

Assist Robot

Phase II

Project Report

Project Team – 8

Team Members

Priyadarsini Nidadavolu(17)

Deepthi Priyadarshini Penmetsa(22)

Dheeraja Vallabhaneni(28)

Tej Kumar Yentrapragada(33)

Table of Contents

Section	Description
1	Introduction
2	Project Goal and Objectives
3	Project Plan
	3.1 Schedule
	3.2 Project Timelines
	3.2.1 Team Members
	3.2.2 Tasks and Responsibilities
	3.3 Burndown Chart
4	Increment Report
	4.1 Increment based on Phases
	4.1.1 Phase 1 - Existing API
	4.1.2 Phase 2 - Recommendation System
	4.2 Design of Features
	4.3 Implementation
	4.4 Deployment
5	Project Management
	5.1 Implementation Status Reports
6	Bibliography

1. Introduction:

The main goal of the project is to help people in finding their misplaced objects. Basically humans have a tendency to forget their belongings somewhere in their house and search for it for hours together. For example, if I have an important business meeting to attend, but I don't remember where I placed my car keys, then I will be in huge loss. So to prevail in these circumstances here comes our Friendly Robot- My Friend which could assist me in keeping track of my personal things. So what this robot will do is that it will have entire map (laser scan) of the building and objects in the building in its memory. So we will feed the robot with the objects that are highly important to us, like car keys, some files, phone and laptop. This robot will keep its eye on these objects and notify their location to its master upon request. Additionally our Robot who will be an eFriend who will help us to choose the furniture to our home. Also our robot will suggest us the top rated books.

2. Project Goal and Objectives:

The primary goals of our project is described below:

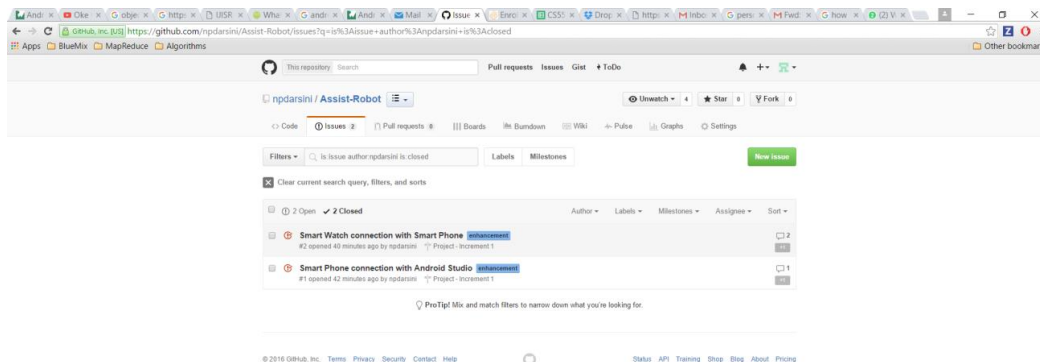
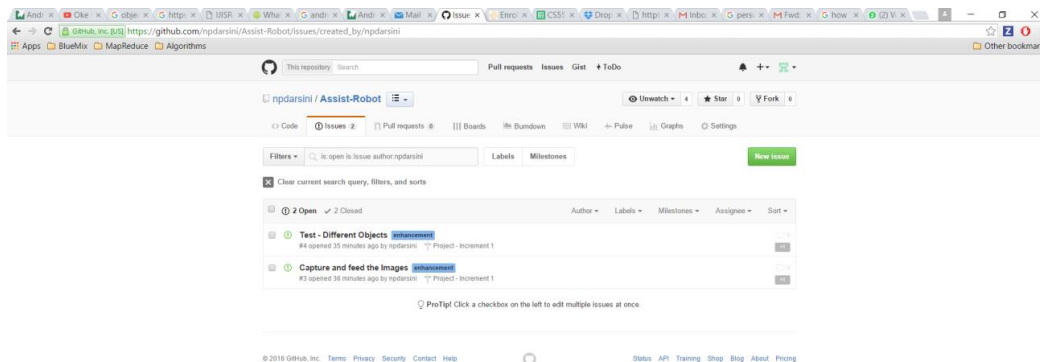
- To implement a module which has an interaction with robot. Eg: You can ask few questions to the robot and the Robot will be responding to you back. You can ask the robot about your misplaced phone. So that it will answer you after it had found the phone.
- To make the robot learn about the personal items like laptops, phones, watch, keys etc.
- To design a robot which can find the learned objects that are misplaced in a building.
- To build a recommendation system which will be able to recommend the list of books which are rated high and are related to our interests.
- To build a recommendation system which will suggest us about the latest furniture details, their quality and from which brand/ shop we could purchase from. This feature enables us to decorate our houses with rich interior designing.
- To send a notification to your smart watch when it finds the lost object.
- To remind the user about his day to day events that were previously taught.
- To make the robot act as an assistant in getting things specified by the user. (Mr Robot – Get me my phone).

- To make a single robot act as assistant to all the people living in same house. It recognizes the user first and then assists that particular user in finding the belongings.

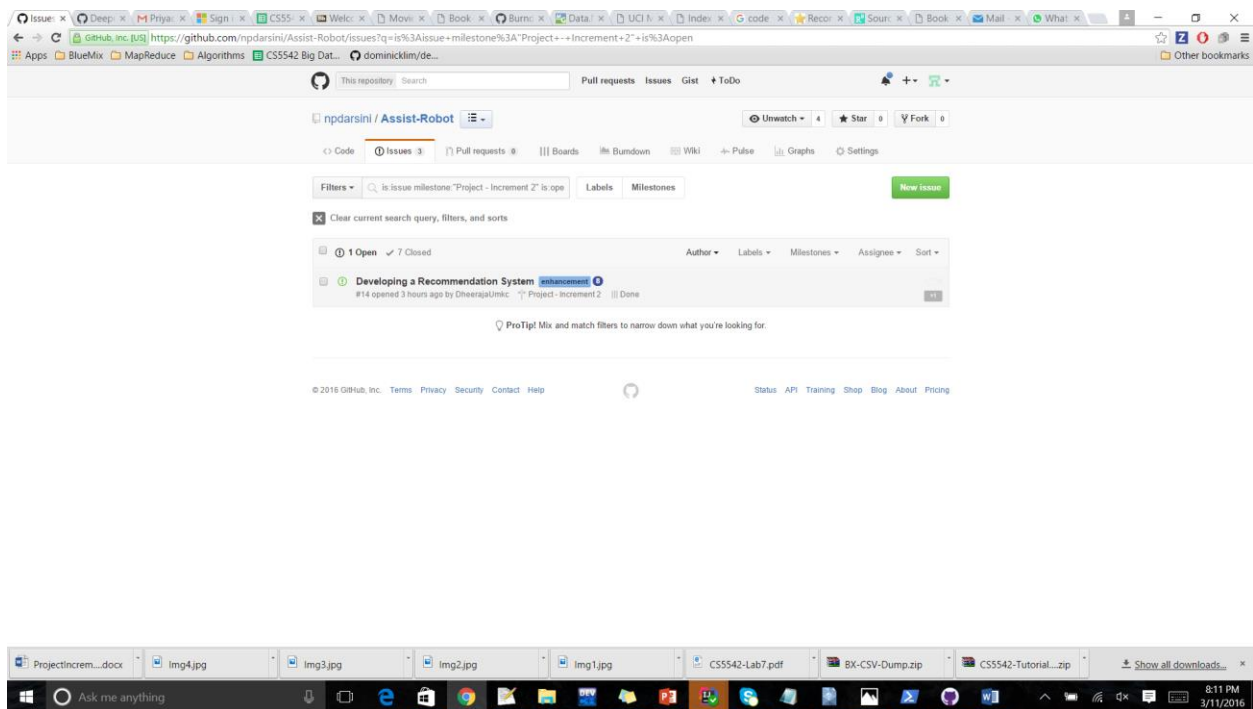
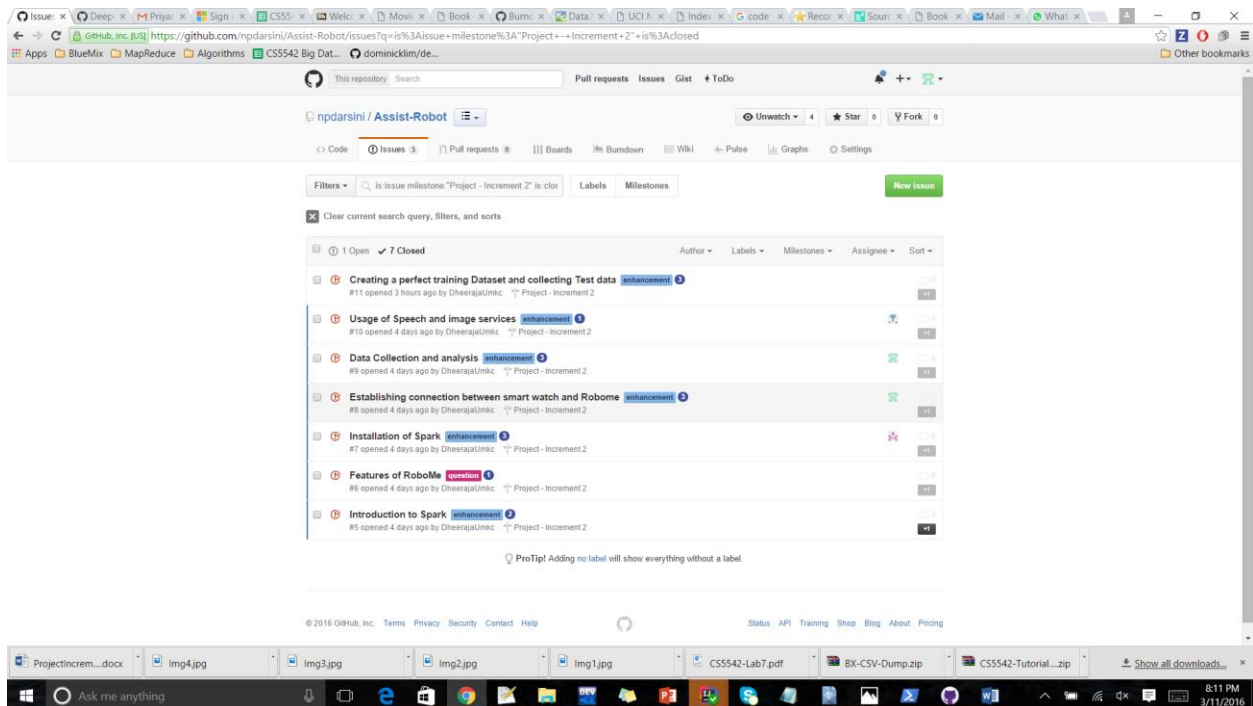
3. Project Plan:

