Implementation of Natural Language Processing in Customer Service

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Abstract

The use of artificial intelligence and natural language processing (NLP) in customer service is growing quickly. Technology is being used to interact with users and answer their questions. Using NLP in customer services is in the form of artificial intelligence applications that allow users to communicate with models using different languages through text or speech, and the model will provide answers to the users. The main goal of this systematic review is to locate and analyze the existing articles and studies on the use of NLP technology in customer service in terms of research domain, applications, datasets used, and evaluation methods. To create the final review article, relevant papers were sorted and filtered based on inclusion exclusion standards and quality assessment. In addition, discovered that Twitter dataset was the second dataset in terms of the most often used datasets. For the evaluation, most of the researchers used Accuracy, Precision, Recall, and F1 as the methods to evaluate the performance. However, the most important limitation was the dataset because it can be associated to the volume, diversity and quality of the dataset, thus the dataset may have a huge impact on the outcomes.

Keywords: Sentiment Analysis, Opinion Mining, NLP, basic elements of Sentiment Analysis

1. Introduction

Natural Language Processing (NLP) deals with the basic processing of the satisfied items. The data object is being translated into a computer file by NLP. An opinion Processing is a kind of natural language processing to track the attitudes of people about any given item. Opinion Analysis is also named in many names as Analytics, Opinion Mining, Opinion Production, and Mining Assessment [1]. Opinion Processing is not essential to a consumer but critical to an organization/corporation's growth. Opinion Mining performs a critical and active role in the company sector. By using user reply and thoughts, a supplier may develop and change its product design, price, deals and service [2]. Opinion Analysis is a tool used only to gather and research relevant data about any specific business or organization service from Web forums, search engines, online blogs, and social media. There are many users who purchase products through E-commerce websites. Through online shopping many E-commerce enterprises were unable to know Whether the customers are satisfied by the services provided by the firm. So people come across various reviews in the website but these reviews are genuine or fake is not identified by the user. In some websites, some good reviews are added by the product company people itself in order to make in order to produce false positive product reviews. They give good reviews for many different products manufactured by their own firm.

Sometimes the entrant will give false review to loss the other company product. To identify and control this type of fake review is very tedious job on today.

In this paper proposed to monitor and control of these fake reviews automatically. This system will find out fake reviews made by posting fake comments about a product by identifying the IP address along with review posting arrangements and through OTP verification. This system will check the user whether he has already bought this product and he can eligible to give comment or review. Sometimes user may chance to give fake through cautiously. This application will check user behaviour and his count of review posting through OTP Validation. This system uses data mining methodology and OTP (one time password) Validation method. This system helps the user to find out correct review of the product

Existing System

Today most of the people spend their time onto the websites of online shopping portals for making some purchases. Before they place any order they go through the reviews that is being posted for that product. According to the survey taken it is shown that nearly 30% of the people examine the reviews of the product with the reviews of the other production order to acquire a consistent and an honest product. About 50% of the people look upon the rankings of the product they wish to purchase and more than 80% of the people depend on the reviews posted for that particular product before they make a purchase. So it is clear that every person give importance to the reviews posted by each other in the online websites.

Drawbacks

1. Fake review lead a customer to make a buy low quality product. The product does not work long term
2. Customer satisfaction doesn't meets the requirements
3. Good reviews are added by the product company people itself
4. Consumer are not getting reliable product because of fake reviews and rating

Proposed System

Proposed system offers much more services in recognizing. Fake reviews when compared with existing system. This system will find out fake reviews made by the social media optimization team by identifying the phone number or mail. User will login to the system using his user id and password. And will view various products and will give review about the product. And the user will get genuine reviews about product. And while reviewing he needs to enter the email id from which he is reviewing and it would be verified. If he writes a fake review then his id will be blocked not allowing him to share his opinions again.

dvantages

1. The proposed system may pave path to recommend the users with appropriate service or product based on the analysis we perform through this system.
2. Product sales prepare independent database and Using Data Visualization to show the top rating products for best sales.
3. The proposed system will control the fake review so the user can get real review of the product.
4. The advanced data analysis is proposed to control the fake review of the product on the ecommerce website.
5. E-Mail notification mechanism implemented in this project enhances the administrator to send confirmation of orders and acknowledgement for customer purchase
6. User gets genuine reviews about the product and User can spend money on valuable products.

Salient Features of the System

Every product details of the company will be uploaded in online. It includes departments for which the product is manufactured, their functionality, description of the products, services given to the customer in future and other related information. Every registered customers of the company could order their product by filling up order application provided to them. From this stage prediction analysis's work starts. Every customer's order will be collected in separate database. Their log will be cross checked with their previous orders. The database will be filtered to finalize their choice of interest i.e. whether customer is willing to buy the product because of brand of features. The iterative analysis on individual customer database will yield product ranking. Thus this application facilitates the customer to suggest them the item or product they may purchase in future related to their purchase based on their purchase.

