

E-commerce boom in Pakistan during COVID-19



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Chapter 1

Introduction

1.1 Project Overview

During this Covid pandemic the world faced major setback in their respective economies. This pandemic gave the opportunities to several small medium scale SME's to join the race to publish/register their business online. E-commerce played huge part in the economy of different nations including Pakistan which were struck hard by Covid-19. This new dimension of business gave the ability to reach more customers than the traditional retail as curfew and small Geo-location lockdown were imposed by the law enforcement agencies to decrease the pandemic affect. With so many people making their purchases online, it is then fastest growing retail market. Yet this market needs serious analysis of the fake reviews. The goal of this project will also be that the authentic and genuine product details and sellers can be provided to the user/customer on a single platform rather than visiting different online sellers and websites. This will further increase the credibility of the products and the sellers.

1.2 Problem Description

As we know the scope of online businesses has increased with almost every company engaging in it, fake reviews are posted on websites by the companies themselves in order to boost their products.

One of the biggest challenges faced by the Customers who shop through online websites is that they come across multiple problems such as fraudulent items, unauthentic sellers, defaulted products, and spending too much time on the internet in search of the variety of desired products. These are the most common problems faced by the customers nowadays which decreases their trust and will to opt for online shopping.

Visiting different websites with no information about authenticity of products and sellers can be hectic for the customers which can decrease their interest in online shopping. Irrelevant websites can also be a cause of distraction from the product that is needed and can be a major source of time wasting.

1. Unfriendly, Scammy, or Complicated Websites
2. Spending Too Much Time Online
3. Less Contact With the Community
4. Risk of Fraud

1.3 Problem Objective

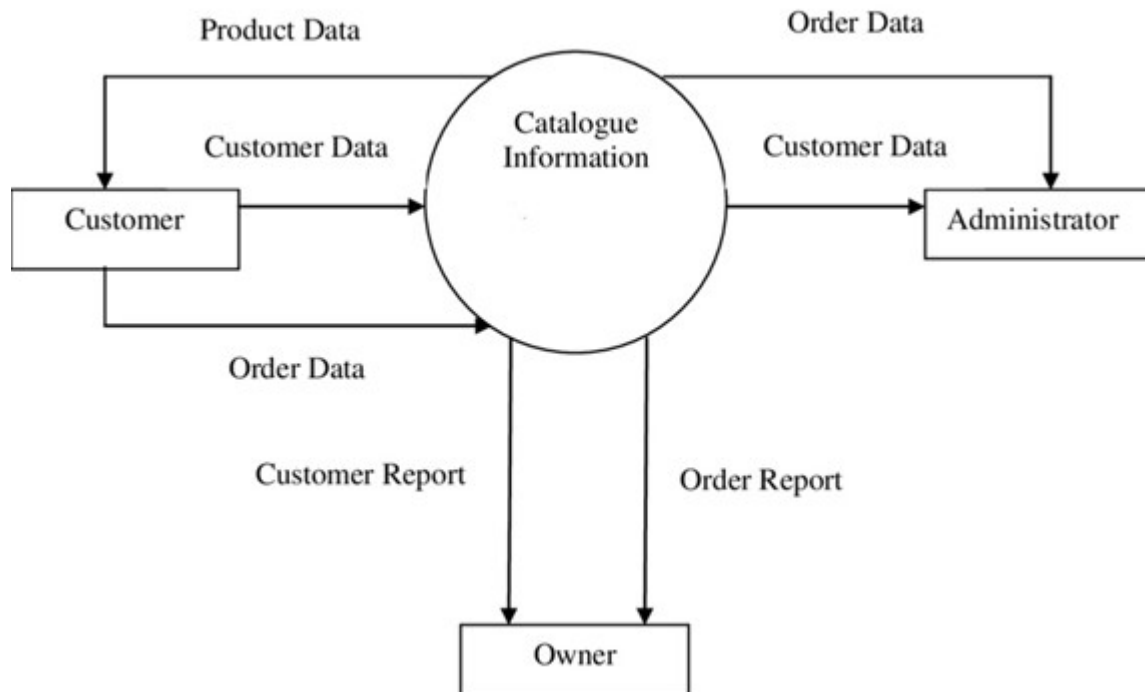
The goal will be to web-scrape product data from the well-known online websites. The data gathered is analyzed through sentiment analysis based on either their ratings or reviews. Parallel to this a E-commerce website will be developed by us which will have the analyzed data which is up to the mark and is authentic will be in its database along with the website it originates and its product details. This ensures less time consumption and more user satisfaction.

1. Analysis of the reviews is to be carried out for the authenticity of relative and genuine products
2. Analysis made will be helpful in guiding the customers in the right direction
3. Analysis can further result in the prevention of scams and frauds with the customer.
4. This can help in differentiating between a reliable seller and an un-reliable seller
5. Analysis can further help in building trust and promoting online businesses.
6. Easy access of products and multiple sellers could be provided to the customer on a single platform, decreasing their efforts and making online shopping easy.

1.4 Project Scope

The basic idea for opting this project is to target the E-commerce industry which lacks a platform which provides user authentic and fraud proof items from the most well-known websites. This proposed project will provide customers with a solution

and a feasible option where they can go to shop with a minimized fear of getting scammed. Once it is done, this website will run on a allocated domain and accessible to customers.



1.5 Feasibility Study

A feasibility study is an analysis that evaluates all important elements for a project, including economic, technical, legal, and scheduling issues, to determine the chance of the project being completed successfully. Major challenges Involved:

1. It will be hard to review different types of ratings and review.
2. When there are not enough reviews for it to learn and differentiate.

Resource Requirement:

1. Datasets of reviews from multiple sites, which will be gathered through web scraping from multiple websites
2. Surveys taken from the population facing this particular issue

Chapter 2

Literature Review

In today's world, sentiment analysis is the most popular research topic in the Natural Language Processing field (NLP). The primary goal of this research topic is to identify the emotions and opinions of customers or users through text analysis. The social web has made vast amounts of information available to people all over the world at the click of a mouse. Consumers frequently rely on such content, particularly views or experiences with a specific product, so it is critical that this information be made available in a systematic manner. Sentiment analysis investigates these points of view. This paper describes several approaches to sentiment analysis and demonstrates a useful methodology. It also emphasises the Nave Bayes classifier's superiority.

2.1 Related Work

Despite the fact that numerous research studies have been conducted in this field using various models, sentiment analysis is still regarded as a difficult problem with many conflicts to be resolved. Some of the existing difficulties are caused by slang words, new accents, grammatical and spelling errors, and so on. This paper intends to conduct a literature review using various machine learning algorithms and data sets. The current literature review surveys nearly 20 contributions that cover various types of applications used for sentimental analysis. The analysis begins by highlighting the contributions of each work and observing the type of machine learning algorithms used. Furthermore, the analysis focuses on determining the type of data used. Furthermore, the used environment and performance measures covered in each work are evaluated, and the work is concluded with proper research gaps and challenges, which aids in identifying the non-saturated application for which sentimental analysis is most needed in future research.

1. In 2019, Saad and Yang aimed to provide a comprehensive tweet sentiment analysis based on ordinal regression and machine learning algorithms. The proposed model included pre-processing tweets as the first step, and an effective feature was generated using the feature extraction model. For sentiment analysis, methods such as SVR, RF, Multinomial logistic regression (SoftMax), and DTs were used. Furthermore, the Twitter dataset was used to test the proposed model. The test results showed that the proposed model had the highest accuracy, and DTs performed well when compared to other methods.[6]]
2. Fang et al. (2018)[10] proposed multi-strategy sentiment analysis models based on semantic fuzziness for resolving issues in 2018. The results demonstrated that the proposed model is highly efficient.
3. In 2019, Afzaal et al.[17] proposed a novel approach to aspect-based sentiment classification that recognised features precisely and achieved the highest classification accuracy. Furthermore, the scheme was created as a mobile application to help tourists find the best hotel in town, and the proposed model was tested using real-world data sets. The results demonstrated that the presented model was effective at both recognition and classification.
4. In 2019, Feizollah et al.[14] focused on tweets about two halal products: halal cosmetics and halal tourism. Twitter information was extracted using the search function, and a new model was used for data filtering. Later, using deep learning models, a test was performed to compute and evaluate the tweets. Furthermore, RNN, CNN, and LSTM were used to improve accuracy and build prediction methods. According to the results, the combination of LSTM and CNN achieved the highest accuracy.