3.1 Schedule:

Stories: Four user stories had been created as part of Iteration 1. Here are the snapshots for the stories which are in closed and opened state.



Stories: Eight user issues had been created as part of Iteration 2. Here are the snapshots for the stories which are in closed and opened state.



Board:

This screenshot shows a Kanban board for the repository `npdarsini/Assist-Robot`. The board is organized into columns: **New Issues**, **Backlog**, **To Do**, **In Progress**, **Done**, and **Closed**. The **To Do** column contains two items: `Assist-Robot #12` (Complete work flow) and `Assist-Robot #13` (Introduction to ML Algorithms). The **In Progress** column is empty. The **Done** column contains one item: `Assist-Robot #14` (Developing a Recommendation System). The **Closed** column contains eight items, including `Assist-Robot #11` (Creating a perfect training Dataset and collecting Test data), `Assist-Robot #9` (Data Collection and analysis), `Assist-Robot #10` (Usage of Speech and image services), `Assist-Robot #7` (Installation of Spark), `Assist-Robot #5` (Introduction to Spark), `Assist-Robot #8` (Establishing connection between smart watch and Robome), and two items labeled `enhancement`. The interface includes a search bar, a 'New issue' button, and a 'Add a Pipeline' button. The bottom of the screen shows a Windows taskbar with various application icons and the system clock at 8:11 PM on 3/11/2016.

Milestones:

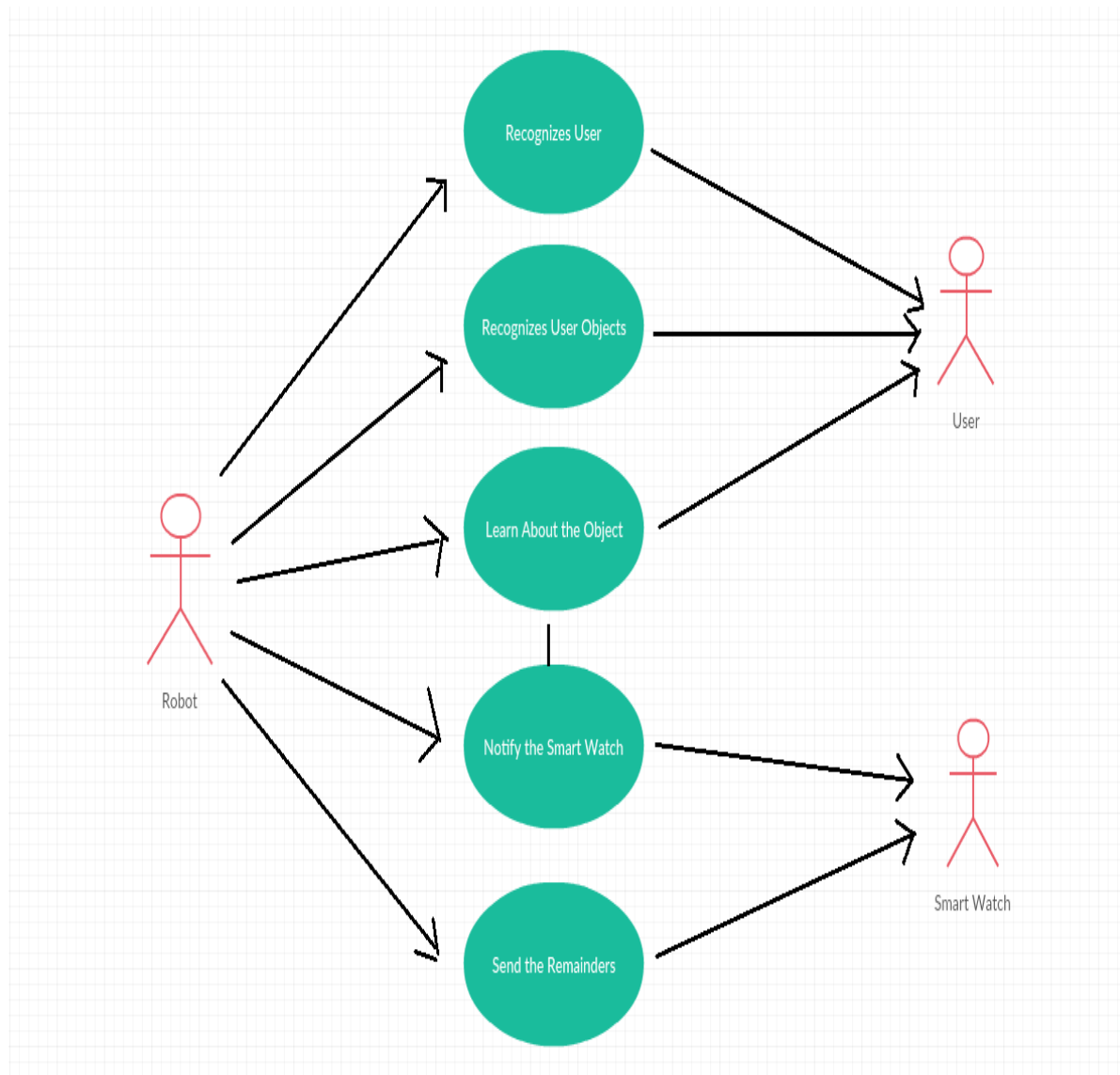
This screenshot shows the Milestones page for the repository `npdarsini/Assist-Robot`. The page displays a list of milestones with their progress bars, due dates, and completion status. The milestones are:

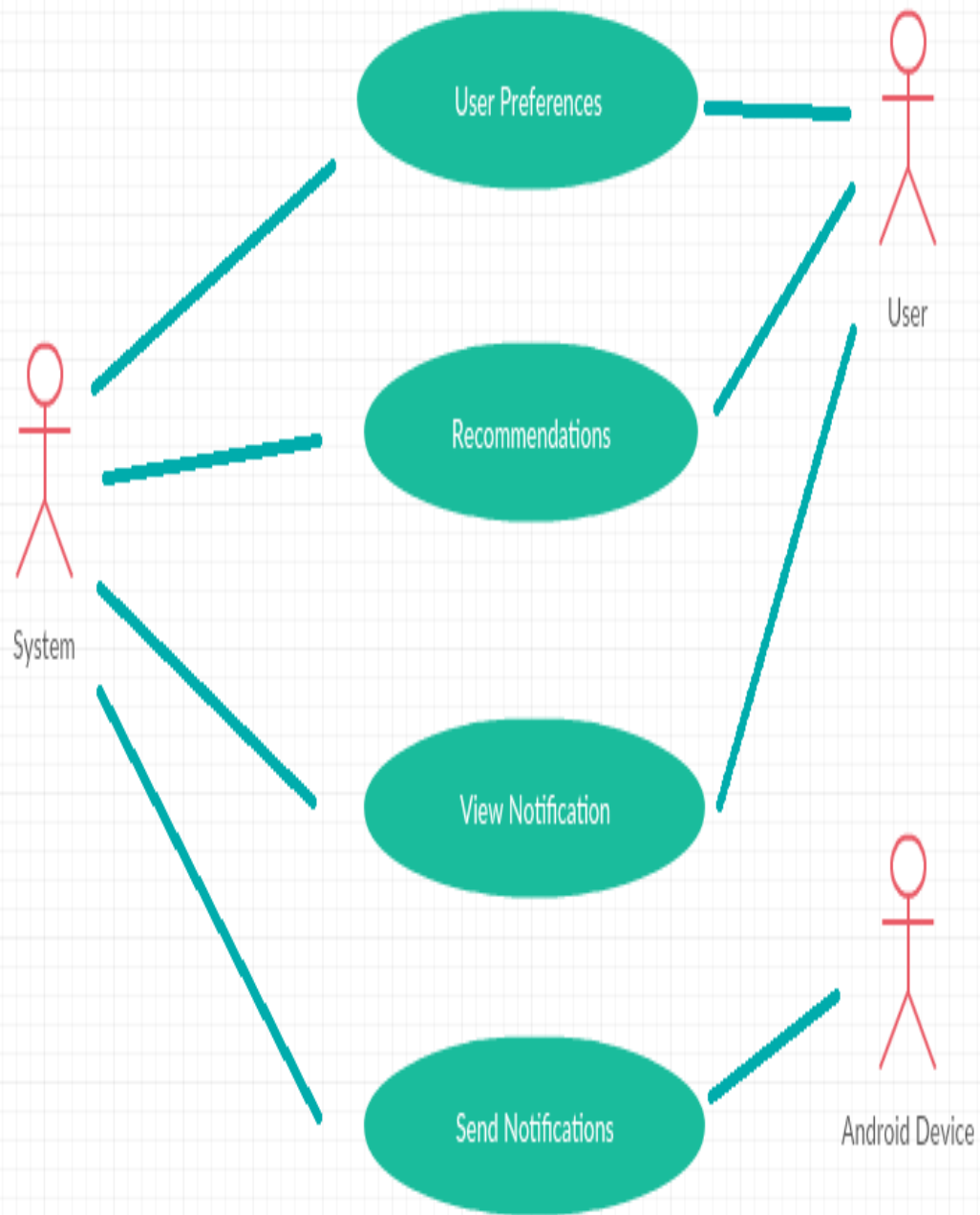
- Project - Increment 2**: Due by March 11, 2016. 87% complete. 1 open, 7 closed.
- Project - Increment 3**: Due by April 6, 2016. 0% complete. 2 open, 0 closed.
- Project - Increment 4**: Due by April 29, 2016. 0% complete. 0 open, 0 closed.
- Project - Video**: Due by May 2, 2016. 0% complete. 0 open, 0 closed.
- Project - Final Submission**: Due by May 6, 2016. 0% complete. 0 open, 0 closed.

The interface includes a 'New milestone' button and a 'Sort' dropdown. The bottom of the screen shows a Windows taskbar with various application icons and the system clock at 8:12 PM on 3/11/2016.

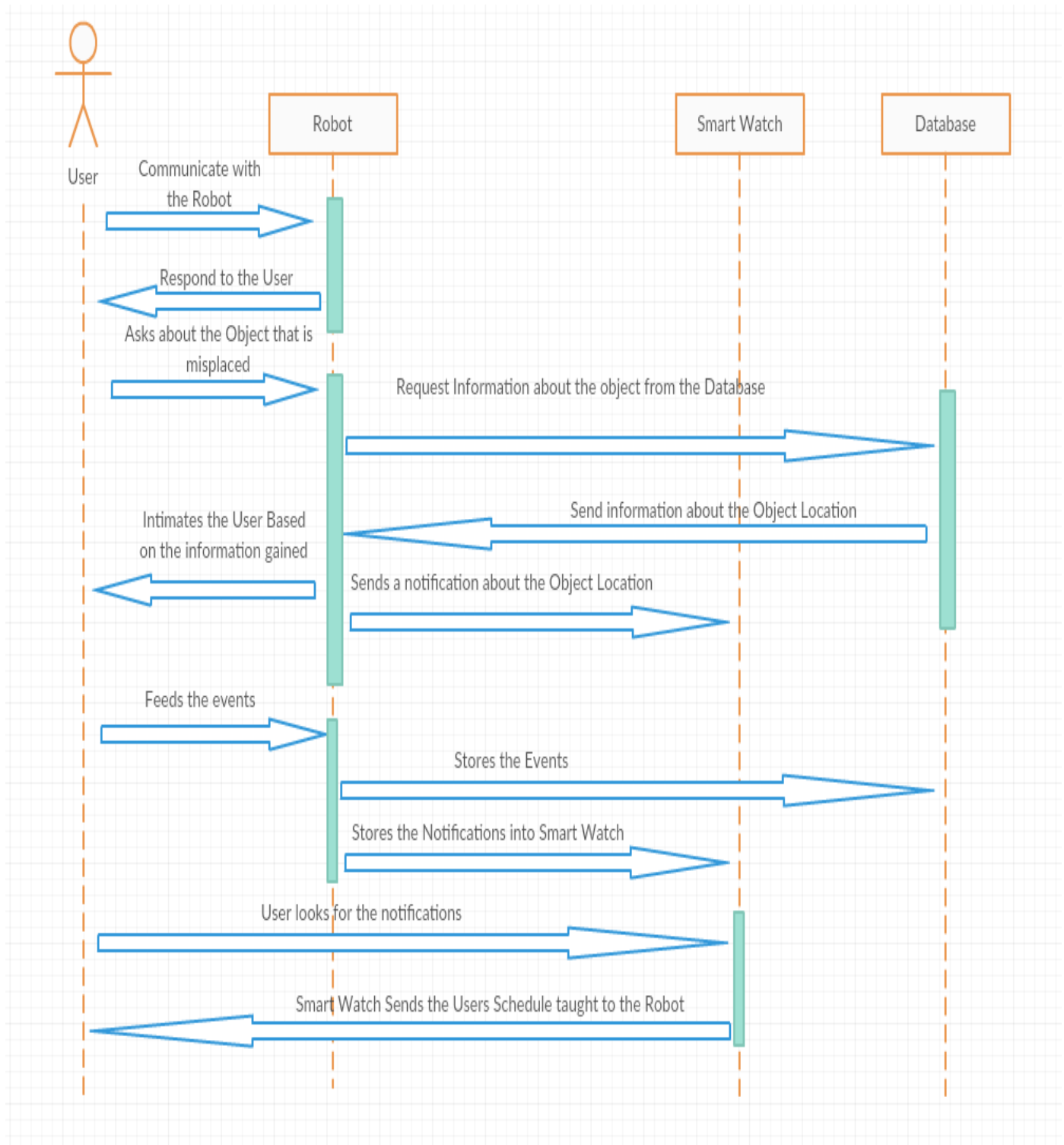
3.1.1 UML Diagrams:

Use Case Diagram

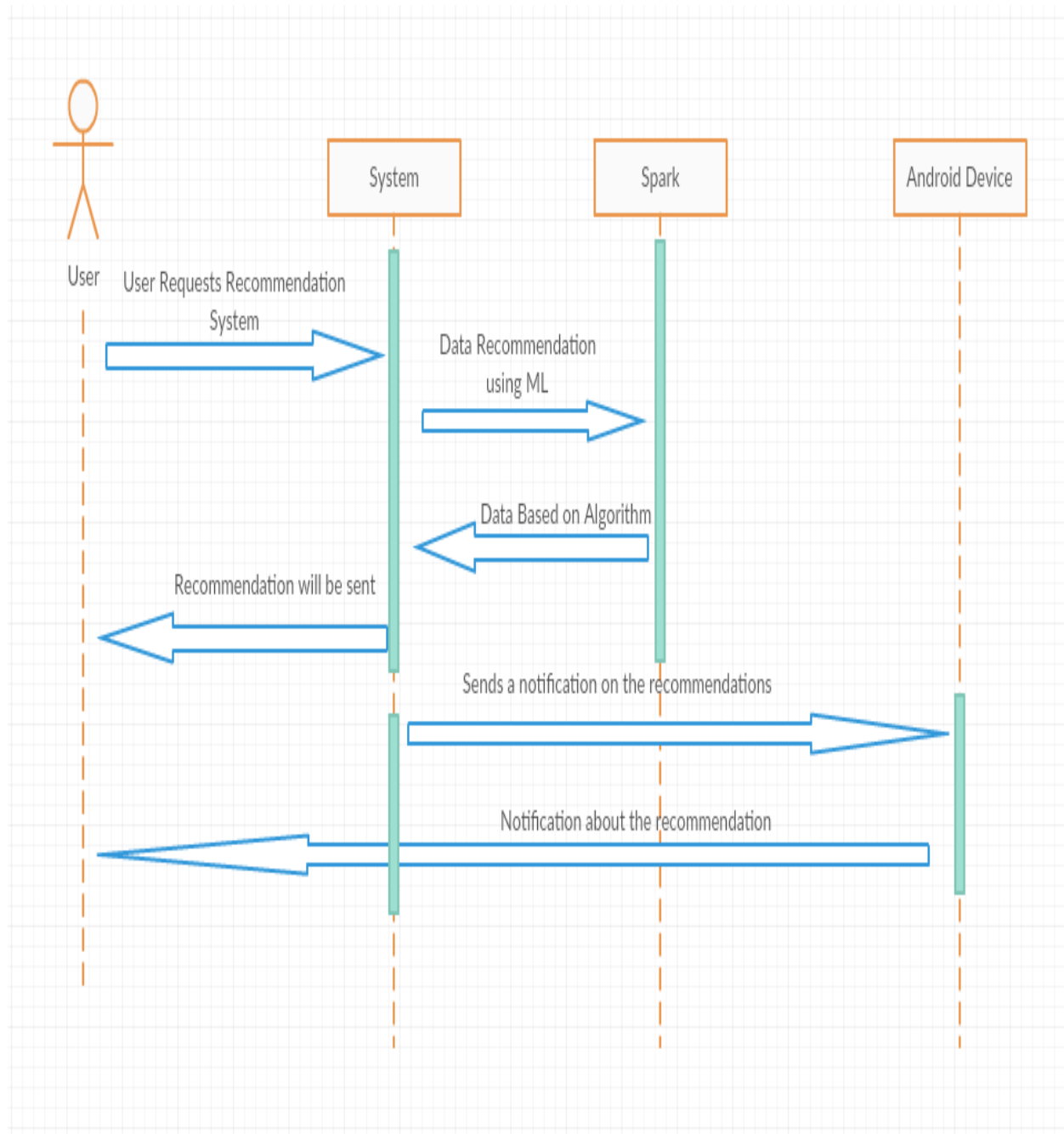




Sequence Diagram:



Sequence Diagram for Recommendation System



3.2 Project Timelines:

Increment	Deadline
Increment 1	19 February 2015
Increment 2	11 March 2016
Increment 3	6 April 2016
Increment 4	29 April 2016
Final Submission	6 May 2016

3.2.1 Team Members:

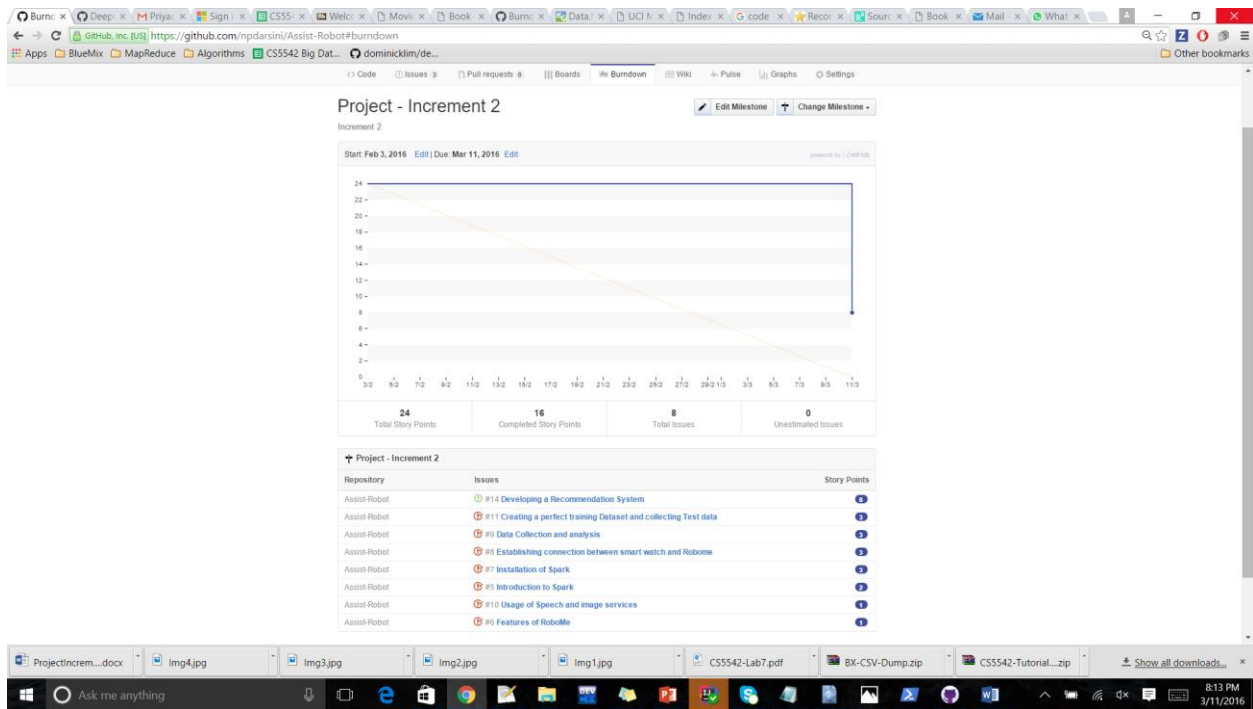
1. Priyadarsini Nidadavolu – 17
2. Deepthi Priyadarshini Penmetsa – 22
3. Dheeraja Vallabhaneni – 28
4. Tej Kumar Yentrapragada – 33

3.2.2 Tasks and Responsibilities:

- **Machine Learning and R Programming** – Deepthi Priyadarshini Penmetsa
- **Spark and Hadoop Technologies** – Priyadarsini Nidadavolu
- **Objective C and IOS Programming** – Tej Kumar Yentrapragada
- **Android Programming** - Dheeraja Vallabhaneni

3.3 Burndown Chart:

Burndown:



4. Increment Report

4.1 Incremental Explanations

4.1.1 Phase 1 -Existing API:

IBM Alchemy API

This API basically performs machine learning and natural language processing techniques. Some of its features include semantic text analysis, sentimental analysis, deep learning, face detection and reorganization, speech to text and vice versa conversions etc. In this we had used this API in order to recognize the objects that we want to teach the Robot.

Achievements upon using this API – The Robot could identify basic objects like laptop, phone, bottle etc.

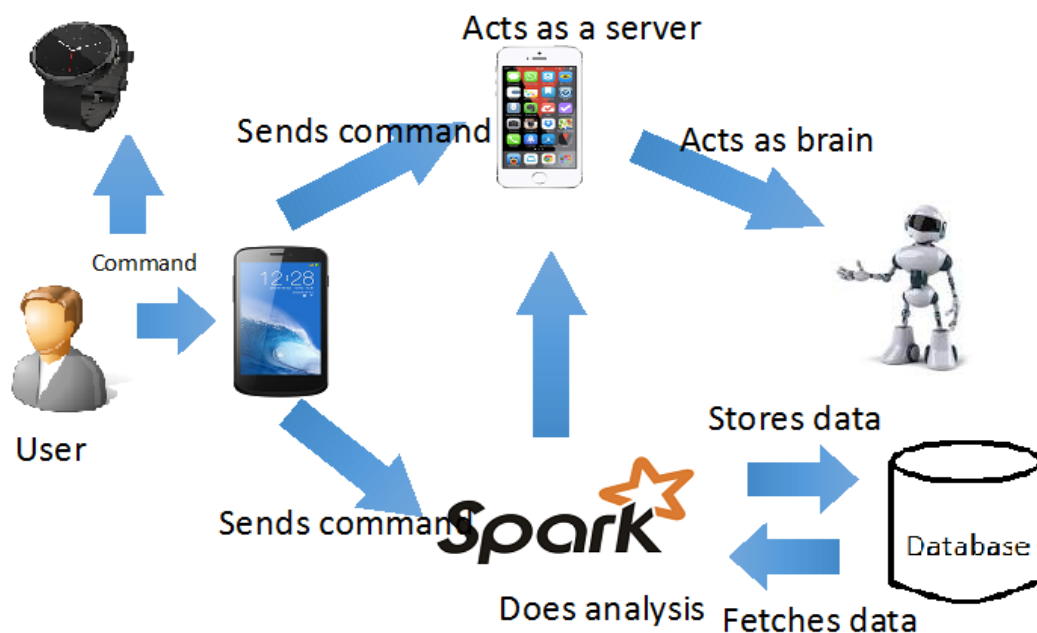
4.1.2 Phase 2 - Recommendation System:

In this phase we had developed two recommendation systems which can recommend the user about the popular furniture showrooms and the famous books. In this we provided the training set with user information (uid, name, ratings etc.), furniture information (list of showrooms, location) and the book information (name, author etc.).

The recommended notification has been sent to the android device (smart watch/phone) using Spark-Android Socket programming techniques.

4.2 Design of Features:

The architecture of our system could be like the user can give commands to the client device which is android phone. Further the Iphone which acts as a server could take commands from the android phone and passes it to the Robot. The Robot performs the necessary actions of the received command and return back to the Android Phone. It also sends the notifications to the Android Smart Watch. The Android device can also pass the command to the Spark and fetch the data from the database (MongoDB, Hadoop DB). Our system will be able to recommend the user based on the trained data sets and the notifications will be sent to the android device.



System Features

The following are the features that were developed as part of Phase I:

We had used IBM's Alchemy API and able to make our Robot to detect the object and return the object name as a result.

The following are the features that are developed as part of Phase II:

We had used machine learning algorithms to develop a recommendation system. In this phase we had developed two recommendation systems with which the system will be able to suggest top rated books to the user based on his interests and the furniture showrooms which could be available for cheaper prices with the location. Basically, we had provided the training data sets and the user preferences which serves as a key inputs for the system. We were also able to connect our system to the android device to which the recommendations has been sent.

4.3 Implementation:

Mobile Client Implementation – Snapshots

This snapshot shows us that the application is able to identify the object and names its Laptop.

ASUS

66% 8:13 PM

AlchemyAPI SDK

Enter URL:

Concepts

Entities

Keywords

Text

Sentiment

Taxonomy

Image Extraction

Combined

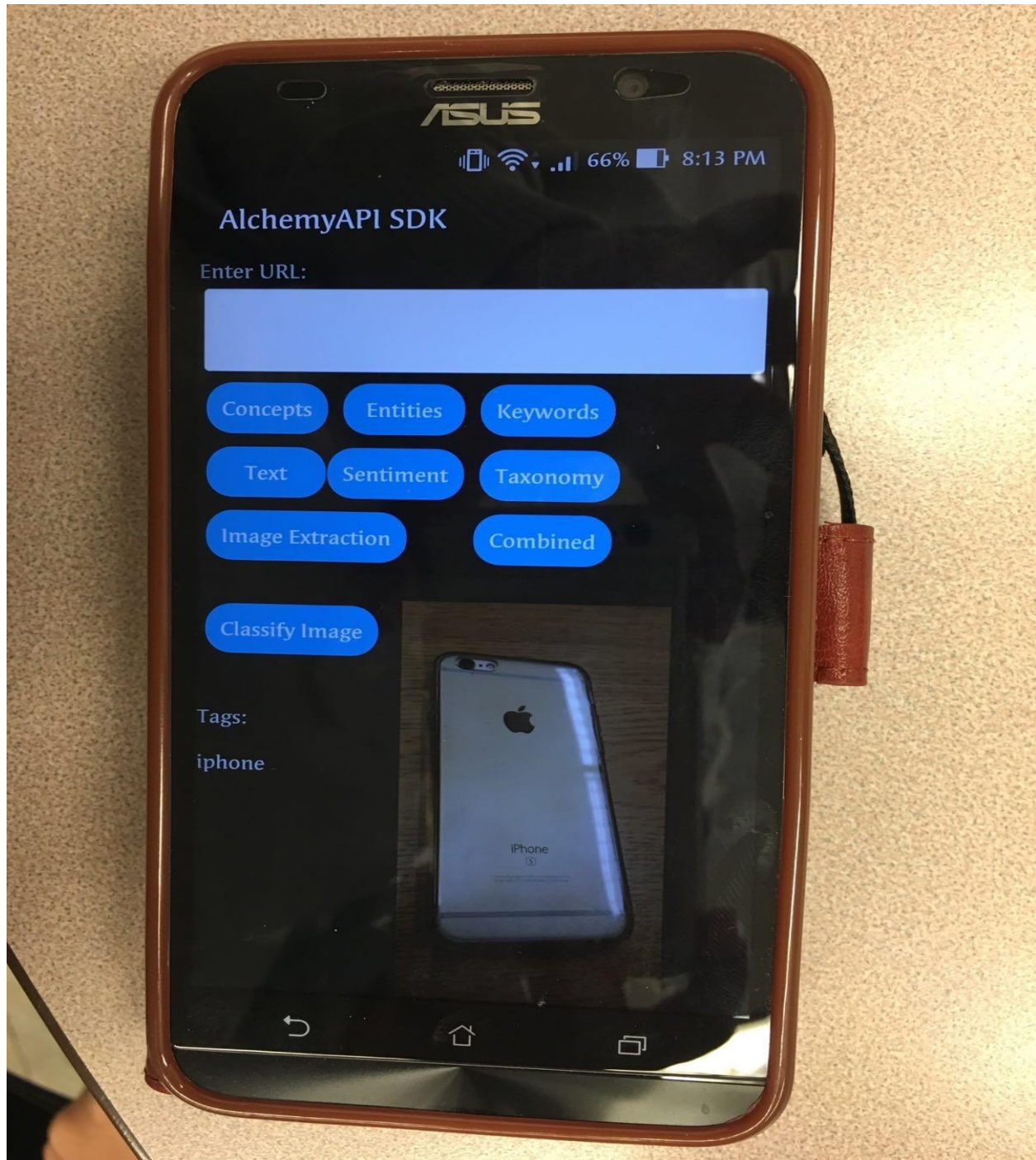
Classify Image

Tags:

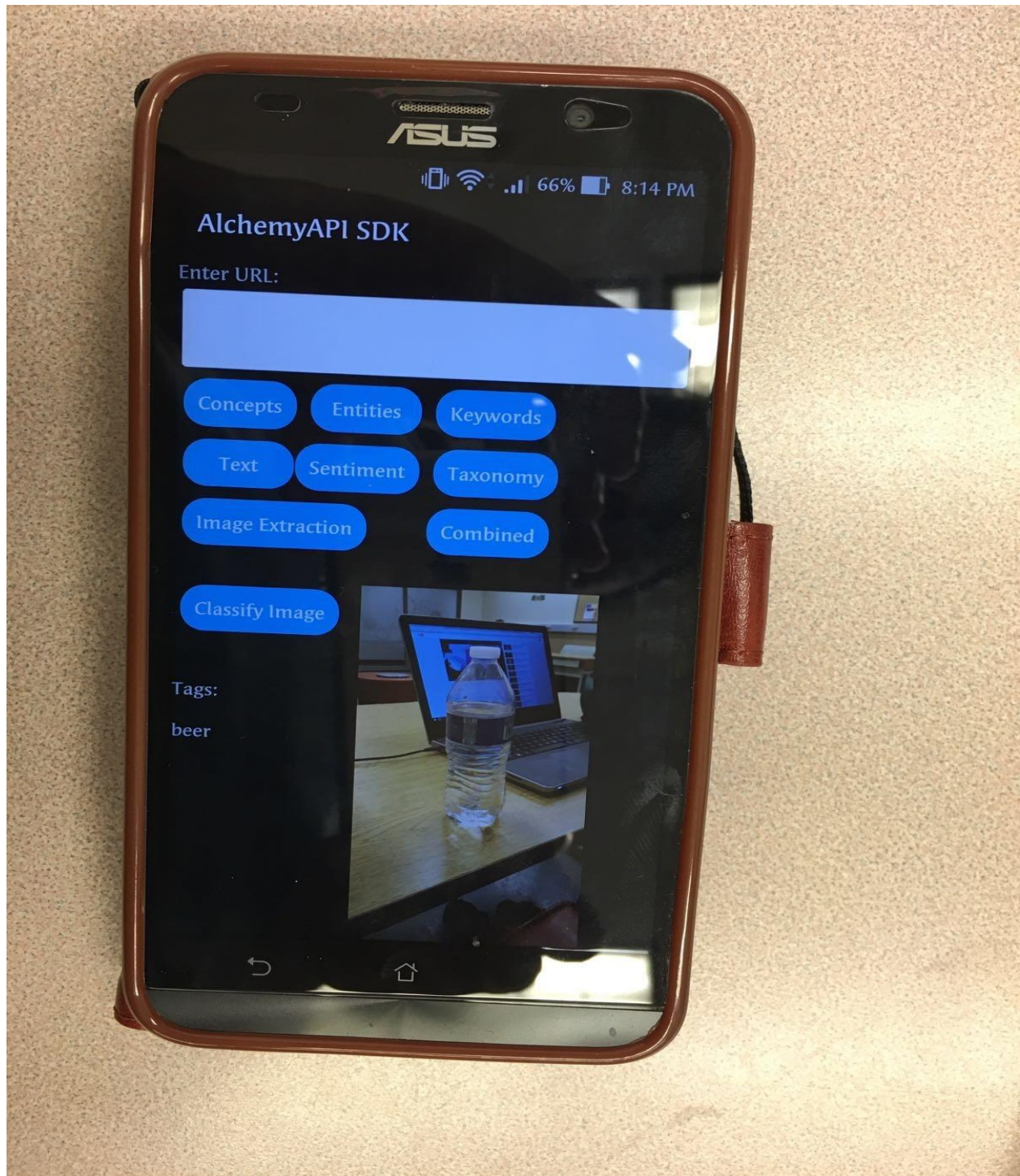
laptop
notebook



This snapshot shows us that the application is able to identify the object and names it as an Iphone.



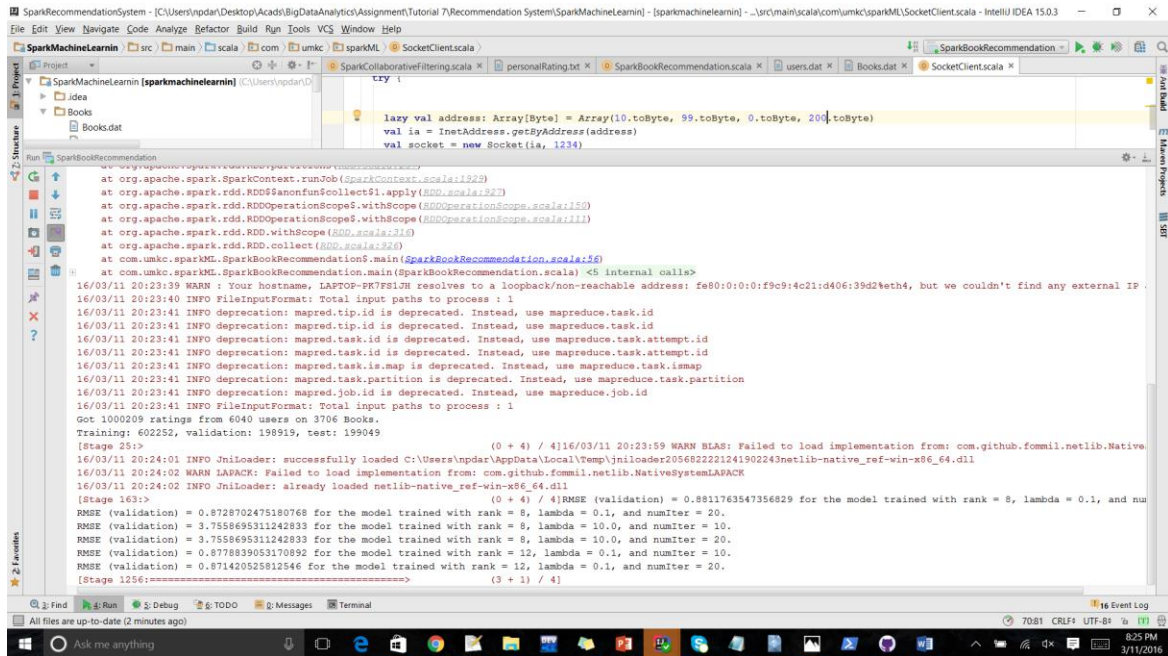
This snapshot shows us that the application is able to identify the bottle.



Recommendation System Snapshots:

Books Recommendation System:

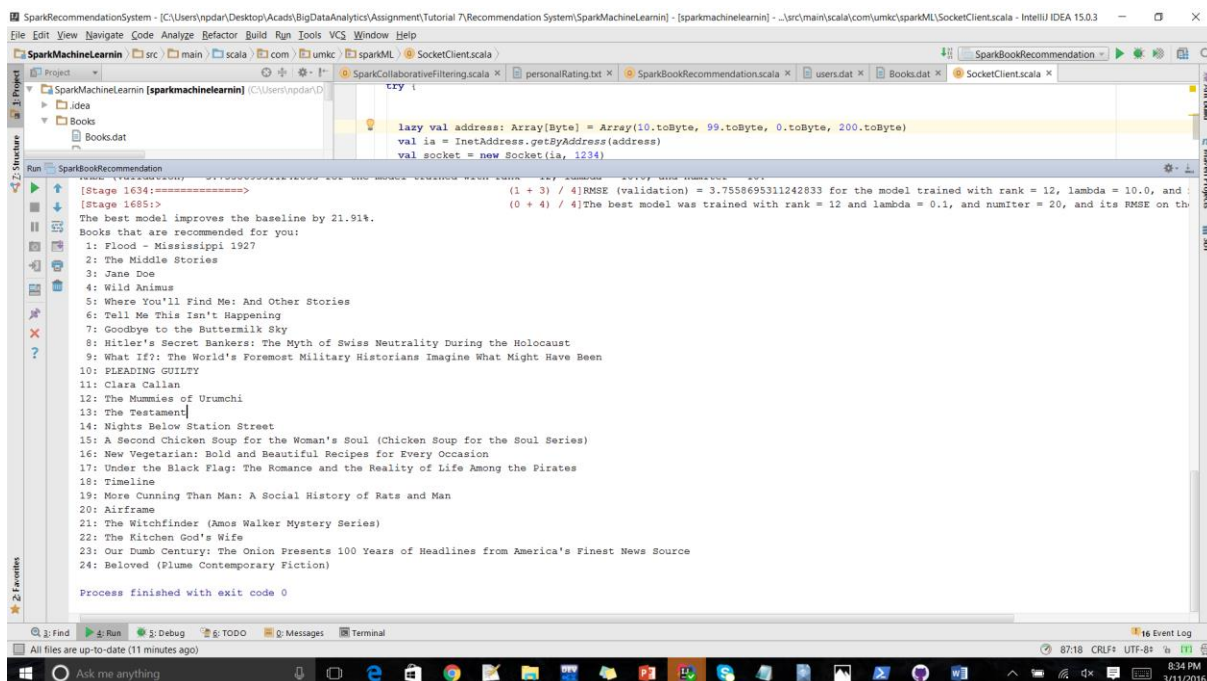
Phase at which the analyzation of training data set is taking place.



```
try {
    lazy val address: Array[Byte] = Array(10.toByte, 99.toByte, 0.toByte, 200.toByte)
    val ia = InetAddress.getByAddress(address)
    val socket = new Socket(ia, 1234)

    at org.apache.spark.SparkContext.runJob(SparkContext.scala:1329)
    at org.apache.spark.rdd.RDD$$anonfun$collect$1.apply(RDD.scala:327)
    at org.apache.spark.rdd.RDDOperationScope$.withScope(RDDOperationScope.scala:150)
    at org.apache.spark.rdd.RDD.withScope(RDD.scala:316)
    at org.apache.spark.rdd.RDD.collect(RDD.scala:326)
    at com.umkc.sparkML.SparkBookRecommendation$.main(SparkBookRecommendation.scala:56)
    at com.umkc.sparkML.SparkBookRecommendation.main(SparkBookRecommendation.scala) <5 internal calls>
16/03/11 20:23:39 WARN : Your hostname, LAPTOP-PRF5LJ1J resolves to a loopback/non-reachable address: fe80:0:0:0:f9c21:d406:39d2%eth4, but we couldn't find any external IP
16/03/11 20:23:40 INFO FileInputFormat: Total input paths to process : 1
16/03/11 20:23:41 INFO deprecation: mapred.tip.id is deprecated. Instead, use mapreduce.task.id
16/03/11 20:23:41 INFO deprecation: mapred.tip.id is deprecated. Instead, use mapreduce.task.id
16/03/11 20:23:41 INFO deprecation: mapred.task.id is deprecated. Instead, use mapreduce.task.attempt.id
16/03/11 20:23:41 INFO deprecation: mapred.task.id is deprecated. Instead, use mapreduce.task.attempt.id
16/03/11 20:23:41 INFO deprecation: mapred.task.id.map is deprecated. Instead, use mapreduce.task.id.map
16/03/11 20:23:41 INFO deprecation: mapred.task.partition is deprecated. Instead, use mapreduce.task.partition
16/03/11 20:23:41 INFO deprecation: mapred.job.id is deprecated. Instead, use mapreduce.job.id
16/03/11 20:23:41 INFO FileInputFormat: Total input paths to process : 1
Got 1000209 ratings from 6040 users on 3706 Books.
Training: 602252, validation: 198919, test: 199049
[Stage 25:] (0 + 4) / 416/03/11 20:23:59 WARN BLAS: Failed to load implementation from: com.github.fommil.netlib.Native
16/03/11 20:24:01 INFO UnLoader: successfully loaded C:\Users\mpdar\AppData\Local\Temp\jni-loader205682221241902243netlib-native_ref-win-x86_64.dll
16/03/11 20:24:02 WARN LAPACK: Failed to load implementation from: com.github.fommil.netlib.NativeSystemLAPACK
16/03/11 20:24:02 INFO UnLoader: already loaded netlib-native_ref-win-x86_64.dll
[Stage 163:] (0 + 4) / 41RMSE (validation) = 0.8911763547356829 for the model trained with rank = 8, lambda = 0.1, and numIter = 20.
RMSE (validation) = 0.8728702475180768 for the model trained with rank = 8, lambda = 0.1, and numIter = 20.
RMSE (validation) = 3.7558695311242833 for the model trained with rank = 8, lambda = 10.0, and numIter = 10.
RMSE (validation) = 3.7558695311242833 for the model trained with rank = 8, lambda = 10.0, and numIter = 20.
RMSE (validation) = 0.8778893053170892 for the model trained with rank = 12, lambda = 0.1, and numIter = 10.
RMSE (validation) = 0.871420525812546 for the model trained with rank = 12, lambda = 0.1, and numIter = 20.
[Stage 1256:] (3 + 1) / 41
```

Recommended Books



```
[Stage 1634:] (1 + 3) / 41RMSE (validation) = 3.7558695311242833 for the model trained with rank = 12, lambda = 10.0, and numIter = 20.
[Stage 1685:] (0 + 4) / 41The best model was trained with rank = 12 and lambda = 0.1, and numIter = 20, and its RMSE on the test set was 0.871420525812546.
The best model improves the baseline by 21.91%.
Books that are recommended for you:
1: Flood - Mississippi 1927
2: The Middle Stories
3: Jane Doe
4: Wild Animus
5: Where You'll Find Me: And Other Stories
6: Tell Me This Isn't Happening
7: Goodbye to the Buttermilk Sky
8: Hitler's Secret Bankers: The Myth of Swiss Neutrality During the Holocaust
9: What If?: The World's Foremost Military Historians Imagine What Might Have Been
10: PLEADING GUILTY
11: Clara Callan
12: The Mummies of Urumchi
13: The Testament
14: Nights Below Station Street
15: A Second Chicken Soup for the Woman's Soul (Chicken Soup for the Soul Series)
16: New Vegetarian: Bold and Beautiful Recipes for Every Occasion
17: Under the Black Flag: The Romance and the Reality of Life Among the Pirates
18: Timeline
19: More Cunning Than Man: A Social History of Rats and Man
20: Airframe
21: The Witchfinder (Amos Walker Mystery Series)
22: The Kitchen God's Wife
23: Our Dumb Century: The Onion Presents 100 Years of Headlines from America's Finest News Source
24: Beloved (Plume Contemporary Fiction)

Process finished with exit code 0
```

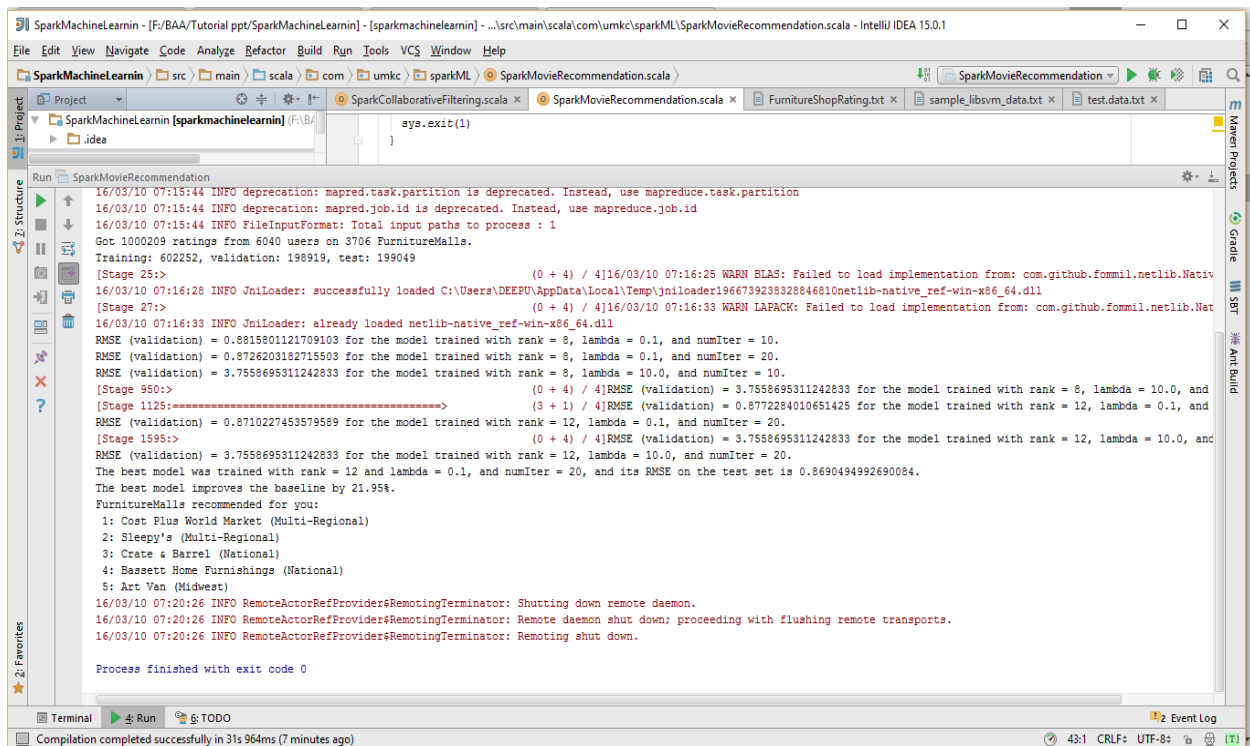
We had also sent the recommended books to the smart phone as a notification:



Furniture Malls Recommendation System

```
16/03/10 07:16:11 INFO FileInputFormat: Total input paths to process : 1
Got 1000209 ratings from 6040 users on 3706 FurnitureMalls.
Training: 602252, validation: 198919, test: 199049
[Stage 25:>] (0 + 4) / 4]16/03/10 07:16:25 WARN BLAS: Failed to load implementation from: com.github.fommil.netlib.Native
16/03/10 07:16:28 INFO JniLoader: successfully loaded C:\Users\DEEPU\AppData\Local\Temp\jni_loader1966739238328846810netlib-native_ref-win-x86_64.dll
[Stage 27:>] (0 + 4) / 4]16/03/10 07:16:33 WARN LAPACK: Failed to load implementation from: com.github.fommil.netlib.Native
16/03/10 07:16:33 INFO JniLoader: already loaded netlib-native_ref-win-x86_64.dll
RMSE (validation) = 0.8815801121709103 for the model trained with rank = 8, lambda = 0.1, and numIter = 10.
RMSE (validation) = 0.8726203182715503 for the model trained with rank = 8, lambda = 0.1, and numIter = 20.
RMSE (validation) = 3.7558695311242833 for the model trained with rank = 8, lambda = 10.0, and numIter = 10.
[Stage 950:>] (0 + 4) / 4]RMSE (validation) = 3.7558695311242833 for the model trained with rank = 8, lambda = 10.0, and
[Stage 1125:>] (3 + 1) / 4]RMSE (validation) = 0.8772284010651425 for the model trained with rank = 12, lambda = 0.1, and
RMSE (validation) = 0.8710227453579589 for the model trained with rank = 12, lambda = 0.1, and numIter = 20.
[Stage 1595:>] (0 + 4) / 4]RMSE (validation) = 3.7558695311242833 for the model trained with rank = 12, lambda = 10.0, and
RMSE (validation) = 3.7558695311242833 for the model trained with rank = 12, lambda = 10.0, and numIter = 20.
The best model was trained with rank = 12 and lambda = 0.1, and numIter = 20, and its RMSE on the test set is 0.8690494992690084.
The best model improves the baseline by 21.95%.
```

This Screenshot shows the Furniture Malls recommended to you:



The notification has been sent to the android mobile which shows the recommended furniture list.



4.4 Deployment:

Git Hub Link:

<https://github.com/npdarsini/Assist-Robot>

5. Project Management:

5.1 Implementation status report:

35% implementation has been implemented. This phase involves the development of recommendation systems with which the user will be notified about the top rated books and the best place to buy his/her furniture. Also the notification will be sent to the connected android device, to make the user work easier. The team members has an equal contribution towards the development and it took around 5 complete days to give an outlook for this phase. First we had tried developing a recommendation system for books, and had used this knowledge to develop the Furniture Recommendation System. Later the notification has been sent to the android device. Assuming the user will be carrying the smart android device every single time, we thought that this could be as an innovative thought as the user don't need to look for the advice in the system every time.

Developing a Recommendation System #14

DheerajUnk commented 4 hours ago · 0 comments

Recommendation System plays a vital role in our project

DheerajUnk added the enhancement label 4 hours ago

DheerajUnk added this to the Project - Increment 2 milestone 4 hours ago

DheerajUnk set the estimate to 8 4 hours ago

DheerajUnk changed the pipeline from In Progress to Done 3 hours ago

npdarsini changed the title from Introduction to Recommendation Systems to Developing a Recommendation System 33 minutes ago

Write Preview

Leave a comment

Attach files by dragging & dropping, selecting them, or pasting from the clipboard.

Close issue Comment

Labels: enhancement

Milestone: Project - Increm...

Estimate: 8

Assignee: No one—assign yourself

Notifications: Unsubscribe

1 participant

Lock conversation

Move issue

Export issue

20160311182720.jpg Q4.jpg ProjectIncr...docx img4.jpg img3.jpg img2.jpg img1.jpg CS5542-Lab7.pdf

8:44 PM 3/11/2016

Creating a perfect training Dataset and collecting Test data #11

DheerajUnk opened this issue 4 hours ago · 0 comments

Test data helps in finding the results and to understand the need for enhancement of the training data

DheerajUnk added the enhancement label 4 hours ago

DheerajUnk added this to the Project - Increment 2 milestone 4 hours ago

DheerajUnk set the estimate to 3 4 hours ago

DheerajUnk changed the pipeline from In Progress to Done 3 hours ago

DheerajUnk closed this 2 hours ago

Write Preview

Leave a comment

Attach files by dragging & dropping, selecting them, or pasting from the clipboard.

Reopen issue Comment

Labels: enhancement

Milestone: Project - Increm...

Estimate: 3

Assignee: No one—assign yourself

Notifications: Unsubscribe

1 participant

Lock conversation

Move issue

Export issue

20160311182720.jpg Q4.jpg ProjectIncr...docx img4.jpg img3.jpg img2.jpg img1.jpg CS5542-Lab7.pdf

8:47 PM 3/11/2016

Browser tabs: Data, Deep, Priya, Sign, CS55, Welc, Move, Book, Burn, Data, UCI, Index, code, Recor, Sour, Book, Mail, What, Other bookmarks

Address bar: <https://github.com/npdarsini/Assist-Robot/issues/9>

Data Collection and analysis #9

Closed DheerajUnk commented 4 days ago 0 comments

Labels: enhancement

Milestone: Project - Increme...

Estimate: 3

Assignee: npdarsini

Notifications: Unsubscribe

Participants: 2 participants

Lock conversation: Lock conversation

Buttons: Move Issue, Export Issue

Activity:

- DheerajUnk commented 4 days ago: Collection of data related to project. analyzing it and making it useful to the project
- DheerajUnk added this to the Project - Increment 2 milestone 4 days ago
- DheerajUnk added the enhancement label 4 days ago
- DheerajUnk set the estimate to 3 4 days ago
- DheerajUnk changed the pipeline from New Issues to In Progress 4 hours ago
- DheerajUnk changed the estimate from 3 to 5 4 hours ago
- npdarsini was assigned by DheerajUnk 4 hours ago
- DheerajUnk closed this 4 hours ago
- DheerajUnk reopened this 4 hours ago
- DheerajUnk changed the title from Issue5 to Data Collection and analysis 4 hours ago
- DheerajUnk changed the estimate from 5 to 3 4 hours ago
- DheerajUnk changed the estimate from 3 to 5 4 hours ago
- DheerajUnk changed the estimate from 5 to 3 4 hours ago
- DheerajUnk closed this 3 hours ago

Taskbar: 20160311182720.jpg, Q4.jpg, ProjectIncr...door, img4.jpg, img3.jpg, img2.jpg, img1.jpg, CS5542-Lab7.pdf, Show all downloads...

System tray: 8:46 PM 3/11/2016

Browser tabs: Estabi, Deep, Priya, Sign, CS55, Welc, Move, Book, Burn, Data, UCI, Index, code, Recor, Sour, Book, Mail, What, Other bookmarks

Address bar: <https://github.com/npdarsini/Assist-Robot/issues/8>

Establishing connection between smart watch and Robome #8

Closed DheerajUnk opened this issue 4 days ago 0 comments

Labels: enhancement

Milestone: Project - Increme...

Estimate: 3

Assignee: npdarsini

Notifications: Unsubscribe

Participants: 2 participants

Lock conversation: Lock conversation

Buttons: Move Issue, Export Issue

Activity:

- DheerajUnk commented 4 days ago: We send a notification from robome to smartwatch
- DheerajUnk added the enhancement label 4 days ago
- npdarsini was assigned by DheerajUnk 4 days ago
- DheerajUnk set the estimate to 3 4 days ago
- npdarsini changed the pipeline from To Do to Backlog 3 days ago
- DheerajUnk changed the pipeline from Backlog to Done 5 hours ago
- DheerajUnk added this to the Project - Increment 2 milestone 4 days ago
- DheerajUnk changed the title from Issue4 to Establishing connection between smart watch and Robome 4 hours ago
- DheerajUnk closed this 4 hours ago
- DheerajUnk reopened this 4 hours ago
- DheerajUnk closed this 3 hours ago

Taskbar: 20160311182720.jpg, Q4.jpg, ProjectIncr...door, img4.jpg, img3.jpg, img2.jpg, img1.jpg, CS5542-Lab7.pdf, Show all downloads...

System tray: 8:45 PM 3/11/2016

Installation of Spark #7

Closed DheerajaUnk commented 4 days ago · 0 comments

DheerajaUnk commented 4 days ago
Since usage of spark makes the project more flexible because of availability of RDDs

DheerajaUnk added the **enhancement** label 4 days ago

dunt10 was assigned by DheerajaUnk 4 days ago

DheerajaUnk added this to the **Project - Increment 2** milestone 4 days ago

DheerajaUnk set the estimate to 3 4 days ago

npdarsini changed the pipeline from **To Do** to **Backlog** 3 days ago

DheerajaUnk changed the title from **Issue 3** to **Installation of Spark** 4 hours ago

dunt10 was unassigned by DheerajaUnk 4 hours ago

DheerajaUnk changed the pipeline from **Backlog** to **Done** 4 hours ago

Deepu23start was assigned by DheerajaUnk 4 hours ago

DheerajaUnk closed this 4 hours ago

DheerajaUnk reopened this 4 hours ago

DheerajaUnk closed this 4 hours ago

Labels: **enhancement**

Milestone: **Project - Increment...**

Estimate: **3**

Assignee: **Deepu23start**

Notifications: **Unsubscribe**

3 participants

Lock conversation

Move issue

Export issue

Features of RoboMe #6

Closed DheerajaUnk opened this issue 4 days ago · 0 comments

DheerajaUnk commented 4 days ago
Going through the features of Robome and what all can be derived using its basic features

DheerajaUnk added **enhancement** **question** labels 4 days ago

Deepu23start was assigned by DheerajaUnk 4 days ago

DheerajaUnk added this to the **Project - Increment 2** milestone 4 days ago

DheerajaUnk set the estimate to 5 4 days ago

npdarsini changed the pipeline from **In Progress** to **To Do** 3 days ago

npdarsini changed the pipeline from **To Do** to **In Progress** 3 days ago

DheerajaUnk changed the pipeline from **In Progress** to **Done** 5 hours ago

DheerajaUnk removed the **enhancement** label 4 hours ago

Deepu23start was unassigned by DheerajaUnk 4 hours ago

DheerajaUnk changed the estimate from 5 to 1 4 hours ago

npdarsini was assigned by DheerajaUnk 4 hours ago

npdarsini was unassigned by DheerajaUnk 4 hours ago

Labels: **question**

Milestone: **Project - Increment...**

Estimate: **1**

Assignee: **No one—assign yourself**

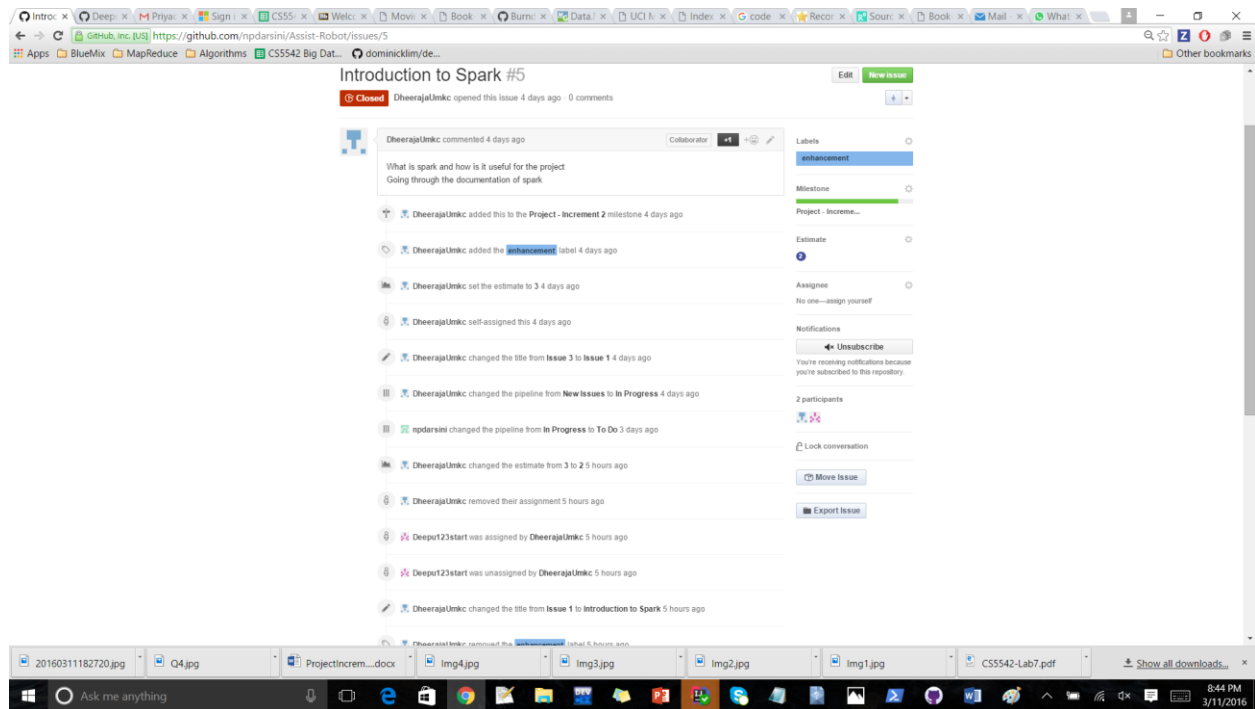
Notifications: **Unsubscribe**

3 participants

Lock conversation

Move issue

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Bibliography:

Lab Tutorials and the material provided by Dr. Lee.