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A STUDY ON SENTIMENT ANALYSIS OF THE TWO-WHEELER ELECTRIC VEHICLE USERS IN INDIA

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ABSTRACT:

In India, where traffic congestion and air pollution are serious problems, two-wheeler electric vehicles have emerged as a promising means of transportation. They provide an economical and environmentally beneficial alternative to traditional two-wheelers that use fossil fuels. Due to this, the market for electric two-wheelers has been expanding significantly in recent years. On the traits and habits of two-wheeler electric vehicle users in India, there is, however, little research. Manufacturers must comprehend this group's needs and preferences in order to design and promote their products successfully. The development of laws to encourage the use of electric vehicles and address the issues with infrastructure and charging stations can both be aided by such insights for policymakers. This study aims to examine customer attitudes towards electric vehicles in India in order to gain useful insight into the factors that influence the country's adoption of EVs. The goal of the study is to get a wide range of opinions and perspectives from a large number of Indian drivers by using data from popular automobile websites on Google.Because two-wheelers are a common mode of transportation in India and, as a result, have a significant impact on the adoption of EVs as a whole, the study focuses specifically on their use. The study includes companies like Ola Electric, Benling, Ather, TVS iCube, Revolt, Bajaj Chetak, Hero Electric, Okinawa, Okaya, and Ampere, giving a complete picture of the current players in the Indian electric vehicle market.The results of the study show that Support Vector Machine is the best machine learning method recommended in this study, with an accuracy level of 84%. It has been determined through sentiment analysis that two-wheeler electric vehicle customers in India have a generally positive attitude towards these vehicles.

Keywords: *Sentiment Analysis, Two-wheeler electric vehicles, Support Vector Machine, Naïve Bayes*

I. INTRODUCTION:

Electric vehicles must be the mode of transportation of the future in today's society, where new technology is used everywhere on a daily basis. The promotion of environmentally friendly modes of transportation, pollution, rising fuel demand, and global warming are just a few of the

reasons why electric vehicles are being promoted. Our reliance on oil has resulted in ongoing exploitation of the world. We must end our reliance on oil at this point. Oil is a major contributor to pollution because of the hazardous gases it releases into the environment, which are harmful to both plants and animals. By using alternative energy sources like electric vehicles, we can cut down on the amount of harmful gases that are released into the environment. India's rapid daily population growth is correspondingly outpacing the transportation demand. As a result, there is an increase in demand for gasoline. Too much smoke from traditional automobiles contributes to air pollution and many deaths annually. Right now, the electric scooter market is expanding far too quickly. Electric bikes and scooters are the most popular new vehicles due to their low upkeep requirements. In order to assist customers in purchasing an electric vehicle, businesses must therefore be aware of customer expectations.

As the population grows, so does the need for transportation, which has led to an increase in gasoline demand. Nonetheless, conventional vehicles are a significant wellspring of air contamination and are liable for some passings every year. As a result, environmentally friendly alternatives like electric bikes and scooters are needed. Due to their low maintenance requirements, electric bikes and scooters are rapidly expanding the market, making them a popular choice for consumers.

The study provides a comprehensive overview of the present players in the Indian electric vehicle market by including companies like Ola Electric, Benling, Ather, TVS iCube, Revolt, Bajaj Chetak, Hero Electric, Okinawa, Okaya, and Ampere.

II. REVIEW OF LITERATURE:

1. **Felisia Handayani, Metty Mustikasari (2020),** conducted a sentiment analysis of electric cars using recurrent neural network method in Indonesian tweets Sentiment analysis was used in this study to look at tweets on Twitter with the phrase "electric car." Tweet Scraper was used for one of the pre-study steps and for the data retrieval process with a Python library. The Long Short Term Memory architecture of the Recurrent Neural Network is used to build models. The final test results showed that datasets with 3,000 data points and a 70:30 ratio of training data to testing data produced the highest accuracy. The distribution data ratio also has an impact on test outcomes, as evidenced by the precision, recall, and accuracy values of 0.618, 0.507, and 0.722 of these datasets, respectively.
2. **Dipak Kawade, Kavita Oza(2017),**carried out sentiment analysis through Machine Learning Approach. Twitter is one of the most well-known platforms for social networking, where users can freely express their feelings, thoughts, and opinions. People's reactions to a terrorist attack (Uri attack) were mined through the collection, analysis, and use of these tweets. Text mining tools were utilized to identify the emotions and polarities of tweets during their

