International Journal of Mechanical Engineering Research and Technology

ISSN 2454-535X

Email ID: info.ijmert@gmail.com or editor@ijmert.net

International Journal of Mechanical Engineering Research and Technology

ISSN 2454 – 535X
http://www.ijmert.com
Vol.16 Issue 3, 2024

A HYBRID LEXICON-BASED MACHINE LEARNING FRAMEWORK FOR POLITICAL SECURITY THREAT PREDICTION

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Abstract: The internet is pivotal to public safety today. The US Knowledge People group positions digital dangers close by illegal intimidation and other key difficulties. Safeguarding a country is more diligently now. With such a lot of information, data on the online, and fake news, there's a never-ending chance of impelling scorn and undermining public safety. Project joins emotions and perspectives to country dangers. Negative emotions in internet data could undermine public safety. Specialists should rapidly recognize and address these opinions. Emotions and public safety concerns are connected, but there is little assessment and structure investigation of feelings and their measurements. Review have for the most part characterized human emotions , not their significance to public safety risks or how to figure their ascent. This idea proposes foreseeing political risks utilizing web news feelings. It centers around political security, an essential public safety issue. The examination utilizes word investigation and ML to connect information holes and show their adequacy utilizing genuine web news information. The exploration utilizes complex troupe picking up utilizing a stacking classifier, Random Forest-Decision Tree models, and a standalone Random Forest model. This group method further develops framework expectation, conveying intimidation forecast more strong. Client testing is empowered through an easy to use Flask framework with SQLite network and basic information exchange and signin. It increments model execution and gives a sensible stage to genuine client collaborations, giving a total framework ease of use and viability assessment.[37]

Index terms *- Cyberspace, lexicon-based approach, machine learning, national security, opinion mining, political security, sentiment analysis.*

1. INTRODUCTION

Cyberspace has turned into a national security paradigm. The Overall Danger Evaluation of the US Intelligence Community (2016) records digital dangers close by psychological oppression, Weapon of mass destruction expansion, and counterintelligence [1]. Current country security is more troublesome than before. Large information, tremendous data, web reports, and phony word are gotten out internet based

International Journal of Mechanical Engineering Research and Technology
ISSN 2454 – 535X
http://www.ijmert.com
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today. Pessimistic feelings and problematic lead might undermine public safety.

Specialists have uncovered a significant connection between profound perspectives and public safety risks. It was additionally seen that message feelings, or sentiments, could inspire gloomy feelings like rage or fear, which can hurt public safety. Continuous distinguishing proof of troublesome feelings assists specialists with controlling the issue ahead of schedule since the internet data is frequently loaded with feelings that might present public safety worries (as indicated by every part of public safety). As referenced in [2], holes, approaches, and area applications that depend on current assessment mining strategies, (for example, the dictionary based approach and ML procedures) can be used to surmise state feelings across spaces.[39]

National security emotion evaluations and structures are inadequate. Assessment mining research in public safety has not been totally investigated, yet it can distinguish dangers and shield a country. Hence, this field needs broad examination [3]. Past examination has zeroed in on ordering human feelings utilizing different procedures. The connection among feelings and public safety concerns and how to predict their increment have gotten less review. This paper proposes a clever hypothetical system for estimating political risks in view of feelings in web news. The focal point of this examination is political security, an indispensable part of public safety. Exploratory review utilizing the half breed technique to mine kin's mentalities or convictions, including profound political security, approves the proposed structure. We utilize a dictionary based approach and ML strategies like Decision Tree, Naïve Bayes, and Support Vector Machine to do this. Each cross breed approach in the preliminaries was tried utilizing different ML techniques for execution, accuracy, and precision. Online news sources gave text information to tests.

2. LITERATURE SURVEY

A deliberate writing assessment of 122 papers analyzed all important examination in assessment mining application and the Kansei procedure to handle the internet opinion mining troubles [2]. Somewhere in the range of 2015 and 2021, ACM, IEEE, SCIENCE DIRECT, SpringerLink, and SCOPUS data sets were looked. This paper breaks down assessment mining techniques and the Kansei procedure to further develop web opinion and feeling mining. A large portion of the work zeroed in on ML, dictionary based [7,8 10], half breed, and Kansei ways to deal with message feeling and feeling mining. The Kansei technique, ML, and assessment mining's potential social ramifications are talked about, alongside significant turns of events and concerns.

