WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

An Approach to Optimize Authorship Verification in Online Social Networks Using LSTM Deep Neural Network

Geetanjali Baraskar[1], Aashish Tiwari[2]

[1]M. Tech Scholar in Dept. of Computer science Engineering, SVCE, Indore (M.P). (geetanjalibaraskar665@gmail.com)
[2] Professor, Dept. of Computer Science Engineering, SVCE, Indore (M.P), India. (ashishtiwari@svceindore.ac.in)

Abstract

Due to the proliferation of web-based applications and the growth in the amount of data created and stored, the World Wide Web now contains an unprecedented wealth of information for its users. The Internet has evolved into a global forum for the free flow of information, knowledge, and ideas. The use of social networking sites like Twitter, Facebook, and Google+ continues to rise rapidly since they enable users to exchange opinions on issues, talk with other groups or post messages worldwide. The expanded usage of Online Social Network (OSN) has become necessary to appear to grow of Authorship Verification (AV), OSN is the environment in which users can connect with other users to discuss ideas of any topics then expansion data and information. AV considered as a resource of researches and information in different ways, as is the case Sentiment Analysis (SA). This approach is contrasted to a prior extraction of features and learning technique that was ineffective in producing improved results using the Tweets API dataset. Twitter is a prominent online community where users publish and respond to short messages known as "tweets," the new model will be able to provide a higher degree of accuracy. In this study, we introduced the Long Short-Term Memory (LSTM) deep neural network technique. What this model entails was tested on a Twitter-based dataset, and it produced improved results with an accuracy of 98.65, precision of 98.74, and F1-score of 98.76.

Keywords: **Optimization, Authorship verification, Sentiment analysis, Neural network, dataset etc.**

I. Introduction

Many other attractive and user-friendly facilities have been established in recent years and the people are participating extensively & increasingly in multiple internet exercises, such as publishing so many kinds of content (blogging, writing reviews etc), as well as having various types of interactions and relationships. The enormous quantity of information thus produced by individuals has never been accessible before and is very useful from various perspectives. An excellent phenomenon that has significantly affected this broad involvement and comprises a major part of the information produced is the SNSs (Social Network Sites). Perhaps in the history to research the relationships, behaviours, interaction as well as characteristics of certain people's groups, there was a need to produce a considerable effort, not to acquire very extensive data about them but to get the distributed information m in the new situation and also with the emergence of social networks and also the vast number of activities that are logged by their users. Online Social Networks (OSNs) are the most common way to share information across the globe. Social networks are the focus of many services as well as integrate a variety of new information and communication capabilities in the community of users. A social network is best seen as a visual structure with nodes and borders representing the users and their interactions. According on the topology of the network utilised, nodes & edges may be labelled or unlabeled on a social network structure. Due to the popularity of social intelligence, websites such as Facebook, YouTube, Twitter, LinkedIn, Pinterest, Google+, Tumbler and Instagram have become a favourite medium for technology and social exchange among various users including consumers and organizations. Social network members play a crucial role and are fully responsible for the information shared in the networks. Consumers will exchange information through websites, movies and files that are relevant. People disclose sensitive material via the establishment of tremendous faith and others have the same trust in the given information. The rapid repute of social networks online and availability of large quantities of data make it an easy goal for the adversaries. Social media feature extraction is a general term for methods of building variables from the communication graph expressing the location and value of individual nodes concerning others. The extraction feature is the transformation into a numerical function, which is used for the automatic training of arbitrary data including text and images. It represents an effective compact function for interesting sections of an image

II. Review of Literature

Today's social network is an emerging field of science. For data collection and production of knowledge, the volume of data transmitted by OSN in the form of text and pictures is enormous. There are many methods, including machine learning, for social network research. A range of observing characteristics is derived from user knowledge by machine learning algorithms. ML applications in the area of SN research involve spammer detection, user recognition, connection estimation, troll page detection, friendly feedback, identification of the population or cluster, pattern analysis, political blog