investigation of the Uri attack. Five thousand tweets are recoded and pre-processed in order to create a dataset of frequently used words. Emotions and polarity were mined using R. The Uri attack was detested by 94.3 percent of the experimenters.

3. **H.P. Suresha, Krishna Kumar Tiwari (2021),** built a model for sentiment analysis of Electric Vehicles of Twitter Data. They gathered user tweets about electric vehicles using Twitter's API and investigated how the general public felt about them. Initially, as the initial stage, following data collection. They developed a natural language processing (NLP)-based pre-processed data model to select tweets. They used topic modeling, word clouds, and EDA to examine various aspects of electric vehicles in the second step. Using Latent Dirichlet allocation, they used topic modeling to deduce the numerous themes associated with electric vehicles. LDA offered a better understanding of themes and was more accurate than LSA, according to a comparison of this study's topic modeling to LSA. Using the "Valence Aware Dictionary (VADER)" and "Sentiment Reasoner (SONAR)," the final step was to determine whether the tweets about electric vehicles and their sentiment were positive, negative, or neutral. For this project, they used the Twitter API to collect 45,000 tweets, along with relevant hashtags, user location, and a number of topics related to electric vehicles. #tesla was found to be the most popular hashtag used by Twitter users to share tweets about electric vehicles. Ekero, Sweden, is home to the majority of people who tweet about electric cars. Tweets about electric vehicles contained the most instances of the word "Tesla." "Elon Musk" was the bi-gram used the most frequently in tweets about electric vehicles. According to VADER, 47.1 percent of tweets were positive, 42.4 percent were neutral, and 10.5 percent are negative.
4. A sentiment analysis of social media data about electric vehicles using feature selection methods (2020), made an effort to collect insights by employing sentiment analysis (SA). It demonstrated a brand-new social media data collection centered on an electric vehicle case study. This study used two approaches to thoroughly assess public opinion on electric vehicles. They first constructed a sentiment analysis tool and then categorized and labeled the data in accordance with the attitudes they had discovered in order to extract the comments' sentiment. While performing classification, they discovered the dimensionality issue and investigated the use of feature selection (FS) models to reduce the data set's dimensionality. They discovered that the most encouraging results were obtained when three FS models—Chi Squared, Information Gain, and Relief—were used in conjunction with a logistic and support vector machines classification strategy. A practical illustration of social media text analytics that can be applied to a variety of fields of study and industries was provided in this paper, which made a contribution.

5. **Panayotis Christidis, Caralampo Focas (2019),** examined the factors that influence the adoption of hybrid and electric vehicles in the European Union (EU) using data from two comprehensive cross-sectional surveys. Each study received 26,500 responses to a questionnaire that asked about socioeconomic and behavioral factors. The number of EU respondents who said they would "definitely" or "probably" consider purchasing a hybrid or battery-powered electric vehicle (H&EV) in the near future increased from 32% in 2014 to 37.4% in 2018. In any case, there is a great deal of variety between EU part states and inside different financial classes. Income, educational attainment, and urbanization all have strong effects on propensity. To address the high degree of collinearity, they investigated and explained the interaction between the variables that affected the indicated propensity to buy such a car using a machine learning classification model. Something that had been generally overlooked in the literature was brought to light by the findings: that purchasing decisions are influenced, if not entirely, by local conditions and regional variation. This conclusion may offer policy recommendations for promoting the use of H&EVs by implementing measures that are tailored to the particular requirements at the local level.
6. **Prof. Tushar Pradhan, Ajaysinh Parmar (2022),** conducted a study on consumer perceptions of e-vehicles in the city of Vadodara. The goal of this study was to find out how people in Vadodara city felt about e-vehicles. The goal of this study was to get people's thoughts, feelings, and perceptions about being aware of and likely to buy vehicles to keep the environment sustainable. Keyword searches for the subject in various published journals, working papers, and books served as the basis for the analysis of the research articles. For this study, they used a descriptive research design. They obtained the data by utilizing primary data through a questionnaire. In hypothesis testing, they effectively evaluate the data through the use of statistical tools like the Chi-square test. They concluded that customers prefer non-electric vehicles to electric ones.

