SAN JOSÉ STATE UNIVERSITY | CHARLES W. DAVIDSON COLLEGE OF ENGINEERING

foodcoin

FoodCoin : Food wastage reduction application for Restaurants

CMPE 272 Enterprise Software Platforms
Team Project Report

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1. Introduction

1.1. Problem statement:

Approximately 40 percent of food in the United States itself goes to waste. That entails that Americans are throwing out roughly $165 billions worth of food every year.

Cutting down food losses by mere 15 percent has the potential to suffice for nourishing more than 25 million Americans each year on top the the current situation where one in six Americans miss a regular supply of food to eat. Improving over the efficiency of our food management system is a triple-bottom-line solution that needs collective efforts by businesses, governments and consumers. [1]

Businesses should make use of the opportunities to streamline the processes within their organizational structure, in order to minimise food losses and maximise revenue.

This is where we fit in. We provide solutions for businesses to optimize their operations enabling them to reduce food wastage and save money.

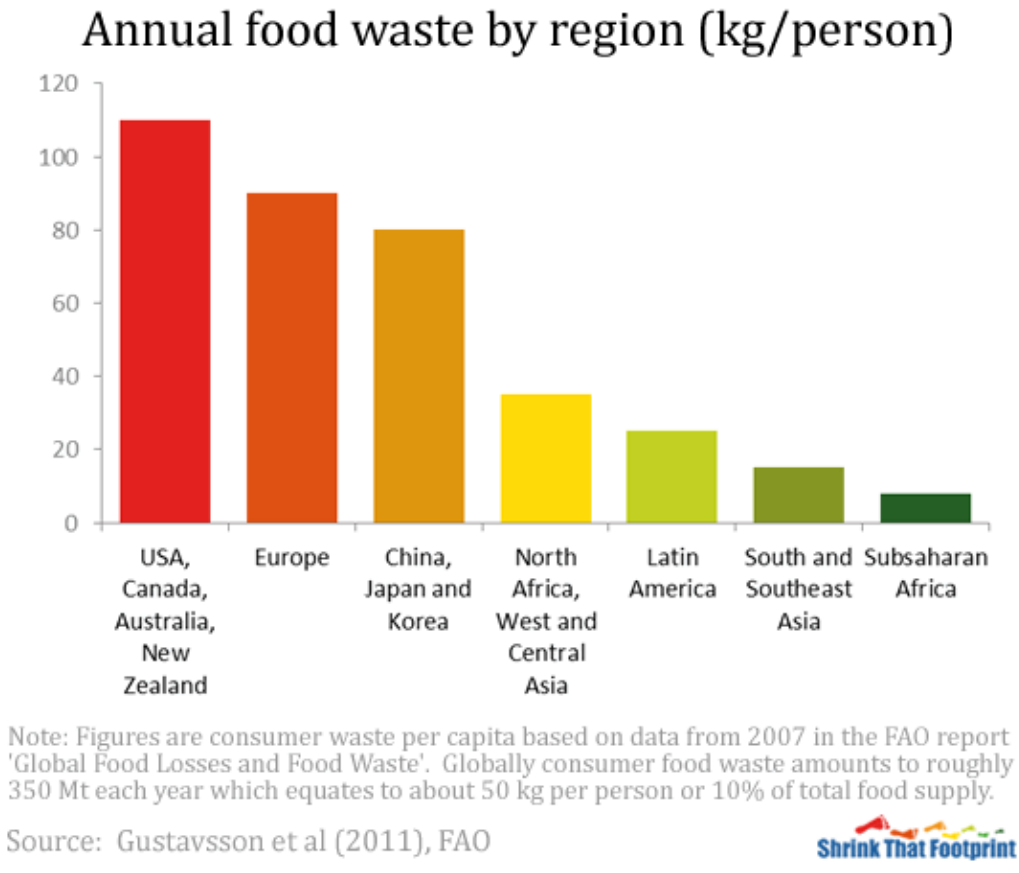


Fig 1. Estimate of per person food waste for seven different regions of the globe. [2]

Fig 2. Food wastage statistics. [3]

1.2. Solution Statement

As we know, Improving food management system is a triple-bottom-line solution requiring collective efforts by businesses, governments and consumers. Out of these agencies, governments and consumers are segregated entities and others have less or no access to their practices and methods.

However, businesses have a lot of scope of improvement in this area. This is because, businesses like restaurants are affected more by food wastages, as it directly translates to losses.

Hence, we target restaurants as the larger audience of food wastage reduction application's recipients, and keeping restaurants in mind as prime recipients of the solution, we have designed our services.

1.2.1. Solutions offered before daily operations of Restaurants start:

1.2.1.1. Prediction of Number of guests per day:

We provide the prediction of the number of customers that can be expected on any given day, based on the customer behavior extracted from customer analytics. This will facilitate in planning restaurant's day work ahead.

A credible and dependable expected daily customer traffic is provided to restaurants, which is rendered to them by running our analytics on the pattern of customer visits in past.

1.2.1.2. Prediction of the quantity of food.

Prediction of the quantity of food materials that will be required throughout the day is rendered to restaurants in advance, before their business day starts.

This makes it much simpler to work out inventory maintenance in advance without understocking and overstocking.

1.2.2. Solutions offered after daily operations of Restaurants:

1.2.2.1. Sentiment Analysis.

We process the user reviews and we render the ready to use information based on the analytics on the user reviews, which have crucial information on customer expectations.

Through the Sentiment Analysis of the user reviews, it is very easy to have a check on what is working and what is not working, as we capture the information about the mood of the customer from the review. This facilitates in making the customers happy- by not doing what they do not like in general, and doing more of what they like.

1.2.2.2. Push Notifications:

Food materials that are processed partially or fully in the kitchen, but do not reach to the plates of the customers are the ones at the maximum risk of going to waste. In order to prevent wastage of such items and make them move quickly to the plates of the customers, discounts and offers should be provided which will be a motivation to go for those items first.

We send the real time notifications to the subscribers who can benefit from discounts on the excess food in pantry, which otherwise has the potential of going to waste. Through SMS on mobile phones as well as through native notifications inside the application, we communicate with our subscribers, who in turn help restaurants in reducing food wastage.

2. Design and Architecture

FoodCoin application is planned to have an availability both on web client and mobile clients. For the initial release in this document, we talk only about the web client.

In the following section we discuss the design and architecture of the application.

2.1. Design flow diagram:

This diagram (Fig. 3) shows how the processes which are the essential elements of the application are inculcated in the design flow path of the project.

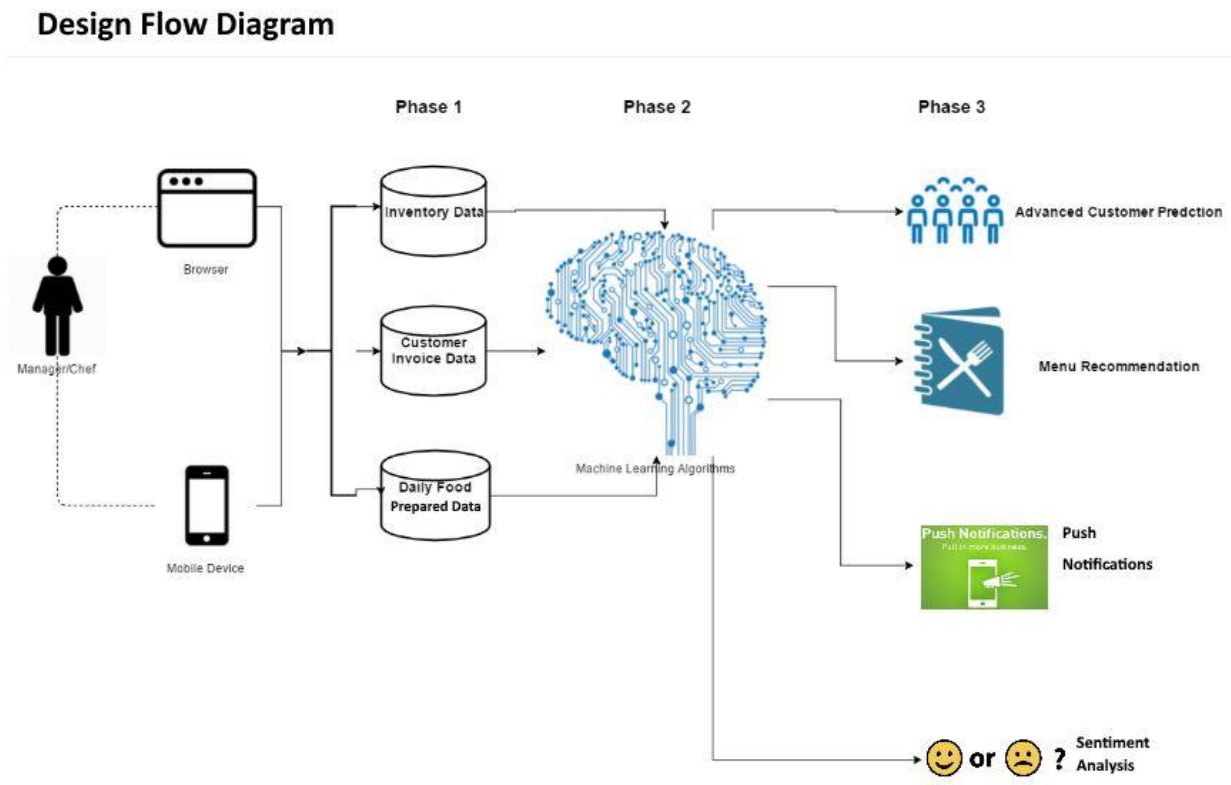


Fig 3. Deployment-Oriented System design flow diagram.

2.2. Sequence Flow Diagram

Our Application processes are a series of events closely bound to the core functional activities of a restaurant corresponding to several functional components, which is illustrated in the following diagram (Fig. 4).

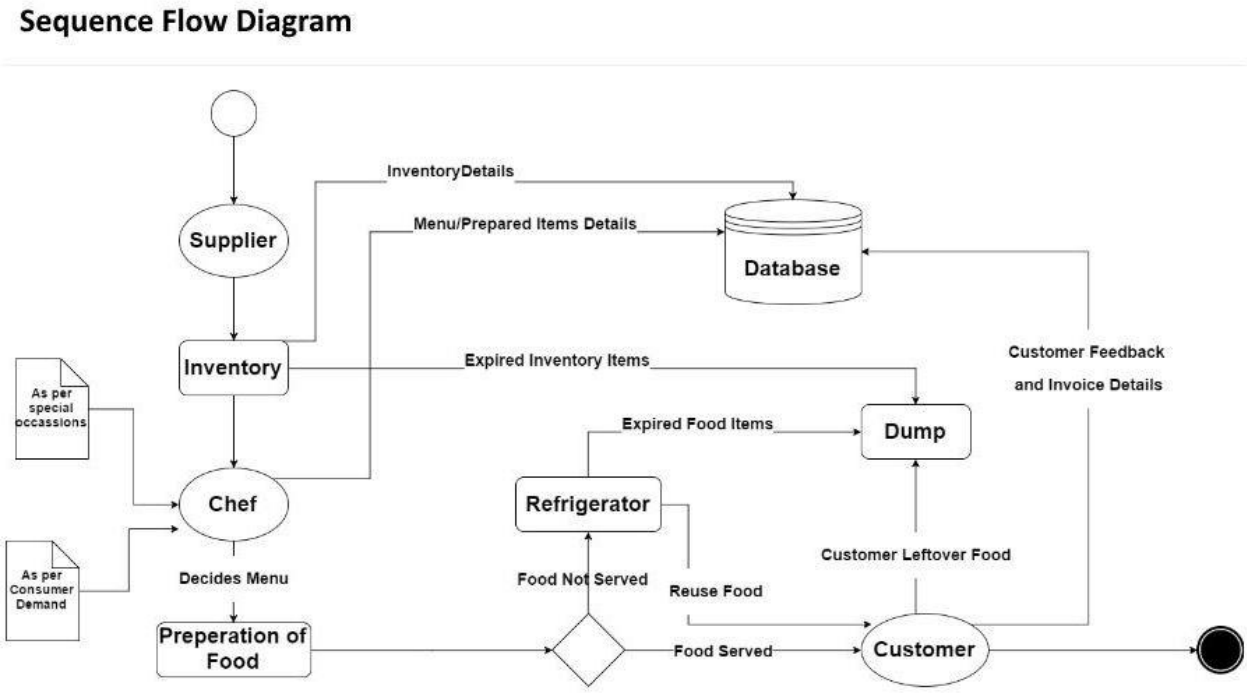


Fig 4. Functional Sequence Flow Diagram

2.3. Activity Diagram

We did our system design based on the different types of activities the end user will perform. The end user starts with user registration, and once registered, signs into the application.

From there, user goes into a journey through various active interactions on the application. Figure 5 illustrates the various kinds of activities that a user goes through.

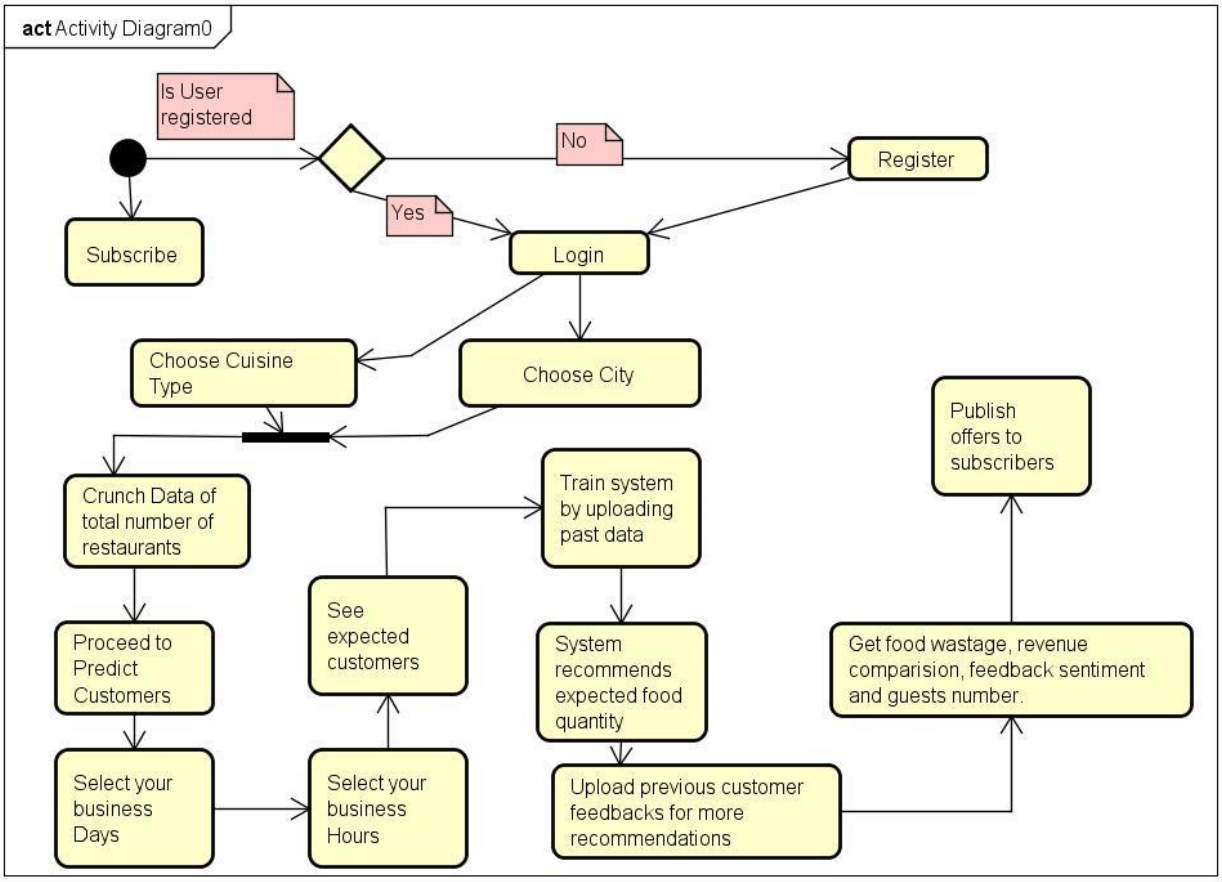


Fig 5. Activity diagram for the user.

2.4. Deployment Architecture Diagram

Our application follows a distributed system architecture deployed in the cloud. Since the application has a distributed system landscape, different modules of the system are deployed in different cloud placeholders.

The different Services used and deployed in applications are:

Service/Application type	**Cloud Placeholder**
Node.JS Application	IBM Bluemix
Python Flask Application	IBM Bluemix

MongoDB	mlab

Other services used for secure communication are:

- Amazon AWS SNS Service
- Twilio sms service

Figure 6 shows the overall Deployment Architecture diagram of the project's landscape.

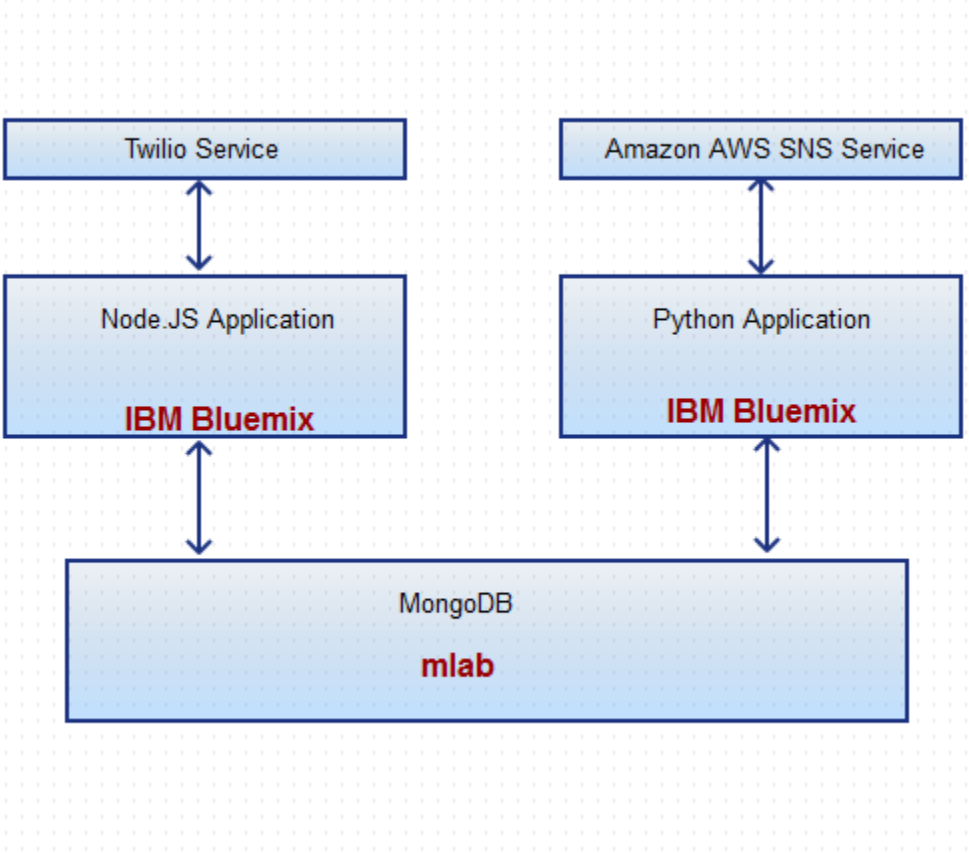


Fig 6. Deployment Architecture diagram.

3. Technology selection and usage

3.1. IBM Bluemix

We have used IBM Bluemix as our application host, since IBM Bluemix is a pioneer in cloud services. IBM Bluemix is an elastic web-based cloud computing vendor, which provides flexible cloud hosting services with high reliability and security. The free services for students are extra bonus for cost-effectiveness.

3.2. Node.js Express.js Angular.Js

Node.js is a JavaScript runtime built on Chrome's V8 JavaScript engine. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient. Node.js' package ecosystem, npm, is the largest ecosystem of open source libraries in the world. Express.js is a minimal and flexible Node.js web application framework that provides a robust set of features for web and mobile applications. Angluar.JS provides a robust UI building platform.

3.3. MongoDB

Our Data is being hosted on MongoDB database. This has a direct influence of the fact that we are using Node.JS application. MongoDB as a very good association and affinity with the Node.JS applications, completing the MEAN (MongoDB, Express.js, AngularJS, and Node.js) stack.

3.4. HTML5 CSS3

HyperText Markup Language (HTML) is the most basic building block of the Web. It describes and defines the content of a webpage.

CSS is to describe a webpage's appearance/presentation (CSS).

3.5. Python

We used the python flask application for the development of the decision tree architecture, as python is a very powerful language that supports and facilitates the development process.

3.6. Amazon AWS SNS Service

Amazon AWS SNS Services have been used to broadcast messages to subscribers of the application.

3.7. Twilio Service

Twilio sms Services have been used to leverage the one time password functionality and the mobile number registration functionality through sms.

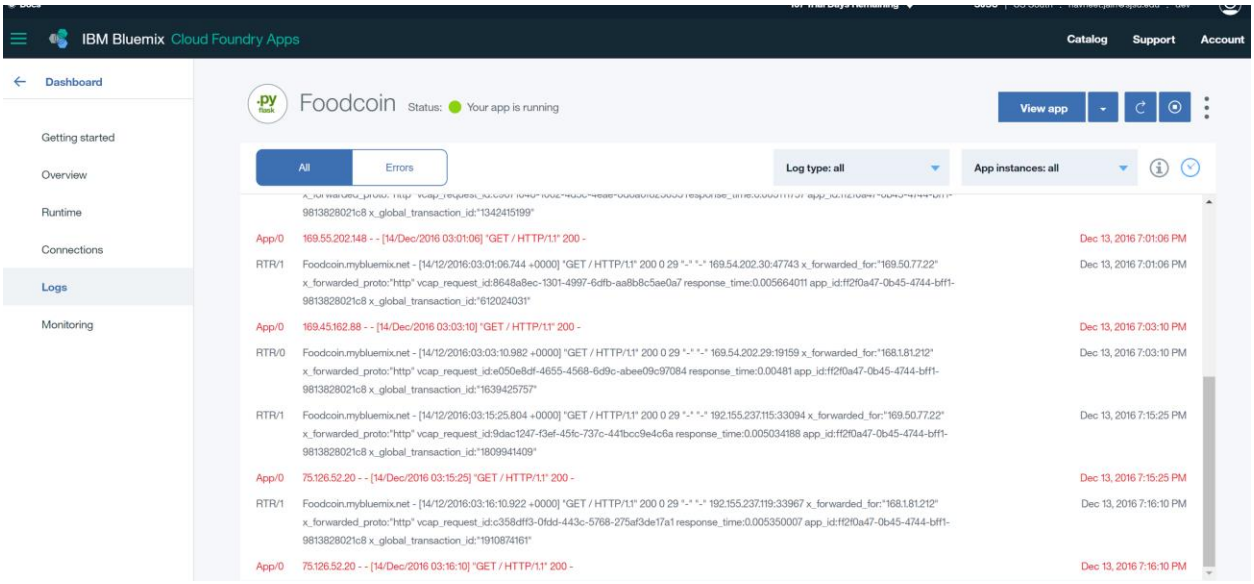
3.8. Highcharts

We show our analytics on different highchart graphs.

4. Components Implementation

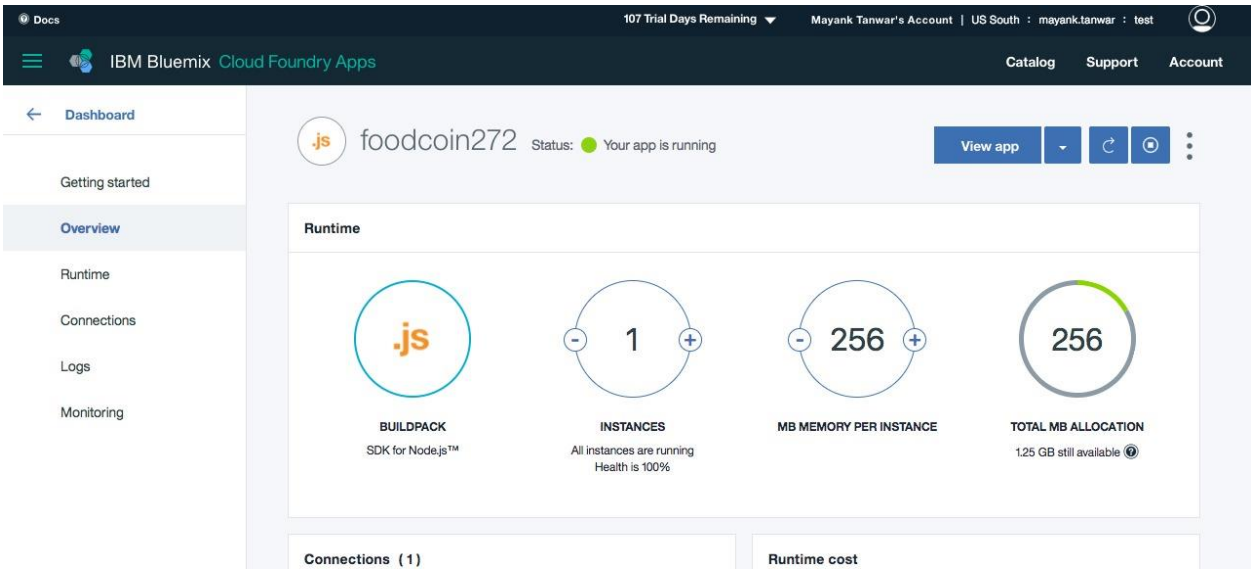
4.1. Python Flask Application on IBM Bluemix

Python flask application for the service is deployed in the IBM Bluemix cloud platform.



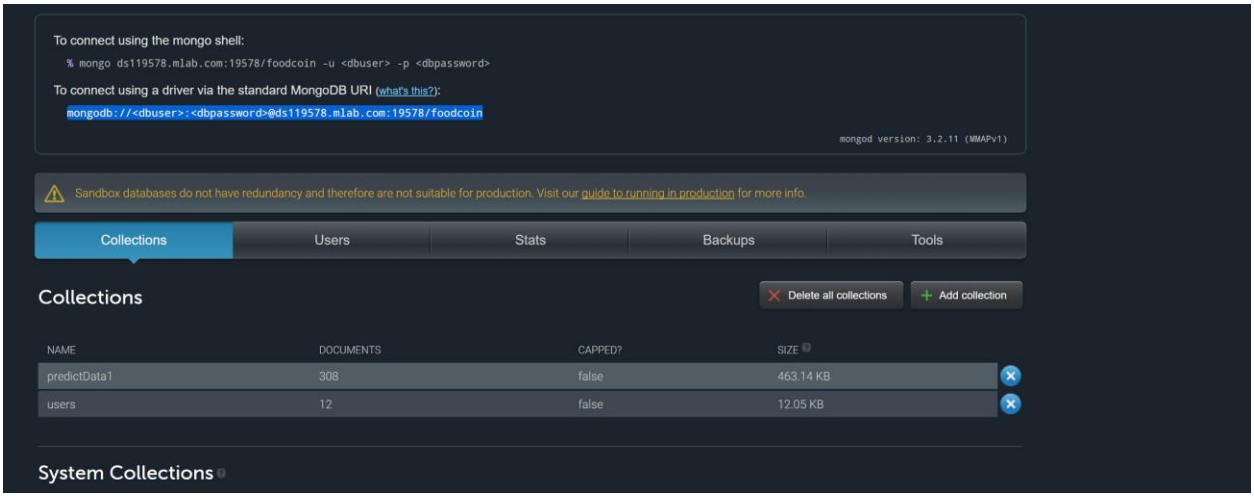
4.2. Node.js Application on IBM Bluemix

The main infrastructure of the application is built on MEAN stack, and the Node.JS application is deployed in the IBM Bluemix cloud.



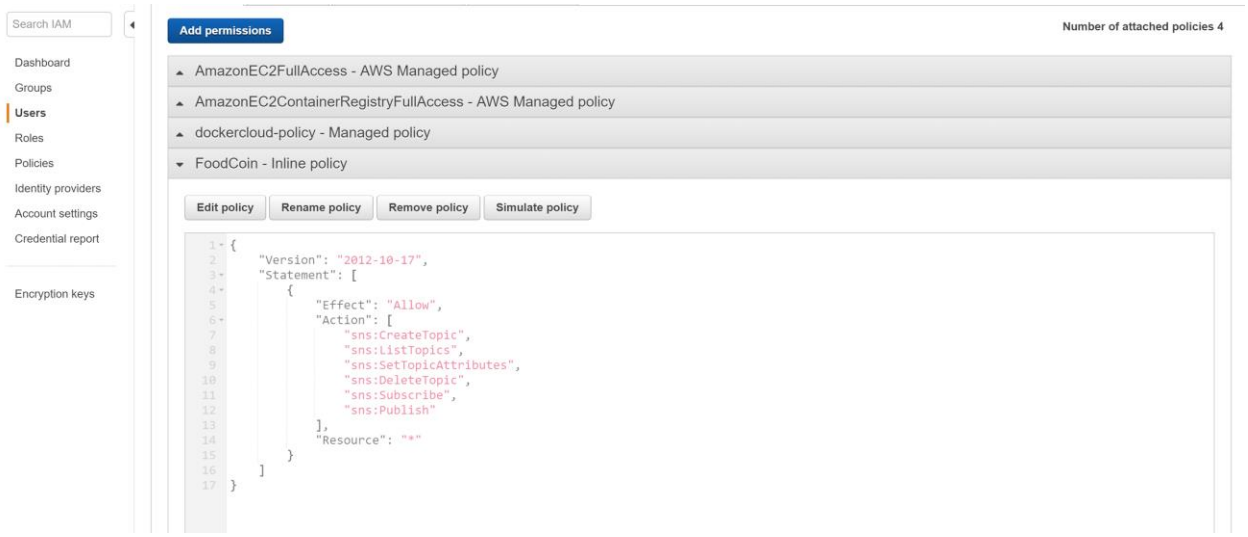
4.3. MongoDB deployment in mlab

MongoDB for the backend database of the application is deployed on mlab cloud database as as service.



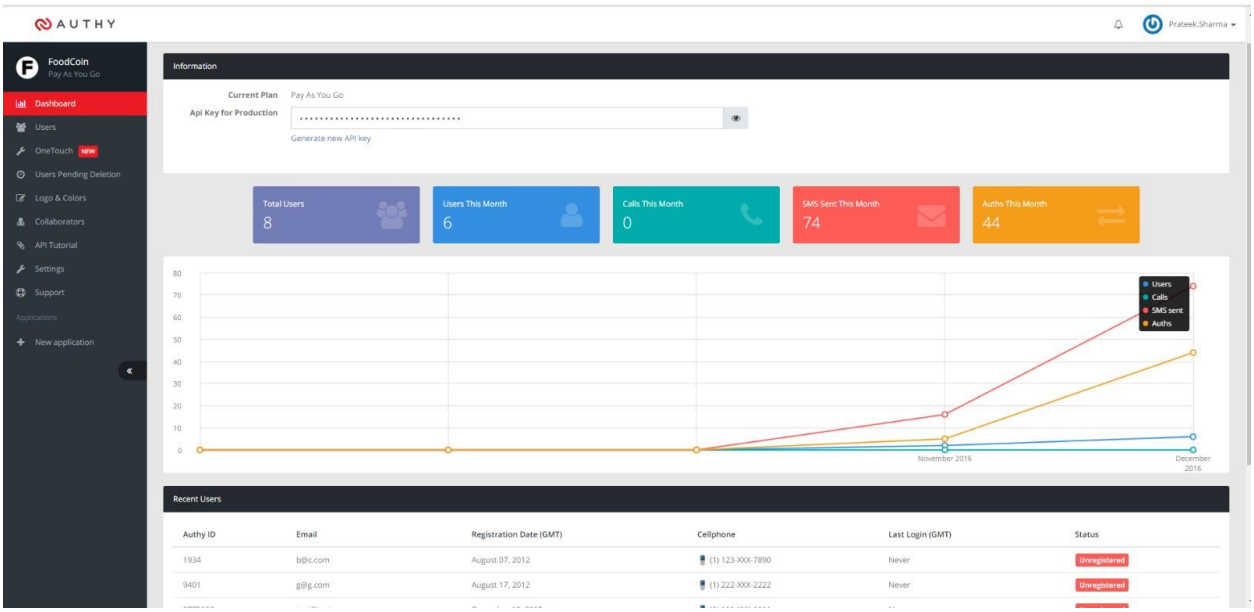
4.4. Amazon AWS SNS Service integration

Application uses Amazon AWS SNS Service to broadcast messages to subscribers.



4.5. Twilio Service integration

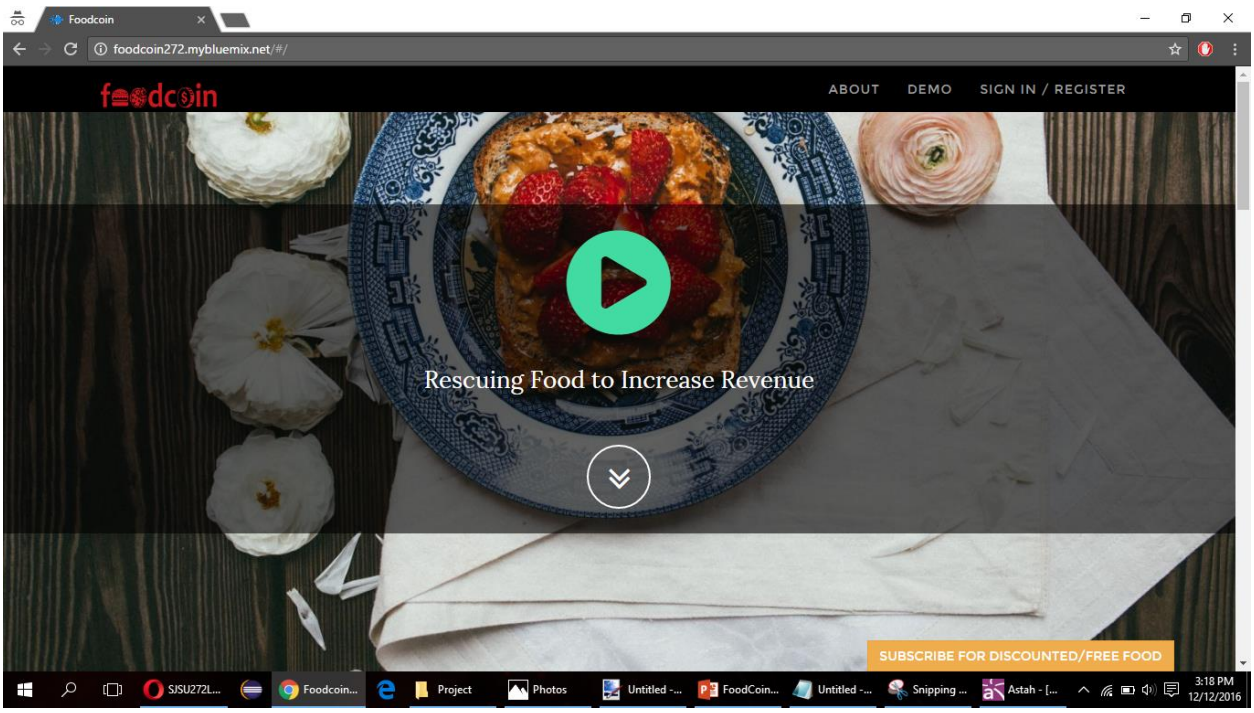
Application uses Twilio service for sending One Time Passwords for Login and Registration via SMS.



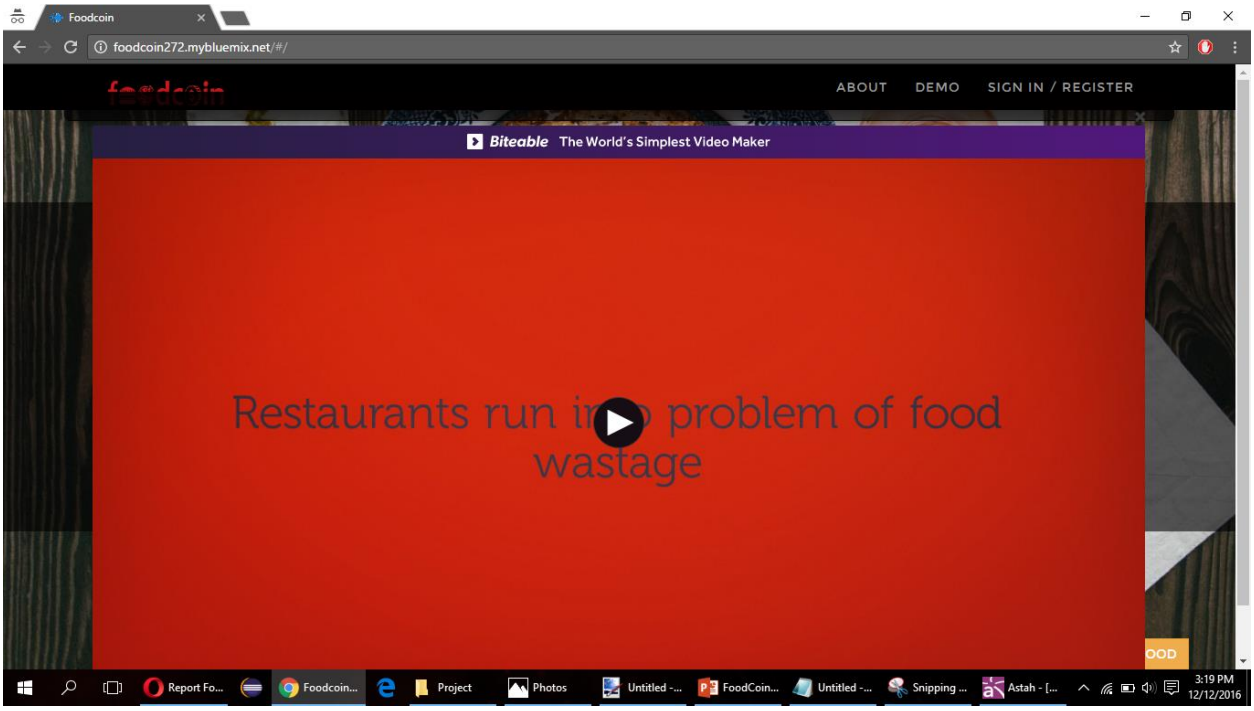
5. FoodCoin Application Demonstration

This section demonstrates the different capabilities of the current application that has been deployed in the cloud.

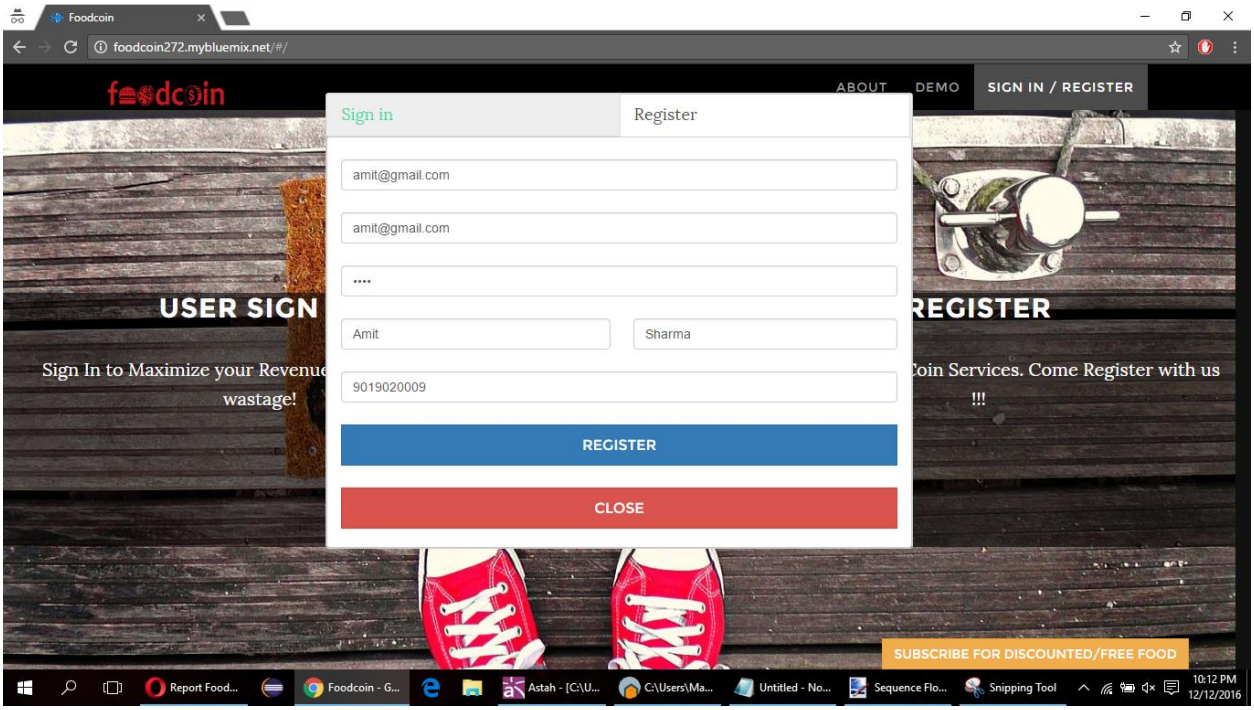
- Going to the application url, user lands into the home page.



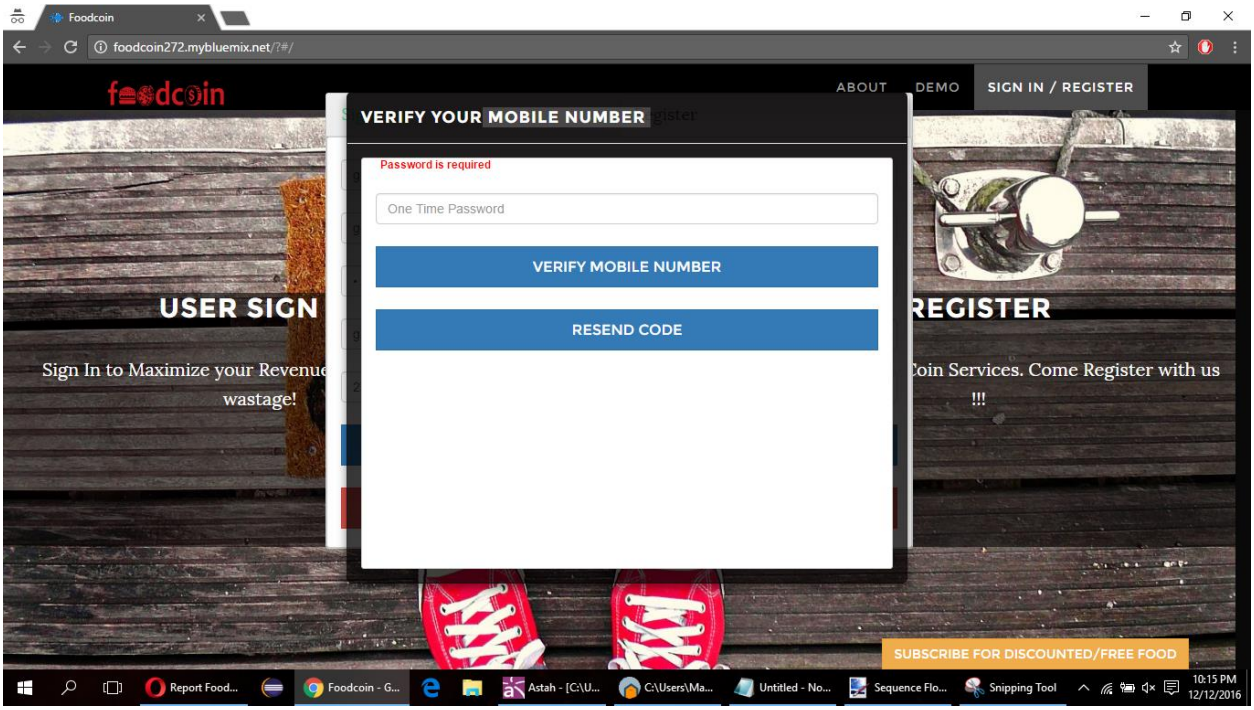
- Next user can have demo and view a the information about FoodCoin service.



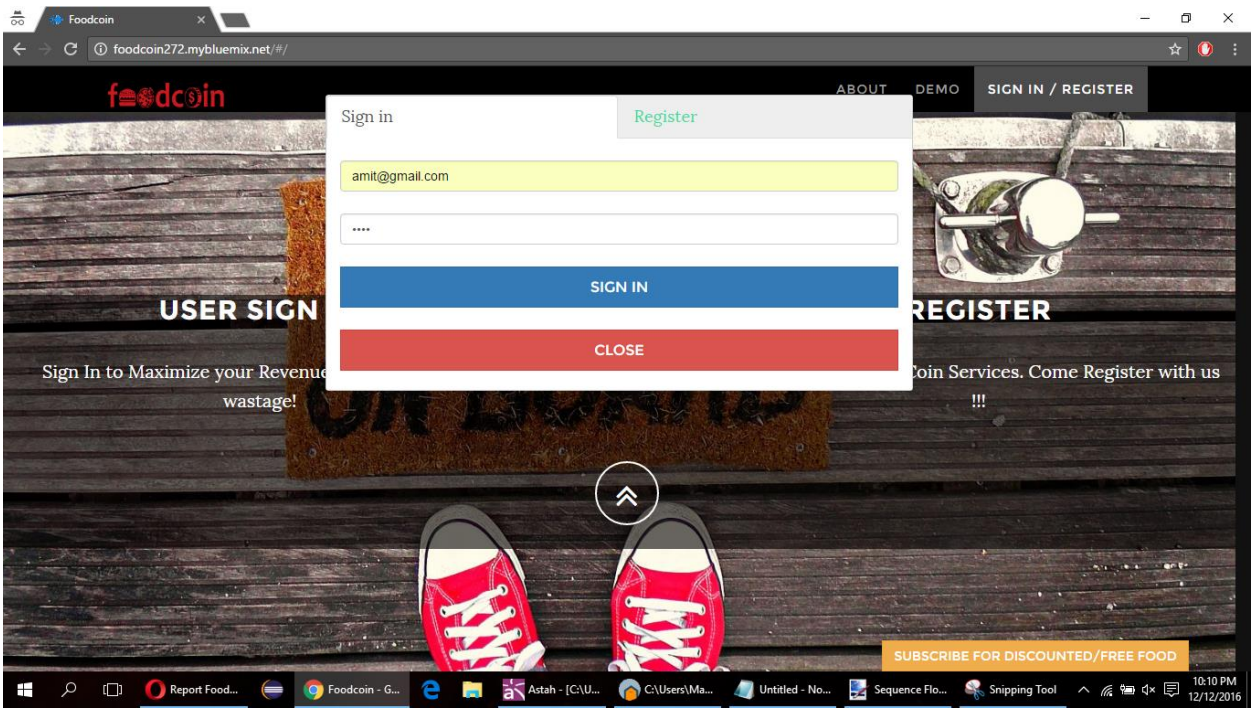
- To us the FoodCoin service, user has to register first.



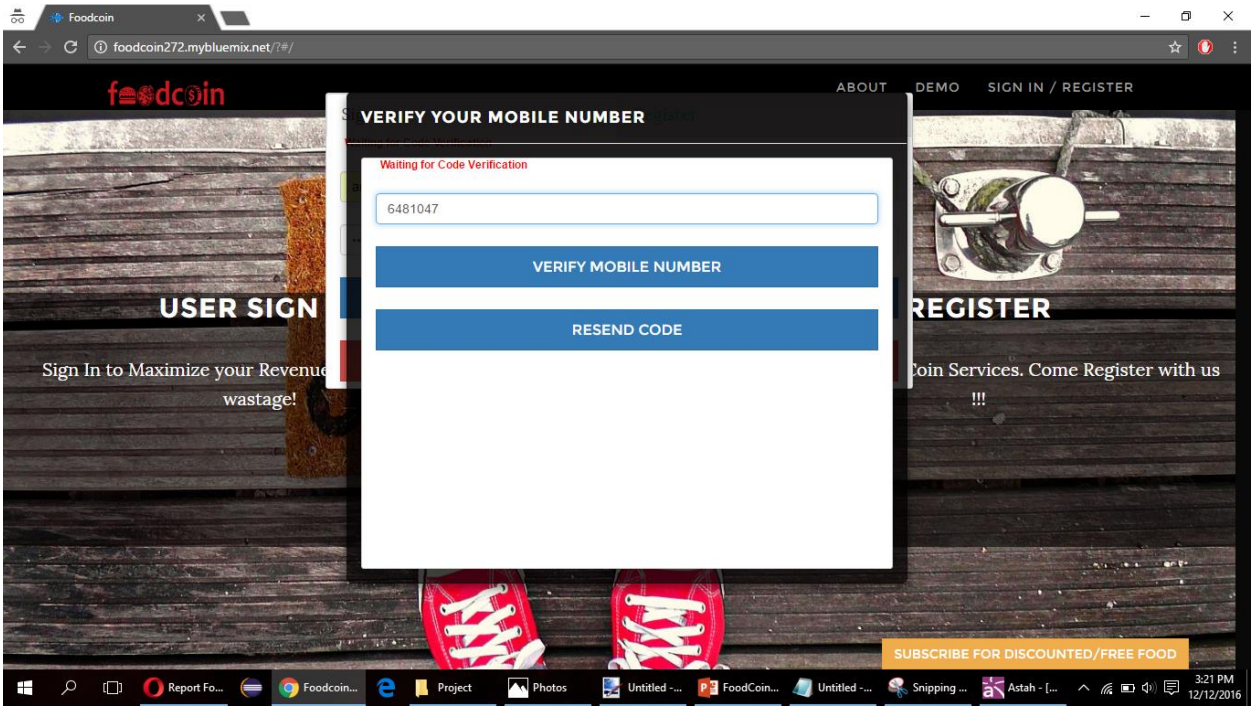
- For the sake of authentic users, users have to register their mobile numbers through one time passwords sent via sms.



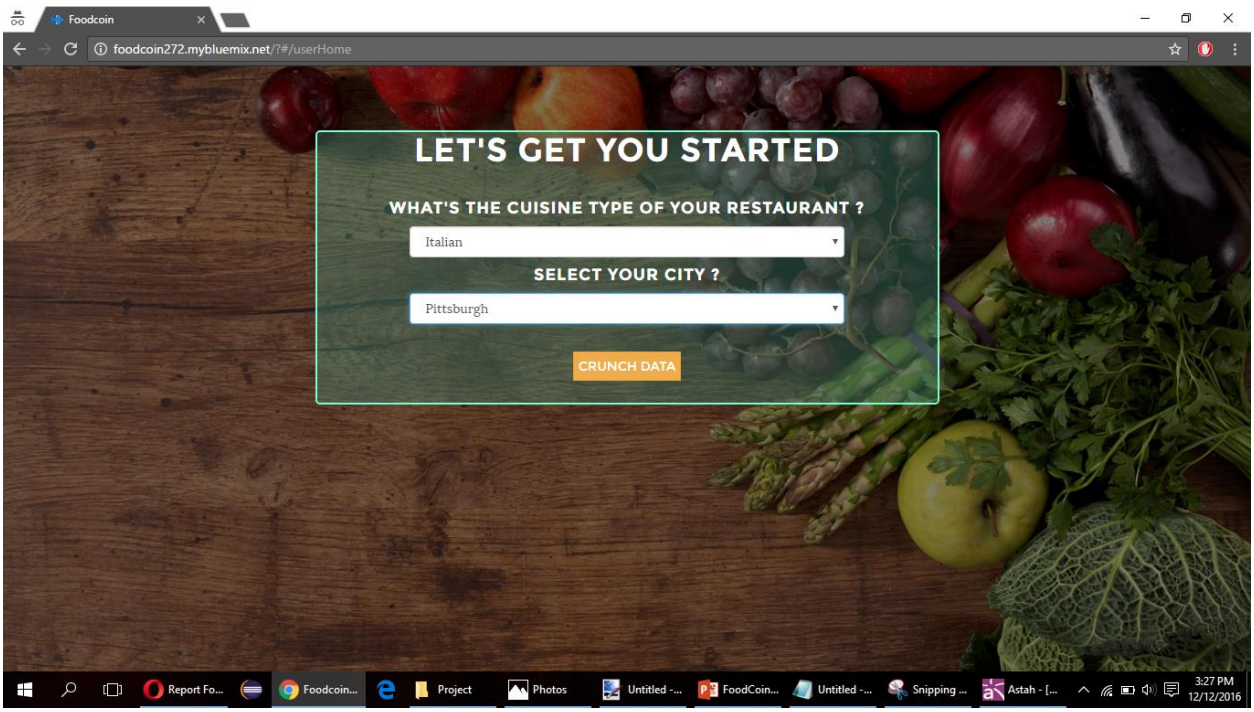
- After registration, user has to sign in.



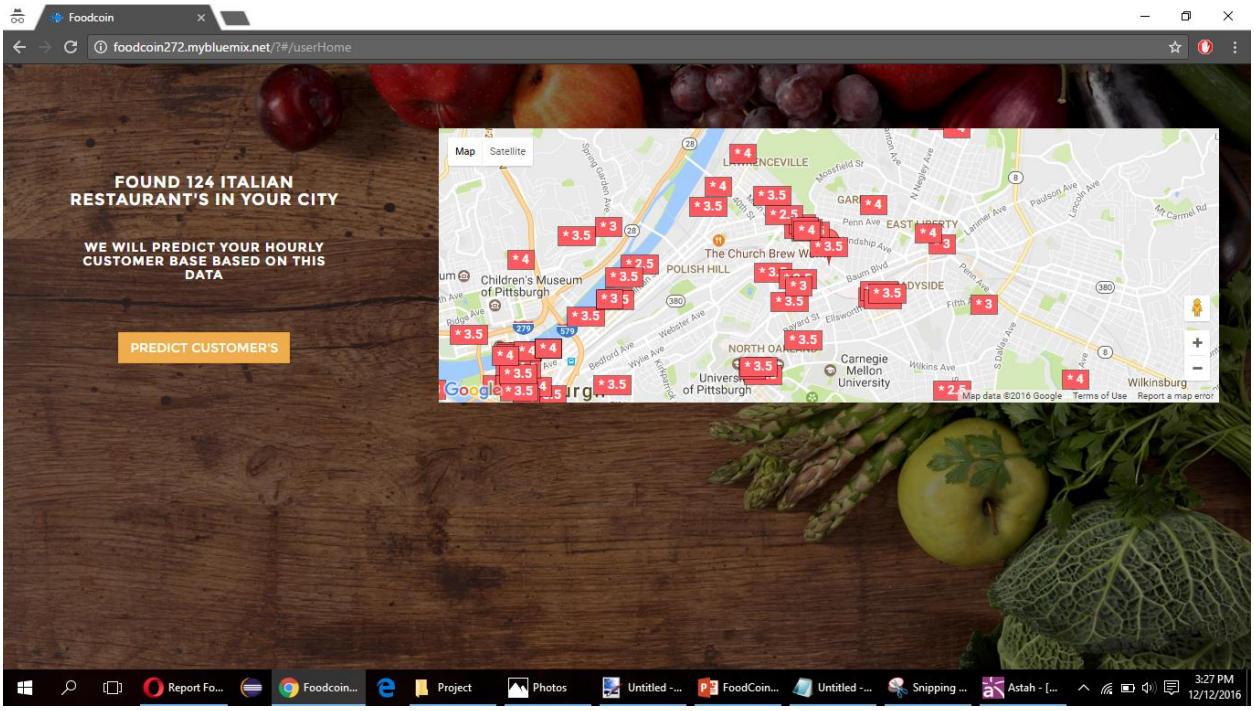
- Every new login requires to validate a one time password sent as sms, for the sake of security



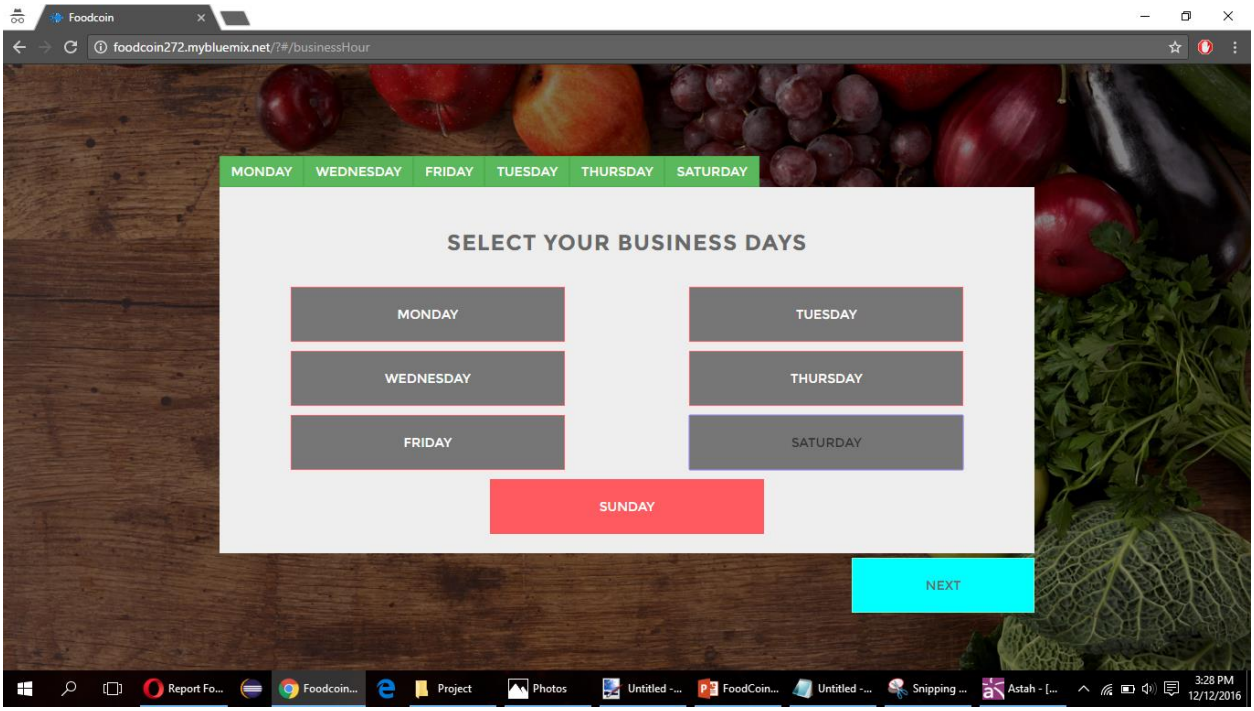
- To get started, user has to select the cuisine and the city.



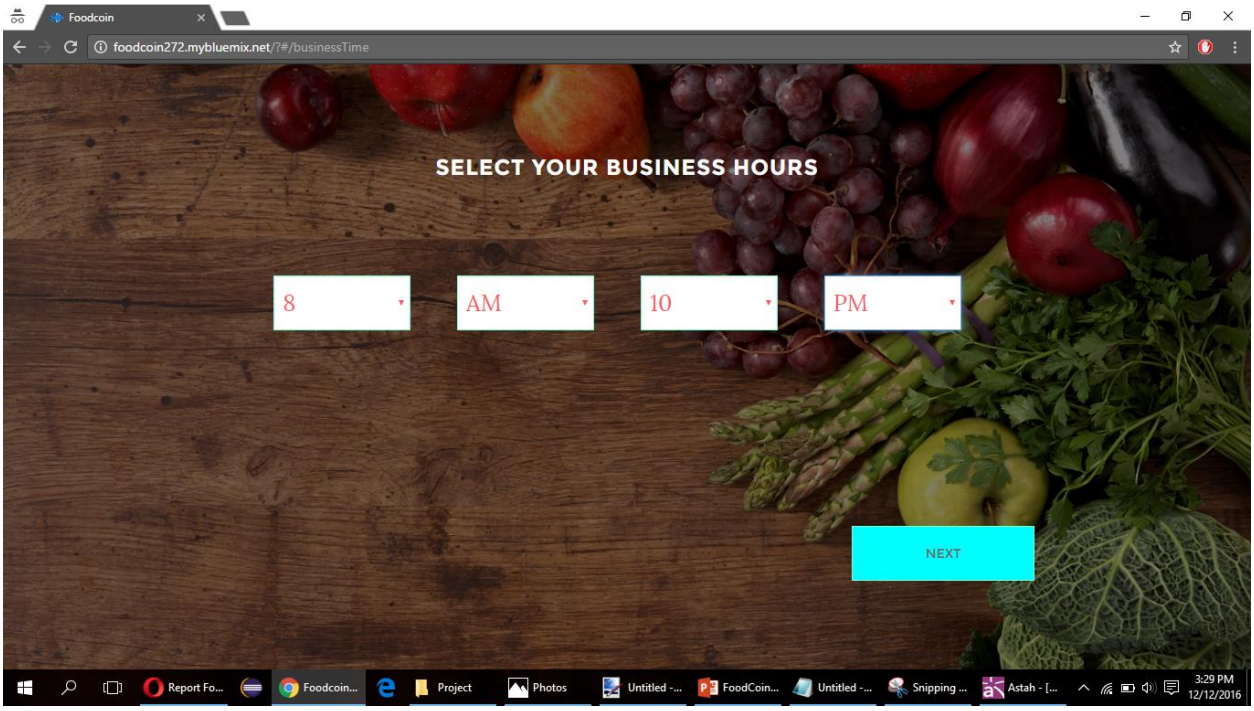
- System then shows the restaurants in the city serving that cuisine.



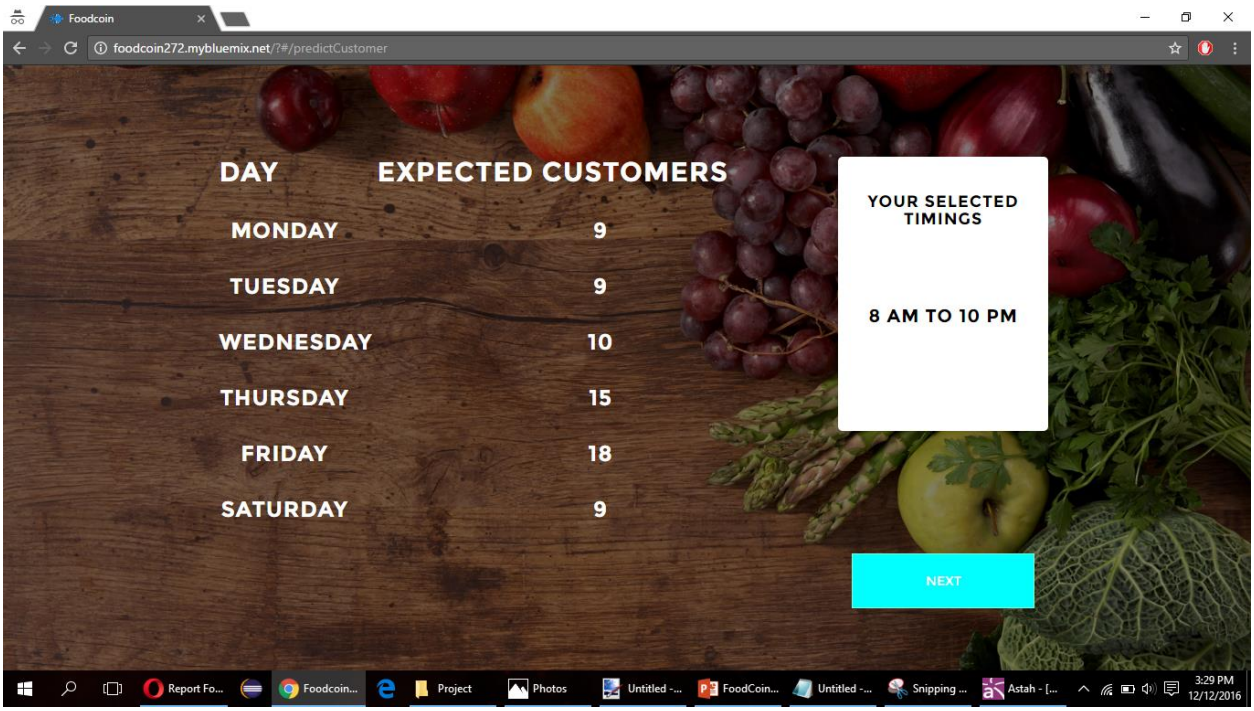
- To get the number of customers predicted, user has to select business days.



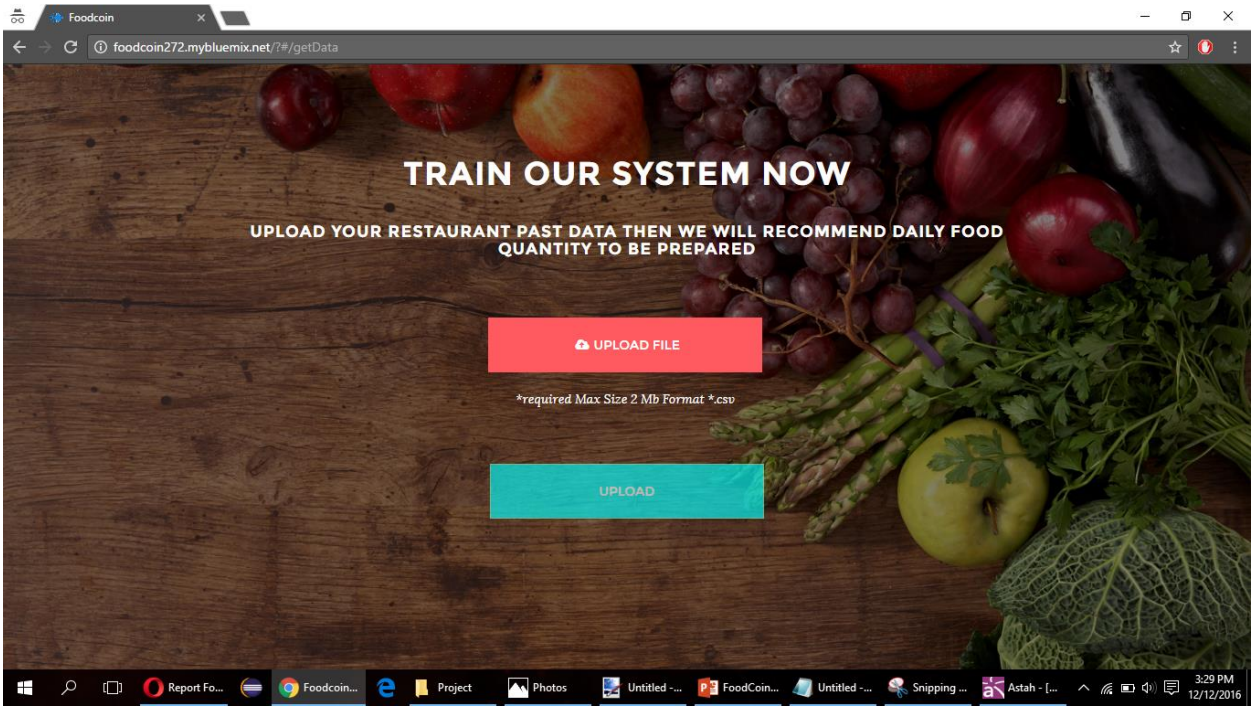
- Further, user has to select business hours.



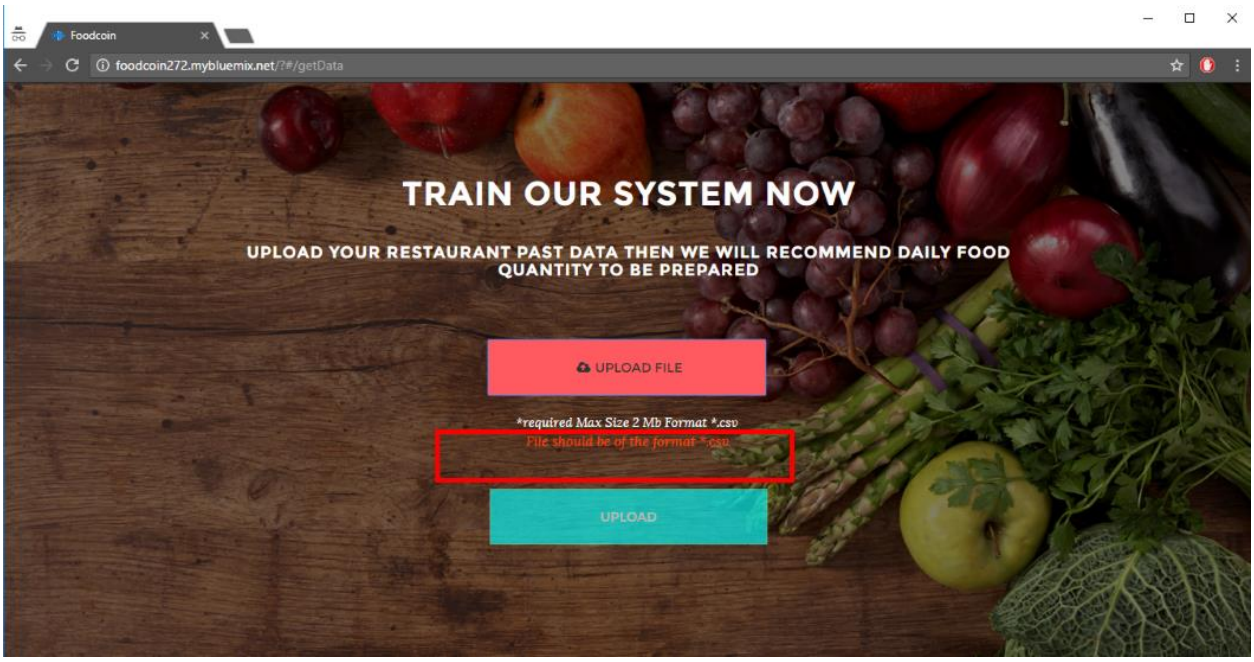
- System recommends expected customers.