opinion analysis, and so on. The development of the ML technique has attracted significant attention for different purposes both from industry and research communities **M. L. Brocardo (2013)**In this study they present a supervised learning method, coupled with the analysis of n-gram for authorship authentication in short texts, to make some steps to achieve this objective. An analytical assessment based on the Enron email dataset including 87 users gives extremely successful findings comprised of a 14.35% Equal Error Rate (EER) for 500 character message blocks. **A. A. Azeta et al. (2014)** the purpose of this article is to offer a social media educational system anti-cultism accessible via three modes: web, mobile and voice. The technology supports on-campus study and engagement and also helps students to prevent cultism on campus via the filtering of social media terms linked to culture or crime. Relevant research techniques and implementing tools were used in the execution of this project. The initiative provides a multimodal platform to promote and stimulate active involvement by students in the educational system. **D. Trång et al. (2015)**Introduces a different technique for evaluating the effectiveness of social media detection techniques. In brief, dual artificially "hijacked accounts" are created by choosing two true consumer accounts by random & changing the residual messages after a number of consecutive messages. This enables us to generate huge quantities of preparing or potentially test information, which isn't straightforward for this issue. What's more, the method made is utilized to dissect the nature of a changed adaptation of the current COMPA framework. **B. Boenninghoff et al. (2019)**In this study, we suggest a novel topology for similarity learning in the neural network that improves the effectiveness of the verification task by using such difficult data sets. There have been a series of successful technological methods for this job; many of them are based on conventional linguistic characteristics such as n-grams. These algorithms provide outstanding results for certain kinds of textual materials such as books &novels. Nonetheless, verification of forensic authorship for social media is considerably more difficult since messages tend to be very brief with several genres and subjects. Traditional techniques based on characteristics such as n-grams have little effectiveness at this time. **M. Liang et al. (2020)**this paper presents a new end-to-end semantine correlation learning model based on a deep hash network and semantical expansion for cross-media social network search (DHNS). The method integrates deep network learning with hash code approximation for data sources into a types of buildings for optimising data that successfully maintains intra-mediated similarities and intermediate correlations, minimising the loss of cross-media correlation as well as the loss of binary hash approximation. Moreover, their method increases the semanticized connection by creating the graph of the image-word link, and by mining the possible semanticized relationship between images and words and by getting semantic integration based on both a deep internal as well as an external depth of knowledge. Findings further suggest that DHNS delivers improved cross-media benchmarking detection efficiency.

III. Research Methodology

In the proposed methodology, the data is collected from Twitter API. In previous work various machine learning algorithms were applied in which feature extraction techniques were also applied, but due to some limitations in these techniques the result achieved Were not upto the mark, therefore a new technique of word embedding has been introduced followed by Ngram which is further classified using classification model LSTM. LSTM revolutionised the two areas of ML & neurocomputing. The extraction stage consists of two steps: first, choose the best characteristics, and then extract the n-gram depending on the chosen features. Selecting excellent features seeks to enhance the quality of n-gram extraction and decrease the computer complexity and noise.

Preprocessing

Pre-processing is the overall term for all the transformation of the data, including centering, normalization, rotation, shifting, shear, etc., before being transformed into the model. In preprocessing, the data has been cleaned by removing punctuations, hashtag and emojis so as to obtain the text only.

Feature extraction

ML algorithms learn of a predefined set of trainings data characteristics to generate test data output. But the fundamental issue with language processing is that ML algorithms cannot operate directly on the raw text. We require certain methods of extraction to transform text into a matrix (or vector) of characteristics. FE is a kind of reduction in dimensionality where a high number of picture pixels are successfully shown so that interesting image components are effectively recorded. Some of the most common extraction techniques include:

Natural language processing (NLP): It is an area of languages, computer science, & AI which focuses on computer-human language interactions, in particularly on how computers are programmed for the processing and analysis of vast quantities of natural language data. The outcome is a computer able to "understand" the contents of texts, such as the language's contextual complexities. The system can correctly extract information and insights from the papers, classify and arrange the documents themselves.

Therefore, by analyzing **N-grams** (mainly bigrams) we may solve this issue instead of individual words (i.e. unigrams). This may maintain local word ordering. If we take into consideration all possible bigrams in the reviews provided, we can always eliminate **N-grams** with high frequency, since they are present in nearly all texts. These high-frequency N-grams are usually referred to as articles, determiners, etc.

Word embedding is one of the vector space models representing information. Word embedding retains contexts & word connections so that related words are more correctly detected. **Word embedding** includes a number of different implementations like **word2vec**, GloVe, FastText and so on. Word2vec is one of the most common word embedding implementations that Google developed in 2013. It discusses word embedding using two-layer, shallow NNs to detect contextual significance. **Word2vec** is excellent at grouping related words and generating very precise estimates about the significance of words based on contexts.

Long Short-Term Memory (LSTM)

LSTM networks are a kind of RNN that may be dependent on order in sequence issues. LSTMs are a complicated field of deep learning. It may be difficult to understand what LSTMs are and how bidirectional and sequence-to-sequence terminology connect to the area. LSTM has been used primarily to represent long-term connections. The GRU is given in this section as a modification of the LSTM cell before additional LSTM network designs are described. GRU was designing time series in order to provide a method to enhance the capacity to prevent long-term dependency by improving short-term information integration.

LSTM cell can add or remove cell state information by using various gates within cell. Gates allows data to enter cell state or prevents it from accessing the cell state with the aid of the multiplication and sigmoid NN layer.