III. OBJECTIVES OF THE STUDY:

1. To analyze the users' sentiments about electric vehicles in India through the Support Vector Machine classification model.
2. To explore the user's sentiments about electric vehicles in India through Naive Bayes classification model.
3. To identify the best model for predicting the user’s sentiments about electric vehicles in India.

IV. RESEARCH METHODOLOGY:

Data sources:

The Web Scraper extension is used to scrape data from a variety of websites, including

Google's bikewale.com and bikedekho.com.

Method of Analysis:

1. Natural Language Processing (NLP) – It is a field that combines data science and artificial intelligence (AI). At its most fundamental level, NLP is all about teaching machines how to understand human dialects and deduce meaning from text. Additionally, because of this, Artificial Intelligence is frequently required for NLP projects.

2. Sentiment Analysis - Sentiment analysis, also known as opinion mining, is a natural language processing (NLP) method for determining a text's emotional undertone. Organizations frequently employ this strategy to identify and group concepts related to a particular product, service, or idea. Data mining, machine learning, and artificial intelligence (AI) are utilized to mine text for sentiment and subjective information.

3. Python - Python is a general-purpose, high-level programming language. With a lot of indentation, its design philosophy emphasizes code readability.

4. Classification Models - Machine learning algorithms known as classification models are used to predict the categorical class labels of new instances based on their input features. Natural language processing, image recognition, speech recognition, fraud detection, and customer segmentation are just a few of the many fields in which they are frequently utilized.

Classification models used in the study include:

a. Support Vector Machine: The training data are represented by a support vector machine as points in space that are clearly separated into categories by a gap that is as wide as it can be. After that, new examples are mapped into the same space and, depending on which side of the gap they fall on, predicted to be in a particular category.

b. Naive Bayes: Based on Bayes' theorem, the naive Bayes algorithm assumes that every pair of features are independent. In many real-world applications, such as document classification and spam filtering, naive Bayes classifiers perform well. To estimate the required parameters, this algorithm needs only a small amount of training data. When compared to more advanced techniques, Naive Bayes classifiers are extremely quick.

V. DATA ANALYSIS & INTERPRETATIONS:

Following are the stages of analysis in the study-

a. **Data Collection:** The first step in any sentiment analysis study is to collect data. To perform an analysis of the sentiment analysis of two-wheeler electric vehicles in India, we would need data on the opinions and attitudes of people towards these vehicles. The Web Scraper extension is used to scrape information from the websites bikewale.com and bikedekho.com for this study. The reviews submitted by customers of the top 10 electric two-wheelers make up the data. The reviews are all kept in a single CSV file. The dataset consists of 1219 rows

and 1 column.