5. Mukhtar et al. (2018) used Supervised Machine Learning and Lexicon-based models to perform sentiment analysis on Urdu blogs from various domains. A well-performing Urdu sentiment analyzer and Urdu Sentiment Lexicons were used in Lexicon-based models, whereas DT, KNN, and SVM were used in Supervised Machine learning algorithms. The data from the two sources were combined to perform the best sentiment analysis. Based on the results of the tests, the Lexicon-based model outperformed the supervised machine learning algorithm.
6. Kumar et al. presented ConVNetSVMBoVW in 2020, a hybrid deep learning strategy for predicting fine-grained sentiment using real-time data. To determine the hybrid polarity, an aggregation model was developed. Furthermore, SVM was used to train the BoVW to predict the emotion of visual information. Finally, it was discovered that the proposed ConvNet-SVMBoVW model outperformed the traditional models.
7. Abdi et al. proposed a machine learning method for aggregating user perspectives cited in reviews in 2018. The proposed technique combined various types of characteristics into a single feature set to model an appropriate classification model. As a result, the performance of four best feature selection models and seven classifiers for selecting the relevant feature set was investigated, and an effective machine learning technique was identified. The proposed method was tested on a number of datasets. The results showed that combining an SVM-based classification approach with IG as a feature selection strategy improved performance.
8. Ray and Chakrabarti created a deep learning system in 2019 for extracting text features and analysing user sentiment related to the feature. To tag the characteristics in opinionated phrases, a seven-layer Deep CNN was used. The authors improved the performance of sentiment scoring and feature extraction models by combining deep learning approaches with a collection of rule-based models. Finally, it was demonstrated that the proposed strategy was the most accurate.
9. Zhao et al. proposed a new image-text consistency-driven multimodal sentiment evaluation model in 2019 that looked at the relationship between text and image. After that, a multi-modal adaptive sentiment analysis model was implemented. The mid-level visual features were retrieved using the standard SentiBank methodology and used to express visual theories by combining multiple

characteristics such as social, linguistic, and visual aspects and incorporating a machine learning model. When compared to standard models, the recommended model produced the best results.

and colleagues published their findings in 2019. We created a semi-supervised sentiment discriminative goal to address the issue using partial sentiment data from documents. Not only did the proposed model reflect the incomplete data, but it also protected the local structures derived from real data. The proposed model was tested on real-time datasets. The results demonstrated that the proposed model performed admirably.

10. Vashishtha and Susan calculated the sentiment associated with social media posts in 2019 using a new set of fuzzy rules comprised of several datasets and lexicons. The built model combines Word Sense Disambiguation and NLP models with a novel unsupervised fuzzy rule-based model to classify the comments into negative, neutral, and positive sentiment classes. In the trials, three sentiment lexicons, four existing models, and nine publicly available Twitter datasets were used. According to the findings, the new approach produced the best results.
11. Yousif et al. presented a CNN and RNN-based multi-task learning approach in 2019. The structure of the recommended method was useful for indicating the citation context, and feature extraction was done automatically. Two publicly available datasets were used to test the proposed method. The findings revealed that the proposed model outperformed traditional models.
12. Hassonah and colleagues Because the SVM classifier was used to build a classification technique based on "Positive, Negative, and Neutral" classes, and two feature selection approaches were combined by the MVO and Relief models, a hybrid machine learning algorithm was proposed for improving sentiment analysis. Furthermore, Twitter data was used to put the proposed model to the test. Experiment results showed that the proposed approach outperformed traditional strategies.

13. Xu et al. developed an NB approach for sentiment categorization in large-scale Ecommerce platform product reviews in 2020. As a result, the parameter evaluation mechanism in NB has been improved to support continuous learning. Many methods were later developed for fine-tuning the learned distribution based on three types of assumptions in order to achieve the best performance. According to the findings, the proposed model has good accuracy in Amazon product and movie review sentiment datasets.
14. Smadi et al. (2018) presented current models for identifying flaws in feature-based sentiment analysis of Arabic hotel reviews using supervised machine learning methods in 2018. Furthermore, SVM and Deep RNN were designed and trained using word, lexical, morphological, semantic, and syntactic properties. The proposed model was tested using the Arabic hotel review dataset as a reference. The results showed that SVM performed well when compared to the RNN model.
15. Maqsood et al. investigated the impact of numerous events that occurred between 2012 and 2016 on stock prices in 2020. The Twitter dataset was used to compute the sentiment analysis for each of these occurrences. The dataset included millions of tweets, which were analysed to determine how people felt about the event.
16. Abdi et al. proposed a deep-learning-based method for classifying user opinions expressed in reviews in 2019. Furthermore, a deep learning model for sentiment analysis was a unified feature set that represented sentiment shifter rules, word embedding, sentiment knowledge, linguistic and statistical information. Furthermore, the proposed model used an RNN with LSTM to take advantage of the benefits of sequential processing and overcome many of the problems that plagued traditional methods.
17. Park et al. developed a deep learning method for improving performance in 2020. As a result of the need to improve performance, two questions have arisen. For non-linearly integrating multiple attention outcomes and assuming the entire context for mentioning complicated phrases, advanced content attention was required. The results of the tests revealed that the proposed model produced the best results.

18. Bardhan et al. investigated a quasi-qualitative methodology for analysing the effects of gender mainstreaming in SRH management in 2019. Stakeholder problems were investigated using verbal narratives from semi-structured interviews, with a focus on group discussions. The sentiments of stakeholders are decoded using sentiment analysis combined with an NLP machine learning system.[4]
19. Araque et al. introduced a deep learning model for improving performance in 2017 by combining existing surface models with deep learning models based on manually extracted features. A deep learning-based sentiment classifier was introduced using linear machine learning and word embeddings methods. Seven datasets were used to validate the efficiency of the proposed model. When compared to traditional methods, the results confirmed that the presented method was effective.[2]

Current study focuses on sentiment analysis of information acquired from social networking websites such as Twitter, Facebook, and MySpace in order to determine viewers' reactions to a certain social event or topic. Sentiment analysis may be used to anticipate market movement based on news, blogs, and social media. Currently, sentiment analysis is a highly profitable strategy for large-scale applications such as 'Smart Cities.' These applications employ purely supervised or unsupervised classification techniques based on document and phrase level categorization. Fuzzy Formal Concept, Genetic Algorithms, and Neural Networks extend these algorithms by making them semi-supervised. To provide a degree of parallelism, research has focused on sentiment analysis with networking [10]. It concentrated on an online accrued utility scheduling technique that provided high speed on numerous processors. However, this increased the system's complexity. The use of normalized lexicon-based sentiment analysis on Twitter for acquiring security-related information was also studied[17]. While it produced a favorable result, no universal dataset was employed. Current online product suggestion systems compare characteristics such as pricing, ratings, and special deals on the product on various e-commerce websites but do not focus on consumers' personal experiences by evaluating their evaluations. As a result, there is a need to create a complete application based on sentiment analysis that prioritizes client ratings.

2.1.1 Existing Works

According to a thorough literature review, the following are the major identified techniques:

- Lexicon-Based Model – It extracts frequent and explicit product features using Syntax Tree Based Classification-Design Syntactic Patterns.[14]
- Unsupervised Word Alignment Model-It is concerned with Word Co-occurrence Frequencies and Word Position.[15]
- Word Alignment Model (Semi-supervised) - This model analyses both formal and informal text. [15]

These are the numerous models discovered using the approaches described above, and some of the related models are discussed further below.

It is possible to combine features from the Word Alignment Model with those from the Lexicon Based Model to create a new semi-supervised lexicon-based model capable of using lexical databases such as WordNet, SentiWordNet, and the Attempt Controlled English Lexicon. [ACE][14][19]. WordNet, one of these lexical databases, organises English words into groups of synonyms known as synsets. SentiWordNet analyses unstructured data and extracts meaningful numeric indices from text in order to provide a WordNet extension in which all synsets can be associated with a value indicating the negative, positive, or objective connotation.

NATURAL LANGUAGE PROCESSING [NLP]

NLP is a set of approaches and techniques that allow computers to comprehend human speech as it is spoken. Common NLP tasks in machine learning include sentence segmentation, parts of speech tagging, parsing text results, deep analytics, and named entity extraction. [14][10]. Controlled Natural Language [CNL] processing is a subset of NLP that limits grammar to facilitate tagging. [14]. fundamental units of sentiment analysis are product review characteristics. Lemmas, multi-words, and valence shifters are examples of these characteristics. [9].

2.2 Various Machine Learning Algorithms and Performance Metrics for Sentiment Analysis:

2.2.1 Machine Learning Algorithm Classification:

The classification of sentiment analysis machine learning algorithms 2.1 is shown in Techniques such as SVM, DT, NB, CNN, KNN, ConvNet-SVMBoVW, fuzzy rule-based classifier, RCNN, SVR, RNN, and Ensemble classifier are used for various contributions of sentiment analysis.