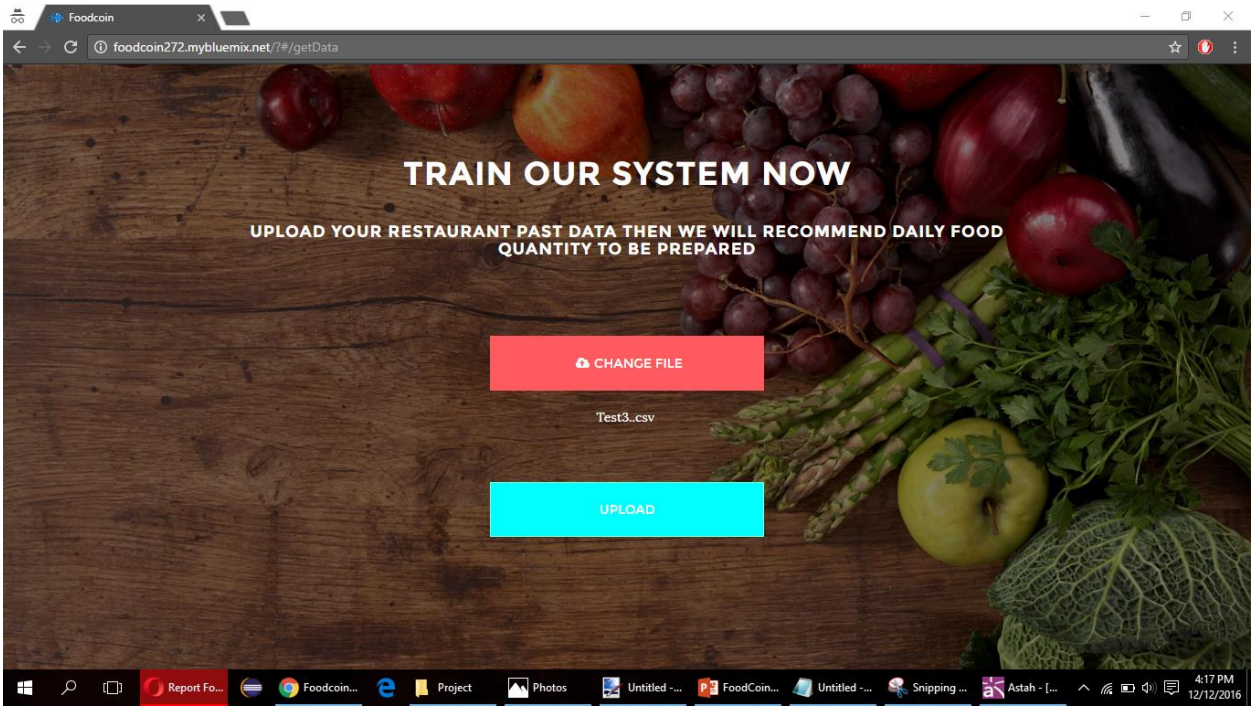
- To train the system, user has to upload past restaurant data in CSV format.



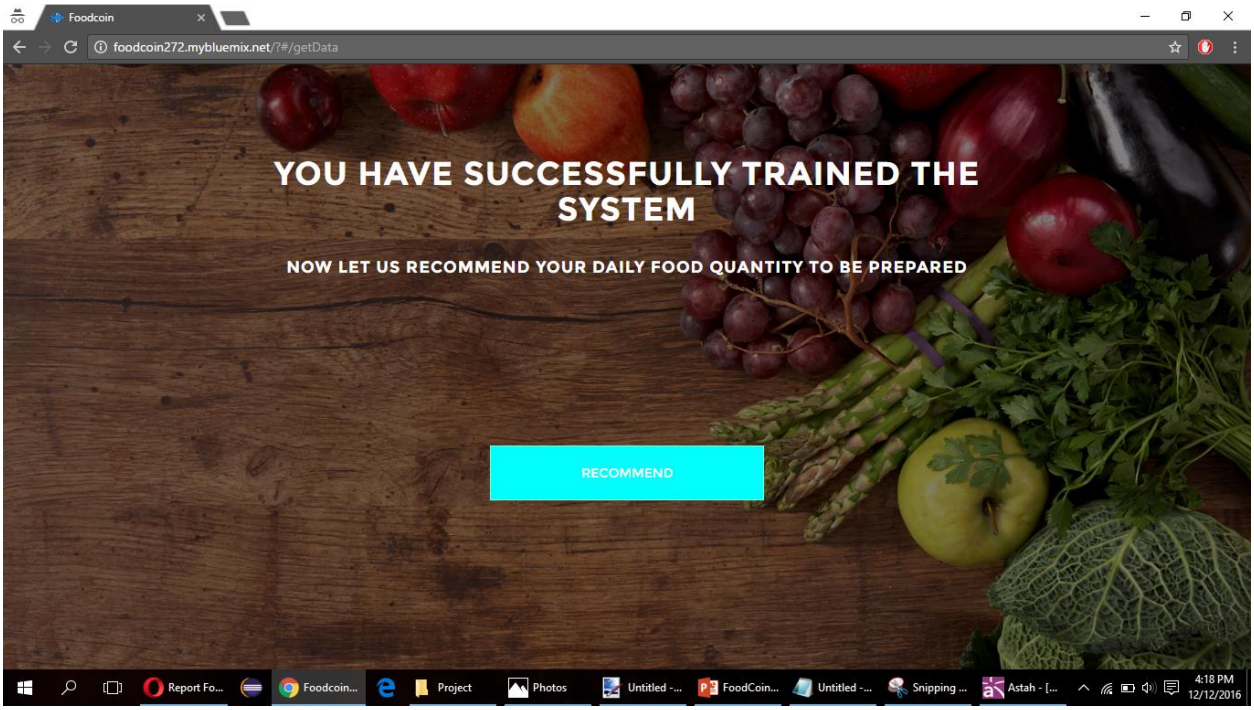
- System accepts file only in CSV format, and rejects other formats.



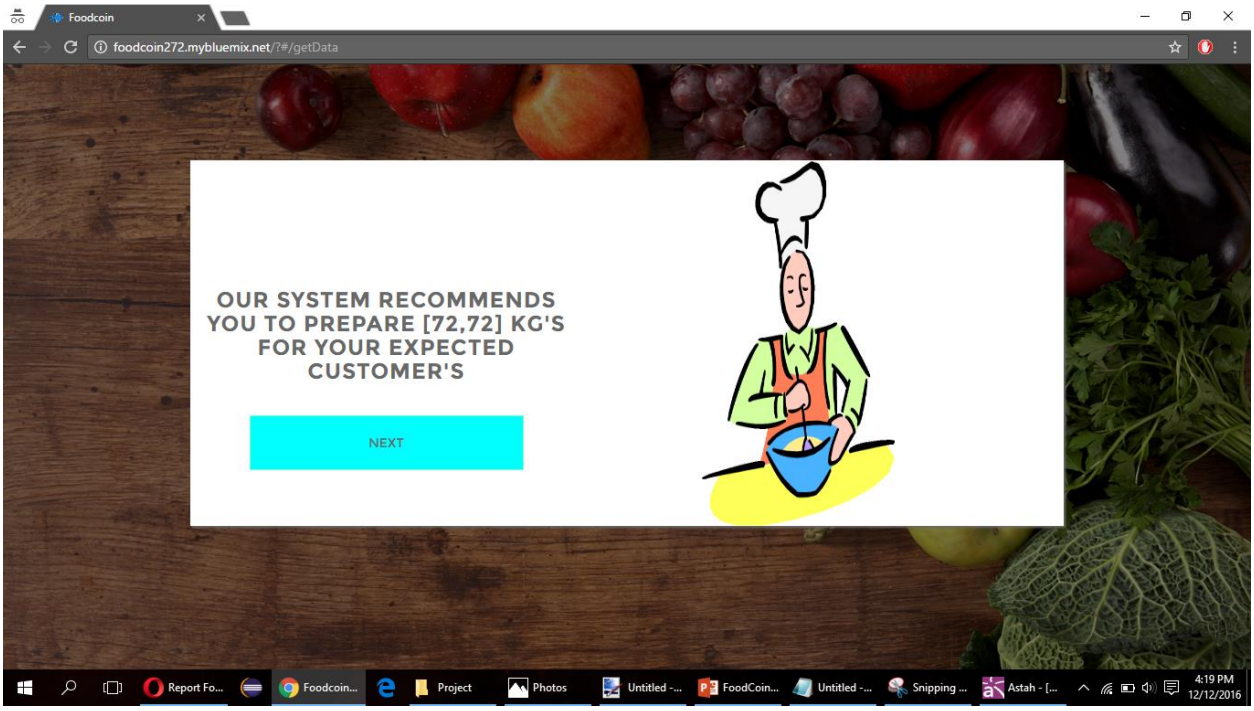
- After user selects a file and uploads meaningful data, the system gets successfully trained.



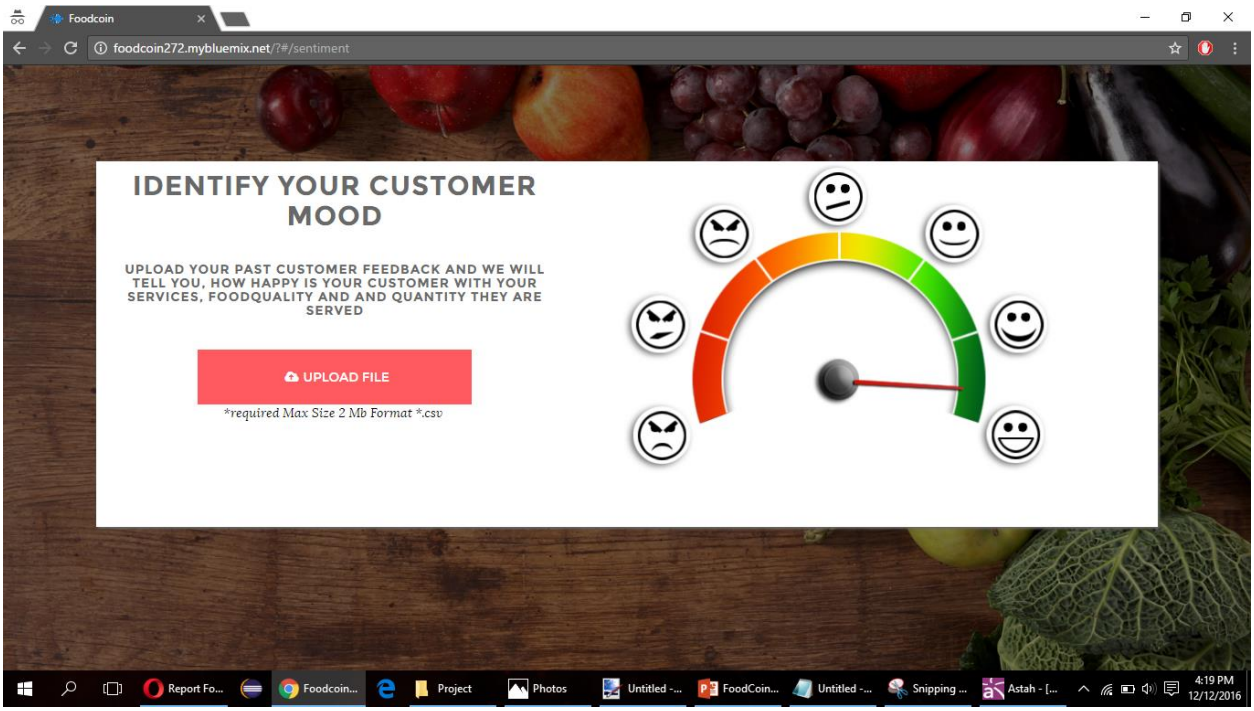
- User goes ahead and clicks on recommend to see the recommendations.