	Reviews
2	The new Ola S1 Pro costs around 1.16lacs on-road price, and I think it was an intelligent decision to invest in electric vehicles now. Ola S1 Pro has soft cushioning seats and good knee room space, which gives comfortable posture t any height rider. Range and charging time is perfect for me.
3	I believe OLA S1 was released into the market without being properly tested. It's just been six months since I purchased it, and now I'm facing difficulties. Along with the indicators, there is a lock and key issue, and it takes more hours now to charge and needs to be charged every few hours.
4	Excellent scooter with lots of high-tech features for daily use. The future of electric vehicles is already available, attractive in comparison to other electric vehicles, and at a similar or lower price. Smooth shopping experience. It's fantastic to ride. Despite the questionable colour quality, the appearance is fantastic.
5	All misleading mileage claims made by the company. Good pickup, The fit, finish, and parts are all of poor quality. It appears that ola was copied from somewhere else and then branded .No assurance of service
6	I'm noticing too many electric two-wheelers on-road nowadays. And quite attractive or say attention-grabbing was the new Ola S1 Pro version. And the matte finish black colour is so classy and gives a very distinctive approach to it. I want to buy it but will wait a few months so, prices start to drop a little as it is a bit pricey for me.
7	Due to its permanent magnet motor of 8.5kW battery, Ola S1 PRO came out with a bang in the market. It easily sustained itself in the competitive market due to good features and high-quality performance rides. Anyways both the variants are good.
8	The all-new OLA S1 Pro is my favourite electric scooter and I have already booked the Pro variant due to simple two reasons, first, its simplistic design and looks are admirable, and second, it generates good speed and gives a high-quality performance on-road.

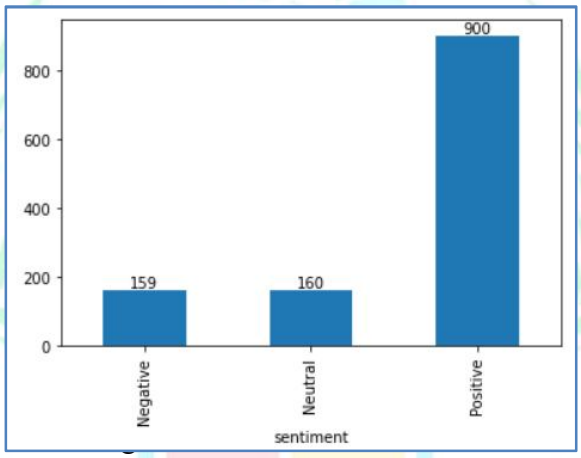
b. Data Cleaning and Pre-processing: Once we have finished collecting the data, we need to clean and pre-process it to remove any noise and inconsistencies. This involves removing stop words, punctuations, and special characters, converting the text to lowercase, and stemming or lemmatizing the words. More specifically, the regular expression pattern [^\w\s]+ is used with the str.replace() method to replace any sequence of one or more characters that are not alphanumeric or whitespace with an empty string. For example, if a cell in the "Reviews" column contained the string "Great look and service!", the code would remove the exclamation mark at the end and return the modified string "Great look and service". The str. lower() method is used to apply the lowercase transformation to each string in the "Reviews" column. This operation can be helpful in various text mining and natural language processing tasks where text needs to be normalized for consistency. Lowercasing can also help in cases where case sensitivity is not important, such as when performing text searches or comparisons. This code imports the stopwords module from the Natural Language Toolkit (nltk) library in Python and then defines a set of English stop words. Stop words are common words that are often removed from text during natural language processing tasks because they are not considered useful for analysis. These include words like "the", "a", "an", "and", "but", and "or". The stopwords.words("english") function call returns a list of English stop words from the NLTK corpus, which is then converted to a set using the set() constructor.

c. **Data Transformation:** After cleaning the data, we need to transform it into a format suitable for analysis.

In this study, textblob library from TextBlob class is imported and used to define a function analyze_sentiment that takes the text string Reviews as input. The TextBlob class is a part of the textblob library, which provides a simple API for common natural language processing tasks, including sentiment analysis.The analyze_sentiment function uses the TextBlob class to create a TextBlob object from the input text. Then, it calculates the polarity of the sentiment of the input text using the sentiment.polarity property of the TextBlob object.

If the polarity is greater than zero, the function returns the string "Positive". If the polarity is equal to zero, the function returns the string "Neutral". If the polarity is less than zero, the function returns the string "Negative".

In this stage, it was found that the data containing neutral sentiments were comparatively less so the data was oversampled by duplicating the neutral reviews to make it approximately equal to the number of negative sentiments.



word_tokenize function from the nltk.tokenize module and the nltk module itself is imported. The word_tokenize function is used to split text into individual words or tokens. The nltk module provides various natural language processing tools, including tokenization, stemming, and part-of-speech tagging. "punkt" tokenizer is downloaded, which is used by the word_tokenize function.

word_tokenize function is then applied to each review in the Reviews column of the DataFramedf. This converts each review from a string of text into a list of individual words. After that, lambda function is applied to each list of words in the reviewwordsDataFrame column. The lambda function takes each word in the list and checks if it is not in the stop_words set (which was defined earlier in the code). If the word is not a stop word, it is added to a new list of filtered words. This step removes common words that are not useful for analysis, such as "the", "and", and "is".

FreqDist function is imported from the nltk.probability module. FreqDist calculates the frequency distribution of a list of tokens.

The list of lists in reviewwords is flattened into a single list of all words and after that the reviewwordsDataFrame column is converted into a list.

The frequency distribution of the words in the reviewwords list is calculated using the FreqDist function.

The most_common() method on the wordfreq object to return a list of the 30 most common words in the reviews, along with their frequency counts.

```
[('bike', 831),
 ('good', 674),
 ('scooter', 656),
 ('electric', 469),
 ('battery', 375),
 ('also', 312),
 ('range', 300),
 ('service', 284),
 ('best', 253),
 ('vehicle', 236),
 ('price', 230),
 ('like', 230),
 ('speed', 225),
 ('one', 215),
 ('buy', 213),
 ('charge', 211),
 ('features', 208),
 ('riding', 191),
 ('ride', 189),
 ('performance', 187),
 ('charging', 180),
 ('ola', 165),
 ('mileage', 163),
 ('time', 162),
 ('looks', 158),
 ('km', 150),
 ('great', 149),
 ('experience', 148),
 ('company', 145),
 ('quality', 144)]
```

Fig 3. A list showing top 30 common words in Reviews

The CountVectorizer class is a part of the sklearn.feature_extraction.text module in the Scikit-learn machine learning library. It is used to convert a collection of text documents into a matrix of token counts.

When working with text data, machine learning algorithms cannot operate directly on text data. So, the text data needs to be converted into a numerical format. One way to achieve this is by using the CountVectorizer class to transform the text data into a matrix of token counts.

The CountVectorizer class has several parameters that can be used to configure the tokenization process, such as stop_words, ngram_range, and tokenizer.

A CountVectorizer object is created and used to transform the text data in the 'Reviews' column of the dfDataFrame into a matrix of token counts. The CountVectorizer object is created with the following parameters:

max_features: An integer specifying the maximum number of features to include in the output matrix. In this case, the output matrix will have at most 180 columns (i.e., features).

min_df: An integer or float specifying the minimum number of documents in which a token must appear in order to be included in the output matrix. In this case, a token must appear in at least 3 documents.

ngram_range: A tuple specifying the range of n-gram sizes to include in the output matrix. In this case, only bigrams (i.e., n-grams of size 2) will be included.

lowercase: A Boolean indicating whether to convert all text to lowercase before tokenizing. In this case, lowercase=False, meaning that the case of the text will be preserved.

stop_words: A set of stopwords to be removed from the text before tokenizing. These stopwords were previously defined using the NLTK package.

preprocessor: A callable function that is applied to each document before tokenizing. In this case, no preprocessor function is applied.

The fit_transform method of the CountVectorizer object is then called on the 'Reviews' column of the dfDataFrame to create the matrix of token counts. The resulting matrix is stored in the X_vector variable.

Finally, the matrix is converted to a pandas DataFrame using the toarray method, and the resulting DataFrame is displayed using the head method. The column names are obtained from the get_feature_names_out method of the CountVectorizer object, which returns a list of feature names corresponding to the columns of the matrix.

d. **Dependent and Independent Variables:** The next step is to identify the dependent and independent variables. The X_vector variable is the independent variable and sentiment is the dependent variable.

e. **Train-Test Split**: The train_test_split function from the sklearn library is used to split the dataset into training and testing subsets.