2. Sentimental Analysis and Opinion Mining

Analysis of emotions-opinion mining, content analysis, attitude AI-decides the emotional sense under the words, to realize the conveyed beliefs and values. Analysis of emotions-opinion mining, text analysis emotion AI- the emotional sense behind the sentences, to explain the thoughts and views. Although humans know the feeling behind a single article immediately it need resources to help cope with the flood of content posted on social media. Tools for sensitivity analysis use natural language processing (NLP) to evaluate online interactions and deeper meaning-positive, negative, neutral. Such devices imitate our minds to a greater or lesser degree, enabling us to monitor the sensation under digital content. Evaluation of feelings driven by AI is a highly general topic. Opinion mining often known as Data analysis, it is a field of research that uses the views, opinions, perceptions, scores, perspectives, and emotions of people about substances such as goods, services, Companies, persons, problems, occasions, topics, and their credits. Examination of the feelings focuses mainly on thoughts that convey positive or negative emotions [3]

Human relation's basic values are all individual behaviour based on Opinions and Opinions. If we make a decision we want to know other thoughts. A corporation also has to receive customer or public input in the real business world for its products and services. They perform surveys, opinion polls, and consumer surveys when corporations or corporate groups need public or company views. Press and consumer perceptions gathering have long become an overwhelming market for companies in the advertisement, public relations and political exploitation themselves. Before buying a product, every user still wants to know the viewpoints of current consumers and others like in state elections want to obtain views on political candidates before deciding to vote on current social media(e.g. articles, discussion boards, archives, micro-blogs, Twitter, feedback and posts on social networking sites) Development on the Internet is proliferating, the content of these sites is increasingly being used by individuals and businesses to make decisions. Nowadays, if someone buys a consumer product, he/she will check feedback with his /her relatives and friends, since there are a lot of customer reviews and comments about the product in public web forums. [4]

Nowadays, a person does not have to perform surveys, opinion polls and market surveys to turn this into a cluster of popular opinion since there is an abundance of this kind of publicly accessible information. Due to the proliferation of numerous websites, however, the identification and analysis of opinion sites on the web and the refinement of the knowledge contained in them remain an amazing job. Typically, each stage contains a huge compendium of opinion text that cannot always be decoded in long blogs and blog posts that the average person pursuer will have a hindrance in finding the positions where

viewpoints can be separated and encapsulated within. So to overcome this programmed analysis of sentiment systems is needed.

2.1. Basic Elements of the Opinion

Mostly the Mining Review is combined with the subject Information Retrieval (IR). Information retrieval operates on real facts, but Opinion Mining draws on subjective information [5].The main components of a Mining Opinion are,

1. Opinion: It is a user-made view, reference or analysis of a particular item.

2. Opinion holder: It is the type who gives exact opinion on the matter.

3. Object: It's the thing that the customer feels about.

2.2. Evaluation of Opinion

Regular opinion: A standard opinion is sometimes referred to as a basic type of view,

Direct opinion: A specific viewpoint contributes to thinking instantly exchanged on the aspect of an objector person, for example, "Picture quality is fantastic."

Indirect opinion: The Unintended Opinion is a view that is expressed indirectly on the aspect of an institution or organization depending on their effect on other corporations. This subtype often tends to occur in the healthcare sector. For example, the phrase "My operating system does not work correctly after a new computer has been installed" proves the adverse effect of a laptop on the "device," which indirectly gives the laptop a negative view or feel. The laptop is the item in this case and the dimension is the impact of the operating system.

Comparative opinion: A statistical viewpoint reflects a homogeneous relationship or distinctions between two or more institutions and/or the choice of the opinion holder, depending on the characteristics of the entities being distributed. For example, two related viewpoints express the statements "Pepsi tastes better than Massa" and "Pepsi tastes better." [6]

2.3. Different Levels of Analysis

Recommended device functions are divided mainly into the polarity of a specific document at the content level, word stage and feature/attribute level/aspect level/phrase level to determine if it gives a positive, negative or neutral opinion. This is often known as 'Emotional Polarity Estimation [7].

Performance of the Data analysis is carried out at three levels

1. The document level
2. The Sentence Level
3. The Feature Level

Document Level Sentiment Classification: It is about categorizing the actual viewed content generated by the authors as good, negative or neutral over a given topic or item throughout the paper. Thus the grouping of subjectivity/objectivity is essential in this form of a grouping of sentiments [8]. The key Challenge of this category is to extract descriptive content to deduce feeling from the whole report.

Sentence Level Sentiment Classification: Within this sort of grouping the amplitude of each argument is calculated. It is a fine-grained standard compared to the category of report standard sentiment. The description of word-level sentiment is linked to works. Firstly, to consider whether the statement in question is factual or subjective. The next one is to explore a favourable, negative or neutral opinion on an opinionated phrase. Like the category of papers, the classification of sentences does not include subject characteristics which were commented in a paragraph [9].

Feature Sentiment Level Classification:

This degree of characterization of sentiments is a far more developed tool for processing opinions. This kind of classification takes into account opinions on the characteristics of different art facts. Product terms are described as product characteristics, specifications, and other facets; Evaluation of these factors recognizes the report's feeling as a device-based Sentiment Analysis [10].

3. Sentiment Resources Analysis or Opinion Mining

Evaluation of feelings also starts with the process of gathering information from Amazon or a Twitter social network or using pre-existing tools such as access to the repositories for public data processing. Evaluation of feelings may be categorized according to input contexts such as blogs, evaluation pages, newspaper articles or social media.

