ISSN: 2321-2152

IJMECE

International Journal of modern electronics and communication engineering

E-Mail
editor.ijmece@gmail.com
editor@ijmece.com

www.ijmece.com

ISSN2321-2152

www.ijmece .com

Vol 12, Issue 3, 2024

USING MACHINE LEARNING TO DETERMINE HIVAIDS PATIENTS' COVID-19 PANDEMIC CONCERNS FROM TWEETS

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ABSTRACT:

Individuals Living with HIV/Helps (PLWHA) are defenseless against the Covid-19 pandemic, and the examination tries to grasp its belongings and alleviating strategies. Vader Opinion and TextBlob extricate PLWHA sentiments from Twitter posts. The undertaking utilizes information investigation, preprocessing, and perception to figure out PLWHA perspectives. In light of Vader Opinion and TextBlob feelings, SVM, Random Forest, and Decision Tree classifiers anticipate tweet extremity. The paper additionally recommends utilizing ensemble techniques like Voting Classifier to work on model execution. A Flask front end for client testing with confirmation is recommended as an expansion for a protected and smooth client experience. High clinical consumptions, late HIV diagnosis, confined medication accessibility, vilification, and absence of inoculation direness were among PLWHA's interests during and after the scourge.

INDEX TERMS Sentiment analysis, thematic analysis, textual mining, tweets, HIV, AIDS, machine learning

1. INTRODUCTION:

Indeed, even with colossal cash and endeavors gave to diminishing its belongings, HIV/AIDS keeps on representing a serious danger to world wellbeing. Late information from the World Health Organization (WHO) demonstrates that large number of individuals overall are as yet impacted by the predominance of HIV/AIDS, with a great many new diseases being recorded every year [1]. More extravagant and less created nations have generally overseen HIV/AIDSin an unexpected way, with many finding it challenging to fulfill the necessities of both treatment and counteraction [2]. These hardships have been exacerbated by the Covid-19 pandemic, which has come about in a syndemic — the union of at least two pestilences — that is overburdening medical services frameworks and assets [3].

Among the numerous troubles looked by People Living with HIV/AIDS (PLWHA) are disgrace, exploitation, and limited admittance to excellent consideration [4], [5]. These issues have been exacerbated by the Covid-19 scourge, which has removed assets and consideration from HIV/AIDS treatment and the executives [6]. It is basic to understand how the syndemic has impacted

PLWHA here and whether previous mishaps have been exacerbated.[32]

Virtual entertainment stages have become significant data and articulation channels for individuals living with HIV/AIDS , permitting them to uninhibitedly share their encounters and concerns [7]. Moreover, improvements in machine learning (ML) have made it simpler to dissect web-based entertainment information and concentrate subjects and mentalities from client created material [8]. Using ML strategies like opinion examination and text mining, scientists might find out about the concerns and dissatisfactions of individuals living with HIV/AIDS all through the pandemic.

This study utilizes feeling examination on Twitter to investigate the concerns of PLWHA during the Covid-19 pandemic. By utilizing ML approaches, for example, text based mining and topical examination, we can find key subjects that catch the battles and encounters of individuals with Parkinson's infection. By utilizing an interdisciplinary methodology, we need to give bits of knowledge that could direct future medicines and strategy while likewise revealing insight into how HIV/AIDS the executives is changing with regards to the Covid-19 pandemic.[34]

2. LITERATURE SURVEY

HIV/Helps keeps on being a significant worldwide medical problem, influencing a great many individuals universally. Progressions in machine learning (ML) and artificial intelligence (AI) have set out new open doors to tackle HIV counteraction, treatment, and the executives issues. Marcus et al. (2020) [3] cause to notice new techniques that utilization AI and ML for HIV avoidance, featuring the innovations' capability to battle the pandemic. AI and ML give imaginative ways of further developing HIV counteraction strategies and mediations by using prescient examination and information driven bits of knowledge.

Complete data about HIV/AIDS, including side effects, causes, and accessible medicines, might be found at the Mayo Center [9]. This dependable site is a significant instrument for understanding the illness' clinical components. Moreover, the conversation of the arrangement and advancement of examination fronts in HIV/AIDS by Fajardo-Ortiz et al. (2017) [13] gives bits of knowledge into the changing field of HIV/AIDS research.

Segregation and shame keep on being significant obstructions to HIV/AIDS backing and care. A complete examination by MacLean and Wetherall (2021) [20] uncovered the connection between burdensome side effects and HIV disgrace among individuals living with HIV/AIDS, particularly in South Africa. To make fruitful medicines to upgrade the emotional well-being and general prosperity of PLWHA, it is essential to fathom the psychosocial impacts of shame.