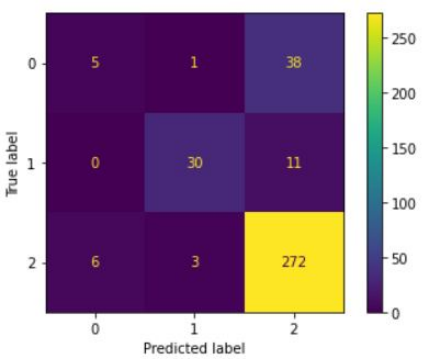
The inputs to the train_test_split function isX_vector, which is the matrix of predictor variables, and y, which is the outcome variable. The test_size parameter is set to 0.3, which means that 30% of the data will be used for testing and 70% will be used for training. The random_state parameter is set to 42, which ensures that the random split will be reproducible across different runs of the code.

The outputs of the train_test_split function are four variables: x_train, x_test, y_train, and y_test. The x_train and y_train variables contain the subset of the data that will be used for training the machine learning model, while the x_test and y_test variables contain the subset of the data that will be used for testing the model.

f. **Sentiment Analysis:** With the data in a suitable format, we can now perform sentiment analysis. Machine learning algorithms such as Support Vector Machine and Naive Bayes are used to classify the sentiments of the text data into positive, negative, and neutral categories.

i.Support Vector Machine:

Support Vector Machine (SVM) classifier is implemented using the scikit-learn library in Python. SVC class is imported from the sklearn.svm module. The SVM model is fitted to the training data x_train and y_train. The fit() method learns the parameters of the SVM model from the training data. The accuracy of the SVM model is computed on the training data, using the score() method. The labels of the test data x_test are predicted using the SVM model, and assigns the predictions to the variable svmpredict. A confusion matrix of the true and predicted labels of the test data is created, using the pd.crosstab() function from the pandas library and a classification report is printed, which includes precision, recall, and F1 score metrics for each class in the test data, using the classification_report() function from the scikit-learn library.



	precision	recall	f1-score	support
0	0.45	0.11	0.18	44
1	0.88	0.73	0.80	41
2	0.85	0.97	0.90	281
accuracy			0.84	366
macro avg	0.73	0.60	0.63	366
weighted avg	0.80	0.84	0.81	366

Fig 4. Confusion Matrix **Fig 5. Classification Report**

ii. Naïve Bayes:

BernoulliNB class is imported from the sklearn.naive_bayes module. The Bernoulli Naive Bayes classifier is used which assumes binary features. The default parameters for the BernoulliNB class are used in this case and Naive Bayes model is fitted to the training data x_train and y_train using fit() method. Accuracy of the Naive Bayes model on the training data is computed using the score() method. The labels of the test data x_test are predicted using the Naive Bayes model, and assigned to a variable. A confusion matrix of the true and

predicted labels of the test data is created using the pd.crosstab() function from the pandas library and also a classification report is printed, which includes precision, recall, and F1 score metrics for each class in the test data, using the classification_report() function from the scikit-learn library. Finally, a visualization of the confusion matrix is created using the ConfusionMatrixDisplay class from the scikit-learn library.

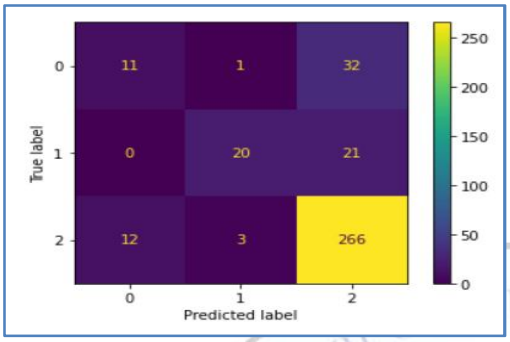


Fig 6. Confusion Matrix

	precision	recall	f1-score	support
0	0.48	0.25	0.33	44
1	0.83	0.49	0.62	41
2	0.83	0.95	0.89	281
accuracy			0.81	366
macro avg	0.72	0.56	0.61	366
weighted avg	0.79	0.81	0.79	366

Fig 7. Classification Report

g. **Visualization:** A word cloud is created to generate a visualization of the most common words in the set of reviews to provide insights into the sentiment or topics of the reviews.

