ABSTARCT

Recently, social media is playing a vital role in social networking and sharing of data. Social media is favored by many users as it is available to millions of people without any limitations to share their opinions, educational learning experience and concerns via their status. Twitter API is processed to search for the tweets based on the geo-location. Someone posts on social network gives us a better concern to Analyze about the particular systems process of the system. Evaluating such data in social network is quite a challenging process. In the proposed system, there will be a workflow to mine the data which integrates both qualitative analysis and large-scale machine learning technique. Based on the different prominent theme's tweets will be categorized into different groups. Machine learning classifier will be implemented on mined data for qualitative analysis purpose to get the deeper understanding of the data. It uses multi label classification technique as each label falls into different categories and all the attributes are independent to each other. Label based measures will be taken to analyze the results and comparing them with the existing sentiment analysis technique.

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CHAPTER 1

INTRODUCTION

Social media website is defined as “a website that facilitates meeting people, finding like minds, communicating and sharing content, and building community”; this kind of website allows or encourages various types of activities, such as commercial, social, or a combination of the two. Social media categories include digital library, e-commerce, entertainment, forum, geolocation, social bookmark, social review, social game, and social network. Social network is the subcategory of social media, which is the social structure of people who are joined by common interest. Social media are social channels of communication using web-based technologies, desktop computers, and mobile technologies. These technologies create highly interactive platforms through which individuals, communities, and organizations can share information, discuss, rate, comment, and modify user-generated and online contents. These advancements enable communication among businesses, organizations, communities, and individuals. Social media technologies change the way individuals and large organizations communicate, and they are increasingly being developed.

Wide range of applications in business and public policy uses sentiment analysis. Sentimental analysis is now being used from specific product marketing to antisocial behaviour recognition. Businesses and organizations have always been concerned about how they are perceived by the public. This concern results from a variety of motivations, including marketing and public relations. Before the era of Internet, the only way for an organization to track its reputation in the media was to hire someone for the specific task of reading newspapers and manually compiling lists of positive, negative and neutral references to the organization, it could undertake expensive surveys of uncertain validity. Today, many newspapers are published online. Some of them publish dedicated online editions, while others publish the pages of their print edition in PDF. In addition to newspapers, there are a wide range of opinionated articles posted online in blogs and other social media. This opens up the possibility of automatically detecting positive or negative mentions of an organization in articles published online, thereby dramatically reducing the effort required to collect this type of information. To this end, Organizations are becoming increasingly interested in acquiring fine sentiment analysis from news articles. Fine-grained sentiment analysis is an extremely challenging problem because of the variety of ways in which opinions can be expressed. News articles present an even greater challenge, as they usually avoid overt indicators of attitudes. However, despite their apparent neutrality, news articles can still bear polarity if they describe events that are objectively positive or negative. Many techniques used for sentiment analysis involve naïve approaches based on spotting certain keywords which reveal the author or speaker’s emotions. We use naïve performs fine-grained sentiment analysis to classify sentences as positive, negative or neutral.

1.2 PROPOSED ALGORITHM

Naïve Bayes Classifier Algorithm

- Naïve Bayes algorithm is a supervised learning algorithm, which is based on **Bayes theorem** and used for solving classification problems.
- It is mainly used in *text classification* that includes a high-dimensional training dataset.
- Naïve Bayes Classifier is one of the simple and most effective Classification algorithms which helps in building the fast machine learning models that can make quick predictions.
- **It is a probabilistic classifier, which means it predicts on the basis of the probability of an object**.
- Some popular examples of Naïve Bayes Algorithm are **spam filtration, Sentimental analysis, and classifying articles**.

Why is it called Naïve Bayes?

The Naïve Bayes algorithm is comprised of two words Naïve and Bayes, Which can be described as:

- **Naïve**: It is called Naïve because it assumes that the occurrence of a certain feature is independent of the occurrence of other features. Such as if the fruit is identified on the bases of color, shape, and taste, then red, spherical, and sweet fruit is recognized as an apple. Hence each feature individually contributes to identify that it is an apple without depending on each other.