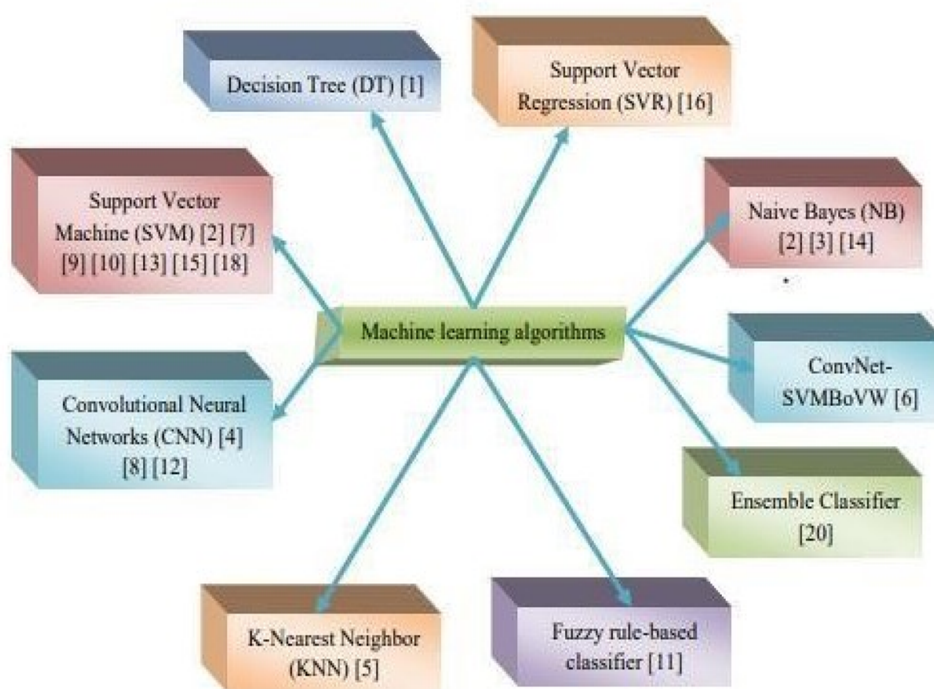


Figure 2.1: Machine Learning Taxonomy Algorithms employed in sentiment analysis

2.2.2 Performance Measures:

The figure 2.1 depicts the evaluation metrics for sentiment analysis using machine learning models. Many of the earlier contributions consider measures such as "accuracy, precision, recall, and FMeasure" in this context. The performance metrics that are rarely used are classified as various. According to Table I, the accuracy measure

is taken into account in 80% of previous contributions. Similarly, precision is taken into account in 60% of previous works. Furthermore, recall and fmeasure are taken into account in 60% and 55% of the previous contributions, respectively. Finally, it is concluded that accuracy is taken into account in many of the earlier contributions, while the other metrics are considered only infrequently.

Table 2.1: Performance Measures Concerned for Sentimental Analysis Under Different Apps

Citation	Accuracy	Precision	Recall	Fmeasure	Miscellaneous
[6]	✓	✓	✓	✓	support,MSE and MAE
[10]	✓	✓	-	-	MAE abd RMSE
[17]	✓	✓	✓	✓	TPR
[14]	✓	✓	✓	✓	-
[15]	✓	✓	✓	✓	-
[19]	✓	✓	✓	-	-
[9]	-	-	-	-	ROGUE-N metric, and ARS
[3]	✓	✓	✓	-	-
[20]	✓	✓	✓	✓	-
[12]	✓	-	-	-	-
[11]	✓	✓	✓	✓	-
[16]	✓	✓	✓	✓	-
[7]	✓	✓	✓	✓	-
[1]	✓	-	-	-	-
[5]	-	-	-	-	Speed up rate and Execution time
[18]	-	-	-	-	MAE and RMSE
[13]	✓	✓	✓	✓	-
[8]	✓	-	-	✓	-
[4]	✓	-	-	-	-
[2]	✓	✓	✓	✓	-

2.2.3 Data Types:

In 2.2, The results of sentiment analysis on various data types using machine learning algorithms are tabulated. Twitter data is taken into account in [6][14]. In[10][17], The hotel data is considered when evaluating the model's efficiency. Blogs in Urdu are used. Social data is represented in textual and visual semiotic modalities. For experimentation, the data from movie reviews is used. The data pertaining to the camera and laptop is assumed. The social media data is collected, and the Amazon review data is used to evaluate the machine learning algorithms. The data from citation sentiment and citation purpose is used. The stock market review data is taken into account for analysis. The corpus text data is used to evaluate the performance of machine learning algorithms.

Table 2.2: Analysis of various data types used for sentiment analysis under various contributions

[6]	Twitter Data
[10]	Review of consumer product and services on hotel
[17]	Restaurants and hotel data
[14]	Twitter keyword related to halal tourism and halal cosmetics
[15]	Urdu blogs in multiple domains
[19]	Textual and visual semiotic modalities of social media
[9]	DUC 2002, and Movie Review Data
[3]	Nikon Camera Data, and laptop domain data
[20]	Social Media data
[12]	Amazon reviews and Yelp reviews
[11]	multiple public twitter data
[16]	Citation sentiment and Citation purpose
[7]	Twitter Social Network data
[1]	Amazon product and Movie review data
[5]	Arabic's hotel's review
[18]	stock markets review
[13]	Movie Review
[8]	laptop and restaurant reviews from SemEval 2014
[4]	Text data from corpous
[2]	microblogging and movie reviews domain

2.2.4 Execution Tool:

Figure 2.2 depicts the execution software used for various types of sentiment analysis using machine learning algorithms. Tools such as MATLAB, Python, Java, R studio, and Mobile App have been used in previous contributions. Python software is used for sentiment analysis in the majority of research studies. As a result, it is concluded that Python is the best tool for sentiment analysis with machine learning algorithms and that new models can still be analysed.

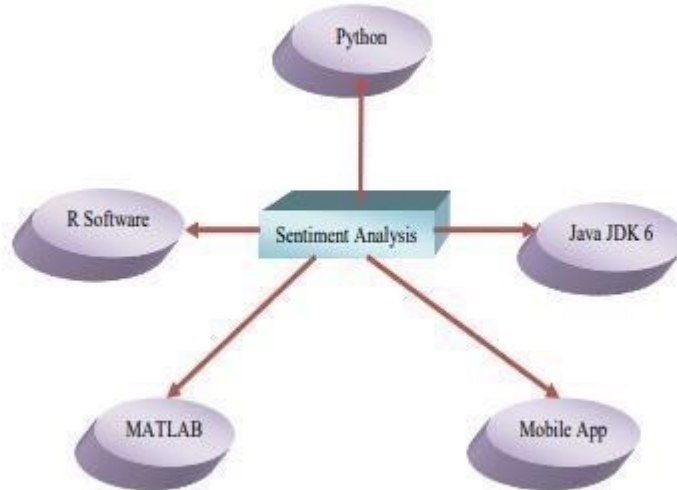


Figure 2.2: Various tools for performing sentiment analysis

2.3 Research Gaps and Challenges:

The machine learning algorithm uses linguistic aspects with the sample data to optimise the system’s performance. Big data models such as Pentaho and Mahout include plugins and libraries that are linked to machine learning algorithms and tested for sentiment categorization. To evaluate big data, the user must first identify the type of method that should be applied to the data, and then use big data analytics tools to address a specific problem, such as predictive analytics.

machine learning-based classification, two document sets are usually required. These data sets are used for both training and testing. The machine learning algorithm was fed the training set in order to learn the characteristics of the text, and the testing set was used to evaluate the classifier’s performance.

Unsupervised and supervised learning techniques using machine learning algorithms are used to categorise text. Unsupervised learning models are used to find the complicated training documents. In supervised learning models, more tagged training materials are used. Furthermore, despite being language and domain specific, these supervised algorithms achieve acceptable efficiency. Furthermore, these algorithms require tagged data, which is typically time-consuming.

Meanwhile, unsupervised algorithms are in high demand because publicly available data is frequently unlabeled, necessitating the best answers. At the time, a semi-supervised learning method is developed, and it produces the best results in categorising feelings. More labelled and unlabeled data is required to design optimal learning techniques in unsupervised learning algorithms. In sentiment analysis, many machine learning methods have been used to classify sentiment. Three well-known machine learning algorithms that have been successful in text categorization are NB, ME, and SVM. The remaining machine learning methods in NLP are ID3, centroid classifier, N-gram model, K-Nearest Neighbor, C5, and winnow classifier. Many traditional models are linked to public-related emotions through social media and text messaging apps. However, there appears to be less effort in sentiment analysis, where ontology and semantics appear to be more important study topics. Traditional research models are now being tested with the help of public review databases. However, in terms of attitudes, this type of evaluation has not been thoroughly evaluated.

It will not provide unique and hidden information beyond the true notions of feelings by categorising them as positive or negative. Furthermore, some individual sentences are extremely difficult to categorise, and precise categorization is impossible. Other limitations included evaluating sentiment throughout the review and document exploration across multiple subjects. Furthermore, previous models tended to focus on major issues rather than minor ones, and their accuracy did not appear to be optimal. Few research approaches have been recognised as standard models; this has been observed. There is only a small amount of research that is not based on conventional models, and the results appear to be less efficient than a suitable method. Text examination with fewer dimensions may require fewer resources. Collecting feelings from the collaborative environment, on the other hand, will necessitate the use of additional resources. In their traditional study, the authors were unable to find numerous confirmations linked to the computational costs of effective methods for executing large data sentiment analysis.

Information Retrieval:

Information retrieval (IR) is concerned with the storage, representation, organization, and access to information items, the representation and organization of which allows the user to easily obtain the information of interest.[3] In other words, information retrieval (IR) is the process of locating unstructured data that meets an information demand within large collections.[17] IR systems find documents in a collection that match a user's query and thus reduce the number of documents relevant to a specific problem, significantly speeding up the analysis by reducing the number of documents

to be evaluated.[10].

There are three major methods for retrieving information:

1. Using RE to scrape reviews from URLs
2. Collecting data sets
3. Using web APIs

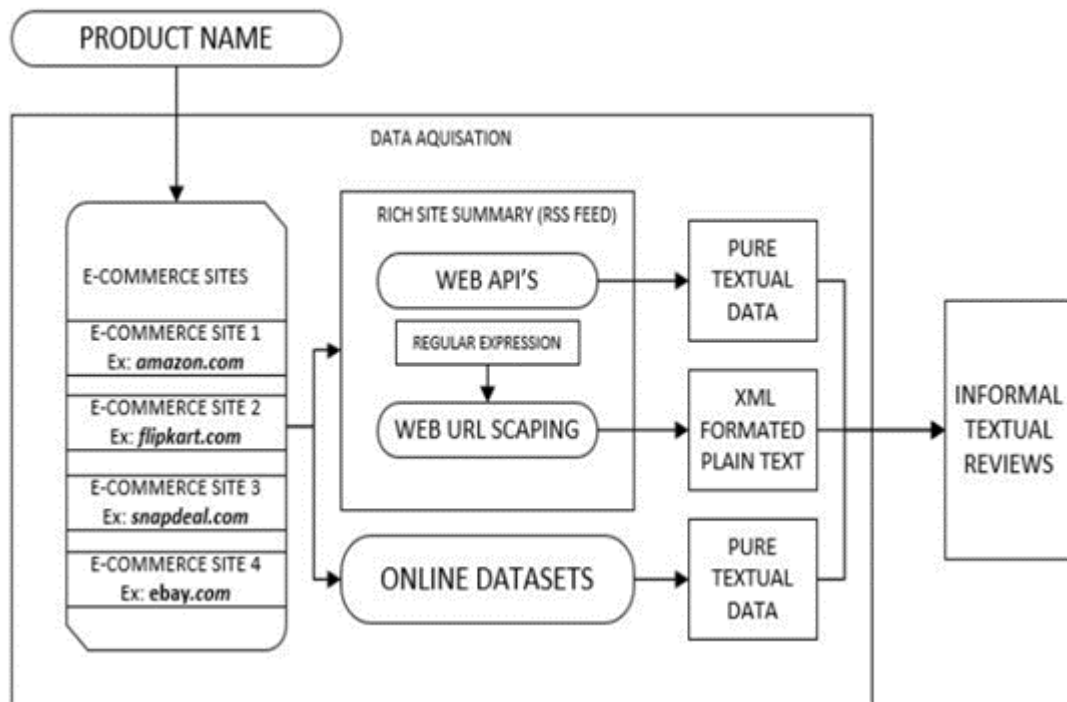


Figure 2.3: Information Retrievel

The technique we opted for in this project was Web URL scraping.

Cleaning and preprocessing:

Data preprocessing is the process of converting raw data into an understandable format by removing incomplete, noisy, and inconsistent data. To perform sentiment analysis on online informal text, more sophisticated methods for cleaning noise in raw text are required. As a result, preprocessing and classification should be given

equal weight.[20].To identify opinion targets (features) from this pure textual information, a 'bag of words' is required. Product feature extraction is another term for this.[12][11].It entails the following responsibilities:

- URL and Hyperlink Removal
- HTML tags and special characters are being removed.
- Extensive abbreviations
- Tagging of parts of speech

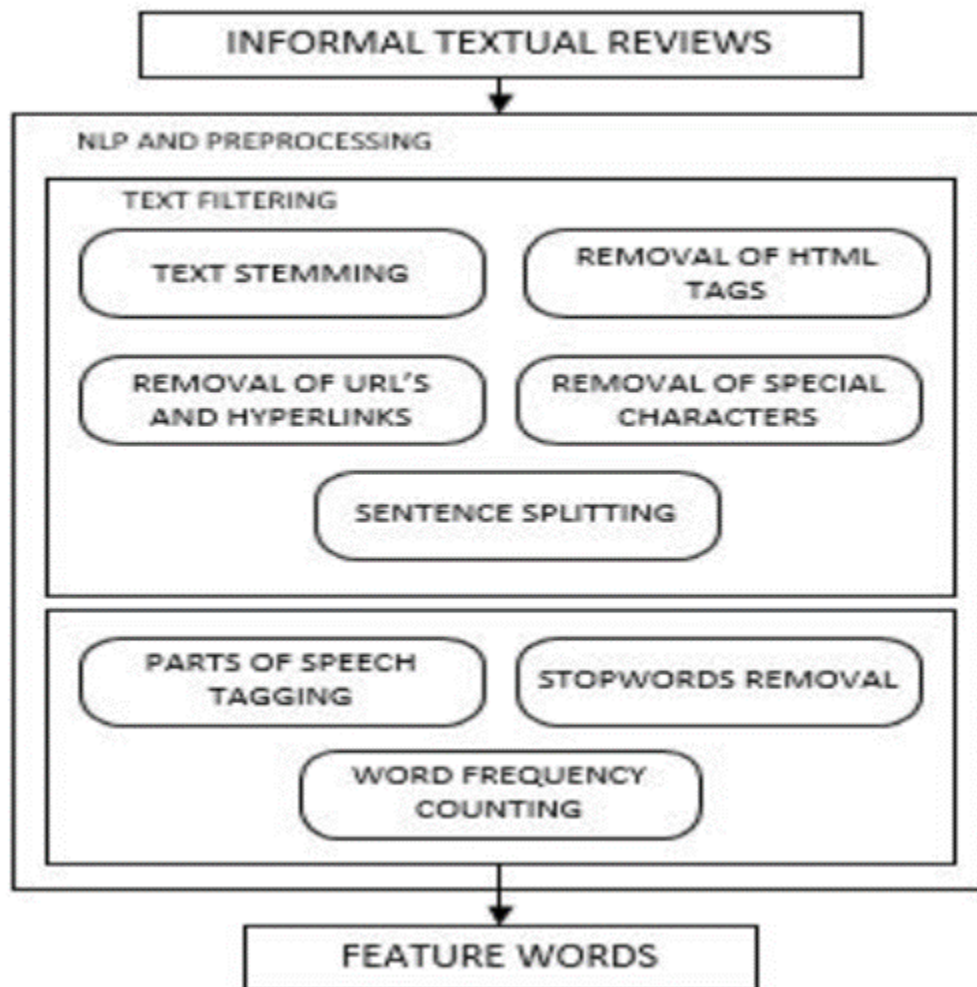


Figure 2.4: Cleaning and Preparation

Sentiment Analysis:

The methodologies for machine learning are as follows:

- A machine learning-based strategy consists of the following according to [16]
 1. supervised learning
 2. unsupervised learning
 3. semi-supervised learning
 4. lexicon-based learning.
- Using the Semantic Orientation method, important n-grams from the text are extracted and labelled as positive or negative, and the document is completed.[19].

The SentiWordNet technique is based on a quantitative examination of the glosses associated with synsets and the application of the vectorial term representations of semi-supervised synset categorization that result. SentiWordNet is a more computationally efficient technique with lower accuracy.[19][7]

This paper describes a semisupervised learning strategy for translating characteristics into target words using WordNet as a lexicon-based data dictionary.

Conclusion:

This article highlights the methods that the survey revealed to be the most efficient for performing sentiment analysis on reviews. Instead of using purely supervised or unsupervised learning algorithms enhanced by heuristic techniques such as ANN to improve accuracy, a semi-supervised strategy is presented in which emphasis is placed on relevant opinion words detected using WordNet. Sentiment analysis will be performed at the sentence level using NLTK and the Nave Bayes probability model.

Chapter 3

Requirement Specifications

This Chapter states all the requirements of Proposed System.

3.1 Proposed System

The proposed work by us is that a fully functional E-commerce website will be made which will inherit the data from other websites. The data which will be retrieved from the websites will be filtered and analyzed before adding it into our website's database. This will give flexibility and ease to the customers as stated before that it will reduce their online time and will have a single platform which will deal with the products required by the customers.

3.2 Functional Requirements

Functional requirements are features or functions that developers must create in order for users to perform their tasks. As a result, it's critical to communicate them to both the development team and stakeholders. In general, functional requirements describe how a system behaves in specific situations.

- Web-app for shopping/surfing products
- Websites scraped according to the data
- Collected data stored in separate .CSV files, building a database
- Sentiment Analysis carried out on the database
- Results displayed to the user on the Web-App according to the website's Authenticity

3.3 Non-Functional Requirements

Non-functional requirements are those that define criteria that can be used to evaluate the performance of a system rather than specific behaviours. They are distinct from functional requirements, which specify specific behaviour or functions.

- **Reliability:**

web-app should be reliable, it should cater the requirements of the user and provide great results. It should not disturb user experience.

- **Maintainability:**

The tool should be easy to manage and maintain by the developers as they are responsible for system maintenance.

- **Availability:**

The tool should be easy to manage and maintain by the developers as they are responsible for system maintenance.

- **Usability:**

User interface (UI/UX) should be easy yet aesthetic so that the user can be attracted towards it and can learn it easily.

- **Security:**

The website should be secure as the user will have to enter his/her personal information to buy the products. The website should maintain the integrity between the user and itself by not letting any unauthorized personnel access other's information.

3.4 Data Requirements

Data requirements specification refers to the process of identifying, prioritising, precisely formulating, and validating the data needed to meet business objectives. When

specifying data needs, data should be referred to in business terminology, preferably using recognised standard business terms.

- Validated Customer information registered on the Website.
- Database/.CSV files created through Web Scrapping.
- Valid Data.
- Sentiment analyzed Report.

3.5 Interfaces

- Web-App/User interface

User will interact with this side of the Website.

- Admin Interface

Admin will interact with this side of the Website.

Chapter 4

Design

This Chapter contains schematics pertaining to the system's design. These designs demonstrate the general operation of the system and provide guidance on how to build the system. To meet system requirements, defines the system architecture, components, modules, interfaces, and data.

4.1 System Architecture

System architecture represents the system application as it's a high-level logical representation of the system. It includes the system's internal and external components. The proposed system consists of:

4.1.1 Web Application

Easy Shop has two major modules as Superuser and a customer. Customers who want to be notified for all products with great ratings and reviews in one place and do not want to waste time searching different websites can redirect to Eashyshop.com to be recommended to amazing products from top online Marketplaces in one place.

4.2 Design Constraints

One of the constraints is that a lot of data from many websites needs to be extracted. To test out the features of this Website we have only used data from a couple of websites. Due to these limitations the main features of the website are tested as this is the beginning of this website.

4.2.1 Data Format

Data is extracted from the websites in the form of .CSV files which will be used to check the features of this Application

4.2.2 Operating System

This System for the time being supports Windows OS, but as we progress into the future this website should be available on Mac OS aswell.

4.3 Design Methodology

The Agile Development method will be used in the development of this module because it takes a different approach than the traditional, linear method. Instead of emphasising documentation and rigid procedures, Agile focuses on how to satisfy users. An application will be designed which will use algorithms to differentiate between false and real reviews by studying and learning from a dataset of multiple fake and real reviews.

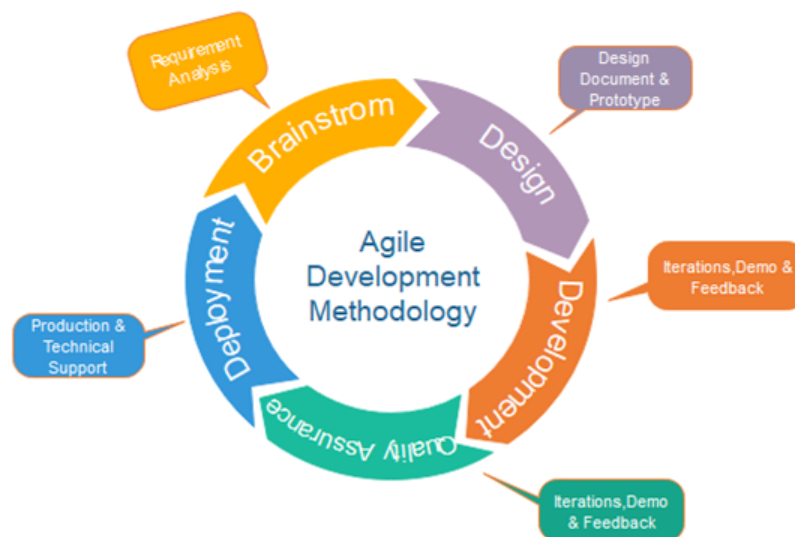


Figure 4.1: Agile Model

Agile methodology is a project management style that divides a project into stages. It necessitates ongoing interaction with stakeholders as well as ongoing development at all levels. Teams go through a cycle of planning, execution, and evaluation once the job begins.

4.3.1 Flowchart Diagram

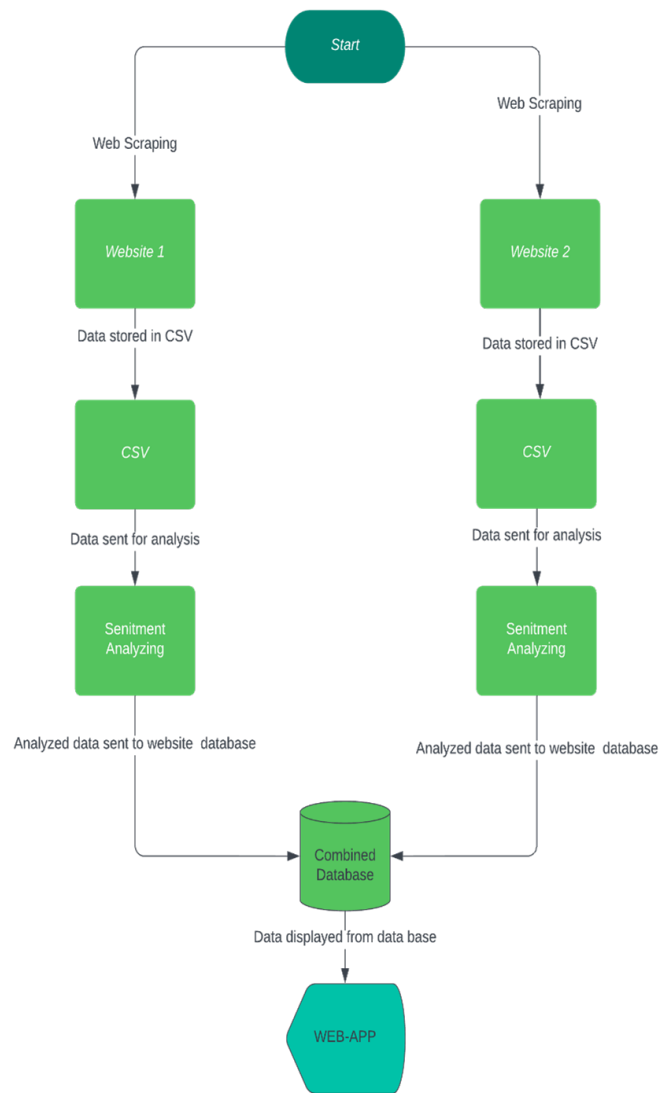


Figure 4.2: Flowchart Diagram

A flowchart is a diagram that depicts a workflow or procedure. A flowchart is also a diagrammatic representation of an algorithm or a step-by-step solution to a problem.

4.3.2 Sequence Diagram

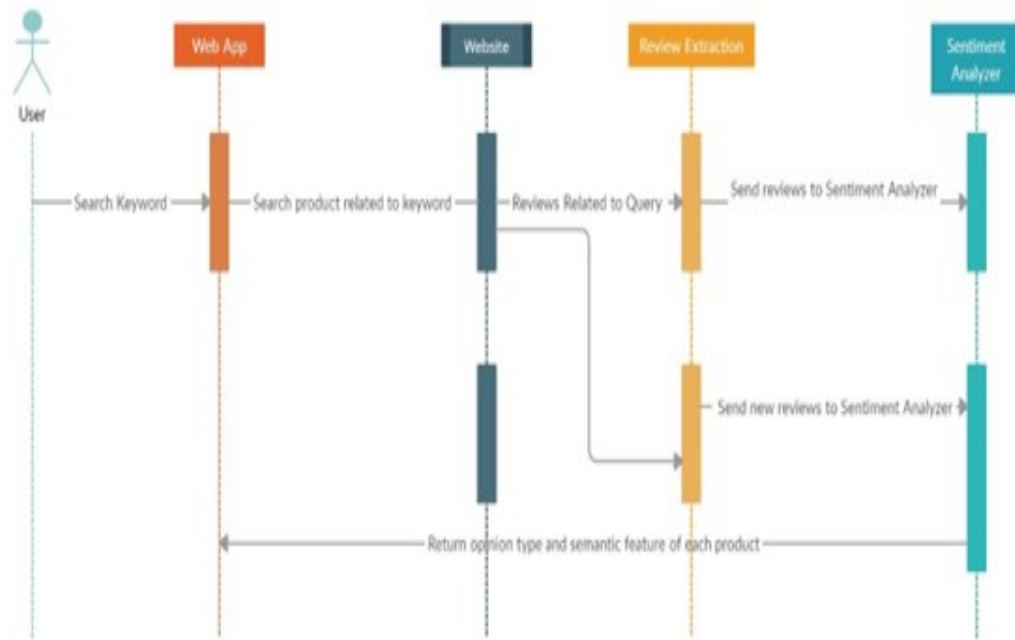


Figure 4.3: Sequence Diagram

4.3.3 Use Case Diagrams

User-Side

This section of use case deals with the user side of the website

1. Sign-up
2. Login
3. Add Product to Cart
4. Update Cart

5. Checkout

Sign-up



Figure 4.4: Sign-up

Login



Figure 4.5: Login

Add Item to Cart



Figure 4.6: Add Product to Cart

Update Cart



Figure 4.7: Update Cart

Checkout



Figure 4.8: Update Cart

Admin-Side

newline

This section of use case deals with the user side of the website

1. Cancel Order
2. Manage Order
3. Change Order Status
4. Update Product

Cancel Order



Figure 4.9: Cancel Order

Manage Order



Figure 4.10: Manage Order

Change Order Status



Figure 4.11: Change Order Status

Update Product



Figure 4.12: Update Product

4.3.4 Use case Tables User Side

Table 4.1: Use Case1

Use Case Id	UC-No 1
Name	Sign-up
Actor	User
Description	User is Signing up on the website.
Pre-Condition:	User lands on the website's landing page
Post-Condition	User is signed into his Profile Dashboard.
Basic Flow	User enters his/her credentials on the website's sign-up screen.
Alternate Flow	Error occurs such as Incorrect Credentials in which case Recheck Credentials.

Table 4.2: Use Case 2

Use Case Id	UC-No 2
Name	Login
Actor	User
Description	User is Logging in on the website.
Pre-Condition:	User must know account's credentials
Post-Condition	User is logged into his/her Profile Dashboard.
Basic Flow	User enters his/her credentials on website's Login Screen.
Alternate Flow	Error occurs when incorrect credentials, in that case Recheck credentials.

Table 4.3: Use Case 3

Use Case Id	UC-No 3
Name	Add Product to Cart
Actor	User
Description	User is Adding Product to Cart.
Pre-Condition:	User is on the Product's page searching for items
Post-Condition	User has added item to Cart.
Basic Flow	User clicks the product card and click the add to cart option.
Alternate Flow	Error occurs when product already in cart.

Table 4.4: Use Case 4

Use Case Id	UC-No 4
Name	Update Cart
Actor	User
Description	User is updating the cart.
Pre-Condition:	User should already have items in cart
Post-Condition	User has successfully updated the cart.
Basic Flow	User keeps on adding items to the cart.
Alternate Flow	Error occurs when incorrect cart is empty.

Table 4.5: Use Case 5

Use Case Id	UC-No 5
Name	Checkout
Actor	User
Description	User is placing order.
Pre-Condition:	User has items in the cart
Post-Condition	User has successfully placed the order.
Basic Flow	User clicks the place order button.
Alternate Flow	Error occurs when incorrect cart is empty.

Admin Side

Table 4.6: Use Case 6

Use Case Id	UC-No 6
Name	Cancel Order
Actor	Admin
Description	Admin is cancelling the order.
Pre-Condition:	User must place order first
Post-Condition	Admin has Successfully cancelled the order.
Basic Flow	Admin cancel the order from the admin Dashboard.
Alternate Flow	No order has been placed.

Table 4.7: Use Case 7

Use Case Id	UC-No 7
Name	Manage Order
Actor	Admin
Description	Admin is Managing/handling the order.
Pre-Condition:	User must place order first
Post-Condition	Admin has Successfully managed/dealt with the order.
Basic Flow	Admin manages the order from the admin Dashboard.
Alternate Flow	No order has been placed.

Table 4.8: Use Case 8

Use Case Id	UC-No 8
Name	Change Order Status
Actor	Admin
Description	Admin is changing the order status.
Pre-Condition:	User must place order first
Post-Condition	Admin has Successfully changed the order status.
Basic Flow	Admin changes the order status from the admin Dashboard.
Alternate Flow	No order has been placed.

Table 4.9: Use Case 9

Use Case Id	UC-No 9
Name	Update Products
Actor	Admin
Description	Admin is Updating the products.
Pre-Condition:	product must be added to the website's database
Post-Condition	Admin has Successfully updated the Product.
Basic Flow	Admin Updated the product from the admin Dashboard.
Alternate Flow	No new arrivals or new products have been added.

4.3.5 System Interaction Diagram

A system interaction diagram is a type of UML diagram that is used to represent the interactive behaviour of a system. Interaction diagrams are used to describe the flow of messages within a system as well as to contextualise one or more lifelines.