1) Blogs and Forums: Research teams also used web forum posts [8] and blogs as the basis for their analysis studies. People that use forums or forums will be approved before approved users are permitted to submit data to publishing sites. Also, forums are related to one topic only; therefore, the use of forums as a platform means that sentiment evaluation is carried out in a single field. Often, bloggers record events all a cross their cities, counties, or across the globe day after day, expressing their impressions in forums. A Large number of such blogs contain testimonials of different products, problems, and events. Much work in the field of analytics has highlighted the value of blogs as a tool pool for personal views [12].

2) Reviews: Most research concentrated on feedback in trend analysis due to various quality and complexity with the feeling. Film and user reviews were amongst the most researched. The object of the views (reviews) is to show the same object's functionality, so it is a subject of a specific field. Furthermore, the sentiment analysis of feedback helps both the goods companies and potential clients. This helps the businesses to estimate an item's profits. In general, it is possible to discover the features desired and resented by the users.

Amazon Product Information (www.amazon.com) or Technical Review Sites such as www.dpreview.com, www.imdb.com and www.cent.com are a wealth of information for recommender systems analysts. [11].

Document assessment is typically medium in scope, and people prefer to use technically. Every product details of the company will be uploaded in online. It includes departments for which the product is manufactured, their functionality, description of the products, services given to the customer in future and other related information. Every registered customers of the company could order their product by filling up order application provided to them. From this stage prediction analysis's work starts. Every customer's order will be collected in separate database. Their log will be cross checked with their previous orders. The database will filtered to finalize their choice of interest i.e. whether customer is willing to buy the product because of brand of features. The iterative analysis on individual customer database will yield product ranking. Thus this application facilitates the customer to suggest them the item or product they may purchase in future related to their purchase based on their purchase. Sentimental analysis **i**s the process to identify and recognize or categorized the user's emotion or opinion for any services like movies, product issues ,events or any attribute is positive, negative, or neutral[13]
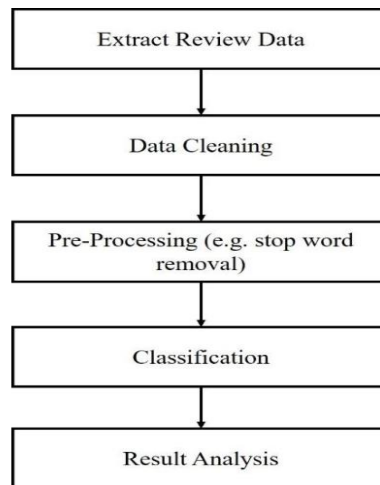
Methodology

Figure 1: Steps for Fake Review Detection

Data collection:

Data collection is the first step in sentiment analysis. There is different source of collecting a data like blog, movie reviews, social networking sites, product reviews. User can collect data from different websites.

Data cleaning

Is used to remove noise and inconsistent data, smoothing the noisy data, identifying or removing outliers, various rules are followed such as unique rule, Consecutive rule, null rule, various tools like data scribing tool, data migration tools are used.

Data pre-processing

In data pre-processing data quality is checked data quality depends upon following factors

Accuracy

Completeness

Consistency,

Time-lines,

Believability and Inter-portability.

Pos tagging

Pos-tagging is a raw text in a fundamental building block of many nlp such as word-sense question answering and sentiment analysis in a simplest form pos-tagging is the task of identifying nouns, verbs, adjectives, adverbs and nouns.

Stop words

Stop words removal is one of the most commonly used pre-processing steps. the idea is simply removing the words that are commonly occurs. Typically articles and pronouns are generally classified as a stop words.

Tokenization

Tokenization is a process which is used to convert text into a token form.

Feature extraction: feature extraction is the most important task in classification. All the irrelevant term has been removed from the dataset like the word which do not express any sentiments

Classifier

For determining the accuracy of a single classifier or for comparing the different classifiers. accuracy is calculated using different classifier. And it is used for classification of data like svm (support vector machine), naïve Bayes, random forest etc. Classifier is the process of organizing data into categories that

make it easy to retrieve, sort and store for future use. A well planned data classification system makes essential data easy to find and retrieve new system developed will be implemented in company's website. The customer interested in order booking can book their orders from this module. Based on the customer's requirements and preferences, the products will be categorized in customer page. From that customer may order their products. In this specific functionality (online orders) this application monitors every customer in individual session. Their preferences and selections will be logged in data database. Later on the mining algorithm proposed will filter their missing orders and shows them their preferences, instead of searching for whole database. Other functionalities implemented in this project will rank the products by their sales and uniquely identify their customers. The concern has to understand the existing problem with difficult types of alternatives.

prediction	Fake	Real
Fake	TP	Fp
Real	Fn	tn

TP- true positive

FP– false positive

FN–false negative

TN- true negative

The technology today will become outdated the very next day. To keep abstract of the technological improvements the system need refinements, so it is concluded, it will be improved for further enhancements, whenever the user needs an additional feature into it.

4. Conclusion

The Existing research works in customer reviews has focused mainly on how to expedite the search for frequently co-occurring groups of items in shopping cart type of transactions. But less attention has been paid to the use of these frequent item sets for customer needs and preferences. This system describes a method that uses partial information about the contents of a customer orders for the preferences of what else the customer is likely to buy. Item set trees a recently proposed data structure is used to obtain, in a computationally efficient manner, all rules whose antecedents contain at least one item from the incomplete customer shopping cart. This document explained the basic ideas of an analysis of sentiments and the famous and most used tools of sentiment analysis. And it also explained the types of opinion mining and the basic key features of the listed sentiment analysis tools. It gives the basic idea and features of the tools available and also helps to choose the tools that are suitable for a particular area of the research and mining process..