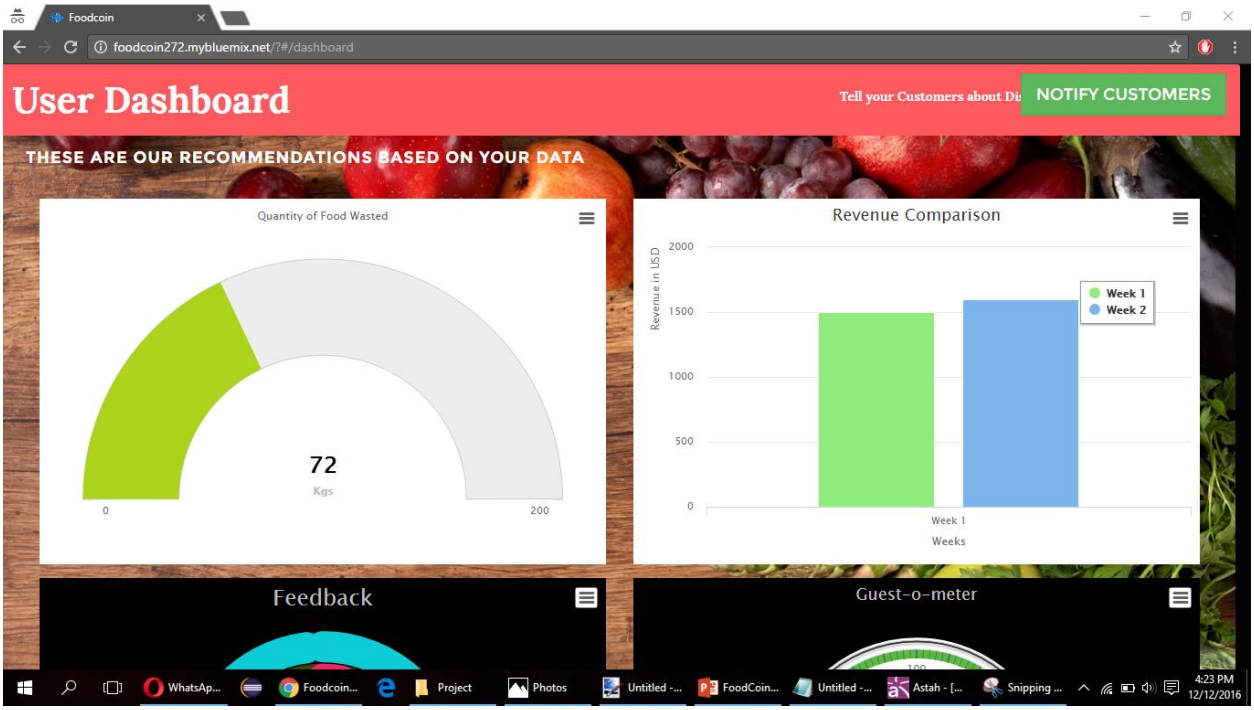
- System recommends the food quantity for already recommended number of customers



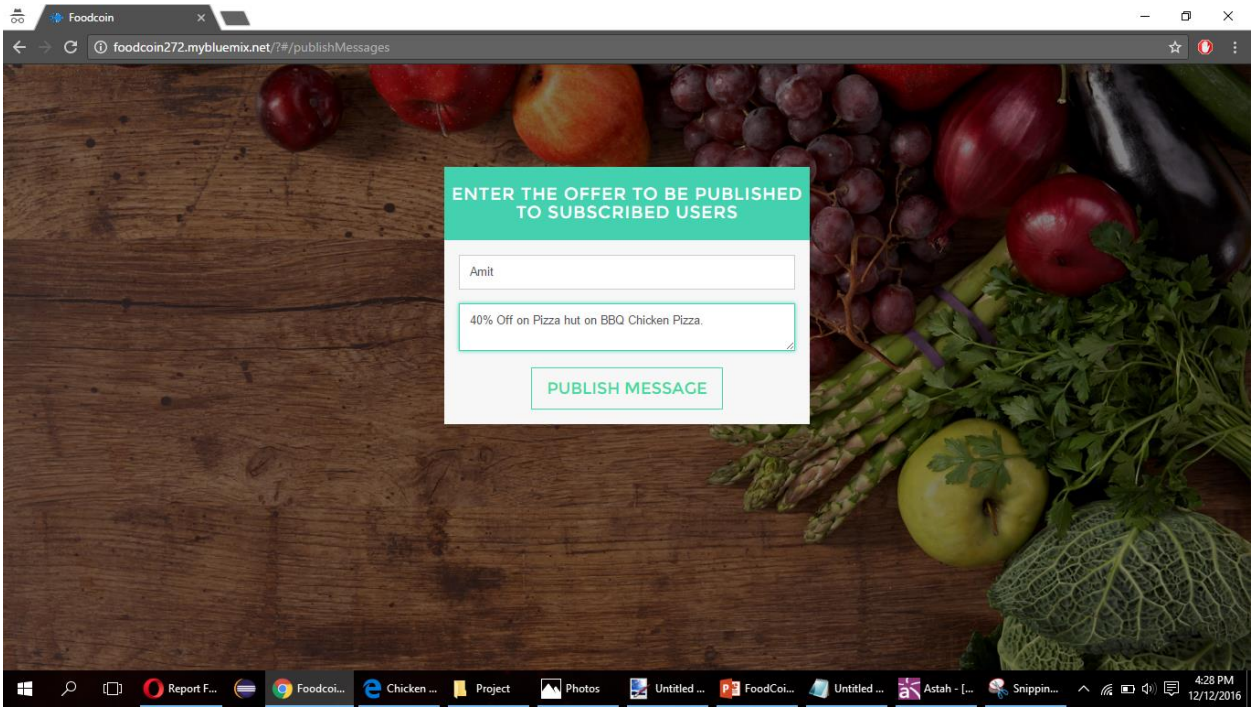
- User has to upload the past customer feedback to see the sentiment analysis.



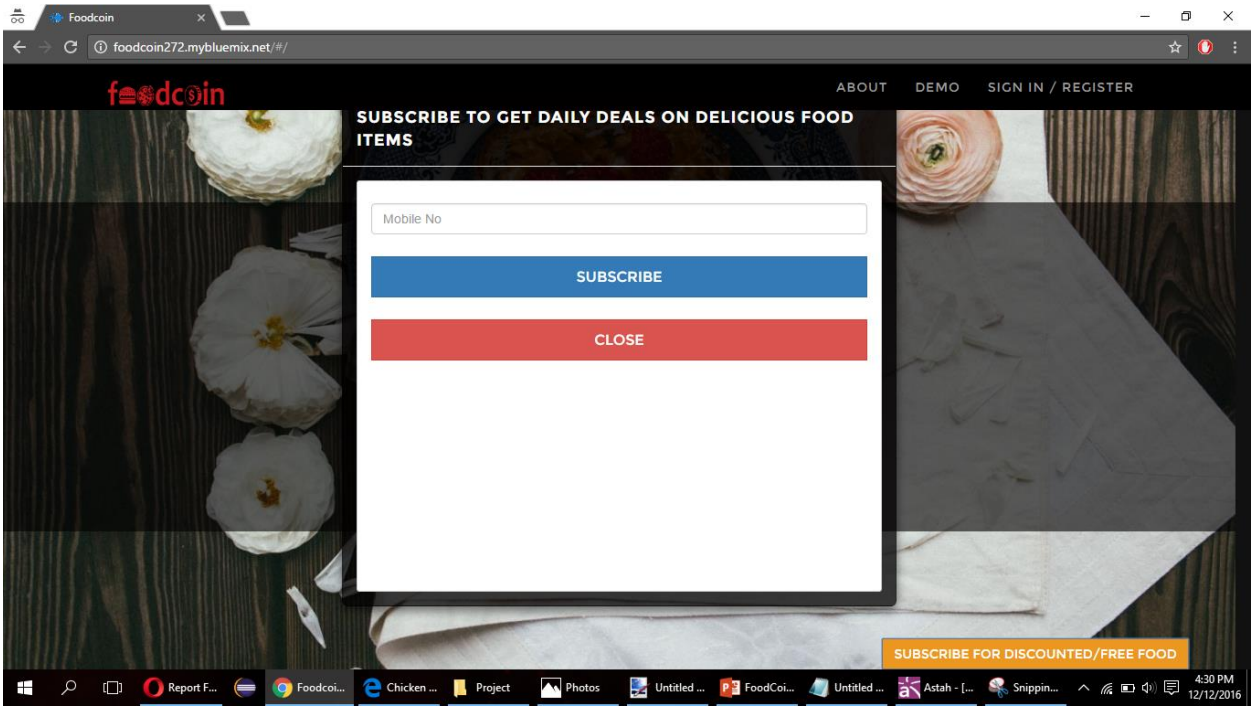
- System shows different statistics- Quantity of food wasted, Revenue Comparison, Feedback sentiment, guests visited.



- User has the ability to broadcast message about discounts and offers to all subscribers via sms.



- Anybody can enter their phone number to be added into the subscriber's list from the home page, to be able to get the offers and discounts via sms.



6. Business Model

- We are Software as a Service (SaaS) vendor.

- We provide services to restaurants which enable them to reduce their food wastage, know more about their customer sentiments, know their customer traffic and food requirement.

- Our service is free to join and test for first 3 months.

- After 3 months, independent restaurants still can continue to use it for free.
- However, for restaurant chains, they have to pay a nominal fee if their chain size is more than 5 in number.

- We will show recommendations for inventory procurements. We will charge vendors who will be on recommendation list on every transaction made through us. Restaurants can use this feature for free.

- Recommendations will not be like advertisements. They will have a dedicated space on our app and will be available for voluntary participation.

7. Summary

Our application provides a way to reduce the food wastage for the restaurants which lose a part of their operating income due to losses by food wastage. The system is in its first release and will require continuous development and a lot of participation and engagement from the restaurants to be able to understand their problems well and stream line the processes.

8. References:

[1] https://www.nrdc.org/sites/default/files/wasted-food-IP.pdf

[2] http://shrinkthatfootprint.com/the-big-footprint-of-food-waste

[3] http://www.treehugger.com/green-investments/50-all-food-produced-wasted.html