Today, online entertainment and information examination are utilized in numerous areas and associations to go with better business choices [3]. Undertakings change their preparation and navigation by applying examination to information. Feeling examination or assessment mining impacts our day to day choices. Purchasing a telephone, exploring a film, or contributing will all impact day to day existence. Feeling examination or assessment investigation decides popular assessment [13, 15, 16]. It very well might be finished utilizing Vocabulary or ML. Some message feeling extraction calculations are as yet wasteful. Naive Bayes and Support Vector Machine

International Journal of Mechanical Engineering Research and Technology
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are utilized for feeling investigation, which just groups good and pessimistic. Despite the fact that opinion Investigation has progressed, a few imperfections stay that make it wrong and wasteful. This article overviews opinion examination strategies and approaches. This will help figure out opinion examination strategies.

Assessment mining extricates source feelings about an objective from a progression of records. This article [4] analyzes methodologies and apparatuses for mining sees from paper citations (revealed discourse). We show the troubles of this work, roused by the many targets and effect peculiarities in citations. Clarified statements from EMM news gathering motor news are utilized to test our strategies. We infer that nonexclusive assessment mining frameworks need immense vocabularies and particular preparation and testing information.[40]

Twitter is a well known virtual entertainment stage for offering viewpoints and speaking with others. When totaled, tweets can show prominent sentiment on occasions. A famous ML calculation for text characterization is utilized to group Twitter postings as certain or negative [6]. We likewise train an errand finishing calculation utilizing physically named (positive/negative) tweets. The point is to interface Twitter assessment to occasions. The prepared model purposes Bayesian Logistic Regression (BLR) arrangement. Outer vocabularies distinguished abstract or goal tweets, Unigram and Bigram highlights were added, and TF-IDF sifted through the elements. The FIFA World Cup 2014 was our contextual analysis, accordingly we used Twitter Streaming Programming interface and certain authority world cup hashtags to mine, channel, and interaction tweets to analyze public demeanor in regards to startling occasions. Future events can be anticipated utilizing a similar technique.

Web 2.0 made people more able to express their impressions on day to day and worldwide worries [7]. Social media's development has likewise helped these drives by giving a straightforward discussion for worldwide assessment sharing. Online Word of Mouth (eWOM) remarks are utilized in business and administration enterprises to permit clients to voice their perspectives. Throughout recent years, research gatherings, the scholarly world, public and administration organizations have zeroed in on feeling examination, or assessment mining, to separate and assess public temperament and perspectives. This work gives a precise evaluation of opinion examination, including perspectives from north of 100 distributions distributed in the earlier 10 years on fundamental undertakings, methods, and applications [3, 10, 11, 15 16]. Feeling investigation requires a few subtasks that might be finished utilizing various strategies. This investigation of 2002-2015 writing is gathered by subtasks, ML and NLP techniques, and feeling examination applications. The record incorporates open issues and a rundown table of 166 distributions.

3. METHODOLOGY

i) Proposed Work:

By conquering model limitations, the proposed framework develops. Word reference based feeling investigation is joined with Decision Tree, Naive

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Bayes, and Support Vector Machine machine learning strategies. This one of a kind blend fills feeling examination holes to estimate the internet political security gambles. Dictionary based investigation assesses feelings utilizing laid out word references [7,8,9], further developing political security risk forecast and the executives. The examination utilizes complex gathering picking up utilizing a stacking classifier, Random Forest-Decision Tree models, and a standalone Random Forest model. This ensemble method further develops framework forecast, conveying intimidation expectation more strong. Client testing is empowered through an easy to understand Flask framework with SQLite network and straightforward information exchange and signin. This redesign builds the model's presentation and offers a stage for true client communications, giving a total convenience and viability assessment.

ii) System Architecture:

The framework configuration predicts political security threats consecutively. Information section is trailed by cleaning and readiness. After emotion calculation with the NRC jargon, TFIDF changes news things into word-recurrence based numeric vectors [9]. A train-test split makes model preparation and evaluation subsets from the dataset. On the preparation set, Decision Tree, SVM, Naive Bayes, Random Forest, and Stacking Classifier are trained. Model assessment on the testing set assesses accuracy, precision, recall, and F1 score. This total engineering gives methodical political security threat prediction system advancement and assessment.

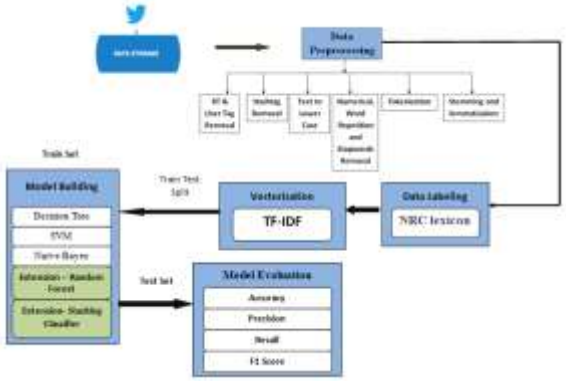

Fig 1 Proposed architecture

iii) Dataset collection:

This study gathered web news information and named it utilizing self-created strategies. Dictionary based marking was utilized to name input text assessments. With sentiments marked for each sentence, an ML framework characterized the printed dataset. The new example message is anticipated by evaluating whether sentences incorporate positive or negative perspectives or sentiments. Every hybrid approach was assessed utilizing metric execution evaluation to quantify accuracy, precision, and recall.

Fig 2 dataset

iv) Data Processing:

Data processing transforms crude information into business-helpful data. Data researchers accumulate, put together, clean, check, dissect, and organize

International Journal of Mechanical Engineering Research and Technology
ISSN 2454 – 535X
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information into charts or papers. Information can be handled physically, precisely, or electronically. Data ought to be more important and decision-production simpler. Organizations might upgrade tasks and settle on basic decisions quicker. PC programming improvement and other computerized information handling innovations add to this. Big data can be transformed into pertinent bits of knowledge for quality administration and direction.[43]

v) Feature selection:

Feature selection chooses the most steady, non-repetitive, and pertinent elements for model turn of events. As data sets extend in amount and assortment, purposefully bringing down their size is significant. The fundamental reason for feature selection is to increment prescient model execution and limit processing cost.

One of the vital pieces of feature engineering is picking the main attributes for machine learning algorithms. To diminish input factors, feature selection methodologies take out copy or superfluous elements and limit the assortment to those generally critical to the ML model. Rather than permitting the ML model pick the main qualities, feature selection ahead of time enjoys a few benefits.

vi) Algorithms:

Naive Bayes Bayes' hypothesis based probabilistic ML technique. It expects highlight freedom, meaning one element doesn't impact another. Because of its effortlessness, effectiveness, and capacity to deal with large datasets, Credulous Bayes is great for opinion examination and danger expectation in this venture. Innocent Bayes is a quick and solid characterization technique for continuous examination of political security printed information feelings and suppositions by working out the likelihood of a given opinion or danger class in view of explicit elements (words or emotions).

```
nb_cls = GaussianNB()#create naive bayes object
nb_cls.fit(X_train, y_train)#train on training data
    #with open('model/nb.txt', 'wb') as file:
        #pickle.dump(nb_cls, file)
    # file.close()
predict = nb_cls.predict(X_test)#perform prediction on test data
#call metric function to calculate accuracy and other metrics
calculateMetrics("Naive Bayes", predict, y_test)
```

Fig 3 Naïve bayes

Support Vector Machine (SVM) [13] is a supervised ML method for arrangement and relapse. SVM augments edge by recognizing the best hyperplane to divide classes in highlight space. It orders new data of interest by hyperplane position. In this undertaking, SVM can deal with high-layered highlight spaces and process and characterize complex text based information to decide sentiments and foresee political security threats [13].

```
svm_cls = svm.SVC()#create SVM object
svm_cls.fit(X_train, y_train)#train on training data
    # with open('model/svm.txt', 'wb') as file:
        # pickle.dump(svm_cls, file)
    # file.close()
predict = svm_cls.predict(X_test)#perform prediction on test data
#call metric function to calculate accuracy and other metrics
calculateMetrics("SVM", predict, y_test)
```

Fig 4 SVM

Decision Tree algorithm [13] makes a dynamic tree-like model utilizing ML. It works by recursively isolating the dataset into subsets in light of the main qualities, creating a tree structure with center hubs addressing highlight based choices and leaf hubs addressing expected results. Decision Tree's ability to deal with all out and mathematical information

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pursues choice making straightforward for this venture. Interpretability is vital to understanding the connection among feelings and political security issues, settling on it a decent decision for building an sentiment and emotion examination model to conjecture and oversee such threats.

```
dt_cls = DecisionTreeClassifier()#create Decision Tree object
dt_cls.fit(X_train, y_train)#train on training data
    #with open('model/dt.txt', 'wb') as file:
    #    pickle.dump(dt_cls, file)
    #file.close()
predict = dt_cls.predict(X_test)#perform prediction on test data
#call metric function to calculate accuracy and other metrics
calculateMetrics("Decision Tree", predict, y_test)
```

Fig 5 Decision tree

Random Forest (RF) A ensemble learning strategy constructs a few decision trees during preparing and yields the mode (classification) or mean expectation (regression) of each tree. To lessen overfitting and increment assortment, each tree is prepared on an irregular subset of information and qualities. This undertaking is great for RF since it can oversee confounded information cooperations and give solid expectations. The calculation's capacity to perceive unobtrusive examples in emotive and assessment loaded language makes it ideal for classifying political security takes a chance from online considerations and emotions.[45]

```
rf_cls = RandomForestClassifier()#create Random Forest object
rf_cls.fit(X_train, y_train)#train on training data
   # with open('model/rf.txt', 'wb') as file:
  # #    pickle.dump(rf_cls, file)
    #file.close()
predict = rf_cls.predict(X_test)#perform prediction on test data
#call metric function to calculate accuracy and other metrics
calculateMetrics("Extension Random Forest", predict, y_test)
```

Fig 6 Random forest

The stacking classifier utilizes numerous fundamental classifiers like Random Forest Classifier and Decision Tree Classifier to further develop forecast. LGBM Classifier is utilized as the last assessor to join the fundamental classifiers' results in this course of action. This technique utilizes every essential classifier's capacities to make an additional precise and strong model. This examination benefits from the stacking outfit's flexibility and adequacy in catching the perplexing relationships among's feelings and political security gambles in literary information, further developing the framework's forecast capacities.

```
estimators = [('rf', RandomForestClassifier(n_estimators=50)),('dt', DecisionTreeClassifier())]
clf = StackingClassifier(estimators=estimators, final_estimator=LGBMClassifier())

# fit the model
clf.fit(X_train, y_train)

y_pred = clf.predict(X_test)
```

Fig 7 Stacking classifier

4. EXPERIMENTAL RESULTS

Precision: Precision quantifies the percentage of certain events or tests that are well characterized. To attain accuracy, use the formula:

Precision = True positives/ (True positives + False positives) = TP/(TP + FP)

$$\text{Precision} = \frac{True\ Positive}{True\ Positive + False\ Positive}$$

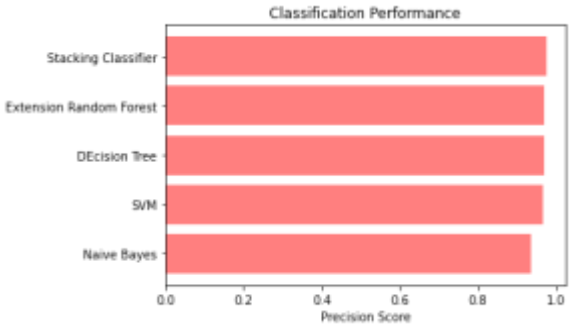

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Fig 8 Precision comparison graph

Recall: ML recall measures a model's ability to catch all class occurrences. The model's ability to recognize a certain type of event is measured by the percentage of precisely anticipated positive prospects that turn into real earnings.

$$Recall = \frac{TP}{TP + FN}$$

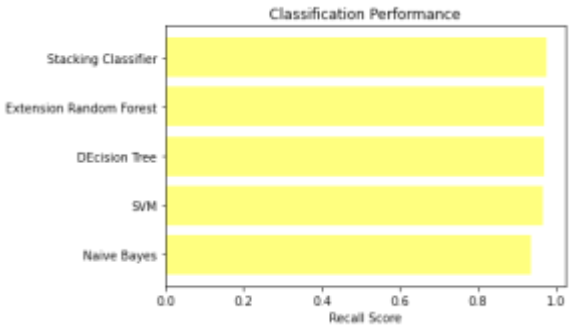

Fig 9 Recall comparison graph

Accuracy: The model's accuracy is the percentage of true predictions at a grouping position.