Future enhancement

In future this system will be added into the following feature

- At present this system is developed by using customer preferences. In future the advanced algorithm like ARM for Distributed databases, Hardware enhanced ARM is added in this application for working in Distributed environment. And the results would yield output for multiple branches.
- At present this system only deals for customer orders, customer preferences in shopping cart and in future other features like analysing product sales and statistical reports can be added to improve this application usage and graphical reports can be added in customer end to give interactive output.

Future enhancement of this work can be done with a complete comparative study with sample data with these tools.

5. Source Code

```
fromdjango.shortcuts import render, HttpResponse, HttpResponseRedirect
fromrest_framework import viewsets
fromrest_framework.response import Response
fromrest_framework.decorators import api_view
fromERP.models import *
fromERP.serializers.serializers import *
fromdjango.contrib.auth import authenticate, login, logout
fromdjango.urls import reverse
fromdjango.db import connection
fromERP.custom_views.common_functions import *
@api_view(['GET','POST'])
defupload_product(request):
        ifrequest.method=='GET':
                return
Response({'data':'','module':'product'},template_name='ERP/product/upload_product.html')
        else:
                serializer=TblproductSerializer(data=request.data)

                ifserializer.is_valid():
                        empserializer=serializer.save()

                        ifrequest.accepted_renderer.format=='html':
                                return        Response({"success_data":        "Data        added
successfully",'module':'client'},template_name='ERP/product/upload_product.html')
                                return        Response({"data":        "Data        added
successfully",'module':'Department'},status=status.HTTP_201_CREATED)
                else:
                        error_details = []
                        for key in serializer.errors.keys():
                                error_details.append({"field": key, "message": serializer.errors[key][0]})
