



## **A HYBRID POSTURE DETECTION FRAMEWORK: INTEGRATING MACHINE LEARNING AND DEEP NEURAL NETWORKS**

**GULAM MAHABUB SUBHANI<sup>1</sup>, MOHAMMAD FARDEEN<sup>2</sup>, NASAPU BANU  
PRAKASH<sup>3</sup>, SYED SOHEL<sup>4</sup>, UYYALA SRIJA<sup>5</sup>**

<sup>1</sup>Assistant Professor, Department of CSE, Malla Reddy College of Engineering  
Hyderabad, TS, India.

<sup>2,3,4,5</sup> UG students, Department of CSE, Malla Reddy College of Engineering  
Hyderabad, TS, India.

### **ABSTRAT:**

The posture detection received lots of attention in the fields of human sensing and artificial intelligence. Posture detection can be used for the monitoring health status of elderly remotely by identifying their postures such as standing, sitting and walking. Most of the current studies used traditional machine learning classifiers to identify the posture. However, these methods do not perform well to detect the postures accurately. Therefore, in this study, we proposed a novel hybrid approach based on machine learning classifiers (i. e., support vector machine (SVM), logistic regression (KNN), decision tree, Naive Bayes, random forest, Linear discrete analysis and Quadratic discrete analysis) and deep learning classifiers (i. e., 1D-convolutional neural network (1D- CNN), 2D-convolutional neural network (2D-CNN), LSTM and bidirectional LSTM) to identify posture detection. The proposed hybrid approach uses prediction of machine learning (ML) and deep learning (DL) to improve the performance of ML and DL algorithms. The experimental results on widely benchmark dataset are shown and results achieved an accuracy of more than 98%.

### **INTRODUCTION**

Online social networks (OSN) and micro-blogging websites are attracting internet users more than any other kind of websites. Their contents are rapidly growing in speed, volume, velocity and

variety, constituting a very interesting example of big data. Big data have been attracting the attention of researchers who are interested in the analysis of people's opinions and the structure/distribution of users in digital media platforms. These websites offer



an open space for people to discuss and share thoughts and opinions and as such, the nature and the huge number of posts, comments and messages exchanged make it almost impossible to control their content. Also given the different backgrounds, cultures and beliefs, many people tend to use illegal comments/messages when discussing with people who do not share the same backgrounds. Illegal comment/message is a speech that is intended to insult, offend or intimidate a person because of some trait (as race, religion, sexual orientation, national origin and so on). Collecting and analyzing these data allows decision makers to study the escalation of such comments/messages. Hence, there is need for automatic big data analysis to overcome the noise and the non-reliability of these unstructured dataset from the digital media platforms. There are different existing models for machine learning on big data and they include: Decision Tree based model, Linear regression based model, Neural Network, Bayesian Network, Support vector machines, Nearest Neighbor, KNN, Naïve Bayes and so on. To reduce the individual limitations of basic machine learning models, a hybrid model is proposed in this work. This

will also help to exploit their different generalization mechanisms and improve the expected output of semi structured sequential data. The strengths of Naïve Bayes are that it is very simple and highly scalable on large dataset and can learn incrementally because it counts the observed variables and update the probability distribution table. It has also proven to be one of the best in text classification, spam filtering, hybrid recommender system, online application and simple emotion modeling ( Ravindra Bachate, 2016). Super vector machines (SVM) are also ranked as one of the best off the shelf supervised learning algorithm as they provide superior generalization performance, requires less examples for training and can tackle high dimensional data with the help of kernels (Yinglie Tian et al,2012). SVM also tends to perform well for classification of text because of its ability to generalize into high dimensions, which is often the case with text categorization.

## RELATED STUDY

Junfei et al (2016) presented a survey of the latest advances in researches on machine learning for big data processing; they reviewed machine



learning techniques and highlighted some promising learning methods such as representation learning, deep learning, distributed and parallel learning, transfer learning, active learning, and kernel-based learning. They concluded by investigating the close connections of machine learning with signal processing techniques for big data processing.