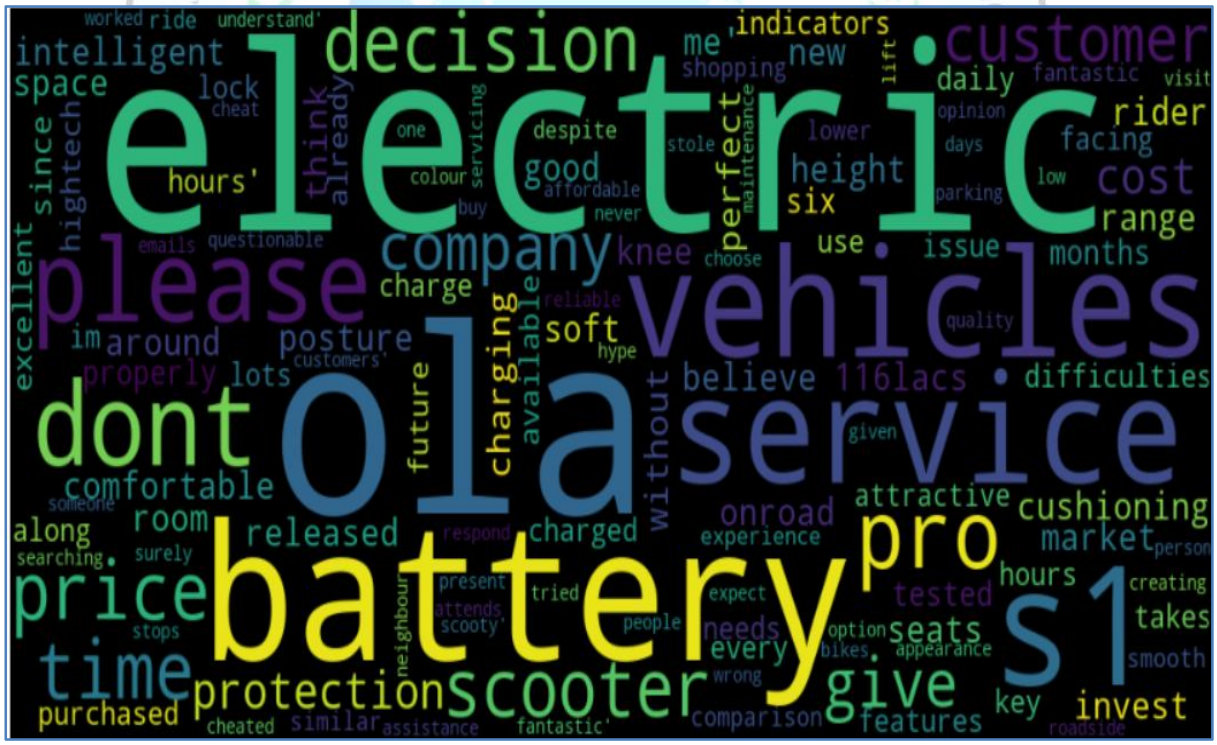


Fig 8. Word Cloud

PERFORMANCE REPORT

MODEL	ACCURACY		PRECISION	RECALL	F1 SCORE
Support Vector Machine	*0.84*	*0*	*0.45*	*0.11*	*0.18*
		1	*0.88*	*0.73*	*0.80*
		2	*0.85*	*0.97*	*0.90*
Naïve Bayes	*0.81*	0	*0.48*	*0.25*	*0.33*
		1	*0.83*	*0.49*	*0.62*
		2	*0.83*	*0.95*	*0.89*

This is the Performance Report of the Classification models used in the study.