$$Accuracy = \frac{TP + TN}{TP + FP + TN + FN}$$

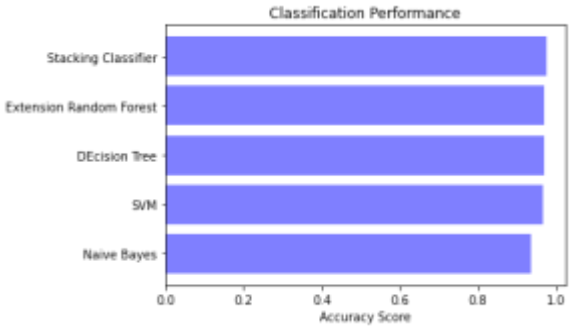

Fig 10 Accuracy graph

F1 Score: The F1 score captures both false positives and false negatives, making it a harmonized precision and validation technique for unbalanced data sets.

$$\text{F1 Score} = 2 * \frac{\text{Recall} \times \text{Precision}}{\text{Recall} + \text{Precision}} * 100$$

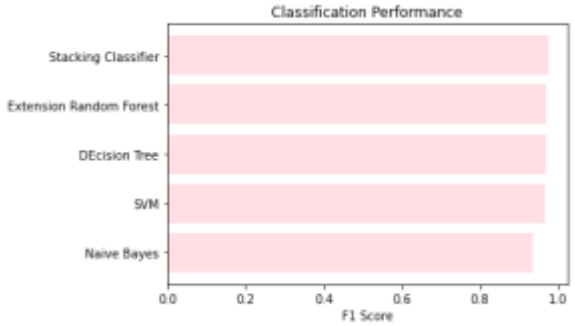

Fig 11 F1Score

	ML Model	Accuracy	Precision	f1_score	Recall
0	Naive Bayes	0.933	0.935	0.935	0.935
1	SVM	0.965	0.965	0.965	0.965
2	DEcision Tree	0.970	0.970	0.970	0.970
3	Extension- Random Forest	0.970	0.970	0.970	0.970
4	Extension- Stacking Classifier	0.975	0.975	0.975	0.975

Fig 12 Performance Evaluation

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ISSN 2454 – 535X
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Fig 13 Home page

Fig 14 Signin page

Fig 15 Login page

Fig 16 User input

Fig 17 Predict result for given input

5. CONCLUSION

An original hybrid strategy consolidates Lexicon-based sentiment analysis with ML techniques. New technique further develops political security threat expectation precision and versatility. The methodology catches fragile public perspectives by utilizing NRC language to evaluate report feelings. It is more modern to Utilize feelings to survey risks. SVM, Naive Bayes, and Decision Tree calculations show that the recommended structure works [13,14]. The venture's social media temperament checking for political security is valuable. Early disclosure of troublesome mentalities assists specialists with countering developing risks, turning away friendly turmoil or threats. High level ensemble learning models like Random Forest and Stacking Classifier further develop peril forecast. The project's extension's Stacking Classifier beat different models in accuracy, precision, recall, and F1 score. This shows it further

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develops political security threat prediction. An easy to use interface made conceivable by Flask and SQLite makes the model more receptive. Client testing, input approval, and consistent model expectations further develop convenience in the front-end.

6. FUTURE SCOPE

Future work incorporates concentrating on additional intricate signs and expanding the feeling jargon to further develop the framework's emotion detection. This change tries to more readily get a handle on literary sentiments. Past political security, the framework might be adjusted for different regions and dialects to guarantee viability in various web-based circumstances. The venture could profit from ongoing danger reaction frameworks to give convenient experiences and preventive strides against the internet political security concerns. Keeping up with framework adaptability requires consistent model preparation in view of information patterns and client criticism. This technique keeps the calculation versatile to online opinion changes, working on its figure accuracy over time.

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International Journal of Mechanical Engineering Research and Technology
ISSN 2454 – 535X
http://www.ijmert.com
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