iRECOMMENDER FOR E-COMMERCE

17-035

Software Requirement Specification

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Sri Lanka

May 2017

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Software Requirement Specification

(SRS documentation submitted in partial fulfillment of the requirement for the Degree of Bachelor of Science Special (honors) In Information Technology)

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May 2017

Declaration

I declare that this is my own work and this SRS document does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

W.W.G.B.P Bandara - IT14015472 - ...……

The supervisor/s should certify the proposal report with the following declaration.

The above candidate is carrying out research for the undergraduate Dissertation under my supervision.

…… ……..……

Signature of the supervisor Date

Abbreviations

SRS	Software Requirement Specification
EC	E-Commerce
NLP	Natural Language Processing
OS	Operating System
SRS	System Requirement Specification

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1. Introduction

The introduction of the Software Requirements Specification (SRS) provides an overview of the entire SRS with purpose, scope, definitions, acronyms, abbreviations, references and overview of the SRS. The aim of this document is to gather and analyze and give an in-depth insight of the complete **iRecommender System for E-Commerce** by defining the problem statement in detail. Nevertheless, it also concentrates on the capabilities required by stakeholders and their needs while defining high-level product features. The detailed requirements of the **iRecommender System for E-Commerce** are provided in this document.

1.1. Purpose

The purpose of this document is to give a detailed description of the requirements for the "**iRecommender for e-commerce**" software. It will illustrate the purpose and complete declaration for the development of system. It will also explain system constraints, interface and interactions with other internal sub parts. This document is primarily intended to be proposed to a customer for its approval and a reference for developing the first version of the system for the development team.

In short, the purpose of this SRS document is to provide a detailed overview about the "**Validation Agent and Customer behavior analyzer"** development which is a main sub part if the system "iRecommender for e-commerce", and its parameters and goals.

The intended audience of this System Requirement Specification are, the members of the research group and the project supervisor Ms. Dinuka Wijendra.

1.2. Scope

This document will cover all the aspects of the Validation Agent and Customer behavior analyzer related to the main system “iRecommender for E-Commerce”. This software system will be an Intelligence based product recommendation addon for E-Commerce Web Stores. This system will be designed to produce a more accurate and useful recommendation engine which will link user's social media(twitter) with the E-Commerce services they use. The link will change the history of recommendation engines by daily updating the user's requirements with the help of their public sharing contents on social media.

More specifically, this system is designed will allow spreading of the recommendation which is currently bounded to past search results and purchase history to a wider range which is out of the e commerce website. As the product recommendations are updated frequently with more accurate predictions, the users will save their valuable time and the web store owners will have their sales increased.

This system will be triggered once a registered user is logged to an e commerce web store. iRecommender is optimized to track down and gather the user’s actions on the website using web mining techniques. Users clicks and views will be saved on a separate csv log file and expose to NLP techniques to extract only the useful information.

The gathered, filtered data are stored in a neo 4j database and will be exposed to Machine Learning techniques to identify the products that the user is interested in. Using these information, search history and the purchase history the Validation agent will validate and update the recommendations that were done by iRecommender”

1.3. Definitions, Acronyms, and Abbreviations

Term	Definition
E-Commerce User	Person who uses the e commerce website
Natural Language Processing	The application of computational techniques to the analysis and synthesis of natural language and speech.
Machine Learning	A type of artificial intelligence (AI) that provides computers with the ability to learn without being explicitly programmed
Tweets	User's publicly shared content on Twitter
Software Requirements Specification	A document that completely describes all of the functions of a proposed system and the constraints under which it must operate. For example, this document.
Neo4J database	Collection of all the information monitored by this high speed system.

Table 1 : Definitions, Acronyms, and Abbreviations

1.4. Overview

The next chapter, the Overall Description section, of this document gives an overview of the functionality of the product. It describes the informal requirements and is used to establish a context for the technical requirements specification in the next chapter.

This research is mainly based on Web Mining, Natural Language Processing and Data Mining that lets EC users have their product recommendations from their first login to an EC store. This system will save the users valuable time and increase revenue of the EC store owners by optimizing their stores to give a better customer service.

There are several main goals that needs to be achieved throughout the project. The system will overcome the cold start problem which existing in almost all the recommendation engines in the present. Nevertheless, the system will automate the recommendation suggestion process based on day to day updates and tastes of customers and their behavior in an EC store by linking their Twitter accounts with iRecommender.

2. Overall Descriptions

When considering a EC web stores, customers are mainly focusing on time saving. Once a customer is logged in to an EC website, the customer needs to get his work done or product purchased as fast as possible. As a solution, there are recommendation systems running on each web stores that are suggesting products to their users. There suggestions are mostly done using search results and purchase history of each specific customer. As these recommendation engines are only using information from the history, their suggestions are not accurate enough to serve the customer needs.

The system **"iRecommender for E-Commerce"** will overcome the drawbacks that are presence in the current recommendation systems. This system will take information outside the web store to make their predictions. So, the suggestions will be more accurate and will be updated frequently according to the customers taste. All the suggestions that were done by the iRecommender are validated frequently with using web mining techniques and NLP techniques. The validation process is carried out by the **Validation Agent and Customer behavior analyzer** of iRecommender system.

Customer behavior analyzer is the component which tracks the user activities on the e commerce website. This component is triggered at the point of login of the customer and important data which are required for the iRecommender's validation agent are collected through the actions performed by the user. The customer behavior analyzer is responsible on tracking the user activities on the website. Once the user is logged in to the website, the analyzer is triggered and all the activities of the customer are recorded in a log file. The Log files in different web servers maintain different types of information.

Validation Agent is the component of the iRecommender system which is responsible for the validation of the prediction done by Predicting agent. The validating agent tracks and analyses the user activities that were collected by the Customer Behavior Analyzer. The analyzed data are exposed to web mining techniques to validate the product suggestion done by the predicting agent. the validation agent which joins with Customer Behavior Analyzer is responsible on the existence of iRecommender. Inputs for validation agent are taken from the Predicting agent and the customer behavior analyzer. For new users, the prediction is done by analyzing the tweets. Once the prediction is done and the customer is actively using the website, the validation agent Talley's the activities of customer with the predictions done by iRecommender. The validation agent keeps its connection with the predicting agent and provide the information that are necessary to generate the future product suggestions.

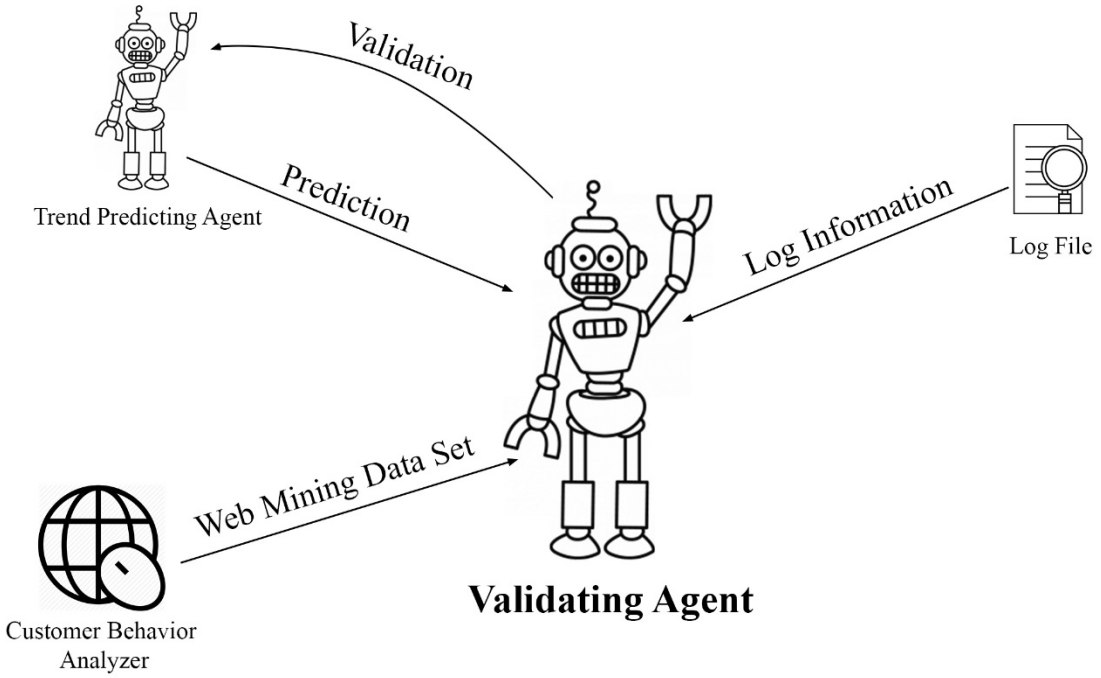

Figure 1 : Validating Agent

2.1. Product perspective

	Netflix	**eBay**	**Amazon**	**Ali Express**	**Walmart**
Cold Start Problem	✓	✓	✓	✓	✓
Database delay	✓	X	✓	✓	✓
No scalability	X	X	X	X	X
Inefficient cluster management	✓	X	X	✓	✓
Usage of only one type of recommendation technology	✓	✓	✓	✓	✓

Table 2 : Existing Drawbacks

How iRecommender overcomes the defects

- Cold Start Problem

Once a new user is registered, this issue emerges with the recommendation engine. As the Engine, doesn't have sufficient data to predict a product recommendation the new users are not getting personalized recommendations.

- Database Delay

One of the most important factor is the quick responsiveness of the database with the executed queries. In most of the recommendation engines, they use relational databases which are very inefficient when considering a growing data set.

- No scalability of the system

Scalability is known as

- High availability.
- Redundancy in the face of server failures, both for the data and for the operational service.
- Managing increasing read load.
- Managing increasing data set size.
- Managing increasing write load.

- Inefficient data cluster management

To achieve best performance of the system, users should be clustered into different categories to predict the best matching product for the customer.

- Usage of only one type of recommendation technology

Almost every existing recommendation engine only uses a single technology out of Content based recommendations and Collaborative Recommendation. In order to achieve the best personalized prediction, the both technologies should be used.

2.1.1. System interfaces

- ✓ PyCharm - is an Integrated Development Environment (IDE) used in computer programming, specifically for the Python language.
- ✓ Python - a high-level general-purpose programming language.

2.1.2. User interfaces

iRecommender is a system that relates to ecommerce web stores to optimize their recommendations. Therefore, iRecommender is not consisting with any interface. We are mainly developing algorithms which does not contain interfaces.

2.1.3. Hardware interfaces

Computers : This is the main hardware component needed in order to use iRecommender. As there are several types of computers such as Laptops, Desktops, palmtops, etc. iRecommender supports each computer which has an active internet connection and browsing facilities.

Mobile Phone : iRecommender supports each and every brand of mobile devices which has an active internet connection and browsing facilities. iRecommender doesn't depend on the type of operating System that is functioning in the device

2.1.4. Software interfaces

- ✓ Mobile Phones : Android operating system
  Symbian Operating system
  IOS (Apple Mobile Devices)

- ✓ Computers : Windows
  Mac OS
  Linux
  Ubuntu

- ✓ Web Browsers : Google chrome
  Mozilla Firefox
  Microsoft Edge
  Safari

- ✓ Databases : Neo 4j
  Apache Spark™

- ✓ IDE's : Pycharm
  Python IDLE
  Jet Brains IDE
  Visual Studio
  Sublime Text3

- ✓ Server : Operating System: Cent OS7 (64 bit)
  Python 2.7
  PHP
  MYSQL

2.1.5. Communication interfaces

- ✓ Computer need a good internet connection to browse the e-commerce web site.
- ✓ Server needs a strong internet connection to communicate with the application.
- ✓ Mobile devices should have an active internet connection. (3G/4G/WCDMA/Wifi)

2.1.6. Memory constraints

- ✓ Minimum requirement of 1GB RAM on Computers
- ✓ Minimum requirement of 3GB free storage on hard drive.

2.1.7. Operations

There's only one type of user for iRecommender. That is the customer on e-commerce web store. His user privileges are defined as follows

- ✓ Login to the ecommerce web store.
- ✓ View iRecommender suggestions.
- ✓ Search for products.
- ✓ Purchase products.

2.2. Product functions

The product can be categorized in to two main sub parts as Customer behavior analyzer and Validation agent. The Customer behavior analyzing process is a web mining process. The web mining process undergoes three main process as Pre-Processing, Pattern discovery and Pattern analysis

Customer behavior analyzer

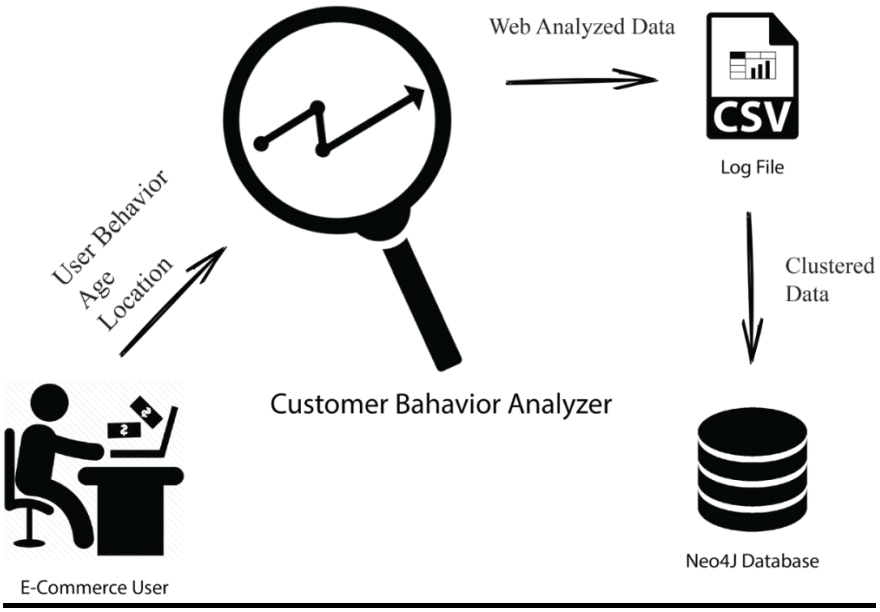

Figure 2 : Customer Behavior analyzer

Pre Processing : The data on the log file are not directly analyzable. The Log file contains unwanted data that has to be cleaned. During the preprocessing step. These unwanted data are identified through algorithms and they were removed to minimize the log file obtained.

Pattern Discovery : The minimized log file that contains formatted data are exposed to the step of pattern discovery. Using data mining techniques these data are analyzed to identify useful information for the validation Agent. The patterns are clustered under details like Session Id and User ID identified from the log file.

Pattern Analysis : During Pattern Discovery process, both important information that were received from the Predicting agent and the Pattern discovery are used. By introducing suitable algorithms and exposing the collected data, the validating agent validates the suggestions made by iRecommender.

Validation agent

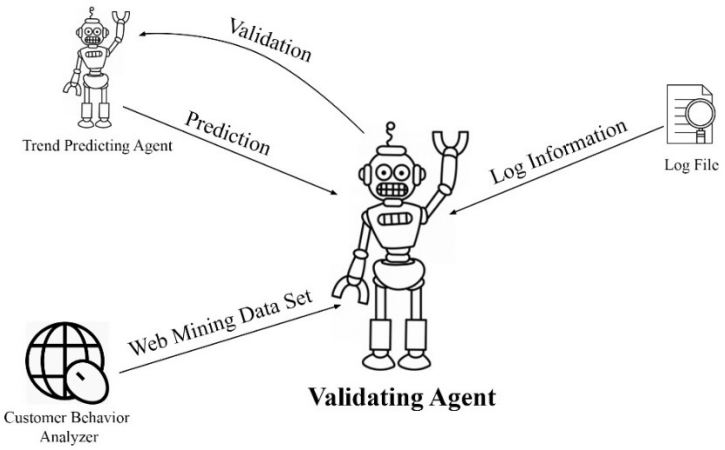

Figure 3: Validating Agent

As Figure 3 describes, the validation agent which joins with Customer Behavior Analyzer is responsible on the existence of iRecommender. Inputs for validation agent are taken from the Predicting agent and the customer behavior analyzer. For new users, the prediction is done by analyzing the tweets. Once the prediction is done and the customer is actively using the website, the validation agent Talley's the activities of customer with the predictions done by iRecommender. The validation agent keeps its connection with the predicting agent and provide the information that are necessary to generate the future product suggestions

Use Case 01	User Registration
Pre-Conditions	User should have a Twitter account in order to use iRecommender
Successful End Condition	Redirect to the E Commerce Web Store
Actors	E Commerce Customer/User
Main Success Scenario	1. User types a user name of his or her choice. 2. User types Twitter ID and Password 3. User types a password twice 4. User types the email 5. Submit 6. System checks if the user name is not already in use 7. System checks if the two passwords are identical 8. System registers the new user with the given parameters (user name, password)
Extensions	1a. Prompt to re-enter if username already exist

Table 3 : Use Case 01 - User Registration

Use Case 02	User Login
Pre-Conditions	The user is not yet logged in
Successful End Condition	User can access the E Commerce Web Store
Actors	E Commerce Customer/User
Main Success Scenario	1. User types his/her user name 2. User types his/her password 3. System checks if the given login parameters are valid 4. System creates a new session for the user
Extensions	2a. Login Failure message if parameters not valid

Table 4 : Use Case 02 - User Login

Use Case 03	Customer Behavior analyzing
Pre-Conditions	The user should be logged in to web store
Successful End Condition	Log file stored in the server including all actions performed by user
Actors	E Commerce Customer/User
Main Success Scenario	1. User logs in to the EC webstore 2. User perform his/her actions on store

Table 5 : Use Case 03 - Customer Behavior analyzing

Use Case 04	Validate Suggestion
Pre-Conditions	1. Suggestions should be received by Trend Predicting Agent 2. Customer Behavior Analyzing should be performed successfully
Successful End Condition	User can get iRecommender Suggestions
Actors	E Commerce Customer/User
Main Success Scenario	1. User logs in to the EC webstore 2. User perform his/her actions on store

Table 6 : Use Case 04 - Validate Suggestion

2.3. User characteristics

Types of users who will be using this application would be a person who is using e-commerce web stores in purchasing items. The system will be implemented upon the request of the owner of e commerce web store.

2.4. Constraints

Hardware Limitations

In order to run this application, user should have a computer with following requirements.

- ✓ 1GB or higher RAM
- ✓ Dual core 1.5GHz or higher CPU

Software Limitations

- ✓ The Latest version of any browsing software.

2.5. Assumptions and dependencies

The system is developed by assuming the facts listed below.

- ✓ Users should have a computer or a mobile device with an internet browsing software installed.
- ✓ Users who interact with the ecommerce web site should have a slight knowledge about handling computers and internet things.
- ✓ Computers are with latest version of any browsing software.
- ✓ All users who interact with the ecommerce web site, have a Twitter account linked with the iRecommender.
- ✓ All users have a good Internet connectivity.

2.6. Apportioning of requirements

The requirements described in sections 1 and 2 of this document are referred to as primary specifications; those in section 3 are referred to as requirements (or functional) specifications.

The two levels of requirements are intended to be consistent. Inconsistencies are to be logged as defects. In the event that a requirement is stated within both primary and functional specifications, the application will be built from functional specification since it is more detailed.

Essential requirements (referred to in section 3) are to be implemented for this version of "iRecommender for ecommerce". Desirable requirements are to be implemented in this release if possible, but are not committed to by the developers. It is anticipated that they will be part of future release. Optional requirements will be implemented at the discretion of developers.

3. Specific requirements

3.1. External interface requirements

3.1.1. User interfaces

iRecommender is a system that relates to ecommerce web stores to optimize their recommendations. Therefore, iRecommender is not consisting with any interface. We are mainly developing algorithms which does not contain interfaces.

3.1.2. Hardware interfaces

Computers : This is the main hardware component needed in order to use iRecommender. As there are several types of computers such as Laptops, Desktops, palmtops, etc. iRecommender supports each and every computer which has an active internet connection and browsing facilities.

Mobile Phone : iRecommender supports each and every brand of mobile devices which has an active internet connection and browsing facilities. iRecommender doesn't depend on the type of operating System that is functioning in the device

3.1.3. Software interfaces

- ✓ Mobile Phones : Android operating system
  Symbian Operating system
  IOS (Apple Mobile Devices)

- ✓ Computers : Windows
  Mac OS
  Linux
  Ubuntu

- ✓ Web Browsers : Google chrome
  Mozilla Firefox
  Microsoft Edge
  Safari

- ✓ Databases : Neo 4j
  Apache Spark™

- ✓ IDE's : Pycharm
  Python IDLE
  Jet Brains IDE
  Visual Studio
  Sublime Text3

- ✓ Server : Operating System: Cent OS7 (64 bit)
  Python 2.7
  PHP
  MYSQL

3.1.4. Communication interfaces

- ✓ Computer need a good internet connection to browse the e-commerce web site.
- ✓ Server needs a strong internet connection to communicate with the application.
- ✓ Mobile devices should have an active internet connection. (3G/4G/WCDMA/Wifi)

3.2. Classes/Objects

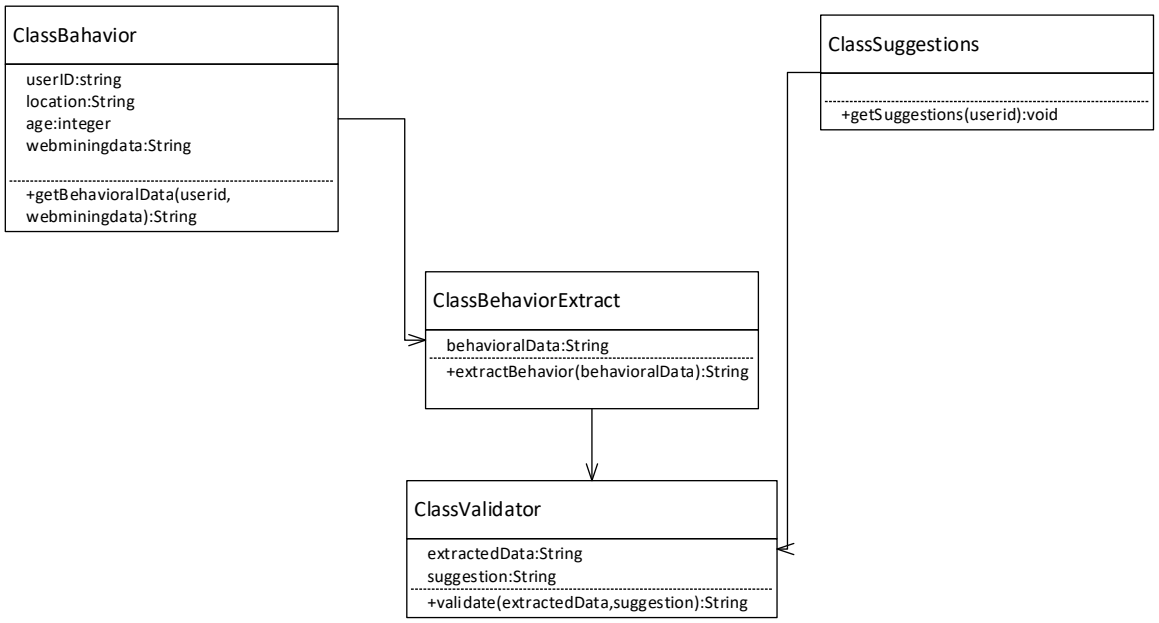

Figure 4 : Class Diagram - Customer behavior analyzer and Validating Agent

3.3. Performance requirements

Our System will run on any kind of Operating System installed any web browsing software (Ex: Google Chrome, Mozilla Firefox, Microsoft Edge, Safari).

There are the types of performance requirements handle by the “iRecommender for e-commerce” product. They are,

- ✓ Response time
- ✓ How fast the system handles individual request
- ✓ Concurrency
- ✓ Scalability

large number of users can interact with the system concurrently.

3.4. Design constraints

In designing “iRecommender for e-commerce” System, there will be several constraints that are need to be considered.

- ✓ When user login to the EC web site, “iRecommender for e-commerce” should suggest the products to user without any delay.
- ✓ All the functions in the system should be always available and accessible.
- ✓ All the Information which are extracted from the system, should be stored in well-organized manner.

3.5. Software system attributes

3.5.1. Reliability

These types of system should have high performance reliability. This system can be used by multiple users concurrently. Any user, who has minimum hardware and software requirements can use “iRecommender for e-commerce” System.

3.5.2. Availability

This system will be available during 24x7 hours. Also users can interact with the system continuously and easily. Every function of the system will be well-designed and tested before used.

3.5.3. Security

This system is secured as all the users can register with the EC web sites. They can use their own credentials to interact with the EC web sites and credentials can be changed at any time. All the password will be encrypted before saving by EC web site’s backend.

3.5.4. Maintainability

“iRecommender for e-commerce” will be developed as version by version. A new version of “iRecommender for e-commerce” will be released when the developers make any modifications to the application.

4. Supporting information

4.1. Overall System Architecture for iRecommender

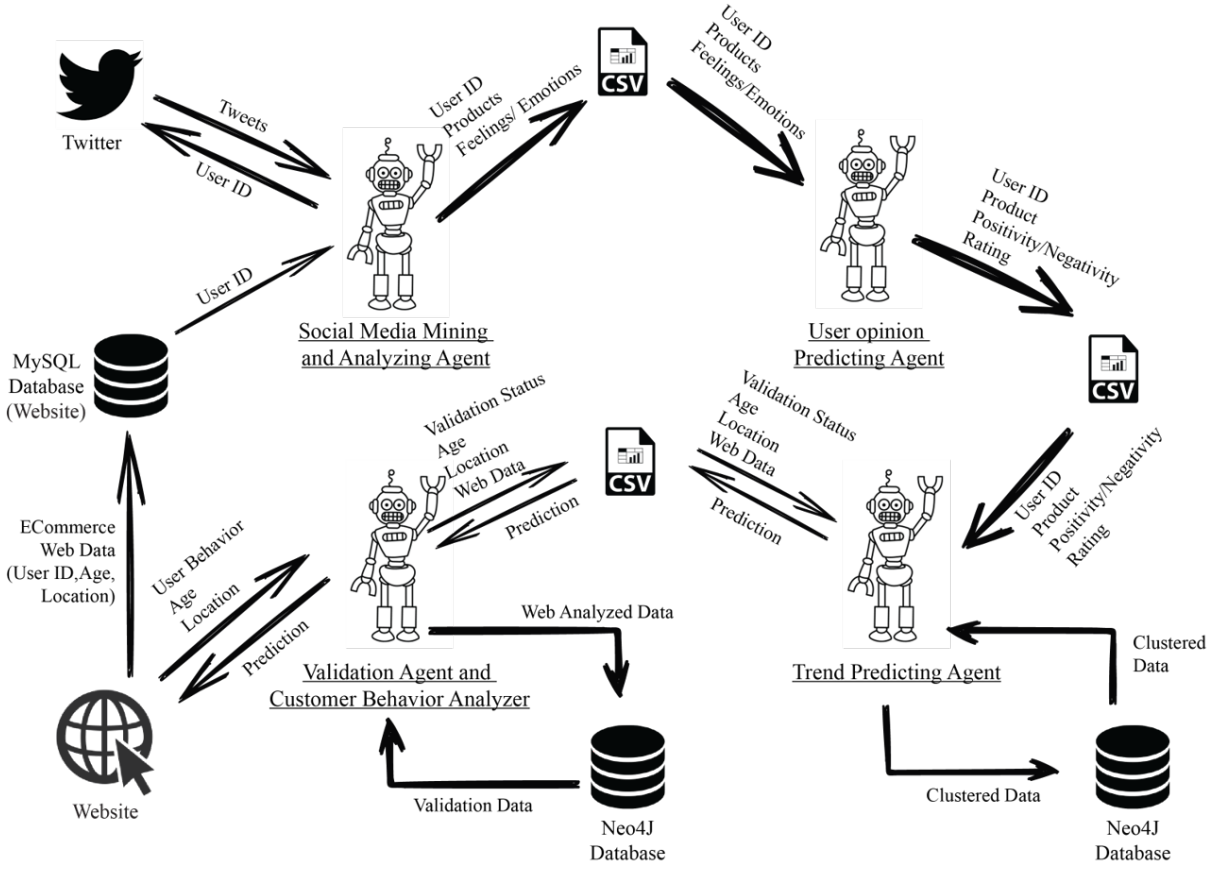

Figure 5 : Overall System Architecture

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Software Requirement Specification

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Bachelor of Science Special (honors) In Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology

Sri Lanka

May 2017

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Software Requirement Specification

(SRS documentation submitted in partial fulfillment of the requirement for the Degree of Bachelor of Science Special (honors) In Information Technology)

M.S.D Dharmawardhana – IT14048906

Ms. Dinuka Wijendra

B.Sc. (Special Honors) in Information Technology
Sri Lanka Institute of Information Technology

May 2017

Declaration

I declare that this is my own work and this SRS document does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

M.S.D Dharmawardhana IT14048906 ...……

The supervisor/s should certify the proposal report with the following declaration.

The above candidate is carrying out research for the undergraduate Dissertation under my supervision.

....

Signature of the supervisor Date

Abbreviations

NLP – Natural Language Processing

ML – Machine Learning

SRS – Software Requirement Specification

OS – Operating System

EC – Electronic Commerce

GB – Giga Byte

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1. Introduction

The introduction of the Software Requirements Specification (SRS) document mainly provides a scope description and an entire overview of everything included in the Software Requirements Specification (SRS) document. This includes purpose, definitions, acronyms, abbreviations, references and overview of the SRS.

1.1. Purpose

The purpose of this document is to give a detailed description of the requirements for the "iRecommender for e-commerce" software. It will illustrate the purpose and complete declaration for the development of system. It will also explain system constraints, interface and interactions with other internal sub parts. This document is primarily intended to be proposed to a customer for its approval and a reference for developing the first version of the system for the development team.

In short the purpose of this SRS document is to provide a detailed overview in User Opinion Predicting Agent of the System "iRecommender for e-commerce", its parameters and goals.

The intended audience of this System Requirement Specification are, the members of the research group and project supervisor Ms. Dinuka Wijendra.

1.2. Scope

This document covers all aspects in “iRecommender for e-commerce” project related User Opinion Predicting Agent using NLP and ML techniques for extract opinions of each user.

Social Networks of specific users are analyzed when they are using online retail stores to buy a specific product. On the point of registering and login to store, “iRecommender” tracks the current users public shared contents (E.g. “twitter: - text”) and analyze the user tweets to predict the taste of the customer. Our main target is Studying Customer Behavior through the Social Networks.

The users are prompted to link their social networks on the point of registering with the online retail store. “iRecommender for e-commerce” analyses their social network shared contents (Texts). And The determined data are stored and exposed to machine learning techniques and data mining techniques to predict the needs of customer.

“iRecommender for e-commerce” automates the searching process based on the predicted outcome. With the solution provided the time wastage of the user is reduced and the searching process is made more accurate to the customer. And this solution causes to increase the sales of the online store.

“iRecommender for e-commerce” solves the struggling issues that were faced by the store owners in suggesting best suitable products for their customers. the specific online stores which are using “iRecommender for e-commerce” will get a higher reputation and higher income among the competitors.

1.3. Definitions, Acronyms, and Abbreviations

Definition

Natural Language Processing and Machine Learning techniques are used to develop User Opinion Predicting Algorithm.

Acronyms

Term	Definition
User	Person who interacts with the e-commerce web site.
Online Retail Stores	e-commerce web sites which are selling products or services.
Tweets	The set of words or texts which is giving some message.
The Taste of the Customer	The interest of the person who are dealing with the e-commerce web site.
Social Networks	A dedicated website or other application which enables users to communicate with each other by posting information, comments, messages, images, etc.
Machine Learning	A type of artificial intelligence (AI) that provides computers with the ability to learn without being explicitly programmed
Data Mining	This is about finding new information in a lot of data. The information obtained from data mining is hopefully both new and useful.
Predicted Outcome	The analyzed result from tweets.

1.4. Overview

This document includes two chapters, references and appendices. The second one provides an overview of the system functionality and system interaction with other systems. This chapter also introduces different types of stakeholders and their interaction with the system. Further, the chapter also mentions the system constraints and assumptions about the product.

In reference section, it includes some helpful documents and web sites which I refer to study to develop my User Opinion Predicting Algorithm.

In appendices section, it includes some document which is helpful to understand the system.

2. Overall Descriptions

The major reason which lead us to come up with this idea is unavailability of automated search in e-commerce web sites according to logged users taste. When we are logging in to the e-commerce web sites like eBay, amazon, Alibaba and they show us common products as suggestions. Sometimes, we struggle at searching items on these sites. The best solution is suggesting products according to the user tastes. Therefore, we think about the automating the search process of e-commerce web sites.

Natural Language Processing, Machine Learning and web mining techniques will be used in order to achieve main goals of this project.

First of all, we have to extract tweets(texts) of each users using Twitter API. In order to get key words and related emotions/feelings, we have to analyze these tweets using NLP and ML techniques.

Then, using these extracted key words and emotions/feelings we have to extract user opinions for each product or good of each user. That's mean is Negativity, Positivity or Neutrality for each product.

Then after, these extracted opinions for each product are deliver to further analyzing and decide what products suggesting or not the. After first logging, these suggestions will be validating. Therefore, automated search process will be more accurate.

2.1. Product perspective

This system is a web based product for e-commerce web sites developing using NLP, ML and Data Mining techniques. This product will be automating the search part of each e-commerce web sites. This can be done by Social Media Analyzing. First extract the Tweets(Texts) from the Twitter using Twitter API and get the key words(Products) and related emotions/feelings according to that product. These key words and emotions/feelings are analyzed by User Opinion Predicting Agent that will done by me and extract related Negativity, Positivity or Neutrality (User Opinion). Analyzing these key words and User Opinions by Trend Predicting Agent and Validation Agent, give the suggestions according to customer taste.

Now a day, there are some existing systems for this suggesting product. There are main two types of existing systems.

- **Content based recommendation Engines.**
  Content-based filtering methods are based on a description of the item and a profile of the user's preference.

- **Collaborative Recommendation Engines**
  collaborative filtering is a method of making automatic predictions (filtering) about the interests of a user by collecting preferences or taste information from many users (collaborating)

  There are some drawbacks in these existing systems. Such as

  - **Cold Start Problem**
    Once a new user is registered, this issue emerges with the recommendation engine. As the Engine, doesn't have sufficient data to predict a product recommendation the new users are not getting personalized recommendations.

- **Database Delay**

  One of the most important factor is the quick responsiveness of the database with the executed queries. In most of the recommendation engines, they use relational databases which are very inefficient when considering a growing data set.

- **No scalability of the system**

  Scalability is known as

  - High availability.
  - Redundancy in the face of server failures, both for the data and for the operational service.
  - Managing increasing read load.
  - Managing increasing data set size.
  - Managing increasing write load.

- **Inefficient data cluster management**

  To achieve best performance of the system, users should be clustered into different categories to predict the best matching product for the customer.

- **Usage of only one type of recommendation technology**

  Almost every existing recommendation engine only uses a single technology out of Content based recommendations and Collaborative Recommendation. In order to achieve the best personalized prediction, the both technologies should be used.

Table 1 illustrate some existing systems with their corresponding drawbacks.

	Netflix	**eBay**	**Amazon**	**Ali Express**	**Walmart**
Cold Start Problem	✓	✓	✓	✓	✓
Database delay	✓	X	✓	✓	✓
No scalability	X	X	X	X	X
Inefficient cluster management	✓	X	X	✓	✓
Usage of only one type of recommendation technology	✓	✓	✓	✓	✓

Table 1 : Evaluation of existing recommendation Engines

2.1.1. System interfaces

- Pycharm
- Python IDLE

2.1.2. User interfaces

According to our Research Project, we don't have implementing any user interfaces. We are mainly focusing on executing the Algorithm and extracting the related output. Therefore, we don't have to implement any user interfaces.

2.1.3. Hardware interfaces

Computer

- This is the main hardware which is needed in order to use the application using any browser (Google Chrome, Mozilla Firefox, Microsoft Edge, Safari) running any Operating System (Windows, Mac, Linux).

2.1.4. Software interfaces

Computer

Any OS.

- Windows
- Mac OS
- Linux
- Ubuntu

Internet Web Browser

Any browsing software.

- Google chrome
- Mozilla Firefox
- Microsoft Edge
- Safari

Data Base

- Neo 4j
- Apache Spark™

Developing Tools

- Pycharm
- Python IDLE

2.1.5. Communication interfaces

- Computer need a good internet connection to browsing the e-commerce web site.
- Server needs a strong internet connection to communicate with the application.

2.1.6. Memory constraints

- Computer need 1GB or higher RAM in order to run a browser software.

2.1.7. Operations

There is only one type of user. That is User of e-commerce web site. There are some user privileges are defines as follows.

- User Can Log in to the EC web site.
- User can search any item on EC web site.
- User can buy any product from EC web site.

2.2. Product functions

Natural Language Processing

- Analyze the Feelings/Emotions in order to extract Negativity, Positivity or Neutrality.
- Calculate the Opinion rating according to the extracted opinion.
    - 0 - Very Negative
    - 1 - Negative
    - 2 - Neutral
    - 3 - Positive
    - 4 - Very Positive

Use Case 01	User Login
Pre-conditions	User should be registered to the EC web site
Successful end condition	Redirect to the EC web home interface
Actors	User of EC web site
Main success scenario	1. Enter username 2. Enter passwords 3. Click login button
Extensions	1a. If the Username is invalid, system will prompt an error message and user should enter correct username again. 2a. If the Password is invalid, system will prompt an error message and user should enter correct password again.

Table 2 : Use Case 1 - User Login

Use Case 02	User Registration
Pre-conditions	User should have a computer with an internet connection
Successful end condition	Redirect to the EC web registration interface
Actors	User of EC web site
Main success scenario	1. Enter valid details in required field 2. Click login button
Extensions	1a. If one of required details is invalid, system will prompt an error message and user should enter correct details again.

Table 3 : Use Case 2 - User Registration

Use Case 03	Analyze feelings/emotions and extract opinion
Pre-conditions	Feelings/emotions should get from the csv file
Successful end condition	Successfully extract the user opinion from feelings/emotions
Actors	User of EC web site
Main success scenario	1. Pass the feelings/emotions to the Algorithm 2. Analyze 3. Return extracted opinion

Table 4 : Use Case 3 - Analyze and extract opinion

Use Case 04	Extract opinion rating
Pre-conditions	Opinions should be extracted from feelings/emotions
Successful end condition	Successfully extract the user opinion rating
Actors	User of EC web site
Main success scenario	1. Pass extracted opinion and Feeling/emotion to Algorithm 2. Analyze 3. Return extracted opinion rating

Table 5 : Use Case 4 - Extract opinion rating

2.3. User characteristics

This application is mainly targeting for clients who are using the EC web sites and as well as EC web site owners.

2.4. Constraints

Hardware Limitations

In order to run this application, user should have a computer with following requirements.

- 1GB or higher RAM
- Dual core 1.5GH_z or higher CPU

Software Limitations

The Latest version of any browsing software.

2.5. Assumptions and dependencies

When designing this system there are some assumptions observed. They are listed below

- Most of users have a computer with installed any browsing software.
- Users who interact with the EC web sites, have at least a slight knowledge about handling computers and internet things.
- Computers are with latest version of any browsing software.
- All users who interact with the EC web site, have a Twitter account.
- All users have a good Internet connectivity.

2.6. Apportioning of requirements

The requirements described in sections 1 and 2 of this document are referred to as primary specifications, those in section 3 are referred to as requirements (or functional) specifications. The two levels of requirements are intended to be consistent. Inconsistencies are to be logged as defects. In the event that a requirement is stated within both primary and functional specifications, the application will be built from functional specification since it is more detailed.

Essential requirements (referred to in section 3) are to be implemented for this version of "iRecommender for e-commerce".

3. Specific Requirements

3.1. Specific Requirements

3.1.1. User Interfaces

According to our Research Project, we don't have implementing any user interfaces. We are mainly focusing on executing the Algorithm and extracting the related output. In order to execute the Algorithm, I use Python Environment.

3.1.2. Hardware Interfaces

Computer

- This is the main hardware which is needed in order to use the application using any browser (Google Chrome, Mozilla Firefox, Microsoft Edge, Safari) running any Operating System (Windows, Mac, Linux).

3.1.3. Software interfaces

Computer

Any OS.

- Windows
- Mac OS
- Linux
- Ubuntu

Internet Web Browser

Any browsing software.

- Google chrome
- Mozilla Firefox
- Microsoft Edge
- Safari

Data Base

- Neo 4j
- Apache Spark™

3.1.4. Communication interfaces

- Computer need a good internet connection to browsing the e-commerce web site.
- Server needs a strong internet connection to communicate with the application.

3.2. Classes/Objects

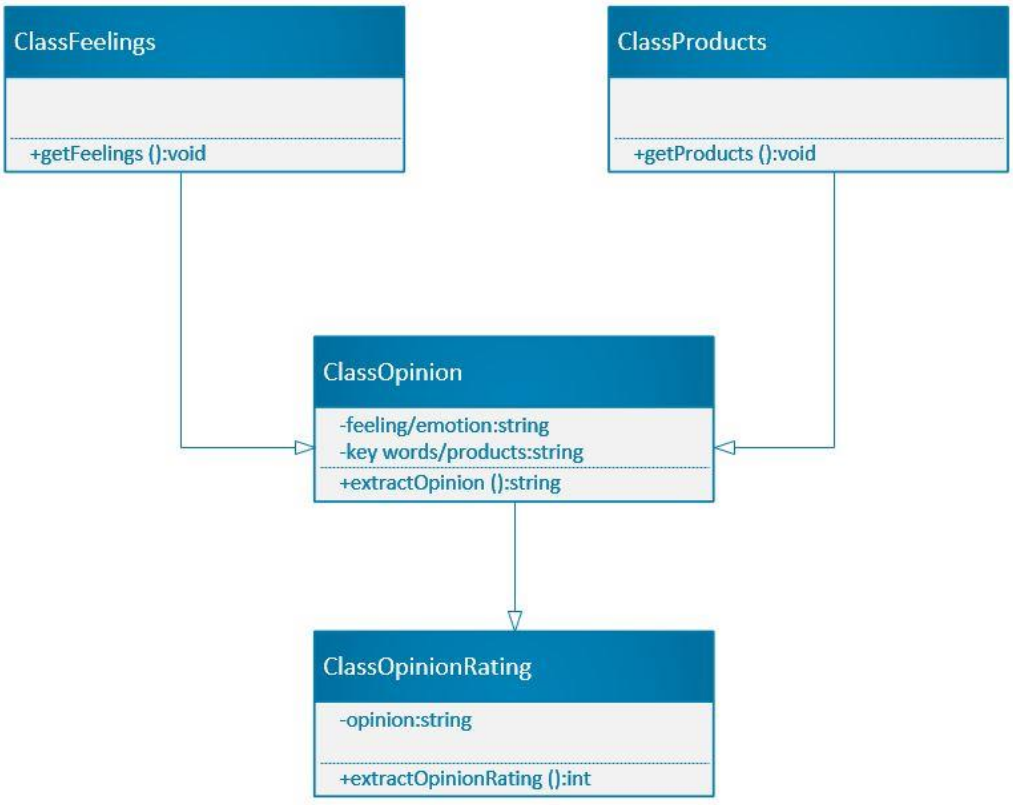

Figure 1 : Class Diagram – Opinion Extraction

3.3. Performance requirements

Our System will run on any kind of Operating System installed any web browsing software (Ex: Google Chrome, Mozilla Firefox, Microsoft Edge, Safari).

There are the types of performance requirements handle by the “iRecommender for e-commerce” product. They are,

- Response time
- How fast the system handles individual request
- Concurrency
- Scalability

In this system large number of users can interact with the system concurrently.

3.4. Design Constraints

In designing “iRecommender for e-commerce” System, there will be several constraints that are need to be considered.

- When user login to the EC web site, “iRecommender for e-commerce” should suggest the products to user without any delay.
- All the functions in the system should be always available and accessible.
- All the Information which are extracted from the system, should be stored in well-organized manner.

3.5. Software System Attributes

3.5.1. Reliability

These type of system should have high performance reliability. This system can be used by multiple users concurrently. Any user, who has minimum hardware and software requirements can use “iRecommender for e-commerce” System.

3.5.2. Availability

This system will be available during 24x7 hours. Also users can interact with the system continuously and easily. Every function of the system will be well-designed and tested before used.

3.5.3. Security

This system is secured as all the users can register with the EC web sites. They can use their own credentials to interact with the EC web sites and credentials can be changed at any time. All the password will be encrypted before saving by EC web site’s backend.

3.5.4. Maintainability

“iRecommender for e-commerce” will be developed as version by version. A new version of “iRecommender for e-commerce” will be released when the developers make any modifications to the application.

4. Supporting information

4.1. Appendices

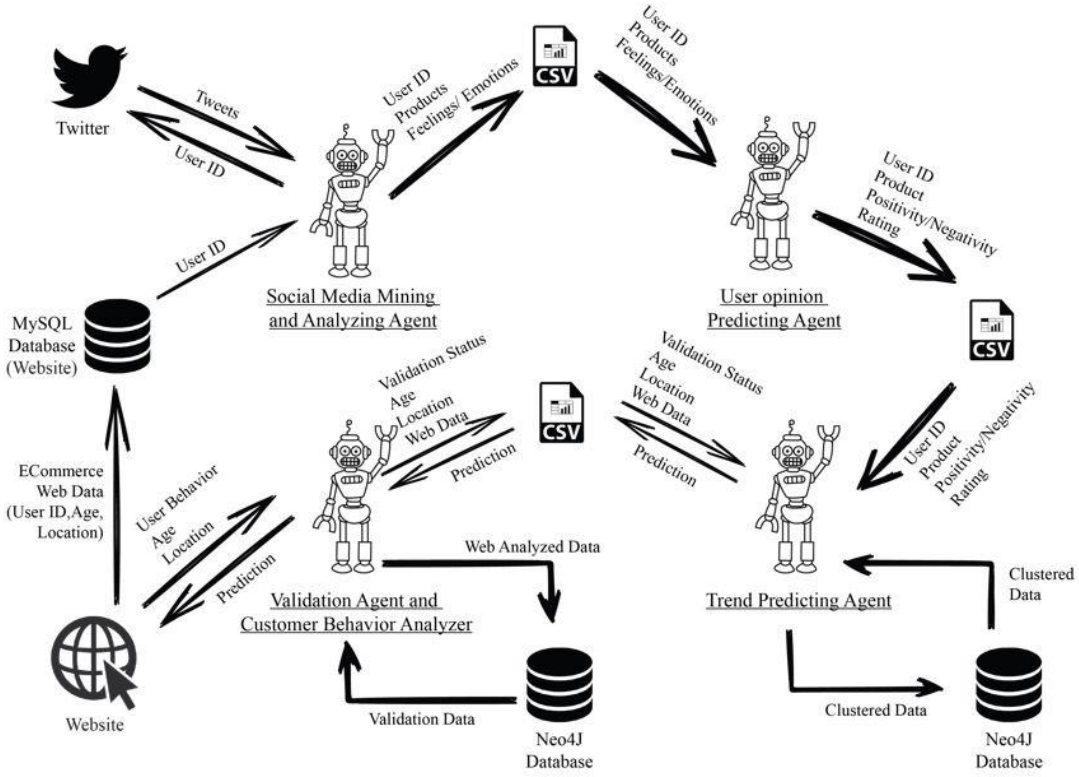

Figure 2 : "iRecommender" System architecture

5. References

[1] B. Liu, Sentiment Analysis and Subjectivity, Chicago: N. Indurkhya and F. J. Damerau, 2010.

[2] M. T. E. M. S. I. F. A. a. R. M. R. Syed Akib Anwar Hridoy, "Localized twitter opinion mining using sentiment analysis," 22 October 2015. [Online]. Available: https://decisionanalyticsjournal.springeropen.com/articles/10.1186/s40165-015-0016-4. [Accessed 20 February 2017].