Global health data and statistics on HIV/AIDS are accessible from the World Health Organization (WHO) [21], which gives significant experiences on the sickness' the study of disease transmission and commonness. Besides, as well as talking about the syndemic effect of HIV/AIDS in Africa during the Covid-19 pandemic, Uwishema et al. (2022) [22] feature the need of facilitated measures to deal with the two pandemics effectively.

An exploration on clinical understudies in Jordan by Sallam et al. (2022) [24] assessed clinical understudies' consciousness of HIV and their deriding sees about PLWHA. Their discoveries feature the meaning of schooling and mindfulness

ISSN2321-2152
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crusades in the battle against bias and shame related to HIV. Moreover, Pinheiro et al. (2021) [27] utilized information mining techniques to treat dementia in HIV/AIDS patients, representing the commitment of ML approaches for controlling and anticipating comorbidities connected with the infection.

By and large, the survey of the writing underscores how different HIV/AIDS research is, with viewpoints that incorporate social, clinical, and specialized angles. Promising strategies for further developing HIV avoidance, treatment, and care are given by AI and ML, which can likewise resolve the mental and epidemiological issues connected with the disease. The worldwide annihilation of the HIV/AIDS pandemic relies upon progressing examination and development around here.

3. METHODLOGY

a) Proposed work:

The proposed exertion is to assess tweets connected to HIV/AIDS by coordinating subject displaying and sentiment analysis draws near. Successful preprocessing of the information will be accomplished by using progressed data processing procedures, like feature selection. To survey the sentiments conveyed in the tweets, ML models such Vader Sentiment, SVM, Random Forest, and Decision Tree will be developed. Moreover, a LDA model for point displaying and TextBlob sentiment analysis will be coordinated to offer an exhaustive understanding of the conclusions and stresses shared via online entertainment. To further develop sentiment analysis for PLWHA[25] during the Covid-19 pandemic, a voting classifier that joins AdaBoost and RandomForest will be made as an extension of the venture. Conventional SVM, Decision Tree, and Random Forest calculations — all of which use feeling inferred highlights — will be contrasted with this ensemble model. Furthermore, a Flask structure that incorporates with SQLite will be utilized to smooth out client enrollment, confirmation, and testing, at last working on the task's openness and ease of use for a more extensive scope of clients.[36]

b) System Architecture:

The system architecture gathers, processes, and breaks down HIV-related tweets for experiences. HIV tweets are at first gathered from web-based entertainment and different sources. Information is cleaned and standardized after assortment to guarantee consistency and accuracy in analysis. The handled information is vectorized utilizing CountVectorizer or TF-IDF to transform text into numbers. Then, at that point, subject displaying techniques like Latent Dirichlet Allocation (LDA) are utilized to find twitter dataset subjects. Topical examination, done physically by trained professionals or consequently, gives further experiences into issues. TextBlob and Vader Feeling assess tweets for extremity (positive, negative, or neutral). Extremity tasks are checked to guarantee sentiment analysis accuracy. In light of the examination results, proposals or bits of knowledge are pursued for choice making or exploration. This engineering permits partners to get huge data from HIV-related twitter information by handling and dissecting it.

ISSN2321-2152
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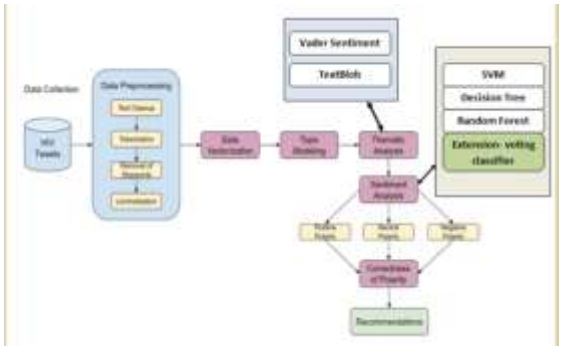

Fig 1 Proposed Architecture

c) Dataset collection:

The Twitter Programming interface was utilized to gather HIV/AIDSrelated tweets utilizing catchphrases including '#HIV', 'HIV', 'HIV/Helps', '#PLWHIV', and '#PeoplewithHIV'. Tweets from Walk 1, 2020, to April 30, 2022, caught a wide range of discussions and feelings. These inquiry conditions yielded 2,839,091 tweets. The tweets were changed over completely to CSV for text analysis and processing. Visualizations of these tweets' overall starting points uncover HIV/AIDS discussions' geographic scattering. Another visualization showed the cleaned and pre-handled tweets, showing the information refining process [56]. This careful dataset gathering strategy gave an enormous and differentiated dataset for investigation and experiences.