A sigmoid layer generates a no. among 0 & 1 that determines how much information is to be allowed through gate. Output value near 0 would not let something through gate, while information is allowed by a value close to 1.

Proposed Algorithm

Step 1. Collecting the dataset using Twitter API, and separating it in train and test csv manually.

Step 2. Perform EDA on the dataset, analyze the dataset then fining the dataset by remove punctuation, hashtags, emojis etc.., then again visualize the data.

Step 3. Extracting features like, Syntactic Features and semantic features.

Step 4. Merging the feature and it into a one feature pack.

Step 5. Building an LSTM-based model for the verification task and feeding it a training dataset. Give it some time to learn how to behave.

Step 6. Evaluate the model's efficacy by putting it to use on the test data when training is complete.

Proposed Flowchart

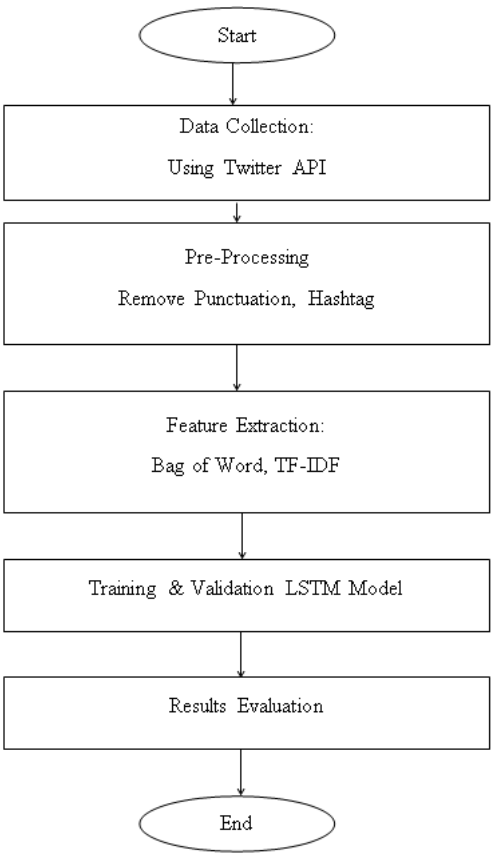

Figure 1: Flow Chart of proposed Methodology

IV. Result and Discussion

Dataset Description

The proposed methodology in this research has been implemented in python 3.0 using Tweets API dataset. Twitter has separated itself as an immediate correspondence medium to an extremely huge crowd. Tweets are exact and pass on the message in a smart way and this has prompted Twitter turning out to be famous that it is presently impacting worldwide scenes. In this post, we will examine the solid sources to procure free Twitter datasets. Twitter informational indexes can be adequately used in the space of scholarly examination, social undertakings, and concentrating on advertising strategies. I have gathered files of different free Twitter datasets collected from different sources which can be exceptionally compelling for somebody searching for a solid wellspring of Twitter informational indexes.

Performance Parameters

The result is evaluated using various performance parameters which are accuracy, precision, recall and F-measure.

True Negatives (TN) -Forecasted negative values (where the actual class value is "no" and the predicted value is "not") are spot-on. For instance, if both actual and predicted classes indicate that the passenger in question has perished, you know that the worst case scenario has indeed come to pass. When the actual class appears, the predicted class, a false positive, and a false negative all take on a negative tone.

True Positives (TP) -Both the actual class value and the anticipated class value are accurate. Consider the distinction between predicted class value, which states that "This passenger is likely to be the exact one next time," and class value, which states that "has survived the above passenger."

False Negatives (FN) –Forecasted class is false, whereas real class is true. In other words, depending on how valuable each passenger class is, we may be able to determine whether or not passengers have survived.

False Positives (FP) –When the actual class is "No" but the anticipated class is "Yes," In other words, if the class prediction indicates that a passenger will live but the class real indicates that they have not, then the passenger has actually passed away.

Accuracy -It is a simple accuracy indicator that is directly related to the total number of measurements. Due to the nearly equal number of false negatives and false positives in symmetrical datasets, they provide better statistical precision.

Accuracy = TP+TN/TP+FP+FN+TN

Precision -The accuracy of a prediction is measured as a percentage of correct positive observations relative to the total number of positive observations expected.

Precision = TP/TP+FP

Recall (Sensitivity)-Yes, it is the proportion of expected favourable comments relative to all positive comments made during class.

Recall = TP/TP+FN

F1 score - It is recall & precision weighted average. This score therefore takes into account both false negatives & false positives.

F1 Score = 2*(Recall * Precision) / (Recall + Precision)

Table 5.1 and figure 5.1 represent the comparison values of base and proposed results. The proposed results used four parameters like Accuracy, Precision, Recall and F-Score. These parameters formulas give better results comparison to previous results.

Table 1: Table of existing methodologies matrices

Algorithms/Results	Accuracy	Precision	Recall	F1 Score
SVM	78	68	86	76
Logistic Regression	77	81	81	75
Random Forest	77	64	86	73
XG-Boost	76	59	90	71

Figure 2: Existing methodologies matrices

Table 2: Comparison table of various ML algorithms with proposed LSTM neural network

Algorithms/Results	Accuracy	Precision	Recall	F1 Score
SVM	78	68	86	76
Logistic Regression	77	81	81	75
Random Forest	77	64	86	73
XG-Boost	76	59	90	71
Novel LSTM	**98.65**	**98.74**	**98.78**	**98.76**

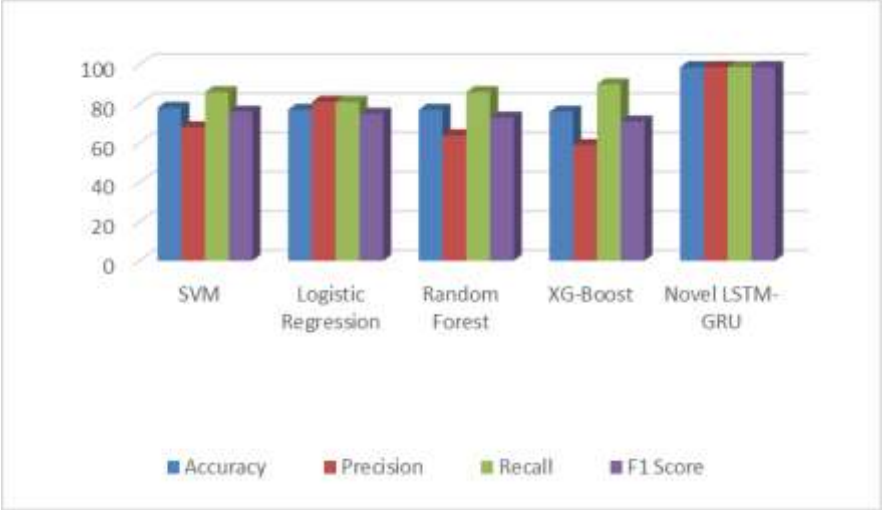

Figure 3: Comparison of various ML algorithms with proposed LSTM neural network

IV. Conclusion

A significant number of Internet-connected individuals worldwide currently use social media (SM) and social networking sites (SNS). With the advantage of near immediate connection to possibly billions of other individuals, the temptation might be to connect to social media as easily and as fast as possible. It is now possible for anybody in the globe to communicate their thoughts and ideas via micro-blogging sites such as Twitter, Facebook, or blogs so on. In this context, a new, human compromised mechanism for the verification of authorship for hacked social media accounts is introduced. Major textual features are extracted from Twitter-based dataset. The above proposed model is constructed in Python 3.0 in which the feature extraction algorithm Word2vec is applied followed by N-gram model. Further LSTM model is applied for classification purpose which was compared by the previous work in which Bag of words was used for feature extraction but had some limitations which were overcome by new proposed model.

References

1. Mohammad Soryani," Social Networks Research Aspects : A Vast and Fast Survey Focused on the Issue of Privacy in Social Network Sites", IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 6, No 3, November 2011 ISSN (Online): 1694-0814 www.IJCSI.org
2. Srinivas Rao Pulluri," A Comprehensive Model for Detecting Fake Profiles in Online Social Networks",IJARSE,2017,06
3. Shrawan Kumar, S. Rajeswari, M. Srikanth and T. Raghunadha Reddy," A New Approach for Authorship Verification Using Information Retrieval Features", researchgate.net/publication/333846843_A_New_Approach_for_Authorship_Verification_Using_Information_Retrieval_Features/link/5f4c8f7192851c6cfd0b9a2e/download
4. Uttama Garg," Online Social Network Analysis using Machine Learning Techniques", International Journal of Advance Science and Technology Vol. 29, No. 10S, (2020), pp.2092-2096
5. Dr. Savita GUPTA," SOCIAL NETWORKING USAGE QUESTIONNAIRE: DEVELOPMENT AND VALIDATION IN AN INDIAN HIGHER EDUCATION CONTEXT", Turkish Online Journal of Distance Education-TOJDE October 2018 ISSN 1302-6488 Volume: 19 Number: 4 Article 13
6. Kiran Malagi," A Survey on Security Issues and Concerns to Social Networks", International Journal of Science and Research (IJSR), India Online ISSN: 2319-7064
7. Zainab Khalid1 , Muhammad Sheraz Arshad Malik2 , Muhammad Usman3 , Mahwish Abid4 , Ijaz Ali Shoukat," Comparative Study of Various Social Network Attacks: Comprehensive Survey", IJCSNS International Journal of Computer Science and Network Security, VOL.18 No.12, December 2018