HBS HIGHLIGHTER

A Project report submitted in partial fulfillment of the requirements for the Award of the degree

MASTER OF COMPUTER APPLICATIONS 2021

Department of Computer Science and Applications
Panjab University, Chandigarh

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Submitted to :
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Acknowledgement

A formal statement of acknowledgement is hardly sufficient to express my gratitude towards the personalities who have helped me to undertake and carry out this project. I hereby convey my thankfulness and obligation to all those who have provided me valuable help, support and guidance for my seminar.

First and foremost, I express my profound gratitude and deep regards to my External Guide Mr. Sumanth Hegde and Swapna (Tech Lead of our project) His keen interest and encouragement has been of immense help to me. He gave me unending support and helped me in numerous ways. His stimulating suggestions helped me to coordinate my project. I would also like to thank my Internal Guide Mr. Mohinder Singh Negi for his valuable time for their suggestions regarding this project.

Vishal

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Hashedin
by Deloitte

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HSR Layout, Bangalore- 560102

TO WHOMSOEVER IT MAY CONCERN

Date: 12th May 2021

Dear Sir / Madam,

This is to inform you that Mr. Vishal Rana ID - IN2021 47, is currently pursuing his internship at Hashedin by Deloitte, Bangalore since 1st February 2021.

Number of working days per week: 5

Mr.Vishal Rana is in his training period and is being assessed on intervals. However, we can share the details of his performance by the end of the 6 months internship.

Regards,

Suchitra Indukuri
(HR Specialist)
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27th Main Road End, Sector 2,
HSR Layout, Bangalore-560102

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Company Profile

Hashedin by Deloitte is one of India's leading technology firms that is specialized in offering software modernization and product innovation solutions.

Hashedin has successfully served more than 100 customers since its inception across industries and continents and has helped them launch new products faster, disrupt industries, and streamline and scale operations.

Now Deloitte Consulting has completed its acquisition of Hashedin Technologies Private Limited. Together the two organizations will help clients to imagine, deliver and run their futures with cloud technologies. Company renamed to **Hashedin by Deloitte**.

Website	http://ww.hashedin.com
Headquarters	Bangalore
Industry	Information Technology and Services
Founded	2010
Location	36/5, Somasundarapalya, 27th main road end, Sector 2, HSR Layout Bangalore 560102, IN

Key People

Himanshu Varshney	**CEO**
Sripathi Krishnan	**CTO**
Anshuman Singh	**COO**
Harhist Singhal	**CBO**
Sandeep Singh	**VP-Delivery**
Amit Bahl	**Director of Technology**
Ankur Richhariya	**VP-Global Services**

Introduction

HBS Highlighter is a SaaS based application. This app is useful for students, scholars. It helps them to highlight any text content from any website and can save them. Later they can visit highlighter's website to see their highlights and can manage them.

It is a chrome extension which would be available in chrome-web store. Users can download the chrome extension and enable it to use its features.

Purpose

What problem does this product solve?

The problem of the scattered content over several sites and problem in referencing it again as it takes a lot of time and effort to browse through a long list of bookmarks or screenshots.

Who will use this product?

Anybody who is mainly searching on many online websites and creating some kind of database (like writing the content manually on papers) or want to save something for later reference.

What is important?

Saves time and makes it easy to refer to the saved content later.

Chapter 2
Existing System and Scope of our Project

Market Overview

The highlighter market currently has the following existing prominent applications.

1. GetLiner
2. GoSnippet
3. Weava Highlighter
4. Notesalong
5. RevNote Highlighter

The existing apps offer the features of highlighting text on webpages, link based sharing, manual tagging and comments. The weava highlighter has the largest user base with more than 500000 followed by GetLiner with a user base of around 100000 users. GoSnippet with around 10000 user base. The top three apps with the larger user base provide free as well as premium versions of their applications where the free model has limited access and usage. Additional features can be unlocked by becoming a paid user.

Scope

Anybody who mainly searches websites and wants to save some content for later reference. This covers a wide range of customers especially from student, scholars and researchers sectors. Later versions of this product will include more features that will help us to cover more of the audience.

The scope of this project is to develop a Minimal Viable Product that offers features that match the functionality of existing products while enhancing user experience with additional features such as reminder service.

Project Goals

The Goal of the project :

- To help our customers highlight the useful content from a vast article & bring the liked content across all the platforms or online sites on a single location for easy reference in future.
- The content will be auto categorized, and the User can avail for a reminder option through emails reference in future.
- The user can share his/her highlighted content with anybody across any platform.
- The user can be suggested personalized articles and newsletters based on the saved content.

Chapter 3

Software Requirements Specification

Software Requirement Specification is the starting point of software developing activity. As the system grew complex it became evident that the goal of the entire system cannot be easily comprehended. Hence the need for the requirement phase arises. The software project is initialized with the client's needs. The software requirement specification is the means of translating the idea of the minds of clients into a formal document.

Software Requirements

Operating systems	Ubuntu 20.04, Windows
Language	Java
Other Technologies	Spring Boot, Spring Security and JPA
Softwares	IntelliJ IDEA, PgAdmin, postgresql And Postman, Git
Browser	Chrome
Database	Postgres

Hardware Requirements

Processor	Intel i7 processor
Ram	8GB
Hard Disk	512GB
Speed	2.4 Ghz

Functional Requirements

- User Registration and Login

As a backend developer we have to make api for user registration and user login. Registered users can simply login using their accounts that they have

used while registering with us. Appropriate message for invalid user or if the user email address is already registered with us.

- Web App/ Chrome Extension

The web application provides the user with a dashboard where they can view and manage their saved content, and manage their user account.

The chrome extension enables users to highlight a particular content from a site and save it for later reference.

- Text Highlight

As a backend developer we have exposed API to extension so that users can highlight and save content in the database through the respective exposed API.

As an extension code logic writer we have to devise an algorithm so that on revisit to that website we can highlight already highlighted content into that website using the color we user has chosen while highlighting.

- Tags

Highlighted content can be organized using different tags. More than one highlight can be tagged using the same tag and a single highlight can be tagged with more than one highlight.

As a backend developer we have to design a database to fit our needs and write logic.

- Search

The saved content can be searched using keywords from the highlighted content or tags or from the website title on the web application dashboard. As a backend developer we have to expose searching capability through an API.

If the searching string is present in website Title, or tags or in the highlighted text content then it should be transferred to front-end from back-end.

- Notags

By default, if the user doesn't select any tag for a particular then it should be visible under notags part. An API should be there that selects highlights which have no tags associated with them.

        - When a website loads all highlights of that website should be visible there.

        - Users should be able to delete a highlight.

        - Comment can be added to a highlight. Already existing comments can be edited or can be removed. A comment acts that can be added to an existing highlight.

- Users should be able to change their personal information, like name, password etc.

Non Functional Requirements

Non Functional Requirements describe user visible aspects of the system that are not directly related with the functional behavior of the system.

- Security
    - User Credentials for logging in need to be stored securely.
    - API should be designed in such a way to prevent any kind of unauthorized access.

- Performance

User Experience with the highlight webpage loading time should be similar to the actual website.

Navigation within web page application should be smooth (transitioning between different screens)

Test cases should cover all edge cases that users may experience while using your extension.

Documentation should be there so that the front-end team can use that documentation for making API calls.

Scalability

System should be able to handle a number of users. For eg. handling around thousands of uses at a time.

Chapter 4

Usefulness of the project

Before discussing the usefulness of the project, we will discuss the pain points of the end users.

The pain points were a part of research work which was done by the business team. The pain points were recorded from original users which cover fellows from the research sector, student sector, persons who just read a lot of websites and want to save content for later reference, travellers who visit websites to read travelling blogs etc.

Most common pain points are listed below

- The only feature available to save is bookmarking. But searching through a long list of bookmarks is a cumbersome process.
- User has to go through the whole website in order to find liked content on a bookmarked website.
- Can't find the required copy of the pasted content in sticky notes.
- Wastes a lot of time searching for lost content again.
- Sometimes storing content offline e.g in sticky notes, does not provide context. So users may want to revisit the source from the sticky note but approaches which exist are not difficult but time consuming and repetitive, which may frustrate users.
- No easy way to organize content for searching later on.
- Not feasible to manage content from various websites while saving them on sticky notes offline.
- Misses the context and hard to go through the entire articles for the required content.

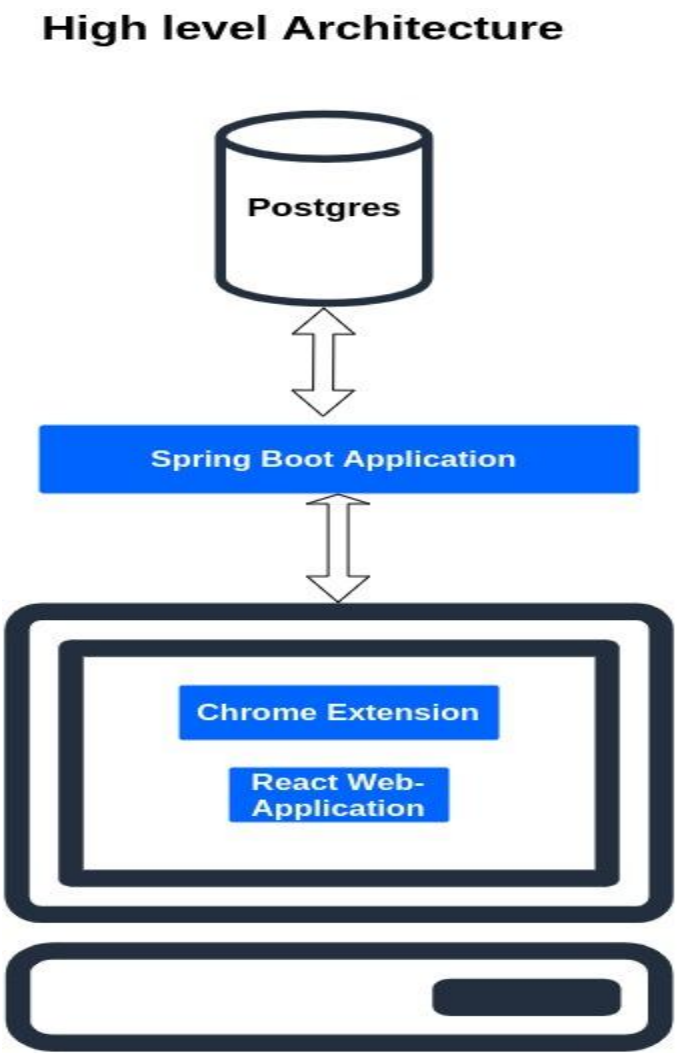
Benefits of our Product.

- Instead of bookmarking the whole website just to refer or to remember a particular content from the website, users can highlight the liked content only and later revisit the website if they want to. The liked content will be visible in the dashboard so no need to go through the whole website.
- Users can easily find the saved content through tags and filters. If they want to revisit the website in order to get context information they can revisit the website just from the highlighted text with a single click in a second.
- Now you don't have to waste a lot of time searching for lost content. Just go to website and user searching and tag filtering functionality for searching a highlight.

- Users can add context information or any other kind of information to a highlight using comments. That way they don't have to go through the entire website in order to get the context of the saved content if they forget what the highlighted content illustrates actually.
- Users can easily organize its contents under tags. That way they can easily refer later if they want to. Users can make a new tag. Users can associate more than one tag to a highlight, that will make the searching process easy from the user's perspective.
- Reminder features allow her to check back at a convenient time and go through the desired content.
- All the required content is stored with a single point of access eliminating the need to use multiple applications.

Chapter 5

Architecture



The above picture represents the high level architecture of our application. The front-end has two different applications that are working together in order to achieve business goals.

FRONT-END

Chrome Extension

The first application is the chrome extension. Chrome extension is available in chrome-web store. Users can download it from there. Using chrome extension users can highlight any content from any website in chrome web browsers only.

Features that this chrome extension provides

- You can highlight and save contents from any website.
- Upon revisiting the website, the user can view his/her highlights colored in the color they have chosen while highlighting a text.
- Users can specify tags while highlighting a content.
- Displaying a comment associated with a highlight when a user hovers over that highlight.
- It is locally storing a token that is used for authentication purposes by the backend API.

React Web Application

The Second application that works at the front-end is React Web application.

- The main purpose of this application is to let users see and manage their highlights at a common place in an easy manner.
- It provides easy and powerful searching capability to the user so that he can search through website-titles, tags and contents of highlights by specifying some string.
- Displays all the tags that the user has used so far.
- Provide easy filtering capability through tags.
- Edit comment, tags associated with a highlight.
- Can delete a highlight.
- Can change personal account information.

BACK-END

Backend is written in Spring Boot with Spring Security and JPA.

Spring Boot

It is an open source Java-based framework used to create a micro Service. It is developed by Pivotal Team and is used to build stand-alone and production ready **spring applications**.

All Business logic is handled in this application, like how the highlights are managed, how it identifies duplicate highlights while adding a highlight in the database so that duplicate highlights cannot be added in the database etc.

Functionality to the front-end application is exposed via APIs.

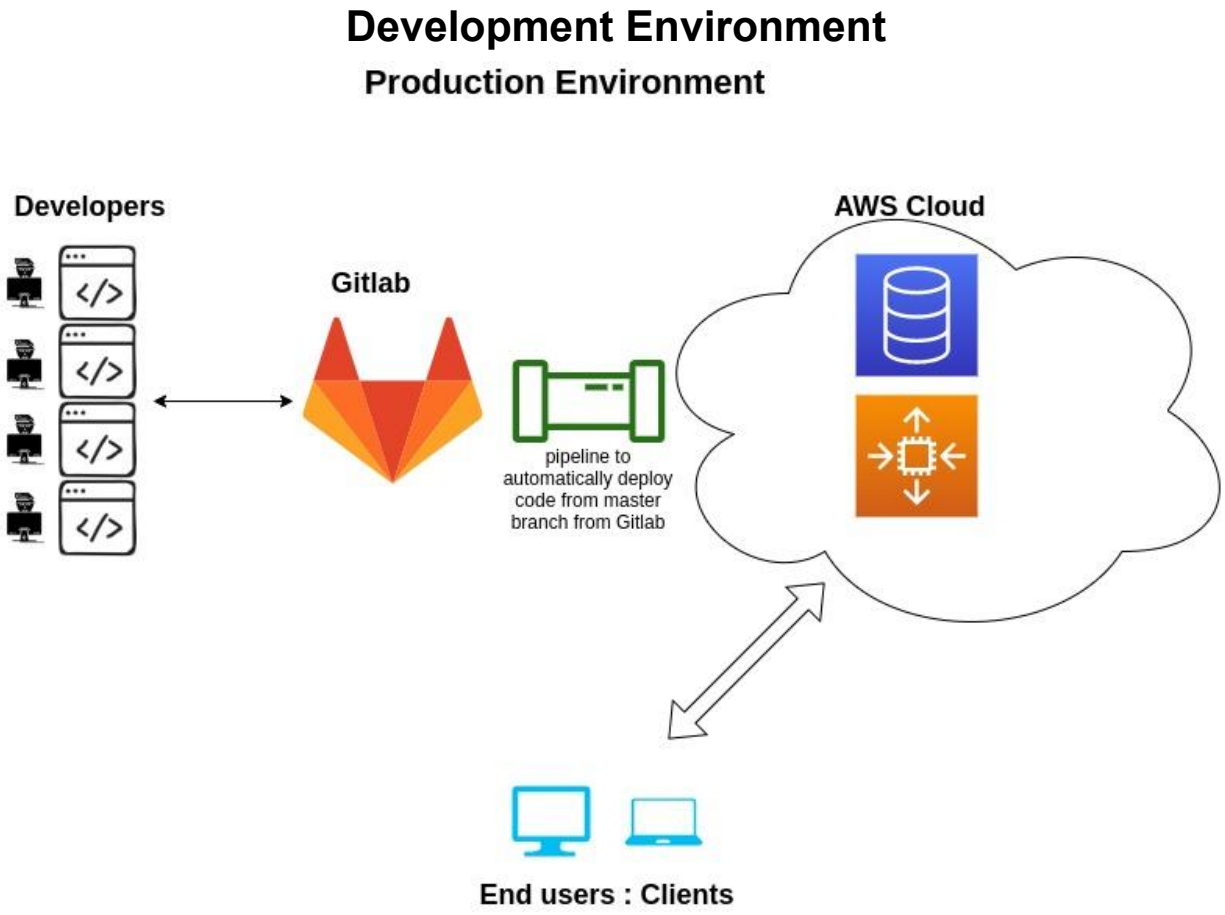
JPA

JPA stands for Java Persistence API. Java persistence API lets developers think in terms of entities rather than tables. We don't write queries in SQL which may be database dependent, instead we write JPA queries that are independent of the database. The JPA itself generated database SQL queries from the JPA queries for performing actions in the database.

We have used JPA for storing, retrieving, modifying and managing relationships between entities in the database.

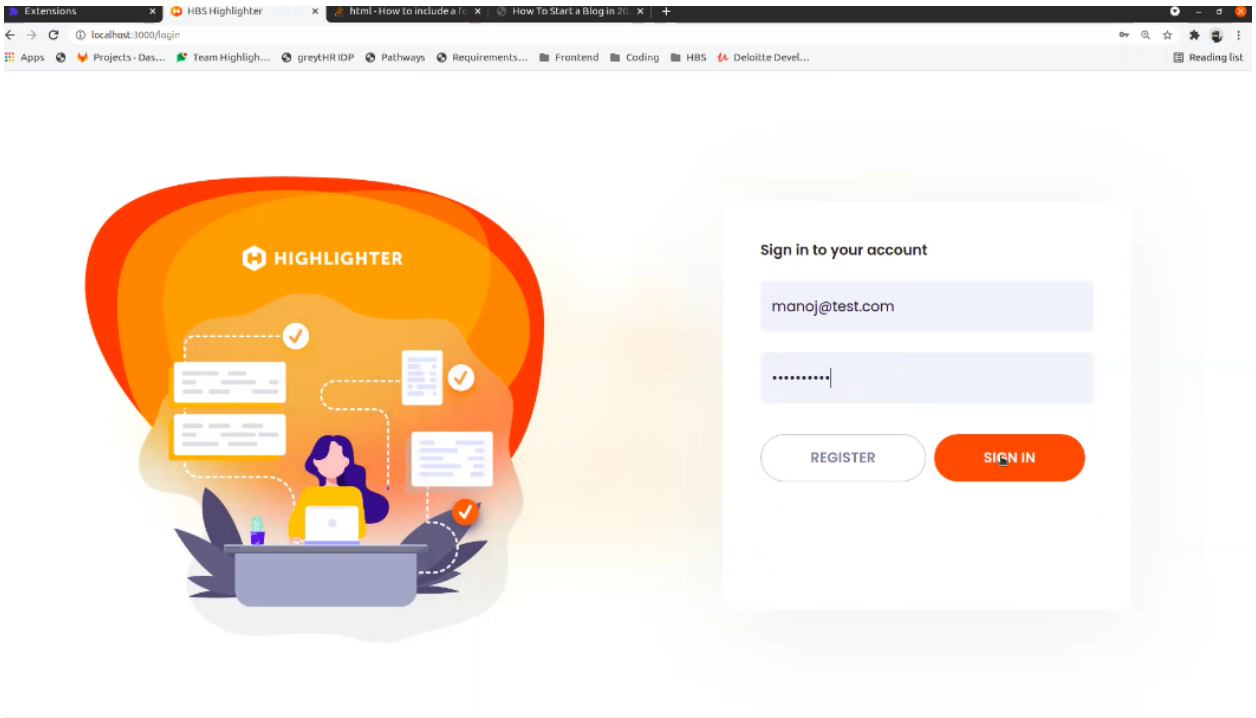
DATABASE

We have used a postgres database hosted in AWS Cloud.

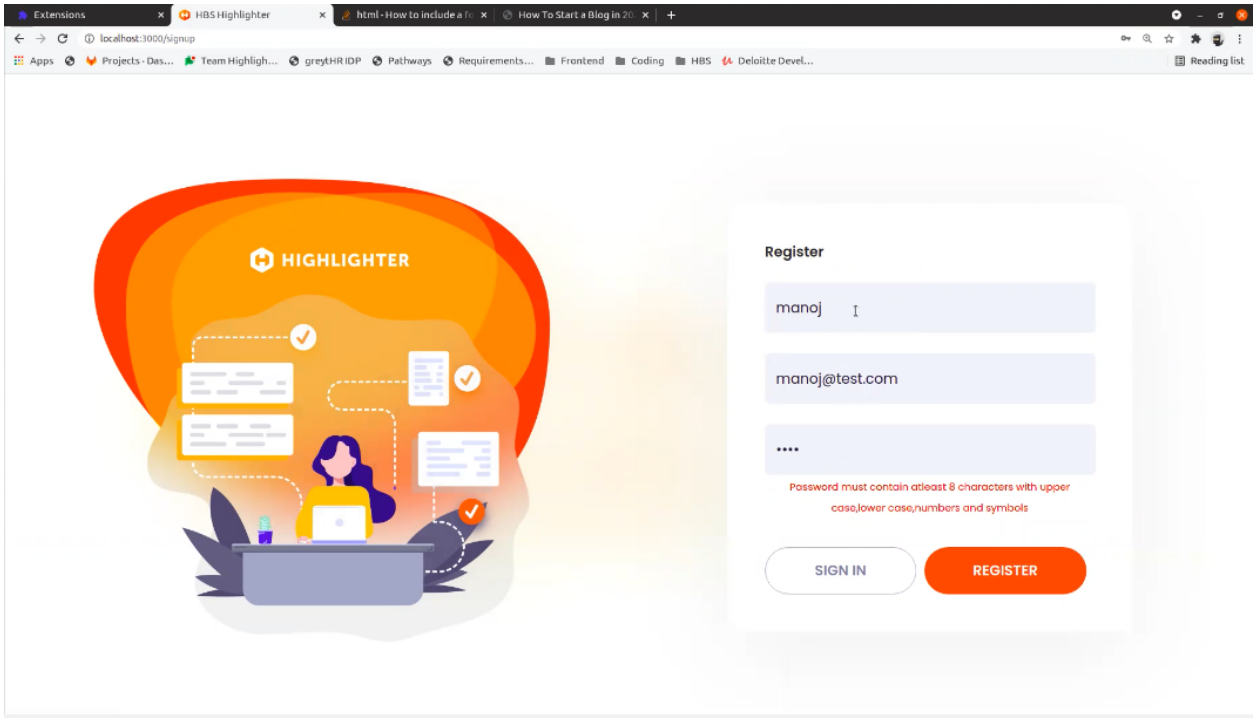


Chapter 6
Screens

1. Login Screen

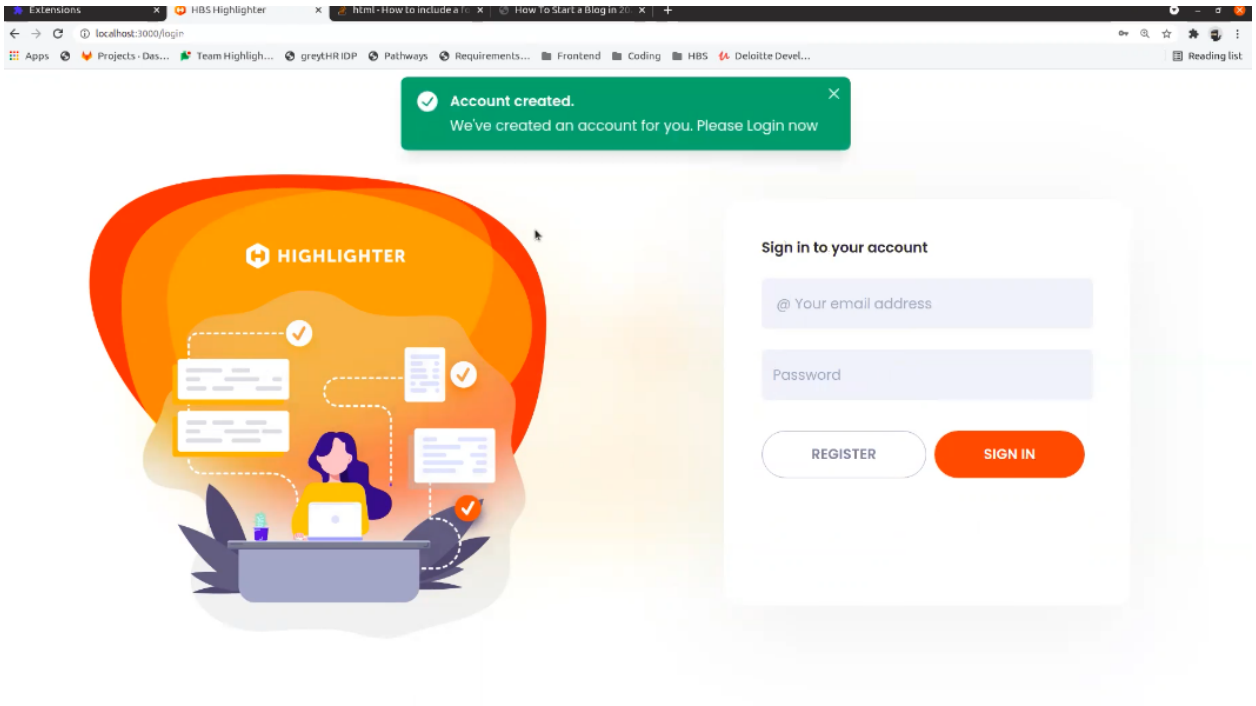


2. Registration Screen



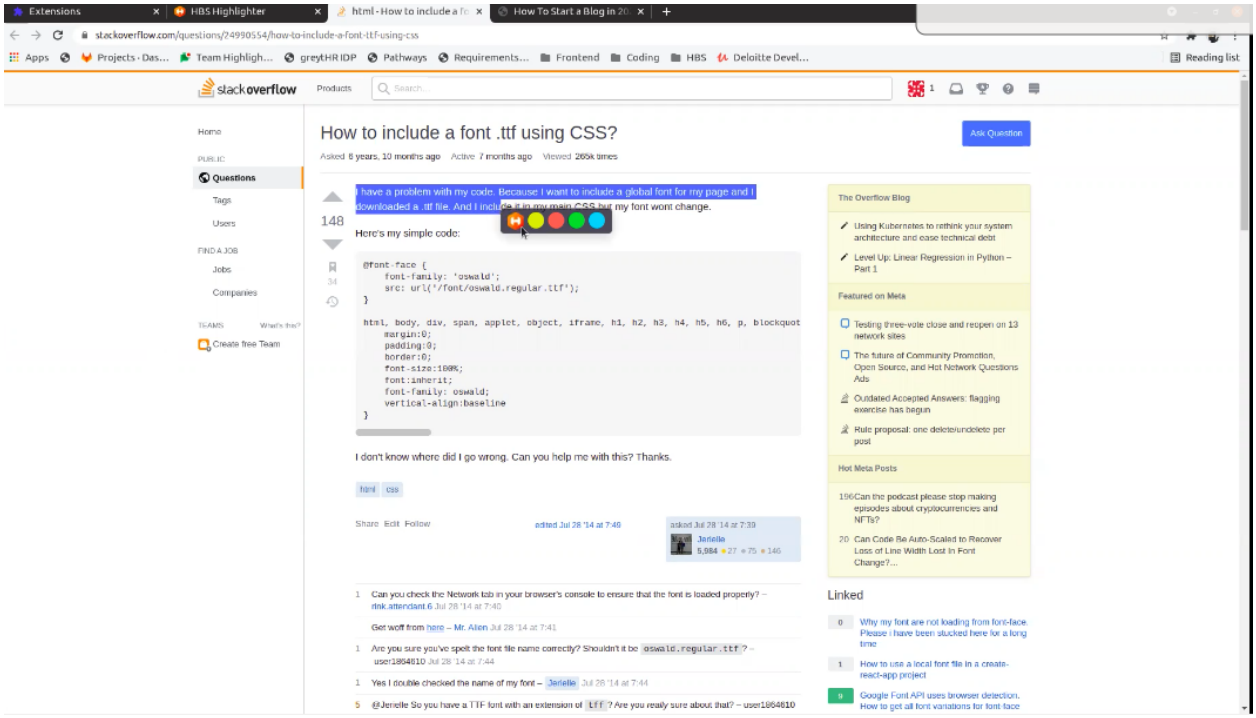
Users must fulfill the password criteria to set their password.

3. After Registration

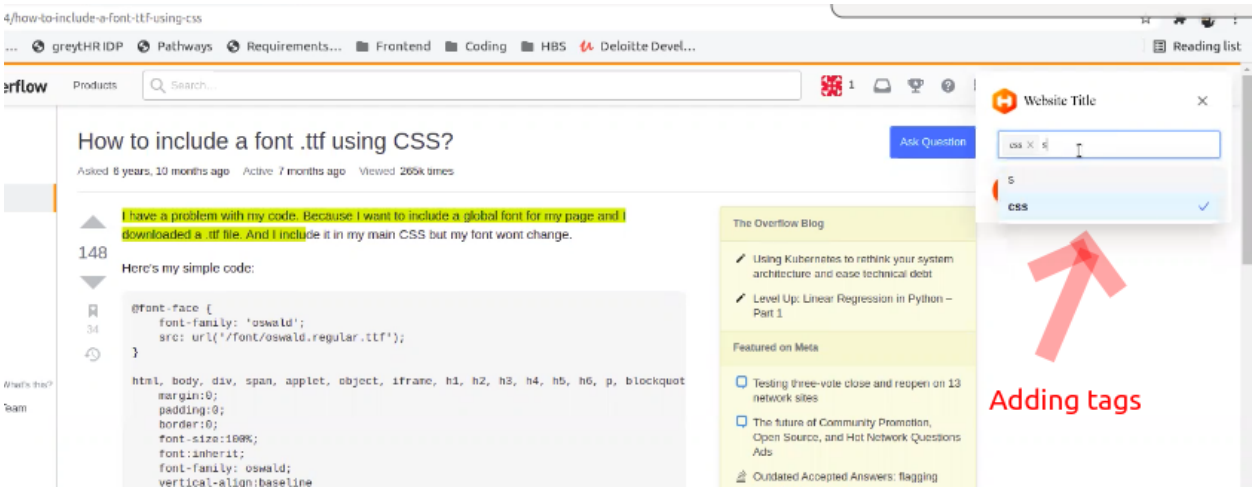


After successful registration the user has to login.

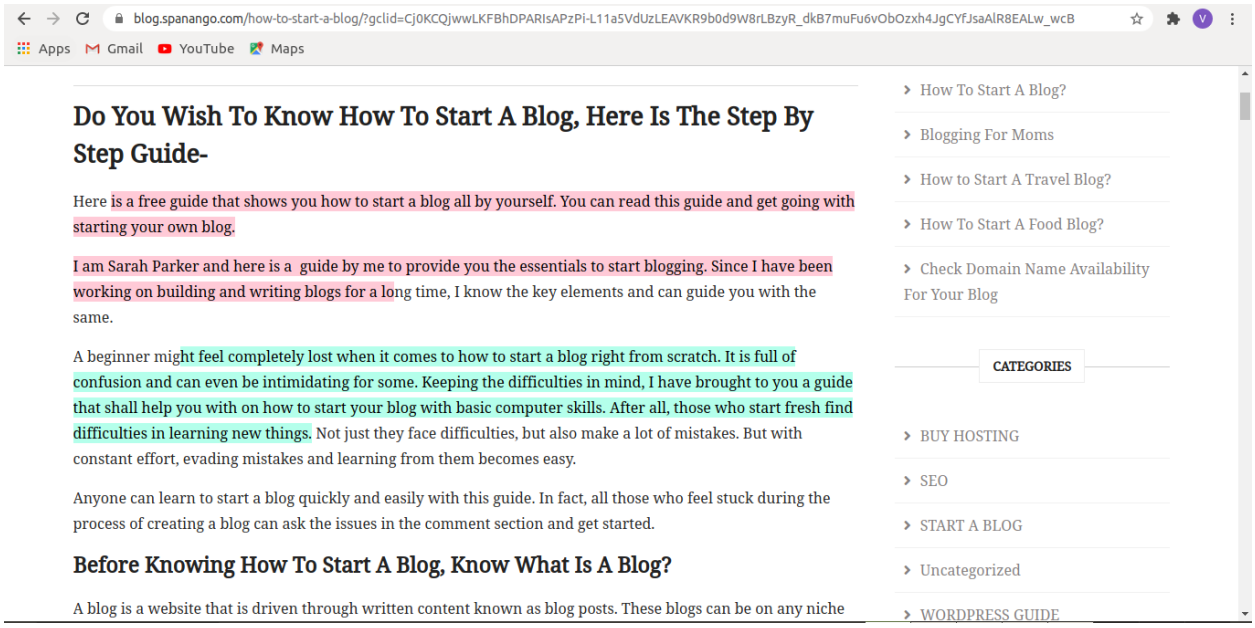
4. Highlighting text from Stackoverflow.