                        data = {
                                "Error": {
                                "status": 400,
                                "message": "Your submitted data was not valid - please correct the below
errors",
                                "error_details": error_details
                                }
                                }
                        ifrequest.accepted_renderer.format=='html':
```

```
                    return                                    Response({"error_data":
data},template_name='ERP/product/upload_product.html')
                return Response(data, status=status.HTTP_400_BAD_REQUEST)


@api_view(['GET','PUT','POST'])
deflist_client(request):
        custom_filter={}
        custom_filter['deleted']=0
        try:
                ifrequest.data['depart']:
                        custom_filter['depart']=request.data['depart']
        except:
                pass
        project_obj = Tbldepart.objects.filter(**custom_filter)
        project_data = TbldepartSerializer(project_obj, many=True).data
        ifrequest.accepted_renderer.format == 'html':
                return                                              Response({"data":
project_data,'module':'Department','custom_filter':custom_filter},template_name='ERP/department/list.h
tml')
        return Response({"data": project_data})


@api_view(['GET','PUT','POST'])
defupdate_client(request,id):
        project_obj=Tbldepart.objects.get(id=id)
        ifrequest.method=='GET':
                data=TbldepartSerializer(project_obj).data
                ifrequest.accepted_renderer.format == 'html':
                        return
Response({'data':data,'module':'Deparment'},template_name='ERP/department/create_update.html')
                return Response({'data':data,'module':'Department'},status=status.HTTP_200_OK)
        else:
                serializer=TbldepartSerializer(project_obj,request.data,partial=True)
                ifserializer.is_valid():
                        serializer.save();
                        ifrequest.accepted_renderer.format=='html':
                                returnHttpResponseRedirect(reverse('ERP:department_list'))