- **Bayes**: It is called Bayes because it depends on the principle of Bayes' Theorem

Bayes' Theorem:

- Bayes' theorem is also known as **Bayes' Rule** or **Bayes' law**, which is used to determine the probability of a hypothesis with prior knowledge. It depends on the conditional probability.
- The formula for Bayes' theorem is given as:

$$P(A|B)= \frac{P(B|A)P(A)}{P(B)}$$

Where,

P(A|B) is Posterior probability: Probability of hypothesis A on the observed event B.

P(B|A) is Likelihood probability: Probability of the evidence given that the probability of a hypothesis is true.

P(A) is Prior Probability: Probability of hypothesis before observing the evidence.

P(B) is Marginal Probability: Probability of Evidence.

Working of Naïve Bayes' Classifier:

Working of Naïve Bayes' Classifier can be understood with the help of the below example:

Suppose we have a dataset of **weather conditions** and corresponding target variable "**Play**". So using this dataset we need to decide that whether we should play or not on a particular day according to the weather conditions. So to solve this problem, we need to follow the below steps:

1. Convert the given dataset into frequency tables.
2. Generate Likelihood table by finding the probabilities of given features.
3. Now, use Bayes theorem to calculate the posterior probability.

Advantages of Naïve Bayes Classifier:

- Naïve Bayes is one of the fast and easy ML algorithms to predict a class of datasets.
- It can be used for Binary as well as Multi-class Classifications.
- It performs well in Multi-class predictions as compared to the other Algorithms.
- It is the most popular choice for **text classification problems**.

Disadvantages of Naïve Bayes Classifier:

- Naive Bayes assumes that all features are independent or unrelated, so it cannot learn the relationship between features.

Applications of Naïve Bayes Classifier:

- It is used for **Credit Scoring**.
- It is used in **medical data classification**.
- It can be used in **real-time predictions** because Naïve Bayes Classifier is an eager learner.
- It is used in Text classification such as **Spam filtering** and **Sentiment analysis**.

Types of Naïve Bayes Model:

There are three types of Naive Bayes Model, which are given below:

- **Gaussian**: The Gaussian model assumes that features follow a normal distribution. This means if predictors take continuous values instead of discrete, then the model assumes that these values are sampled from the Gaussian distribution.
- **Multinomial**: The Multinomial Naïve Bayes classifier is used when the data is multinomial distributed. It is primarily used for document

classification problems, it means a particular document belongs to which category such as Sports, Politics, education, etc.
The classifier uses the frequency of words for the predictors.

- **Bernoulli**: The Bernoulli classifier works similar to the Multinomial classifier, but the predictor variables are the independent Booleans variables. Such as if a particular word is present or not in a document. This model is also famous for document classification tasks.

Python Implementation of the Naïve Bayes algorithm:

Now we will implement a Naive Bayes Algorithm using Python. So for this, we will use the "**user_data**" **dataset**, which we have used in our other classification model. Therefore we can easily compare the Naive Bayes model with the other models.

Steps to implement:

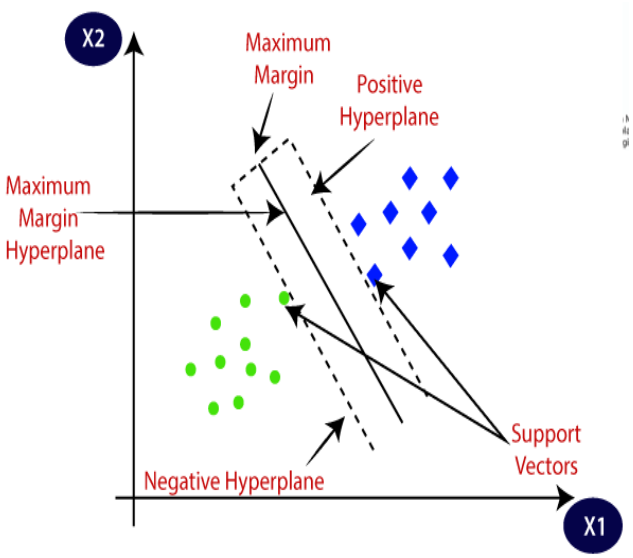
- Data Pre-processing step
- Fitting Naive Bayes to the Training set
- Predicting the test result
- Test accuracy of the result(Creation of Confusion matrix)
- Visualizing the test set result.