Moorthy & Gandhi, (2018) reviewed security issues in big data and evaluated the performance of Machine Learning (ML) and Deep Learning (DL) algorithm in a critical environment. They concluded that both ML and DL have security issues. Perry, (2013) proposed the selection of appropriate machine learning methodologies that can offer substantial improvements in accuracy and performance. He proffered that even at this early stage in testing machine learning on conflict prediction, full models offer more predictive power than simply using a prior outbreak of violence as the leading indicator of current violence.

Asha et al., (2013), stated that machine learning algorithms (MLA) are sequential and recursive and the

accuracy of MLA's rely on size of the data (i.e., greater the data the more accurate is the result). Absence of a reliable framework for MLA to work for big data has made these algorithms to cripple their ability to reach the fullest potential. Hadoop is one such framework that offers distributed storage and parallel data processing. The Existing problem to implement MLA on Hadoop is that the MLA's need data to be stored in single place because of its recursive nature, but Hadoop does not support data sharing. They proposed an approach to build Machine Learning models for recursive MLA's on Hadoop so that the power of Machine Learning and Hadoop can be made available to process big data, and then compared the performance of ID3 decision tree algorithm, K-means clustering algorithm and K-Nearest Neighbor algorithm on both serial implementation and parallel implementation using Hadoop

Awad (2012), used machine learning algorithms like SVM, KNN and GIS to perform a behavior comparison on web pages classifications problem. From their experiment, they concluded that when using SVM with small number of negative documents to build the centroids it has the smallest storage



requirement and the least on line test computation cost. But almost all GIS with different number of nearest neighbors have an even higher storage requirement and on line test computation cost than KNN.

## EXISTING SYSTEM

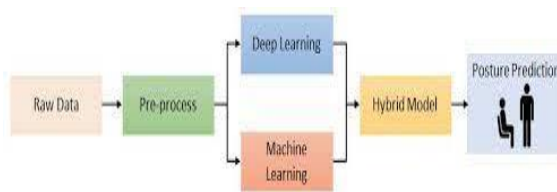
The sensor chair with pressure sensor tries to avoid wrong sitting position which may cause disease. In this posture detection, analysis is compared with decision tree and random forest. The classifier which gives better performance is random forest classifier [12]. For the improvement of sitting posture, sitting posture monitoring systems (SPMSs) is used. It has mounted sensors on backrest and seat plate of a chair. For this experiment 6 sitting postures are considered. Then various machine learning algorithms (SVM with RBF kernel, SVM linear, random forest, QDA, LDA, NB and DT) are applied on body weight ratio which is measured by SPMS. Result from SVM with RBF kernel gives better accuracy as compare to others [13]. There is also an intelligent systems design for the posture detection of sitting person on wheel chair. A network of sensors is used for data collection

using neighbourhood rule (CNN), then data balancing is done with Kennard-stone algorithm and reduction in dimensions via principal component analysis. Finally k-nearest algorithm is applied to pre-processed and balanced data. In this amount of data is significantly reduced but result is remarkable

## PROPOSED SYSTEM

The hybrid methods consists of different classifiers and combining their prediction to train meta-learning model. The hybrid is used to enhance the performance of specific sys- tem. In this study, the prediction of ML classifiers (logistic regression, random forest, KNN, Naïve Bayes, decision tree, linear discriminant analysis, quadratic discriminant analysis and SVM) and DL classifiers (CNN, LSTM) are used as input of CNN, LSTM architecture. Fig 2 shows the architecture of proposed hybrid of ML and DL for posture detection. It is to be noted that, the parameters of each classifier has been set-up empirically after several simulation experiments

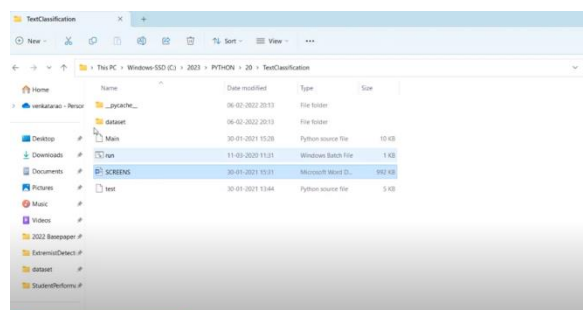
## SYSTEM ARCHITECTURE:



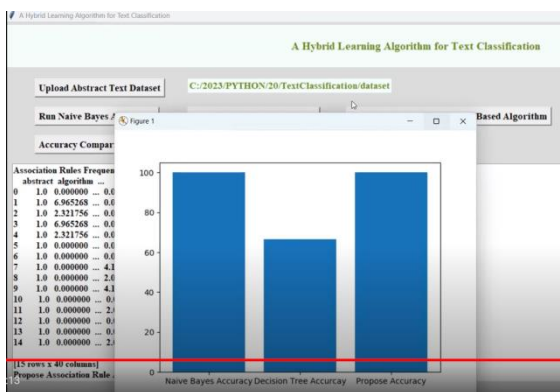
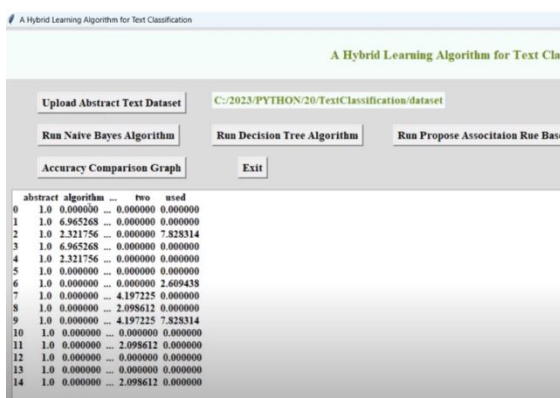
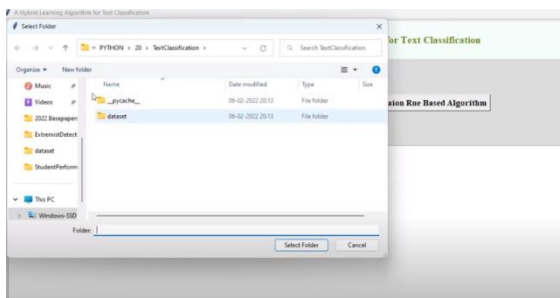
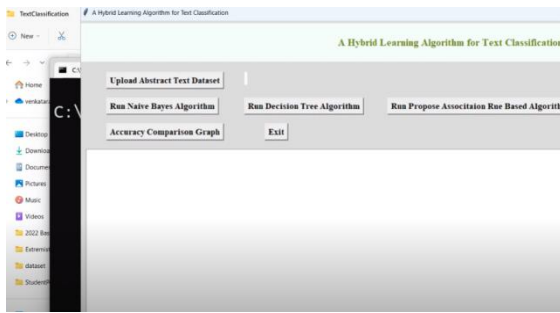
## WORKING METHODOLOGY

Online social networks (OSN) and micro-blogging websites are attracting internet users more than any other kind of websites. Their contents are rapidly growing in speed, volume, velocity and variety, constituting a very interesting example of big data. Big data have been attracting the attention of researchers who are interested in the analysis of people's opinions and the structure/distribution of users in digital media platforms. These websites offer an open space for people to discuss and share thoughts and opinions and as such, the nature and the huge number of posts, comments and messages exchanged make it almost impossible to control their content. Also given the different backgrounds, cultures and believes, many people tend to use illegal comments/messages when discussing with people who do not share the same backgrounds. Illegal comment/message is a speech that is intended to insult, offend or intimidate a person because of some trait (as race, religion, sexual

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## CONCLUSION

The propagation of illegal messages on social media has been increasing significantly in recent years. This may

be as a result of the anonymity and mobility of such platforms, as well as the changing political climate from many places in the world. Despite substantial effort from law enforcement departments, legislative bodies as well as millions of investment from social media companies, it is widely recognized that effective counter measures rely on automated semantic analysis of such content. A crucial task in this direction is the detection and classification of such messages/comments based on its targeting characteristics. This work makes several contributions to state of the art in this research area. A thorough data analysis was carried out to understand the extremely unbalanced nature and the lack of discriminative features of illegal content in the unstructured dataset one has to deal with in such tasks. However, it is always difficult to clearly decide on a sentence whether it contains illegal words or not if the message is hiding behind sarcasm or if no clear words showing illegal, racism or stereotyping exist. Furthermore, online social networks are full of ironic and joking content that might seem illegal which in reality is not.



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