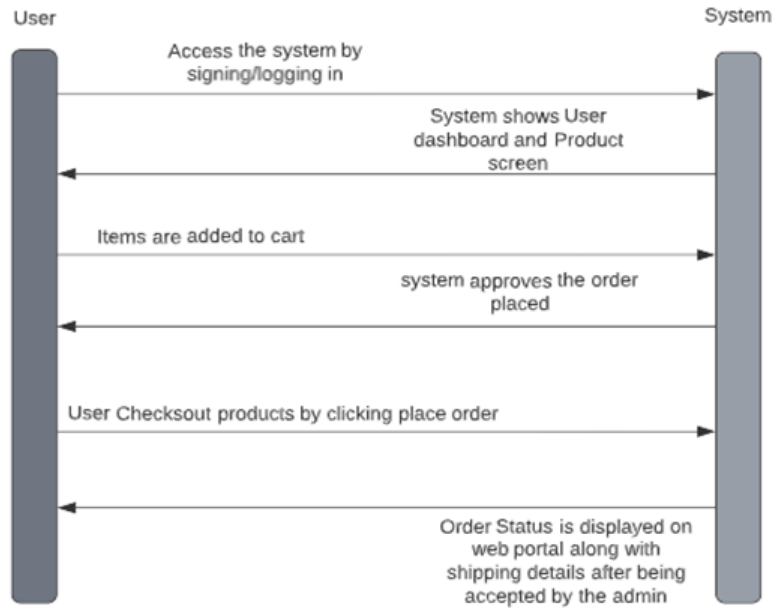


Figure 4.13: System Interaction Diagram

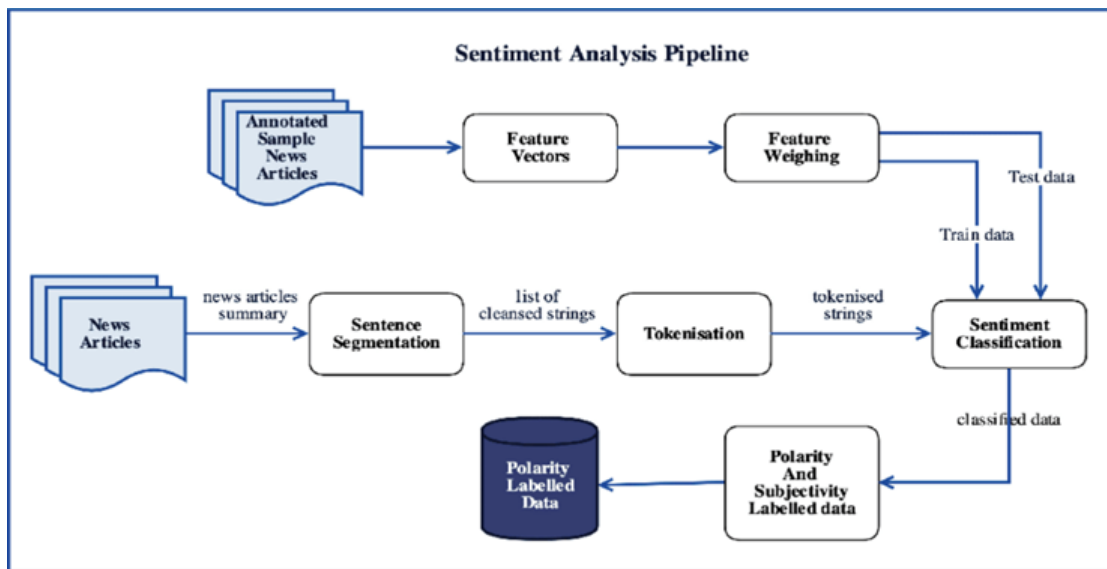


Figure 4.14: Sentiment Analysis Pipeline Diagram

Chapter 5

System Implementation

System Implementation tell the technical specification and software components. It is the process of defining, how the system should build and its system design. We see the actual execution of our system in this chapter. We have implemented our system on Web-based platform by using visual studio and Asp.net MVC Framework.

5.1 Tools and languages used

Environments

5.1.1 PyCharm Community Edition

PyCharm is a Python Integrated Development Environment (IDE) that provides a wide range of essential tools for Python developers. These tools are tightly integrated to create a convenient environment for productive Python, web, and data science development.

5.1.2 Spyder

Spyder is an open-source cross-platform integrated development environment (IDE) for scientific Python programming. Spyder integrates with several prominent Python packages, including NumPy, SciPy, Matplotlib, pandas, IPython, SymPy, and Cython, as well as other open-source software. It is distributed under the MIT licence.

5.1.3 Visual Studio Code

Visual Studio Code, also known as VS Code, is a source-code editor developed by Microsoft for Windows, Linux, and macOS. Support for debugging, syntax highlighting, intelligent code completion, snippets, code refactoring, and embedded Git are among the features.

Tools/Languages Used

This section states the languages used in development of this project.

5.1.4 Django (Python)

Django is a free and open-source Python-based web framework that adheres to the model–template–views (MTV) architectural pattern. It is maintained by the Django Software Foundation (DSF), an independent non-profit organisation based in the United States. Django's main goal is to make it easier to create complex, database-driven websites. The framework emphasises component reusability and "pluggability," less code, low coupling, rapid development, and the don't repeat yourself principle. Python is used everywhere, including settings, files, and data models. Django also includes an optional administrative create, read, update, and delete interface that is generated dynamically via introspection and configured through admin models.

5.1.5 Selenium (Python)

The Python programming language is used in conjunction with Selenium for testing. It is far less verbose and user-friendly than any other programming language. The Python APIs allow you to connect to the browser via Selenium. Selenium can send standard Python commands to different browsers, despite differences in their design.

5.1.6 SQLite3 (Database)

SQLite is a C library that provides a lightweight disk-based database that does not require a separate server process and can be accessed via a nonstandard variant of the SQL query language. SQLite can be used by some applications to store internal data.

5.2 Methodology

This Application is developed using Incremental model, because of a large number of modules and changing requirements. There are two main acting users to this application (Admin or Superuser and The customer or the User) and all of them have different requirements. We have learned short term planning and developed this system in multiple phases.

- Phase 1 - In the very first phase, we have gathered information from students Customers that did online Shopping and priorities those requirements according to the Final Year Project Process and developed the basic Web Application where we can perform basic activities of Ecommerce.
- Phase 2 - In this phase, we have developed a fully functional and interactive webbased system with the updated requirements and designed proper interface to perform all the activities related to Final Year Project Process and in this phase the system is ready for testing.

5.3 System UI

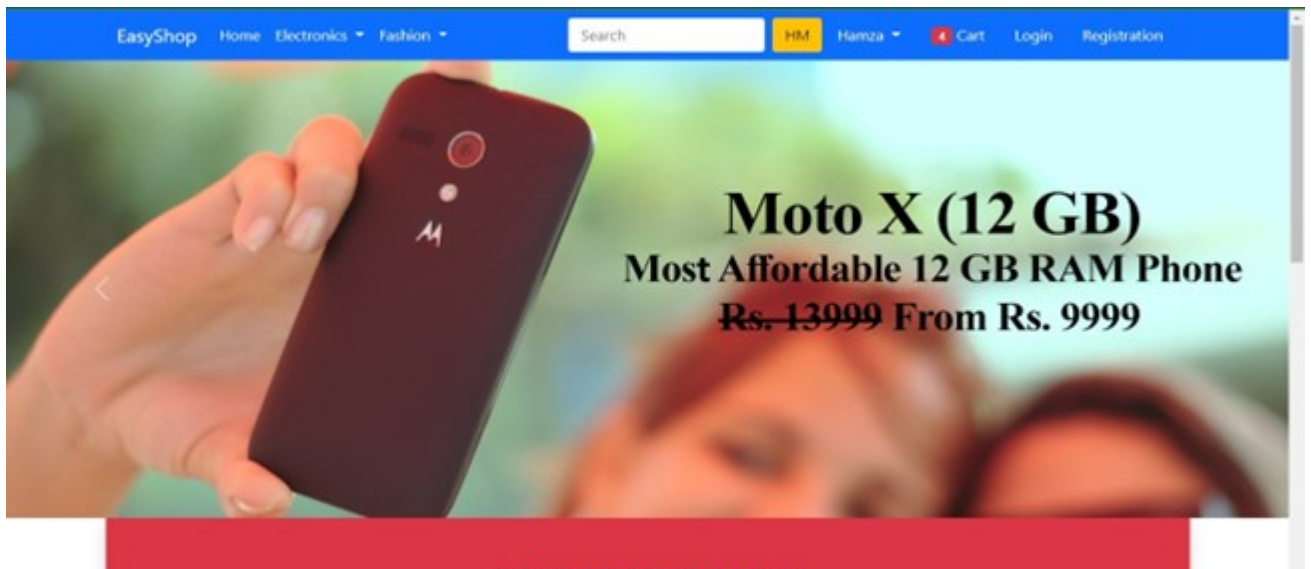



Figure 5.1: Web-app Front page 1


SALE IS LIVE NOW

5% Instant Discount on Askari Bank Credit and Debit Card
Term and Condition Applied (For details visit Bank's official Website)