SVM

Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning.

The goal of the SVM algorithm is to create the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future. This best decision boundary is called a hyperplane.

SVM chooses the extreme points/vectors that help in creating the hyperplane. These extreme cases are called as support vectors, and hence algorithm is termed as Support Vector Machine. Consider the below diagram in which there are two different categories that are classified using a decision boundary or hyperplane:



Graph 1.2.1

Example: SVM can be understood with the example that we have used in the KNN classifier. Suppose we see a strange cat that also has some features of dogs, so if we want a model that can accurately identify whether it is a cat or dog, so such a model can be created by using the SVM algorithm. We will first train our model with lots of images of cats and dogs so that it can learn about different features of cats and dogs, and then we test it with this strange creature. So as support vector creates a decision boundary between these two data (cat and dog) and choose extreme cases (support vectors), it will see the extreme case of cat and dog. On the basis of the support vectors, it will classify it as a cat. Consider the below diagram:

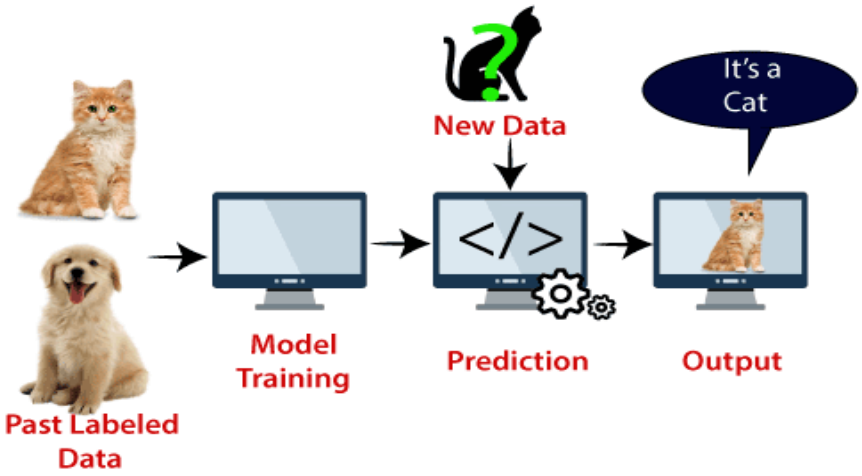


Fig 1.2.1

SVM algorithm can be used for **Face detection, image classification, text categorization,** etc.

Types of SVM

SVM can be of two types:

- **Linear SVM:** Linear SVM is used for linearly separable data, which means if a dataset can be classified into two classes by using a single straight line, then such data is termed as linearly separable data, and classifier is used called as Linear SVM classifier.
- **Non-linear SVM:** Non-Linear SVM is used for non-linearly separated data, which means if a dataset cannot be classified by using a straight line, then such data is termed as non-linear data and classifier used is called as Non-linear SVM classifier.

Hyperplane and Support Vectors in the SVM algorithm:

Hyperplane: There can be multiple lines/decision boundaries to segregate the classes in n-dimensional space, but we need to find out the best decision boundary that helps to classify the data points. This best boundary is known as the hyperplane of SVM.

The dimensions of the hyperplane depend on the features present in the dataset, which means if there are 2 features (as shown in image), then hyperplane will be a straight line. And if there are 3 features, then hyperplane will be a 2-dimension plane.

We always create a hyperplane that has a maximum margin, which means the maximum distance between the data points.

Support Vectors:

The data points or vectors that are the closest to the hyperplane and which affect the position of the hyperplane are termed as Support Vector. Since these vectors support the hyperplane, hence called a Support vector.

How does SVM works?

Linear SVM:

The working of the SVM algorithm can be understood by using an example. Suppose we have a dataset that has two tags (green and blue), and the dataset has two features x1 and x2. We want a classifier that can classify the pair(x1, x2) of coordinates in either green or blue. Consider the below image: