CS5551 – ADVANCED SOFTWARE ENGINEERING

FALL 2018

Department of Computer Science Electrical Engineering

University of Missouri Kansas City

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Hiresh Bhaskar, Jakkala – 17

Jaya Prakash, Ravella– 42

Project Title – Answer Evaluation Engine

Video URL – https://www.youtube.com/watch?v=H2Oc5GMNPa4

GitHub URL – https://github.com/Hiresh12/CS5551_Team6_Project_NLP

ZenHub URL – https://app.zenhub.com/workspaces/cs5551-team-6-2-icp-5b80243877b6fb6e9db9e612/boards?repos=145937414

Heroku URL : https://evaluationengine-6.herokuapp.com/Pages/LoginPage.html

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ACKNOWLEDGEMENT

The work has been completed under the guidance of Dr. Yugi Lee, Rajaram Anantharaman, and TAs (Ruthvic Punyamurtula, BhargaviNadendla, Sravanthi Gogadi) in CS5551 Advanced Software Engineering, University of Missouri -Kansas City), Fall2018.

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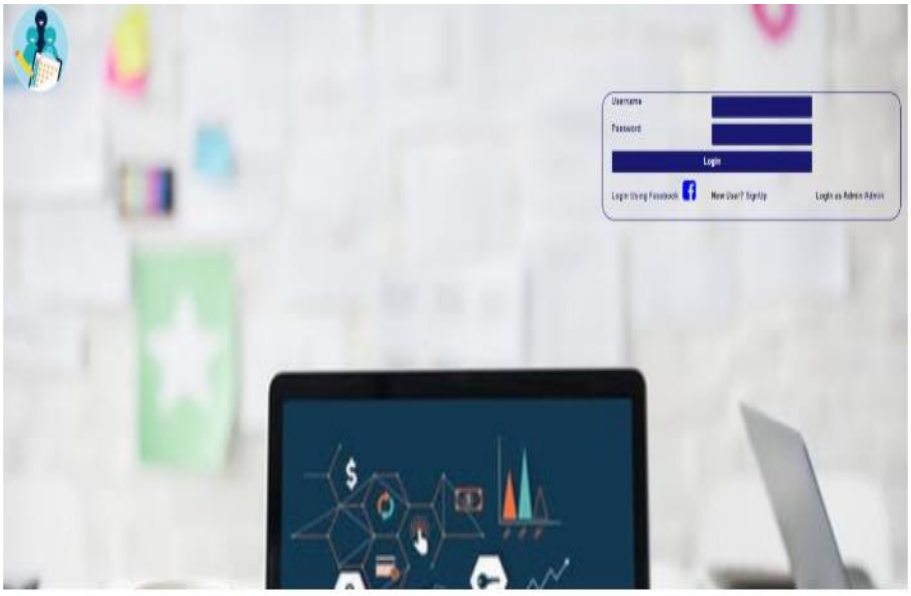
1.Project Deployment:

- **Overall Goal** : To develop a web application for evaluating user's answers for a set of questions using Natural Language Processing.
- **Specific Objectives:**
  1. Develop as admin module to add/edit questions.
  2. Giving suggestion to the user based on the answer key so that user can learn new things about the topics.
  3. Integrate machine learning and NLP into the software for text analysis and matching the analyzed text with answer ## ## key to evaluate the answers.
  4. System will also check for grammar error in the texts.
- **Specific Features:**
  - Developed as a web application.
  - Lightweight and user-friendly UI
  - Integrated Facebook Online Authentication API for login feature.
- **Significance:**

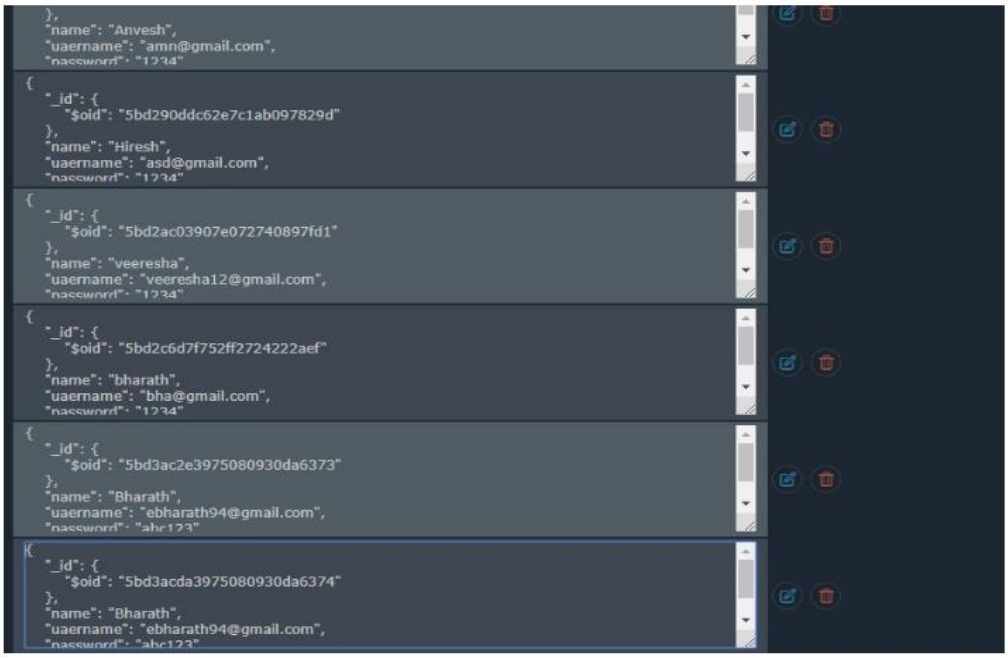
  Our System will estimate the correctness of answer entered by users based on keywords. System will evaluate the answers with the synonyms of the keywords to increase the accuracy of the evaluated score for the answer. System will look for online sources like Wikipedia for the keyword other than manual keywords to reduce the admin's task of updating new keywords in future.

- **User Manual:**

  Login and Registration Pages **-**

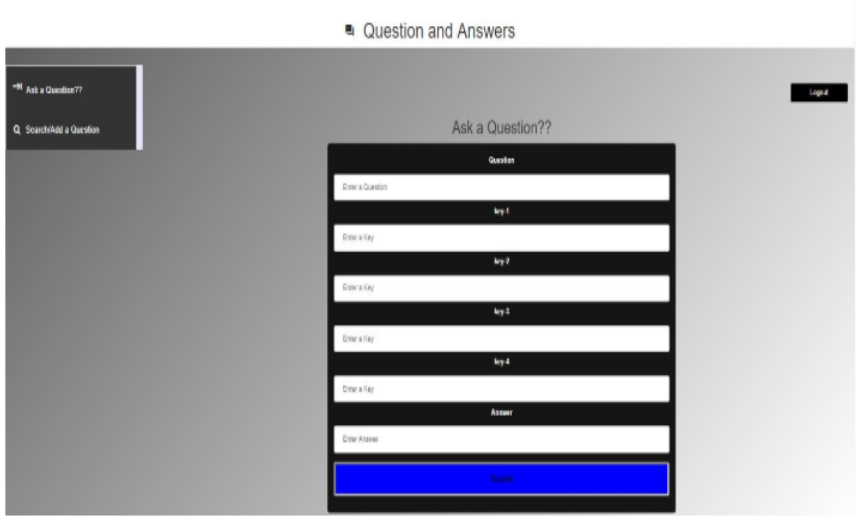


Registered details will be saved in Mongo Database

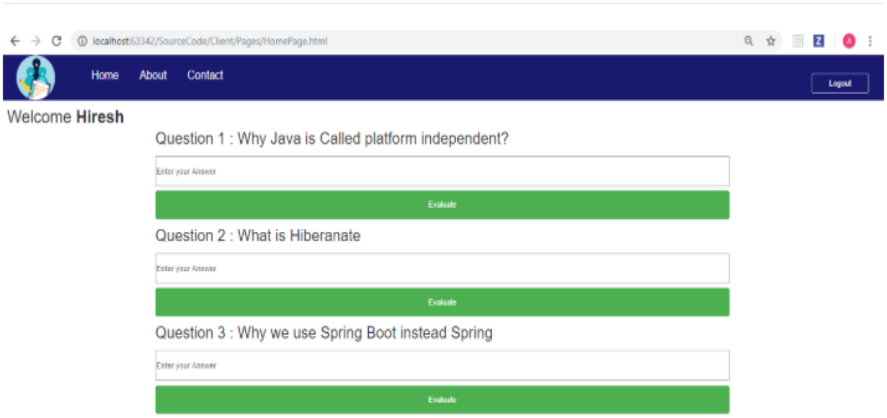


Login Page For admin:

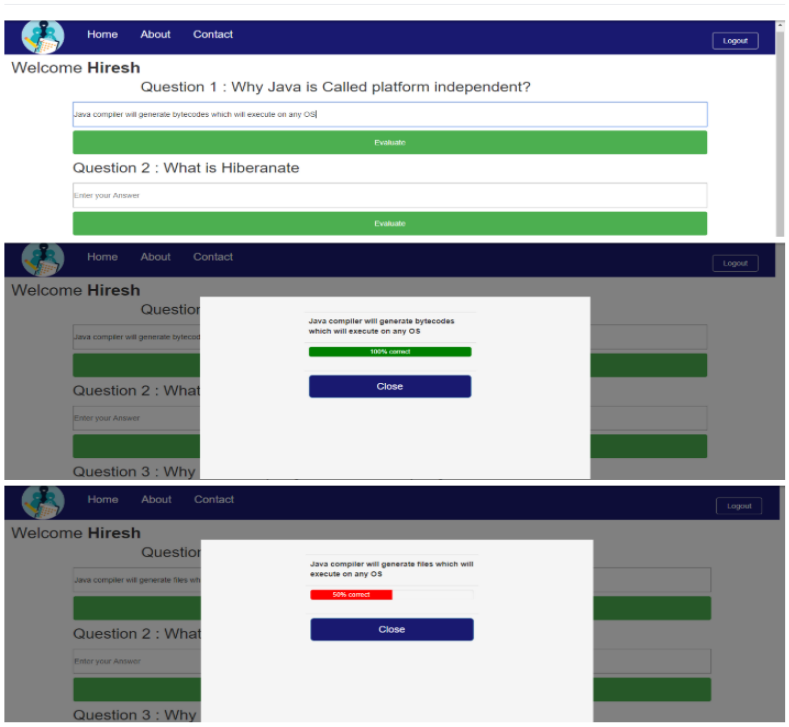
Admin Home Page for inserting the captured data from User Interface



Questions which are stored in Database will be displayed in Home Page



Evaluation criteria:



- **Implementation**
  As of now, we are trying to implement the project in both web as well as mobile app, but according to the time and constraints of the team members, we may limit to web application only. We will be using HTML5,

CSS3, Angular JS, Node JS,NLP API's, as the primary technologies and other couple of technologies or tools, if needed.

- **Deployment**

The whole project is Pushed in to the GitHub for each increment and whenever we are completed with the tasks within the increment and also we will be deploying our application to Heroku for easy access of application.

Heroku URL : https://evaluationengine-6.herokuapp.com/Pages/LoginPage.html

2.Project Management documents:

(i)Increment Planning:

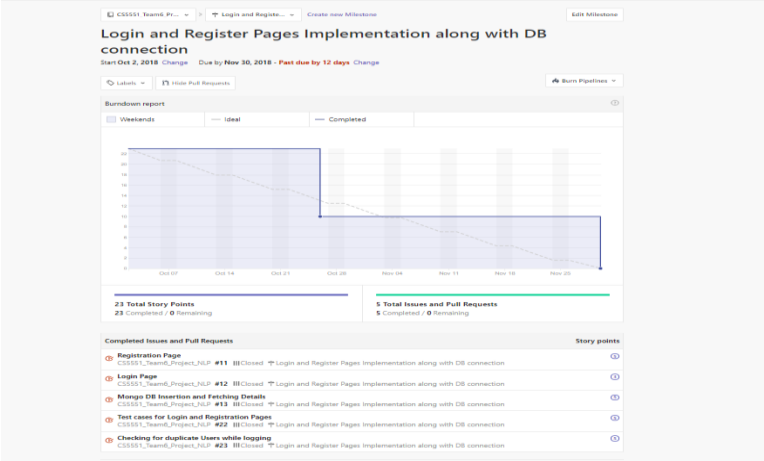
Starting with the **first couple of Increments**, we will be working on Login, Register and User Profile Pages and redirecting the login page to the home page using login. The Creation of Questions, Keywords and answers will be done along with the evaluation of answers based on keywords

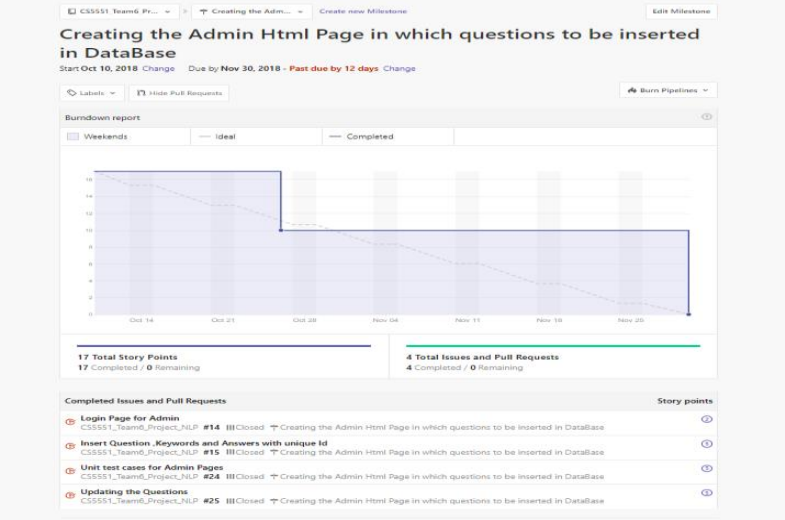
Moving to the **third increment**, we will be working on the duplication of data in database , CRUD operations in admin page and evaluation of answers based on keywords along with many other api's like grammar api.

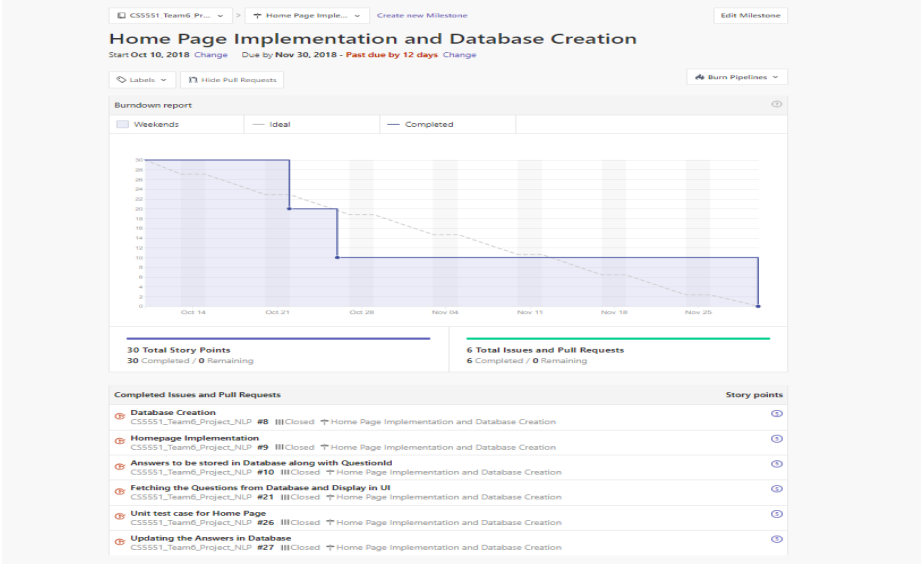
At each phase of the application, the testing goes on and the whole team will be part of this throughout the process of the application.

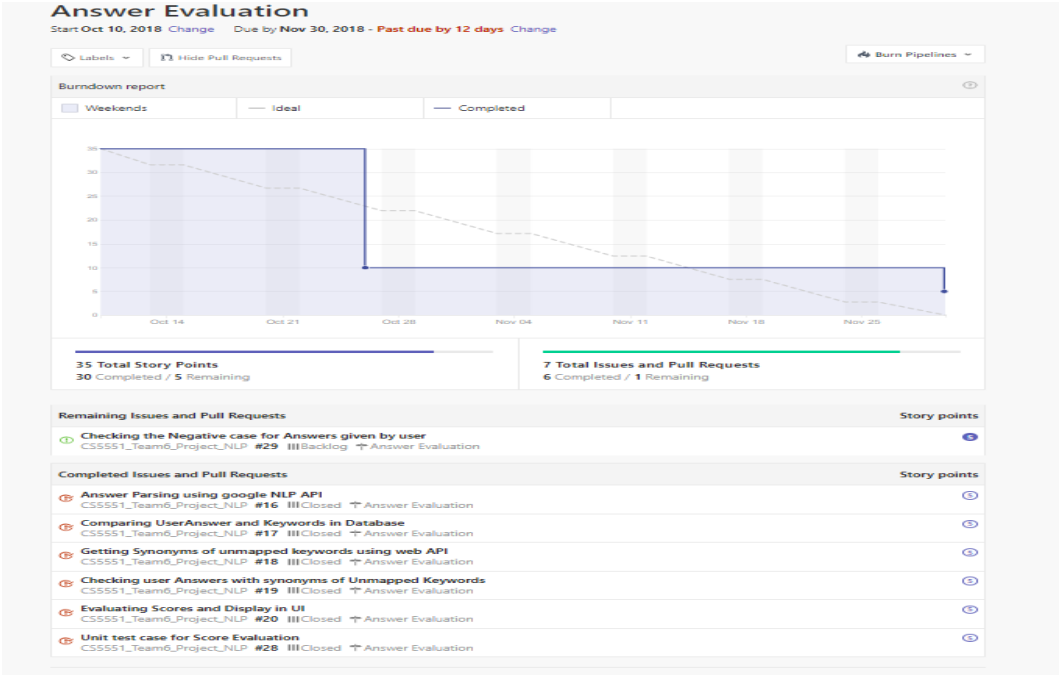
(ii)Burndown Charts

The following Screenshots are Milestones for Login and Register Pages,Admin Page,Home Page Implementation,Answer Evaluation which are created in ZenHub






CS5551_Team6_Pr...
Home Page Imple...
Create new Milestone
Edit Milestone
Home Page Implementation and Database Creation
Start Oct 10, 2018 Change
Due by Nov 30, 2018 - Past due by 12 days Change
Labels
Hide Pull Requests
Burn Pipelines
Burndown report
Weekends
Ideal
Completed
Oct 14
Oct 21
Oct 28
Nov 04
Nov 11
Nov 18
Nov 25
30 Total Story Points
30 Completed / 0 Remaining
6 Total Issues and Pull Requests
6 Completed / 0 Remaining
Completed Issues and Pull Requests
Story points
Database Creation
CS5551_Team6_Project_NLP #8 Closed Home Page Implementation and Database Creation
Homepage Implementation
CS5551_Team6_Project_NLP #9 Closed Home Page Implementation and Database Creation
Answers to be stored in Database along with QuestionId
CS5551_Team6_Project_NLP #10 Closed Home Page Implementation and Database Creation
Fetching the Questions from Database and Display in UI
CS5551_Team6_Project_NLP #21 Closed Home Page Implementation and Database Creation
Unit test case for Home Page
CS5551_Team6_Project_NLP #26 Closed Home Page Implementation and Database Creation
Updating the Answers in Database
CS5551_Team6_Project_NLP #27 Closed Home Page Implementation and Database Creation


Answer Evaluation
Start Oct 10, 2018 Change
Due by Nov 30, 2018 - Past due by 12 days Change
Labels
Hide Pull Requests
Burn Pipelines
Burndown report
Weekends
Ideal
Completed
Oct 14
Oct 21
Oct 28
Nov 04
Nov 11
Nov 18
Nov 25
35 Total Story Points
30 Completed / 5 Remaining
7 Total Issues and Pull Requests
6 Completed / 1 Remaining
Remaining Issues and Pull Requests
Story points
Checking the Negative case for Answers given by user
CS5551_Team6_Project_NLP #29 Backlog Answer Evaluation
Completed Issues and Pull Requests
Story points
Answer Parsing using google NLP API
CS5551_Team6_Project_NLP #16 Closed Answer Evaluation
Comparing UserAnswer and Keywords in Database
CS5551_Team6_Project_NLP #17 Closed Answer Evaluation
Getting Synonyms of unmapped keywords using web API
CS5551_Team6_Project_NLP #18 Closed Answer Evaluation
Checking user Answers with synonyms of Unmapped Keywords
CS5551_Team6_Project_NLP #19 Closed Answer Evaluation
Evaluating Scores and Display in UI
CS5551_Team6_Project_NLP #20 Closed Answer Evaluation
Unit test case for Score Evaluation
CS5551_Team6_Project_NLP #28 Closed Answer Evaluation

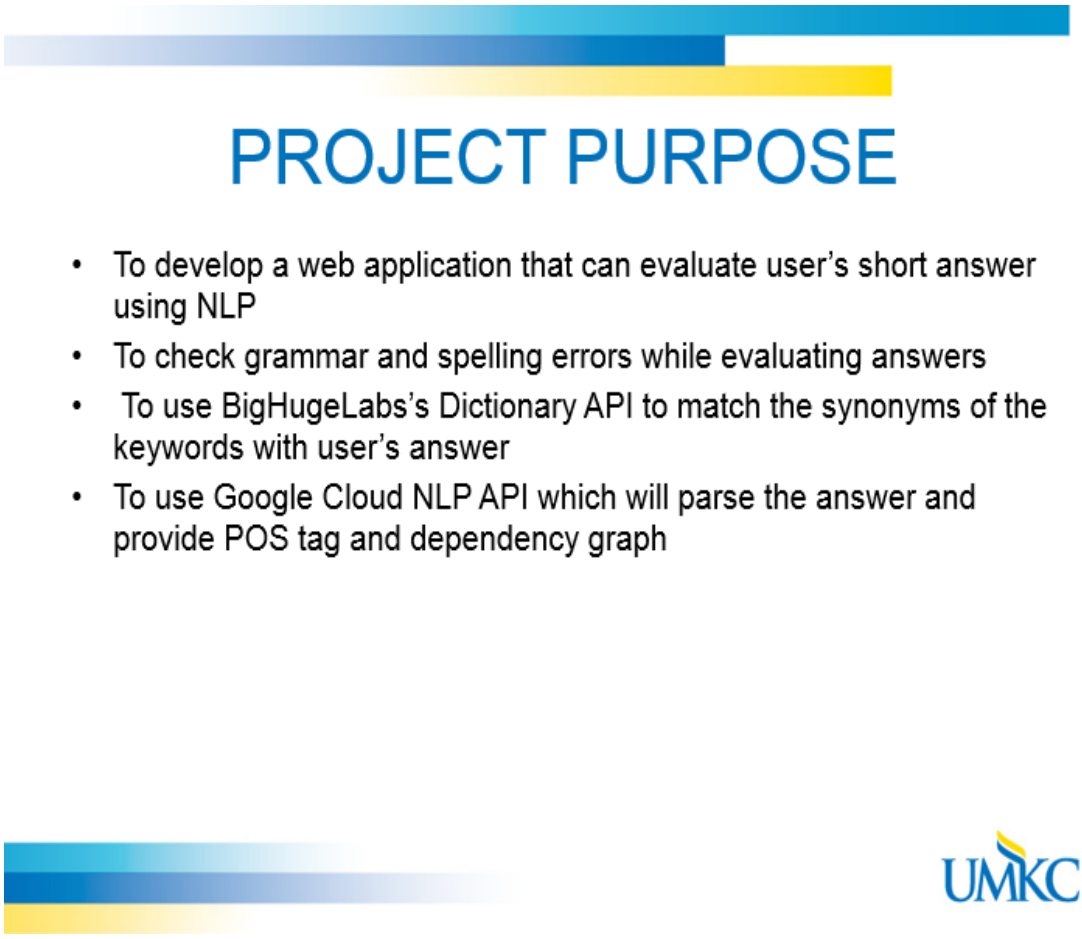
Final Project Evaluation :

Our project has satisfied initial requirements of the project goals we have thought of implementing. The agile process has helped us in planning the increments and successfully able to deliver the outputs for the specified deadlines. Coming to the breakdown of tasks , Hiresh(TeamLeader) brokedown our requirements into individual tasks and used to evaluate them for every increment thus helping us in delivering good work in time. We could have done better by implementing dynamic question evaluation based on Wikipedia sources and also extending our evaluation to more than 10 lines.

Evaluation Points Based on Performance out of 100 by Team Leader(Hiresh)

Hiresh : 100
Anvesh : 100
Prakash : 95
Bharath : 95

3.Project Demo:



TECHNOLOGIES USED

- WebStorm for developing web application
- Google Cloud NLP API for parsing the answer and to get dependency graph
- Text Gears Grammar checker API to the grammar and spelling errors in the answer
- BigHugeLab Dictionary API to get the synonyms for the keywords
- MongoDB for storing user details for login and for storing question and answer keywords for each question
- Facebook OAuth API for social login

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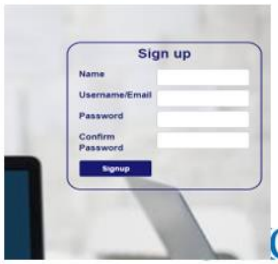
LOGIN AND REGISTER

- New Users can register by giving the details in SignUp Form.
- Once the User is Registered details will save in Mongo Database.
- Registered User can able to login by using registered emailId.
- User can login using Facebook login.



ADMIN PAGE

- Once the Admin logged in with his Credentials admin can add,Update and delete Questions.

INSERTION:

- To Insert the Question just click the Insert Question Tab on Admin Page
- While Inserting the new Question we need to give Question,Answer and Two Keys for Evaluation
- After completing the details give Submit then question details will save in Mongo Database

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UPDATE:
Admin can Update the question with answer and the two keys for Evaluating

DELETE:
Admin can delete the question.

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HOME PAGE

- Once the user Logged in with his Credentials. Questions will be displayed on Home Page
- Questions will add by admin in Admin Page
- User can provide Answer to the question and press the Evaluate button then answer details will store in Mongo Database
- And evaluation result will be shown in popup

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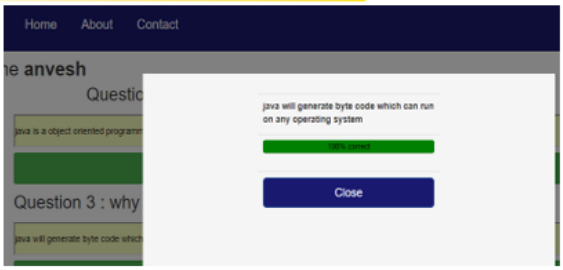
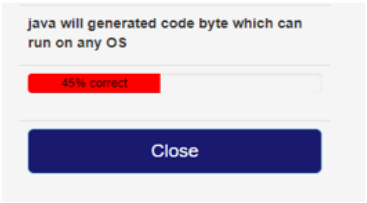
For example, consider Keywords for the answer as “byte code” and “run on any operating system”

The system evaluated the answer and both the keywords are found so marks are given accordingly.



Using the dependency graph generated by NLP API we can checked correctness of the word’s relationship (like compound nouns)
Eg: byte code, black board
System should not evaluate “code byte” as correct



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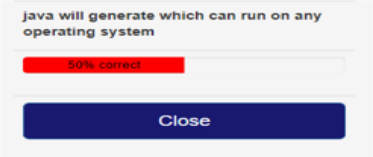
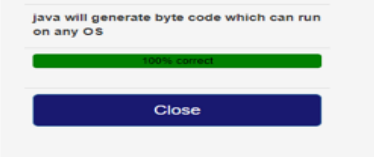
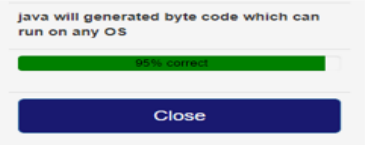
In the right side image, keyword byte code is missing in the answer and system deduced the marks accordingly



System will also handle abbreviations, In the answer "Operating System " is given as OS and system matched it and provided marks accordingly.



System will also check grammar and spelling errors in the user's answer using TextGear's grammar checker API



4.Project Proposal:

To develop a web application for evaluating user's answers for a set of questions using Natural Language Processing.

Significance :

Our System will estimate the correctness of answer entered by users based on keywords. System will evaluate the answers with the synonyms of the keywords to increase the accuracy of the evaluated score for the answer. System will look for online sources like Wikipedia for the keyword other than manual keywords to reduce the admin's task of updating new keywords in future

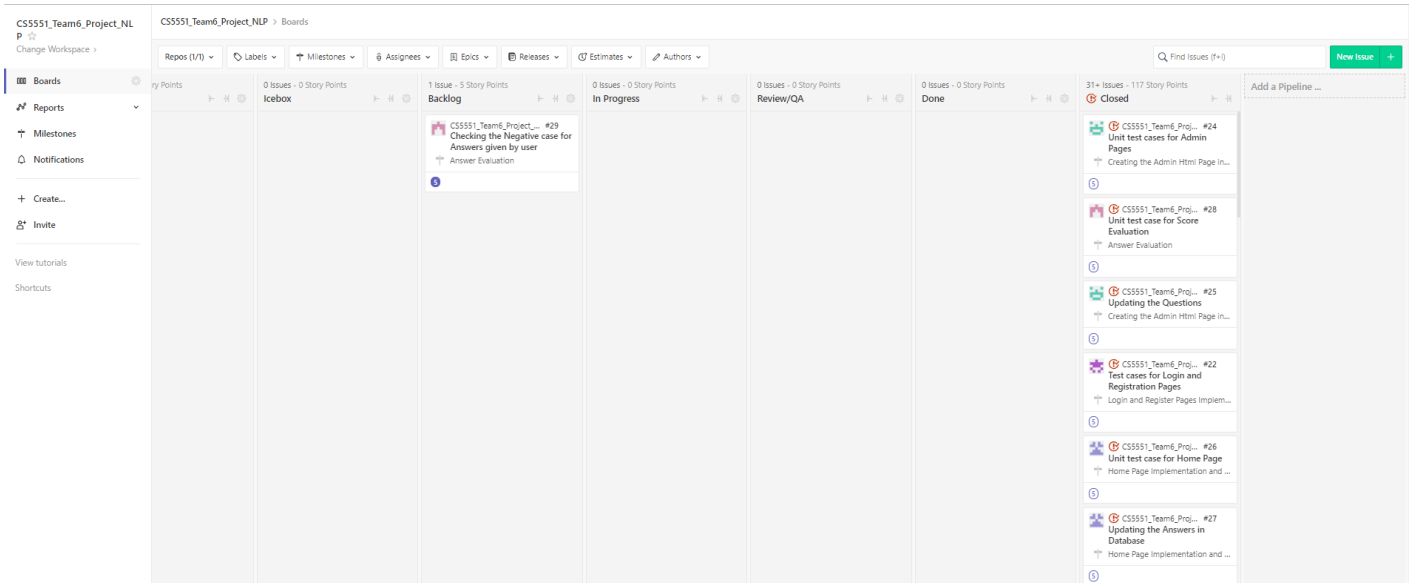
Objectives :

- Develop an application that help users who wants to prepare for competitive exam, interview etc.
- Develop as admin module to add/edit questions.
- Giving suggestion to the user based on the answer key so that user can learn new things about the topics.
- Integrate NLP into the software for text analysis and matching the analyzed text with answer key to evaluate the answers.
- System will also check for grammar error in the texts.

5.Project Plan (using Zen Hub project management Tool)

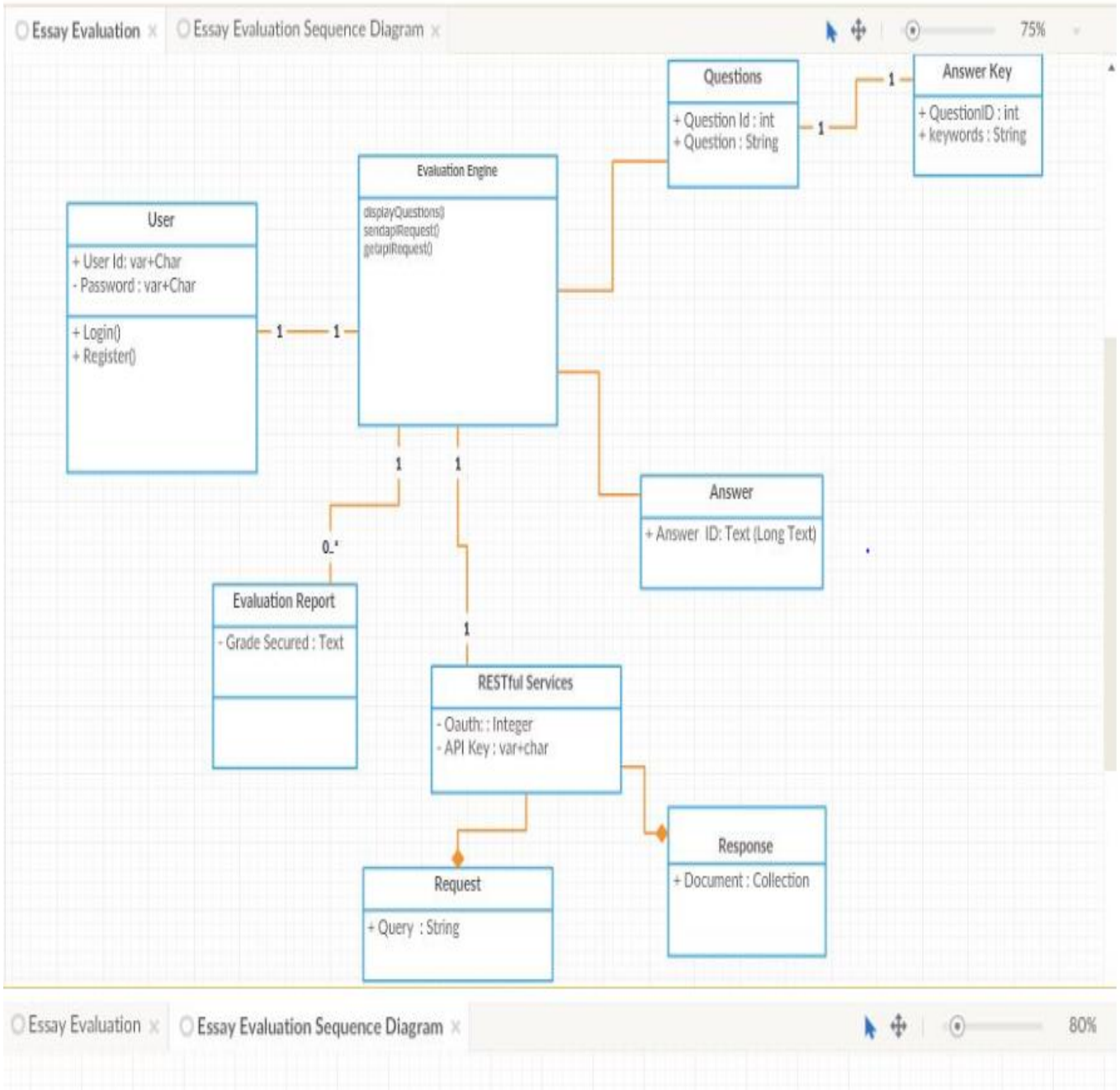
1) Schedule for three different increments

- **Stories (Issues): Scenario and Use case specification**



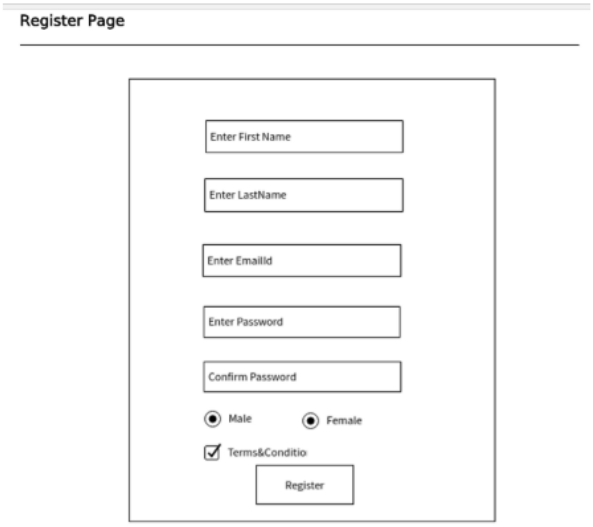
- **Service Design (detailed service design, unit test design)**

  Below attached is the class diagram

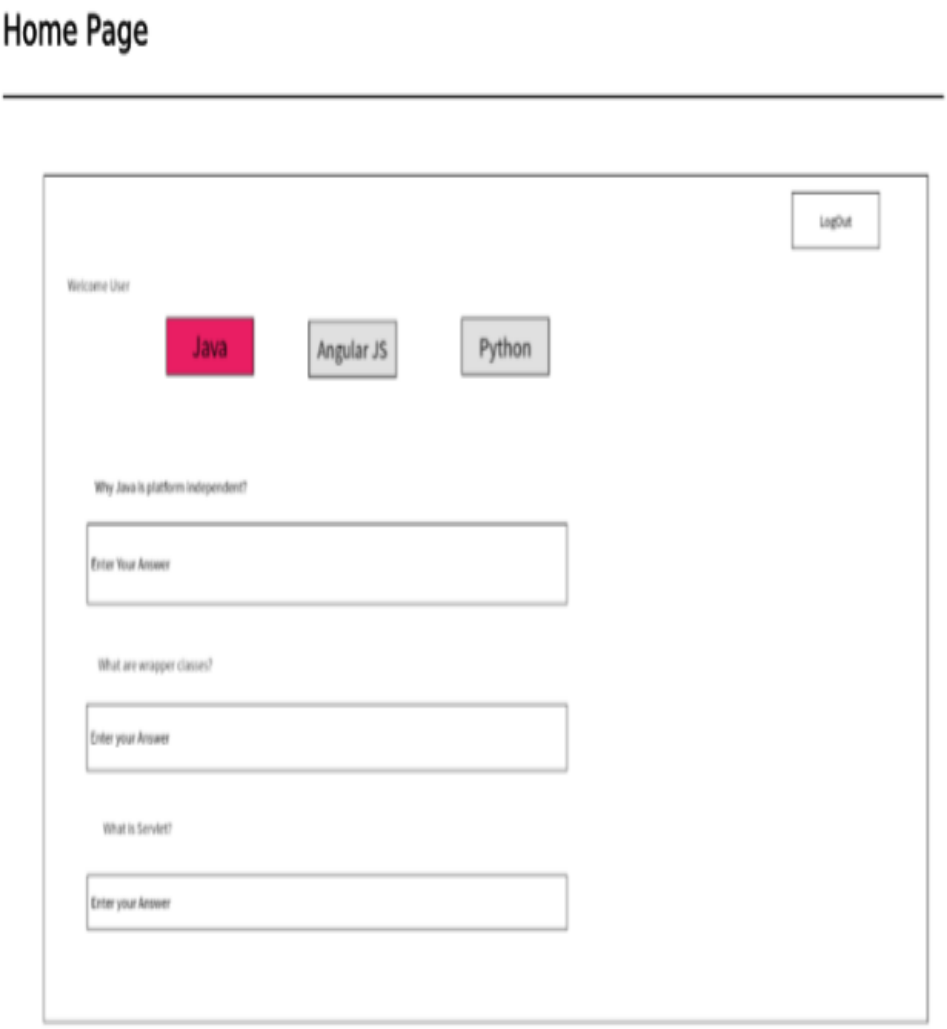


- **User Interface Mockups:**

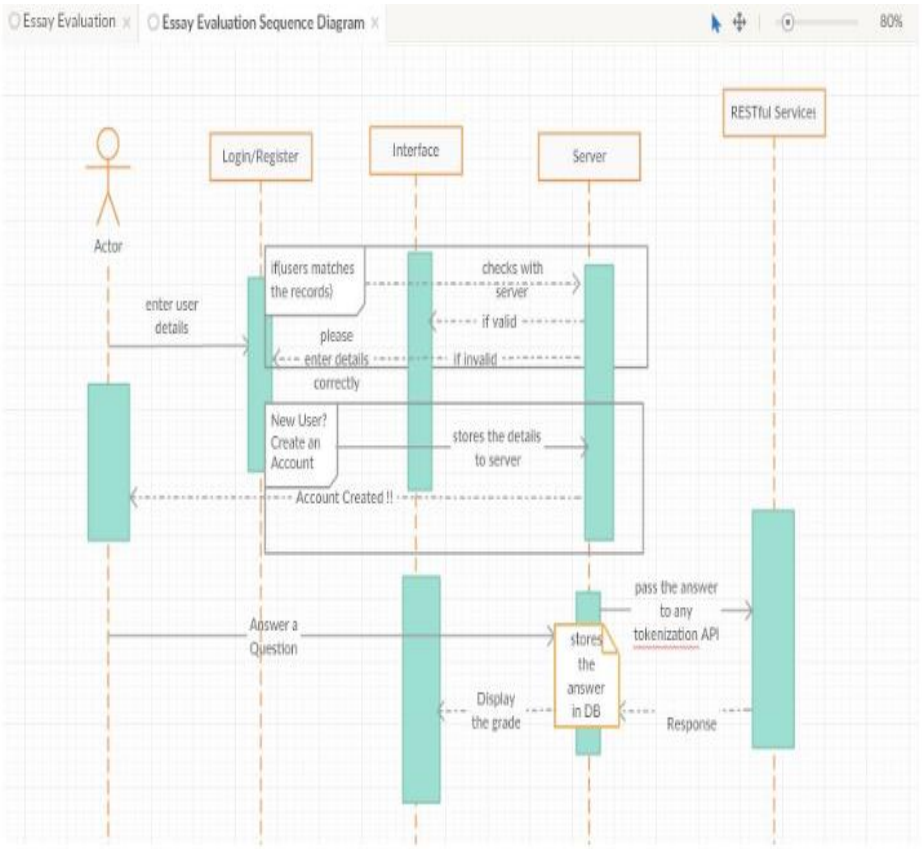
Login & Register Page:



- **Home Page:**


Home Page
LogOut
Welcome User
Java
Angular JS
Python
Why Java is platform independent?
Enter Your Answer
What are wrapper classes?
Enter your Answer
What is Servlet?
Enter your Answer

- **Sequence Diagram**



6.First Increment:

For the First Increment the below tasks are completed for the Project

Hiresh

- Implemented the login and Register Page
- Worked on Google cloud API
- Worked on Microsoft Azure API

Anvesh

- Implemented homepage with logout function.
- Create wireframes for application.

Bharath

- Worked on use case diagrams.
- Worked on NLP API

Prakash

- Worked on collecting question and framing answer keys for the questions.
- Worked on searching NLP API's

7.Second Increment :

The following Tasks Completed for Second Increment

Prakash:

- Login and Registration Pages are completed
- Once the User created using Registration Link details will be saved in Mongo Database.
- Using the Registered Details User can be able to Login.
- Validations are done for Login and Registration Pages.

Bharath:

- Created Admin Login Page to Insert questions into Database.
- Once the admin logged with credentials then he can be able to add the questions with keywords and Answers.
- Created questions will save in Mongo Database.

Anvesh:

- Fetch the Questions from Database and display in UI with one text box for Answer and Evaluate button.
- Once the answer is given by user,Answer details with questionId and UserDetails will save in Mongo Database
- Contact and About Pages are Created.
- When the User click the LogOut Button then user redirects to LoginPage

Hiresh :

- Comparing the keywords and input answer.
- Calculating score based on the matched keywords.
- Display score to the user in UI.
- Checking grammar in user's input.

8.Third Increment:

Following Tasks are completed for Third Increement

Prakash:

- Testcases for Login and Register Pages.
- Need to check for Duplicate User while registering.

Bharath:

- Search Functionality for Questions.
- Tested admin login functionality
- Tested Question and keywords insert into MongoDB

Anvesh:

- Tested whether answers inserted into MongoDB or not.
- Tested Displaying Questions in Homepage in order.
- Duplicate Answer Details Storage needs to be fixed.

Hiresh:

- Negative checking like checking antonyms of the keyword are present in the text and reducing marks accordingly.
- Tested correctness of Answer evaluation with keywords.
- Tested whether system calculating marks correctly or not.

9.References :

- https://cloud.google.com/natural-language/docs/
- http://words.bighugelabs.com/api.php
- https://arxiv.org/ftp/arxiv/papers/1011/1011.1742.pdf
- https://docs.mlab.com/connecting/#methods
- https://console.cloud.google.com/apis/library/language.googleapis.com
- https://azure.microsoft.com/en-us/services/cognitive-services/text-analytics/