                        return        Response({"data":     "Data      Updated      successfully"},
status=status.HTTP_200_OK)
                else:
                        error_details = []
                        for key in serializer.errors.keys():
                                error_details.append({"field": key, "message": serializer.errors[key][0]})
                        data = {
```

```
                                    "Error": {
                                            "status": 400,
                                            "message": "Your submitted data was not valid - please
correct the below errors",
                                            "error_details": error_details
                                            }
                                    }
                    ifrequest.accepted_renderer.format == 'html':
                            return
Response({'data':serializer.errors},template_name='ERP/department/create_update.html')
                    return Response(data, status=status.HTTP_400_BAD_REQUEST)


@api_view(['GET', 'POST','Delete'])
defdelete_client(request,id):
        selected_values=Tbldepart.objects.get(pk=id)
        selected_values.deleted=1;
        selected_values.save();
        returnHttpResponseRedirect(reverse('ERP:department_list'))



@api_view(['GET','POST'])
defadd_feature(request):
        ifrequest.method=='GET':
                return
Response({'data':'','module':'Feature'},template_name='ERP/product/add_feature.html')
        else:
                prod_id = request.POST['product_id']

                obj=Tblproduct.objects.get(pk=prod_id)
                obj.feature=request.POST['feature'];
                obj.desc2=request.POST['desc'];
                obj.save();

                return Response({'data':'success'},template_name='ERP/product/add_feature.html')



@api_view(['GET','POST'])
def partner(request):
        ifrequest.method=='GET':
                return
Response({'data':'','module':'Feature'},template_name='ERP/product/partnership.html')
        else:
                prod_id = request.POST['product_id']
```

```
            client_id = int(request.POST['client_id'])
            obj=Tblproduct.objects.get(pk=prod_id)