EasyShop Mobiles




phone 2
Rs 190000.0




phone 1
Rs 240000.0



phone 2
Rs 190000.0



phone 1
Rs 240000.0



phone 2
Rs 190000.0

Figure 5.2: Web-app Slider 1

EasyShop laptops



laptop 1
Rs 190000.0



laptop 1
Rs 190000.0



laptop 1
Rs 190000.0



laptop 1
Rs 190000.0



laptop 1
Rs 190000.0

Figure 5.3: Web-app Slider 2

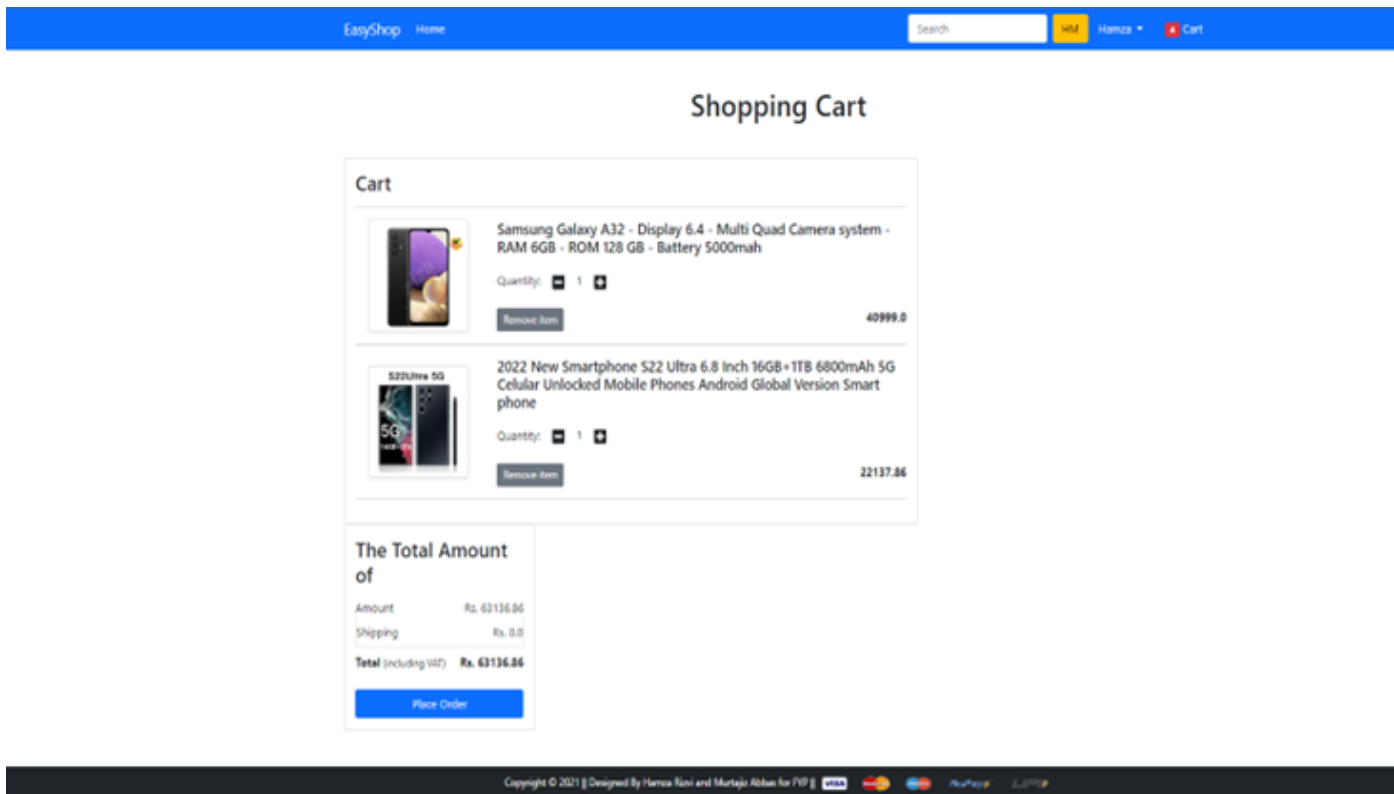


Figure 5.6: Web-app Cart Page

Chapter 6

System Testing and Evaluation

6.1 Introduction

System Testing is the main key for a successful system as it ensures that each module of the system is working as its suppose to. Each module is tested separately in System Testing of software and hardware. The main output needed through testing is the checking of all systems as to whether they meet all the requirements and follow the standards according to the requirement specification. Evaluation is needed for what we have done and that requires qualitative evaluation. We tested our system through multiple test cases in order to evaluate the overall performance. Some of the testing we have conducted are listed as followed:

- Graphical User Interface Testing

GUI testing is a type of software testing that looks at the graphical user interface of a product. Graphical User Interface (GUI) testing ensures that software applications perform as expected by inspecting displays and controls such as menus, buttons, icons, and so on.

- Usability Testing

Usability testing is a technique for evaluating a design's ease of use with a group of representative users. It generally entails watching people perform activities and can be done for a variety of designs. It occurs frequently, from early development to product release.

- System Testing

System testing, also known as system-level testing or system-integration testing, is the process by which a QA team evaluates how the various components of an application interact in the overall, integrated system or application.

- Software Performance Testing

When subjected to a workload, performance testing evaluates the speed, responsiveness, and stability of a computer, network, software program, or device. Organizations will conduct performance testing to identify bottlenecks in performance.

6.2 Graphical User Interface (GUI) Testing

To make sure that the graphical user interface is working properly we did some interface testing.

6.2.1 Test Case for Home Page

Check conducted to ensure if the home page is working properly or not.

Table 6.1: Test Case for Home Page

Test Case Id	GUI-TC 1	
Name	Home Screen	
Requirement:	Internet Connection and Website is hosted on a server	
Step:	Procedural steps	
1	open home page	Pass
2	Item Slider Working.	Pass
3	Redirection is Working.	Pass
4	Relevant Data Showing	Pass
5	Different Pages Accessible	Pass

6.2.2 Test Case for Login Page

Check conducted to ensure if the Login page is working properly or not.

Table 6.2: Test Case for Login Page

Test Case Id	GUI-TC 2	
Name	Login Screen	
Requirement:	Internet Connection and Website is hosted on a server	
Step:	Procedural steps	
1	Open Login Panel	Pass
2	Check Login Button is working.	Pass
3	Check login button is submitting data.	Pass
4	Enter Username and Password	Pass
5	Check if data can be entered	Pass

6.2.3 Test Case for Sign-up Page

Check conducted to ensure if the Sign-up page is working properly or not.

Table 6.3: Test Case for Login Page

Test Case Id	GUI-TC 3	
Name	Sign-up Screen	
Requirement:	Internet Connection and Website is hosted on a server	
Step:	Procedural steps	
1	Open Sign-up Panel	Pass
2	Check Sign up Button is working.	Pass
3	Check if button is submitting data.	Pass
4	Check if data can be entered	Pass

6.2.4 Test Case for Cart Page

Check conducted to ensure if the Cart page is working properly or not.

Table 6.4: Test Case for Cart Page

Test Case Id	GUI-TC 4	
Name	Cart Screen	
Requirement:	Internet Connection and Website is hosted on a server	
Step:	Procedural steps	
1	Open Cart Page	Pass
2	Product Added in Cart.	Pass
3	Product removed from cart.	Pass
4	Data being submitted through Cart	Pass
5	Check if checkout works	Pass
6	Check if address is submitted	Pass

6.3 Usability Testing

To ensure if the system is easy to use by all demographics we conduct a Usability test. Certain users varying in the demographic are asked to use the system so that we can ensure it is easy to user and through their feedback we can improve the current system.

6.3.1 CRUD testing for Data entry

To ensure if the data till checkout is being submitted correctly.

Table 6.5: CRUD testing for data entry

Test Case Id	U-TC 1	
Name	Cart Page	
Requirement:	Internet Connection and Website is hosted on a server	
Step:	Procedural steps	
1	Open Home Page	Pass
2	Product Cart redirecting to appropriate page.	Pass
3	Add product to cart .	Pass
4	Correct item data in cart	Pass
5	open Checkout	Pass
6	Correct address data submitted	Pass
7	Order placed successfully	Pass

6.3.2 Sign-Up test

Table 6.6: Sign-Up Test

Test Case Id	U-TC 2	
Name	Sign-Up Page	
Requirement:	Internet Connection and Website is hosted on a server	
Step:	Procedural steps	
1	Open Sign-Up Page	Pass
2	Enter Data for registration.	Pass
3	Check if Data is submitted.	Pass
4	Check if Sign-up button is working	Pass

6.3.3 Performance testing

Table 6.7: System Performance Test

Test Case Id	SP-TC 1	
Name	System Performance	
Requirement:	Internet Connection and Website is hosted on a server	
Step:	Procedural steps	
1	Run the System	Pass
2	Login to the system.	Pass
3	Go to Home Page.	Pass
4	Navigate to any other page	Pass
5	Add Product to cart	Pass
6	Checkout through cart page	Pass
7	Check if data submitted correctly	Pass

Chapter 7

Conclusion

7.1 Conclusion

In this Project, we have developed a web-based platform for the Users that do online shopping. This system facilitates the User requirements of saving time and finding good quality products that they want to buy with a easy to use interface and saving the users the hassle to surf multiple websites. We developed a website which uses the data extracted and filtered by ourselves to provide feasibility and ease to the users. This website saves time for the user that he/she was to spend on multiple websites to find a single category of a product. This means that the best quality products from multiple websites will be available on Easy Shop which is this developed website. During this course we learned how a fully functional website is made and how different modules of a single project requires different approaches and techniques and how to tackle them. This has expanded our knowledge in the field of E-commerce as well as how the domain of NLP works. Furthermore a lot of support and help came from our supervisor, who has supported and corrected us along this journey. All thanks to Allah, The Almighty who had made us capable of completing this project.

7.2 Future Enhancements

- Diversity of products and Discount codes

We can enhance this project by adding multiple types of products in our project. So that, all the products that are requested by the customers can be provided to them on this single site with discount codes as well.

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