VI. FINDINGS AND CONCLUSIONS:

The experiment's findings demonstrate that, with the accuracy level of 84% Support Vector Machine is the best machine learning technique suggested in this study. As a result, these models may serve as the greatest examples for using machine learning techniques to identify user attitude using information from internet portals. These models not only have the highest accuracy levels, but also significantly higher precision and recall values when compared to other methods.

After conducting sentiment analysis on the opinions of two-wheeler electric vehicle users in India, it can be concluded that the overall sentiment towards these vehicles is positive.Based on the analysis of user reviews and social media posts, the majority of users expressed satisfaction with the performance, convenience, and cost-effectiveness of electric two-wheelers. Many users also appreciated the environmental benefits of these vehicles and expressed a sense of pride in owning and using them.Furthermore, the sentiment towards the future of electric two-wheelers in India was also positive, with many users expressing optimism about the increasing availability and affordability of these vehicles, and the potential for them to revolutionize the transportation industry in the country.

Overall, the sentiment analysis suggests that the two-wheeler electric vehicle market in India is likely to continue to grow and thrive in the coming years. Since, the sentiment towards two-wheeler electric vehicles is positive, we can recommend increasing the production and promotion of these vehicles.

VII. LIMITATIONS OF THE STUDY:

Sentiment analysis difficulties frequently stem from training model accuracy issues. Systems typically lack objectivity and are prone to incorrectly identifying neutral comments. Sentiment can also be difficult to detect when systems are unable to comprehend the context or tone. It is possible for someone to make claims that are not true. The majority of evaluations will include both positive

and negative feedback, which can be managed by analyzing each sentence individually. Yet, the more casual the medium, the more likely it is that people will stir up different perspectives in a single explanation, making it harder for a computer to understand. One label may be more prevalent than others (neutral sentiments in this instance) in the distribution of sentiment labels in the training data in some instances. Since the data is collected from the Indian motorcycle websites there is possibility of data biases caused by the sampling method and issues with data quality and accuracy.

VIII. BIBLIOGRAPHY:

1. https://www.drivespark.com/two-wheelers/2022/top-10-bestselling-electric-two-wheeler-brands-in-india-july-2022/articlecontent-pf160317-036502.html
2. https://twitter.com/India_EV_News
3. https://e-vehicleinfo.com/electric-vehicle-in-india-challenges-opportunities/
4. Kawade, Dipak & Oza, Kavita. (2017). Sentiment Analysis: Machine Learning Approach. International Journal of Engineering and Technology. 9. 2183-2186. 10.21817/ijet/2017/v9i3/1709030151.
5. Tiwari, Krishna Kumar & Suresha, H.. (2021). Topic Modeling and Sentiment Analysis of Electric Vehicles of Twitter Data Asian Journal of Research in Computer Science.
6. Costello, Francis & Lee, Kun. (2020). Exploring the Sentiment Analysis of Electric Vehicles Social Media Data by Using Feature Selection Methods. 18. 249-259. 10.14400/JDC.2020.18.2.249.
7. Saifullah, Shoffan& Fauziah, Yuli &Sasmito, Agus. (2021). Comparison of Machine Learning for Sentiment Analysis in Detecting Anxiety Based on Social Media Data.
8. Biswas, Sandipan & Ghosh, Shivnath& Roy, Sandip. (2021). A Sentiment Analysis on Twitter Opinion of Drug Usage Increase by TextBlob Algorithm Among Various Countries During Pandemic.
9. Al-Amrani, Yassine & LAZAAR, Mohamed &elkadiri, kamaleddine. (2018). Random Forest and Support Vector Machine based Hybrid Approach to Sentiment Analysis. Procedia Computer Science. 127. 511-520. 10.1016/j.procs.2018.01.150.