d) **DATA PROCESSING**

Processing HIV/AIDSrelated tweets expected numerous cycles to get ready text data for analysis. Introductory evacuation of URLs and other pointless characters guaranteed that the text contained just significant material. To streamline the dataset and further develop coherence, accentuation marks were eliminated. To zero in on significant data and take out dataset commotion, stop words like "and", "the", and "is" were erased. To keep up with text consistency, the information was standardized by switching text over completely to lowercase and normalizing contractions and word variations. By expanding message information quality and cognizance, these arrangement techniques improved the information for feeling examination and subject demonstrating, bringing about additional exact bits of knowledge from the dataset.

e) **VISUALIZATION**

Visualization is fundamental for investigating HIV/AIDS tweets during the Covid-19 plague. Perception techniques like word mists, bar outlines, and geological guides might feature information examples and patterns. Word mists show the most well-known tweet words and expressions, outlining HIV/AIDS related topics and issues. Bar diagrams can show watchword or feeling recurrence across time, uncovering worldly examples and concerns. Geographic guides can likewise show tweet source scattering, uncovering provincial issues and mentalities. These perceptions assist legislators and medical care experts with figuring out HIV/AIDS patients' interests during the Covid-19 pestilence and better serve them.

f) Feature Selection

Utilizing ML to distinguish HIV/AIDS tweets during the Covid-19 episode requires feature selection. Feature selection for this situation incorporates finding the twitter dataset elements or watchwords that best reflect HIV/AIDS patients' concerns. TF-IDF or CountVectorizer might be utilized to transform printed information into mathematical elements that demonstrate the recurrence of each tweet word or expression. Then, rank and pick the most useful qualities utilizing chi-square test, common data, or RFE. Choosing the most discriminative highlights permits the ML

ISSN2321-2152
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model to zero in on the qualities that best recognize HIV/AIDS patients' interests during the Covid-19 pandemic, boosting anticipated execution and interpretability.

g) Tokenization

Tokenization is a key text planning step in natural language processing (NLP). Tokenization in CountVectorizer includes breaking a record or message into words or terms and addressing them as tokens. To keep up with consistency, CountVectorizer tokenizes text by killing accentuation marks, breaking it into words utilizing whitespace or specific delimiters, and switching the words over completely to lowercase.

Tokenization breaks text into tokens, which are utilized in NLP examination. These tokens may be words, sentences, or characters, contingent upon the task. Tokenization changes over crude message input into an organization ML calculations can break down, empowering message classification, sentiment analysis, and theme demonstrating.[38]

h) TRAINING AND TESTING

Training and testing are urgent to show development and evaluation while utilizing ML to recognize HIV/AIDS patients' pandemic concerns in tweets.

Around 80% of the named twitter dataset is utilized to prepare the ML model. This methodology opens the model to different tweets that plainly address HIV/AIDS pandemic issues. The model changes its boundaries to limit botches and boost execution by learning information examples and relationships.

The leftover 20% of the dataset is for trying. The model's speculation capacity is tried utilizing this concealed information to recognize worries in new tweets. To assess the model's capacity to recognize HIV/AIDS patients' concerns during the Covid-19 pandemic, accuracy, precision, recall, and F1-score are determined by contrasting its forecasts on the test set to the marks.

i) ALGORITHMS:

Support Vector Machine: SVM is a supervised learning strategy for classification and regression. SVM arranges message as positive or negative for sentiment analysis. It finds the best hyperplane to isolate feature space classes. SVM is great for sentiment analysis in this venture since it handles high-layered information really and sums up well.

```
from sklearn.svm import SVC
svc = SVC(probability=True)
svc.fit(X_train, y_train)
y_pred = svc.predict(X_test)
```

Fig 2 Svm

Decision Tree: Decision Tree is a tree-like worldview for restrictive decisions. In sentiment analysis, a decision tree is framed by isolating information into qualities to group feeling. Decision Trees are helpful for deciphering mathematical and straight out information. Because of their straightforwardness and dynamic lucidity, they are fitting for sentiment analysis.

```
from sklearn.tree import DecisionTreeClassifier
tree = DecisionTreeClassifier()
tree.fit(X_train, y_train)
y_pred = tree.predict(X_test)
```

Fig 3 Decision Tree

Random Forest: Random Forest's [27] ensemble learning method prepares a few decision trees. Each forest decision tree freely predicts opinion, and a

ISSN2321-2152
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greater part vote decides the result in feeling examination. This lifts accuracy and versatility, making Random Forest ideal for convoluted sentiment analysis on fluctuated and dynamic web-based entertainment content.

```
# Random Forest Classifier Model
from sklearn.ensemble import RandomForestClassifier

# instantiate the model
forest = RandomForestClassifier(n_estimators=10)

forest.fit(X_train, y_train)
y_pred = forest.predict(X_test)
```

