the Markov chain concept. This research presents a method for distinguishing foreign banknotes. In this method, only high-quality replicas of actual bills are used throughout training. We tested our system on data from more than a hundred different national denominations, and it correctly recognized 95% of the data in every single one.

Credit rating analysis with support vector machines and neural networks: A marketcomparative study

Examining company credit ratings is a hot subject in the academic journals. Artificial intelligence (AI) methods have recently been shown to surpass traditional statistical methods. This work use a newly discovered machine learning method called support vector machines to present a more convincing explanation for the phenomena under discussion (SVM). We compared our findings to those obtained using a backpropagation neural network (BNN), and found that both methods achieved prediction accuracy in the 80th percentile for the American and Taiwanese markets. Despite this, the SVM's performance was only marginally better. The ability to comprehend the AI-based algorithms is also a focus of research. Using the results of recent research on the understanding of neural network models, we were able to rank the importance of the various financial inputs. With this information in hand, we analyzed the markets in the United States and Taiwan to isolate the fundamental distinctions between the two.

3. IMPLEMENTATION

Nowadays, classification problems are often solved using supervised machine learning (SML) techniques. Moreover, the therapy of medical disorders has shown even promising results [2]. The use of SML algorithms for authenticating bank notes is a relatively unexplored field of study, with just a handful of writers having done so [6, 9, 12]. We need a machine-based method of authenticating currency. To begin, we take in an image of interest and use several image processing techniques to draw out its salient features. In addition, these images are sent into SML algorithms to help verify the genuineness of a certain banknote. Everything we've observed so far suggests that things are moving quite slowly over here.

Disadvantages:

1. very difficult to distinguish a counterfeit from a real note

It's not easy to tell the difference between a counterfeit banknote and a genuine one.

Here, we apply six supervised machine learning algorithms to a dataset from UCI's machine learning repository, with the goal of identifying real Bank cash. We used a variety of machine learning techniques, including SVMs, RFs, LRs, NBayes, DTs, KI, and K-means, to bring this about.

We compared the effectiveness of Nearest Neighbor with three different train test ratios (80:20, 70:30, and 60:40).

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Advantages:

1. Effective

2 Highly effective

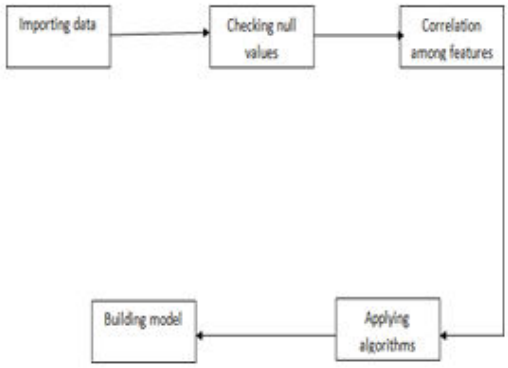

Fig.2: System architecture

The dataset we pulled from the UCI ML repository has been pre-processed and visualized using a number of different charting methods. The banknotes' features are extracted, and then the data set is categorized using the SML methods Logistic regression (LR), Naive Bayes (NB), Decision tree (DT), Random tree (RT), KNN, and Support vector machine (SVM). To evaluate SML algorithms, we have applied them to a dataset with a train/test ratio of 3, 2, and 1 respectively.

4. ALGORITHMS

KNN:

The k-nearest neighbors (KNN) technique is an easy-to-implement supervised machine learning approach that may be used for both classification and regression.

In order to make predictions, machine learning models use input data as their starting point. K-Nearest Neighbors (KNN) is a common and straightforward machine learning approach for classifying data. The neighbor's classification determines the data point's classification.

RANDOM FOREST:

The supervised machine learning algorithm random forest has found widespread use in the areas of classification and regression. A variety of samples are used to construct decision trees, with the results of the classification and regression being determined by the majority vote. For both regression and classification tasks, the Random Forest Algorithm's ability to accommodate data sets with both continuous and categorical variables is a key strength. If you have a classification issue, it solves that one better.

DECISION TREE:

Decision tree method is a supervised learning technique. The decision tree approach, unlike other supervised learning algorithms, may be used to both regression and classification problems. With the use of a Decision Tree, you can train a model to predict the target variable's class or value based on a few basic rules inferred from the available data (training data).

LINEAR REGRESSION:

Supervised learning is the foundation of Linear Regression, a machine learning technique. It's regression work, really. Regression is used to model a desired predicted value from a set of independent variables. Finding the connection between the variables and making predictions is its primary function.

SVM:

SVM may be used to solve both classification and regression issues, since it is a supervised machine learning technique. It applies a transformation method known as the kernel trick on your data in order to get an appropriate cutoff for the range of potential results.

NAÏVE BAYES:

Naive Bayes also use this technique to predict the likelihood of a class given a set of qualities. The majority of applications for this approach are in text classification and multi-class issues.

5. EXPERIMENTAL RESULTS

Fig.3: Home screen

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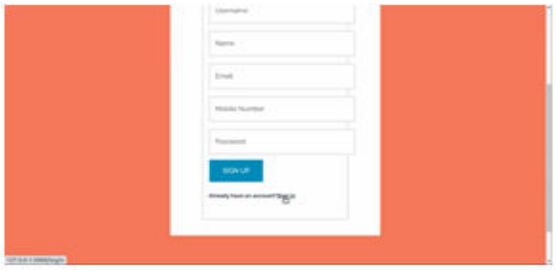

Fig.4: User registration

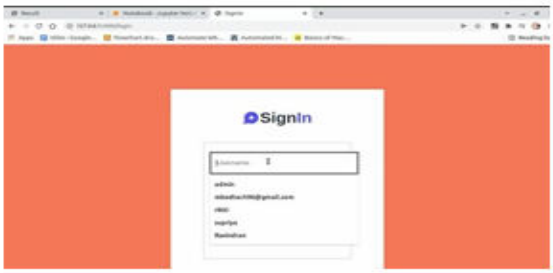

Fig.5: User login

Fig.6: Input screen

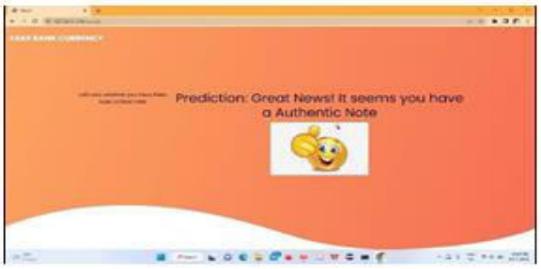

Fig.7: Prediction result

6. CONCLUSION

Using the banknote authentication dataset available in the UCI ML repository, we evaluate the SVM, LR, NB, DT, RF, and KNN SML algorithms using three separate sets of training data and a total of nine possible train/test combinations (80:20, 60:40, 70:30). The dataset contains 1372 records, and may be characterized by the following 5 features: (4 features and 1 target).

It may be used in the same ways as actual currency or a counterfeit bill

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