            obj.client_id_id = int(client_id)
            obj.client_name = request.POST['client_name']
            obj.save();

            return Response({'data':'success'},template_name='ERP/product/partnership.html')


@api_view(['GET','POST'])
defpartner_feature(request):
      ifrequest.method=='GET':
            return
Response({'data':'','module':'Feature'},template_name='ERP/product/partnership_feature.html')
      else:
            prod_id = request.POST['product_id']
            feature = request.POST['partnership_feature']
            obj=Tblproduct.objects.get(pk=prod_id)
            obj.partnership_feature = feature
            obj.save();
            return
Response({'data':'success'},template_name='ERP/product/partnership_feature.html')


@api_view(['GET','POST'])
defget_productname(request):
      ifrequest.method=='GET':
            prod_id = request.GET['id']
            obj = Tblproduct.objects.get(pk=prod_id)
            print(prod_id)
            print(obj.name)
            return
Response({'data':'','name':obj.name},template_name='ERP/product/add_feature.html')


@api_view(['GET','POST'])
defget_clientname(request):
      ifrequest.method=='GET':
            client_id = request.GET['id']
            obj = Tblclient.objects.get(pk=client_id)
            print(client_id)
            print(obj.company_name)
            return
Response({'data':'','name':obj.company_name},template_name='ERP/product/partnership.html')


@api_view(['GET','POST'])
```

```
defget_productdetails(request):
        ifrequest.method=='GET':
                prod_id = request.GET['id']
                obj = Tblproduct.objects.get(pk=prod_id)
                print(prod_id)
                print(obj.name)
                return
Response({'data':'','p_name':obj.name,'client_name':obj.client_name,'client_id':obj.client_id_id},template
_name='ERP/product/partnership_feature.html')


fromdjango.shortcuts import render, HttpResponse
fromrest_framework import viewsets
fromrest_framework.response import Response
fromERP.models import *
fromERP.serializers.serializers import *
fromrest_framework.decorators import api_view
fromdjango.shortcuts import render, HttpResponse, HttpResponseRedirect
fromERP.custom_views.common_functions import *