Fig 4 Random Forest

This task's Voting Classifier involves delicate democratic to consolidate AdaBoost and RandomForest expectations for nuanced results[35]. This gathering method further develops HIV-related tweet sentiment analysis by consolidating various models for anticipated accuracy and constancy.

```
from sklearn.ensemble import RandomForestClassifier, VotingClassifier, AdaBoostClassifier
clf1 = AdaBoostClassifier(n_estimators=10, random_state=0)
clf2 = RandomForestClassifier(n_estimators=5, random_state=1)

eclf = VotingClassifier(estimators=[('ad', clf1), ('rf', clf2)], voting='soft')
eclf.fit(X_train, y_train)

y_pred = eclf.predict(X_test)
```

Fig 5 Voting Classifier

4. EXPERIMENTAL RESULTS

Accuracy: A test's accuracy is its ability to recognize debilitated from sound cases. To quantify test accuracy, figure the small part of true positive and true negative in completely broke down cases. Numerically, this is:

$$\text{Accuracy} = TP + TN\ TP + TN + FP + FN.$$

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

Precision: Precision estimates the level of positive cases or tests precisely sorted. Precision is determined utilizing the recipe:

$$\text{Precision} = \text{True positives}/\ (\text{True positives} + \text{False positives}) = TP/(TP + FP)$$

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

Recall: Machine learning recall assesses a model's ability to perceive all significant examples of a class. It shows a model's culmination in catching occasions of a class by contrasting accurately anticipated positive perceptions with complete positives.

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

F1-Score: Machine learning model accuracy is estimated by F1 score. Consolidating model precision and recall scores. The accuracy measurement estimates how frequently a model anticipated accurately all through the dataset.

$$\textbf{F1 Score} = \frac{2}{\left(\frac{1}{\text{Precision}} + \frac{1}{\text{Recall}}\right)}$$

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

	ML Model	Accuracy	Precision	Recall	f1_score
0	Textblob - SVM	0.640	0.597	0.640	0.675
1	Textblob - RF	0.668	0.646	0.668	0.685
2	Textblob - Decision Tree	0.735	0.722	0.735	0.730
3	Vader - SVM	0.568	0.539	0.568	0.572
4	Vader - RF	0.578	0.646	0.578	0.622
5	Vader - Decision Tree	0.565	0.563	0.565	0.569
6	**Extension- Textblob - Voting Classifier**	**0.942**	**0.943**	**0.942**	**0.945**
7	**Extension- Vader - Voting Classifier**	**0.952**	**0.953**	**0.952**	**0.954**

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Fig 6 PERFORMANCE EVALUATION

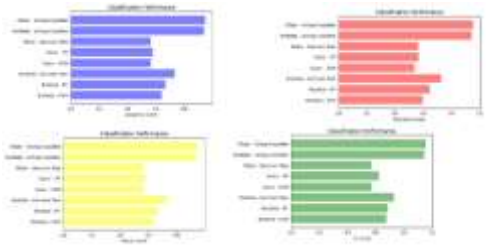

Fig 7 COMPARISON GRAPHS

Fig 8 home page

Fig 9 sign up

Fig 10 sign in

Fig 11 upload input data

Fig 12 Predict result

5. CONCLUSION

At last, the task's utilization of ML and sentiment analysis to examine PLWHA worries during the Covid-19 pestilence is vital.[40]

Utilizing a vote classifier and other ML models has improved sentiment analysis, conveying nuanced experiences into HIV/AIDS related virtual entertainment material. It enlightens hidden

subjects and sentiments in HIV/AIDS studies, working on our cognizance of this weak populace's battles. Specialists and people may effectively sort virtual entertainment material with the opinion extremity classifier.

Flask's incorporation with SQLite and Latent Dirichlet Allocation (LDA) for point displaying works on the undertaking's ease of use and depth, uncovering PLWHA issues all through the pestilence. Generally, the examination could impact PLWHA-explicit medicines and support.

6. FUTURE SCOPE

The examination could spread past Twitter to other web-based entertainment channels to assemble PLWHA contemplations. A full examination would profit from a more all encompassing information on their concerns and encounters.

The venture can rapidly adjust to PLWHA's changing perspectives by growing constant observing instruments. This gives prompt reactions and help, particularly during the plague, when concerns might change rapidly.

Upgrading language support perceives PLWHA's different etymological beginnings. This expansion guarantees consideration, catching feelings in different dialects for a more precise and delegate examination.

Joint effort with medical services specialists and associations helps transform opinion discoveries into custom fitted activities. Joint effort can improve overall PLWHA support projects and arrangements.

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