fromrest_framework.decorators import api_view, permission_classes
fromdjango.core.paginator import Paginator, EmptyPage, PageNotAnInteger
fromdjango.conf import  settings
fromdjango.urls import reverse
fromrest_framework import status


row_per_page = settings.GLOBAL_SETTINGS['row_per_page']


@api_view(['GET', 'POST'])
defjqgrid_test(request):
    #loginuser=session_user_id(request)
    #print(loginuser)
    #print(loginuser.get_all_permissions())
    pdf=0
    excel=0

    return Response({"pdf":pdf,"excel":excel},template_name='ERP/report/review_report.html')


defdictfetchall(cursor):
    "Return all rows from a cursor as a dict"
    columns = [col[0] for col in cursor.description]
    return [
       dict(zip(columns, row))
       for row in cursor.fetchall()
    ]
```

```python
@api_view(['GET', 'POST'])
defjqgrid_data(request):
    print("jqrid")
    fromdjango.db import connection
    sendrows=[]
    withconnection.cursor() as cursor:
        cond=""
        userid=""
        from_date=""
        to_date=""

        ifrequest.GET['id']:
            reviewid=request.GET['id']
            print("reviewid")
            print(reviewid)
            cond+=" and id="+reviewid


        query = """SELECT product_name,review,(select loginid from ERP_tblcustomer where
ERP_tblcustomer.id=ERP_tblreview.customer_id )as customername FROM ERP_tblreview where
1"""+cond

        cursor.execute(query)
        rows = dictfetchall(cursor)
        sendrows=[]
        print(rows)
        for row in rows:
            data={
             "ProductName":row['product_name'],
             "Review":row['review'],
             "CustomerName":row['customername'],
            }
            sendrows.append(data)
    send_data={
        "page":1,
        "rows":sendrows,
        "query":query,
        }
    return Response(send_data)
```
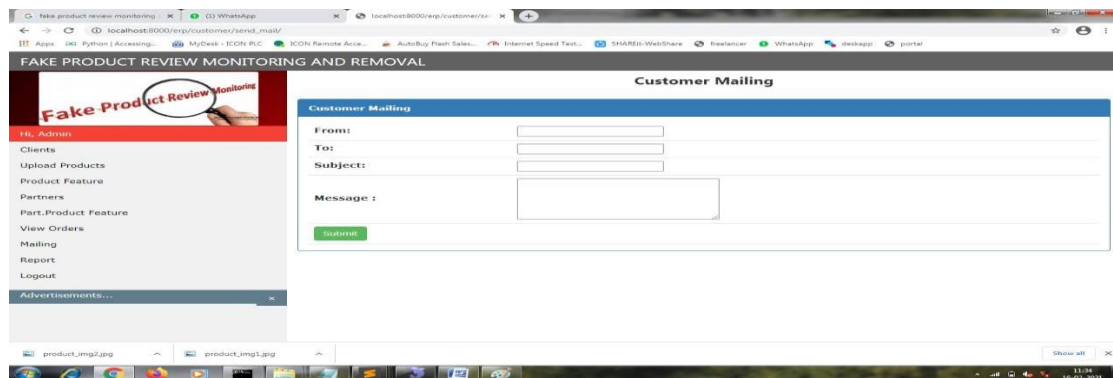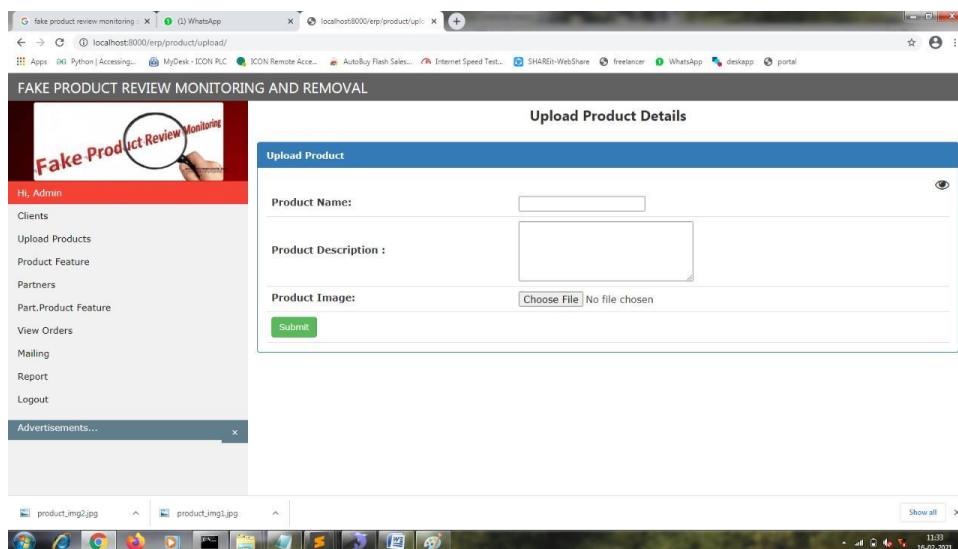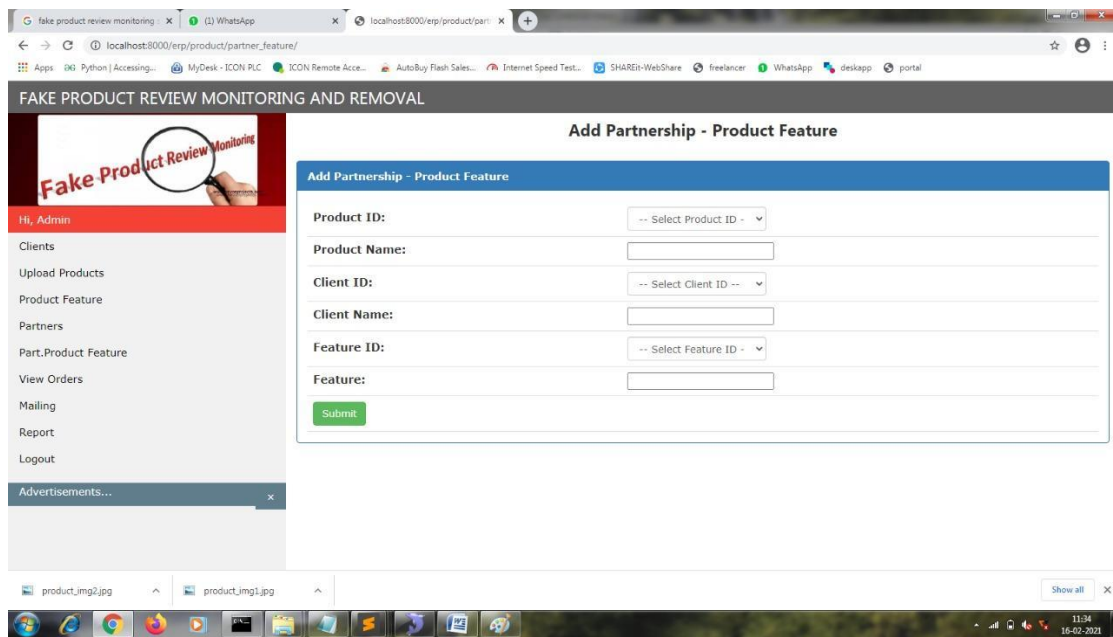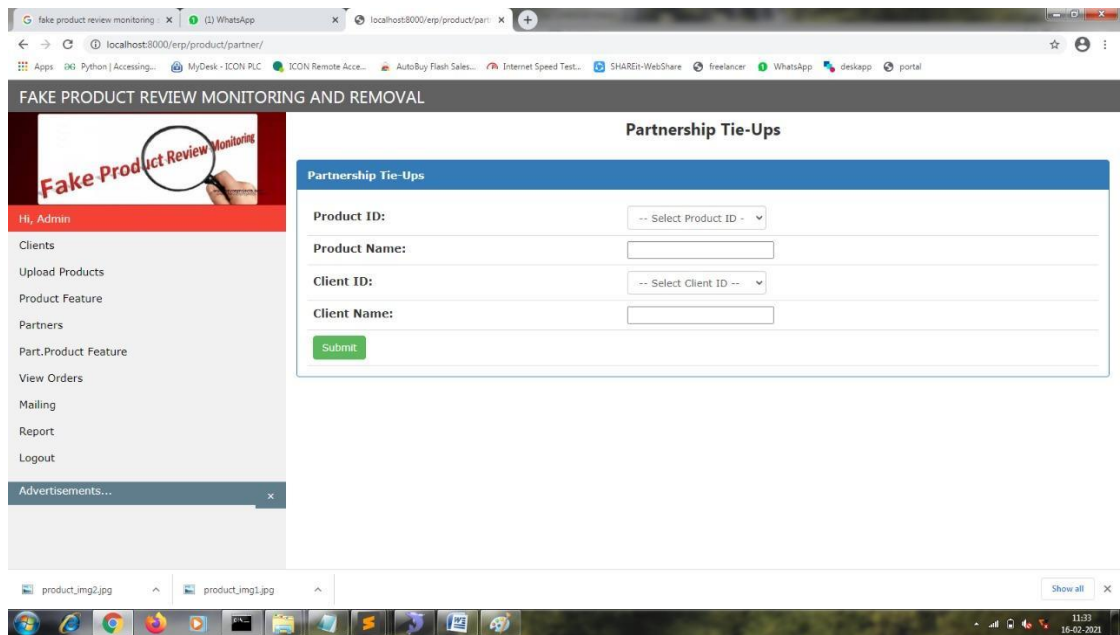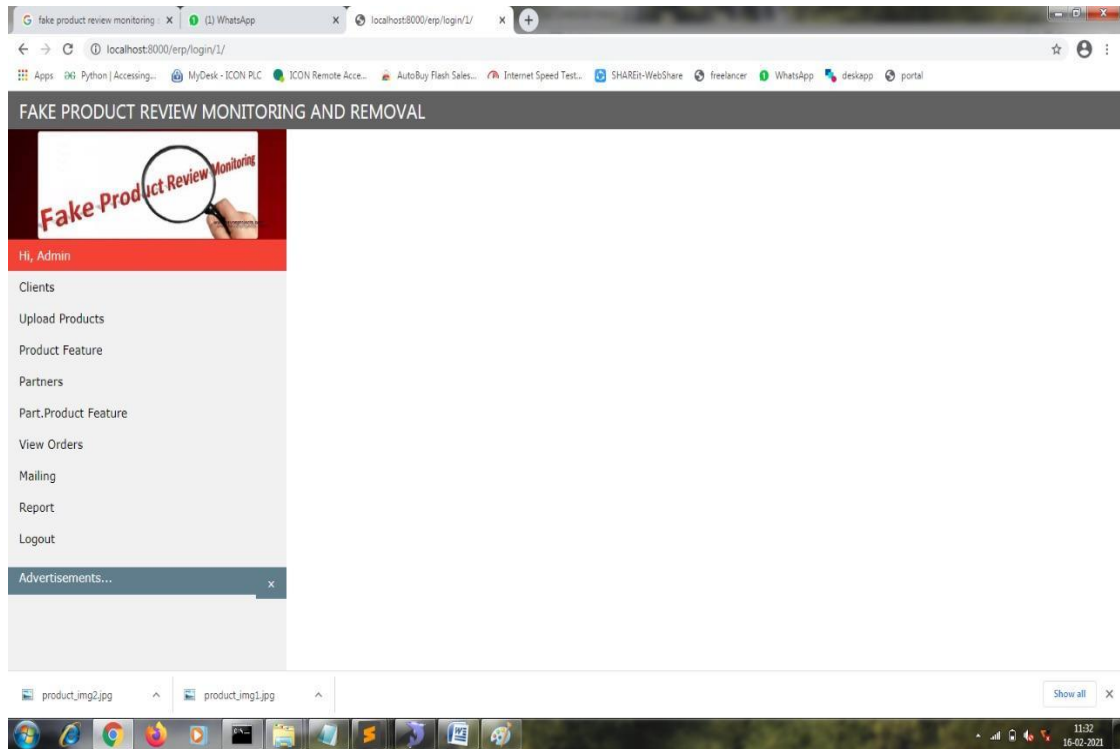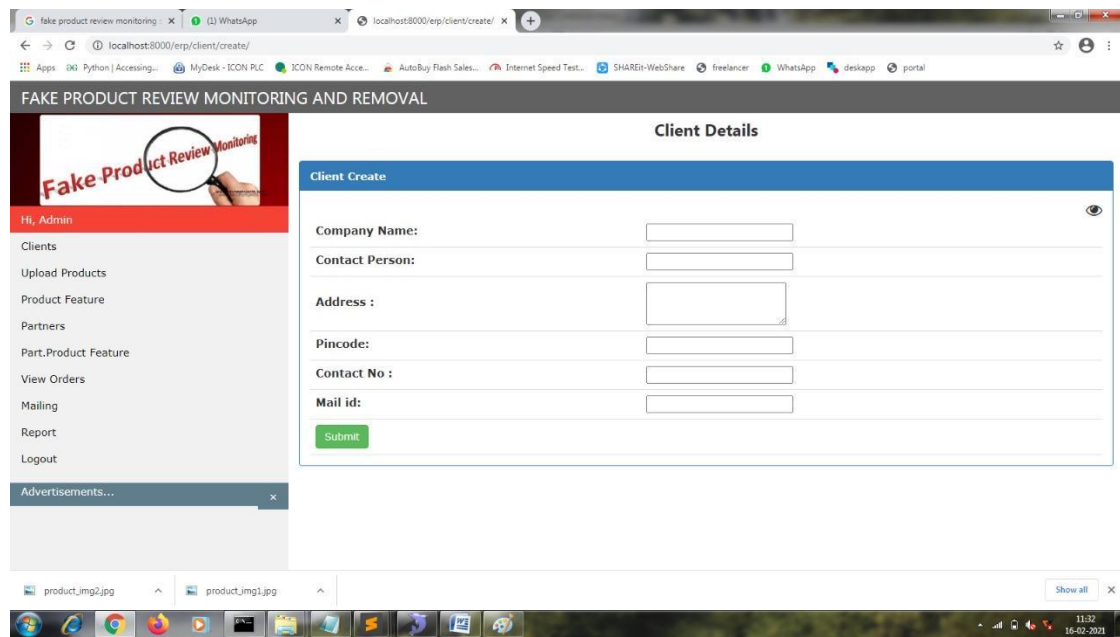
6. Screens
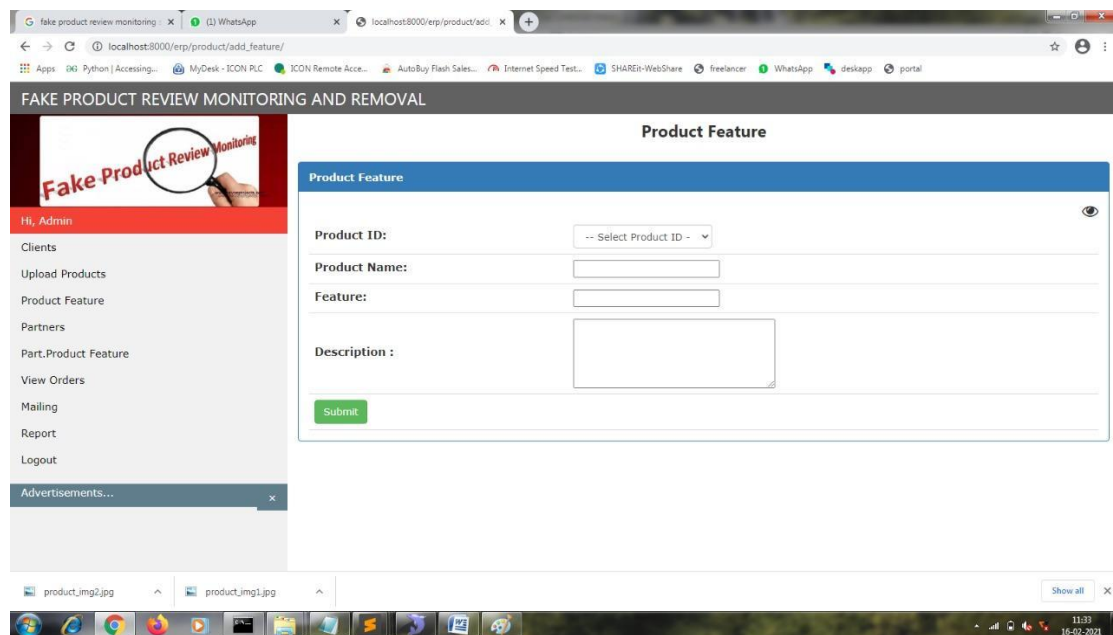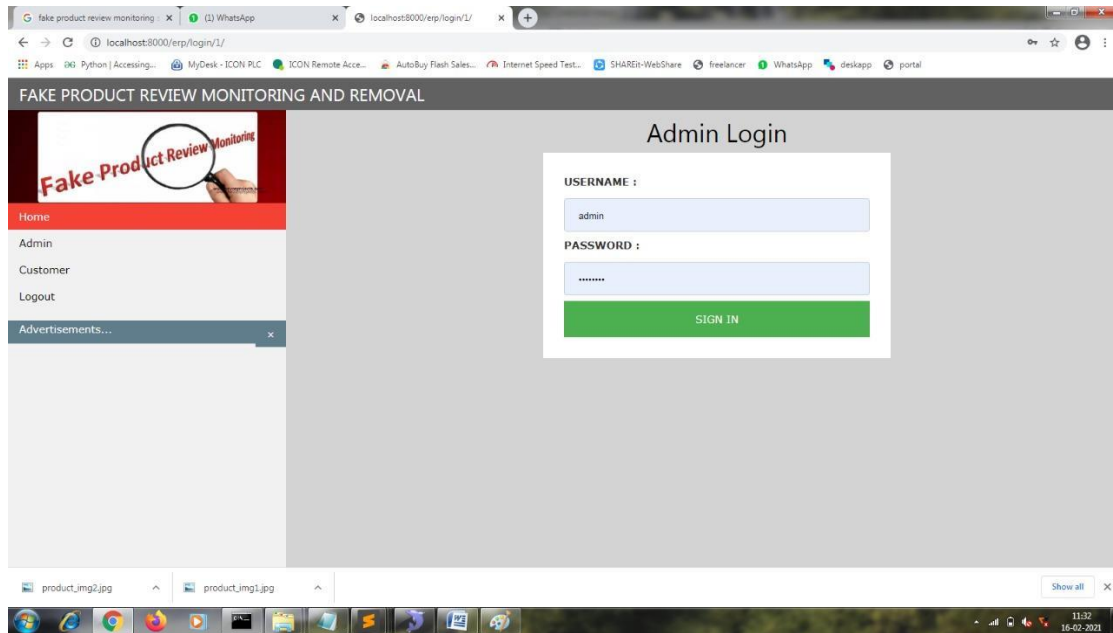
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