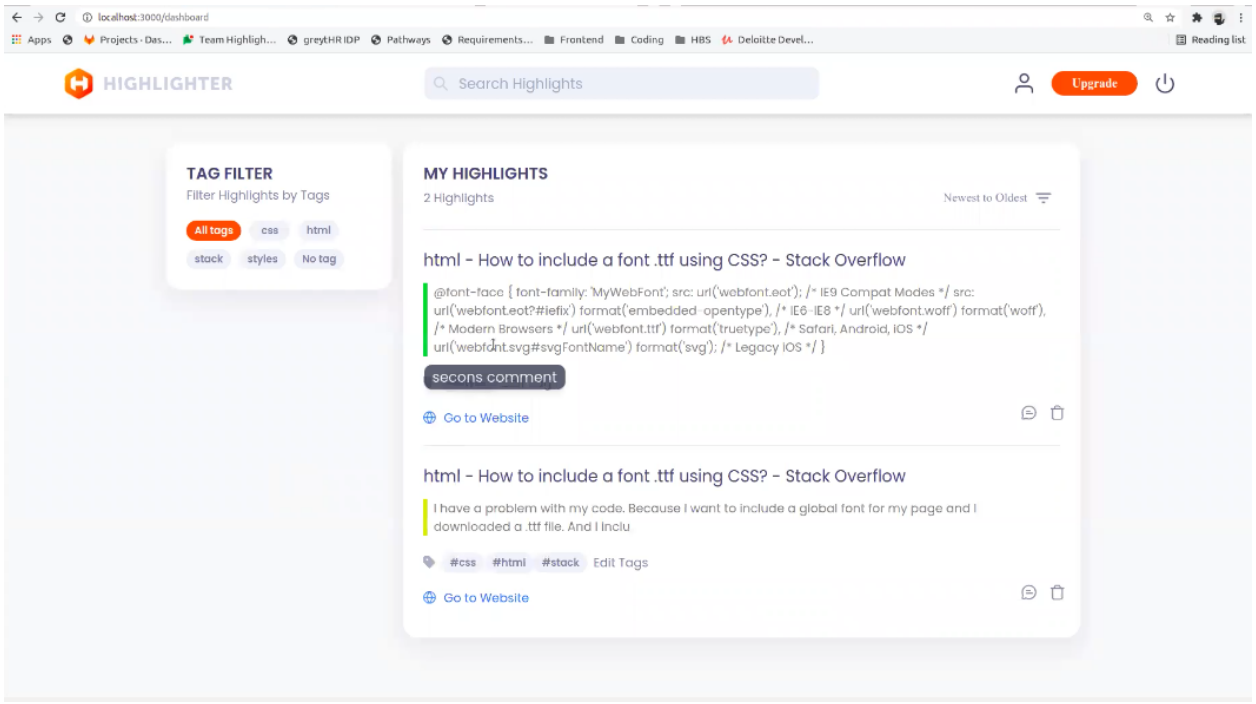
5. Adding tags while saving.



6. You can highlight more than one distinct content from the same website.

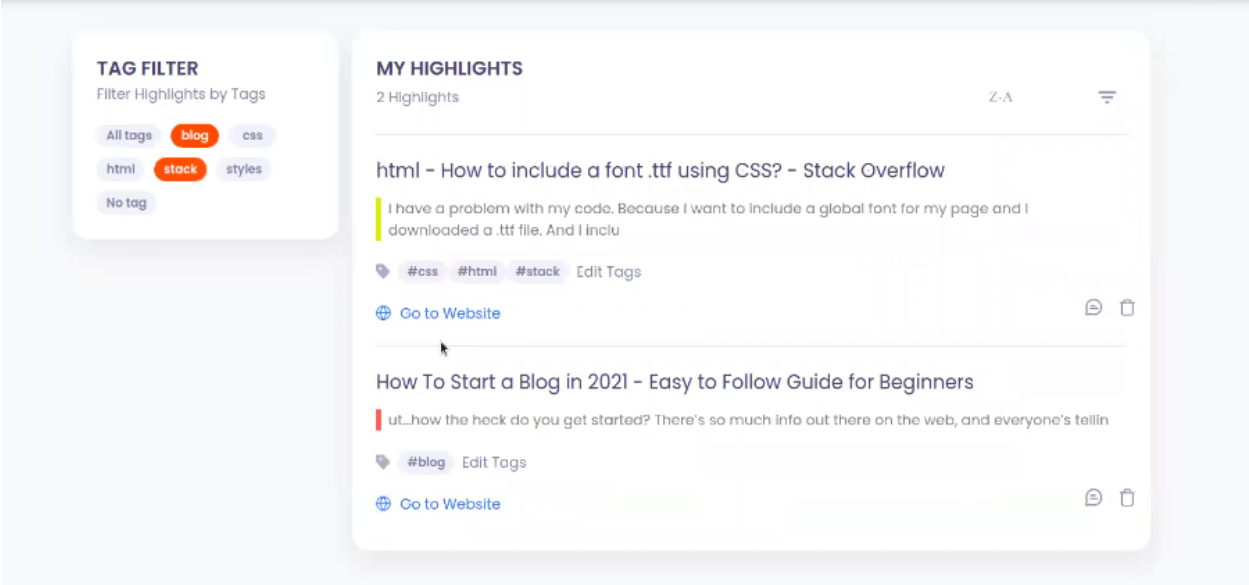


7.Dash board screen



The above dashboard illustrates that the user has created css,html,style and stack tags so far. Highlights are shown in **MY HIGHLIGHTS** section.

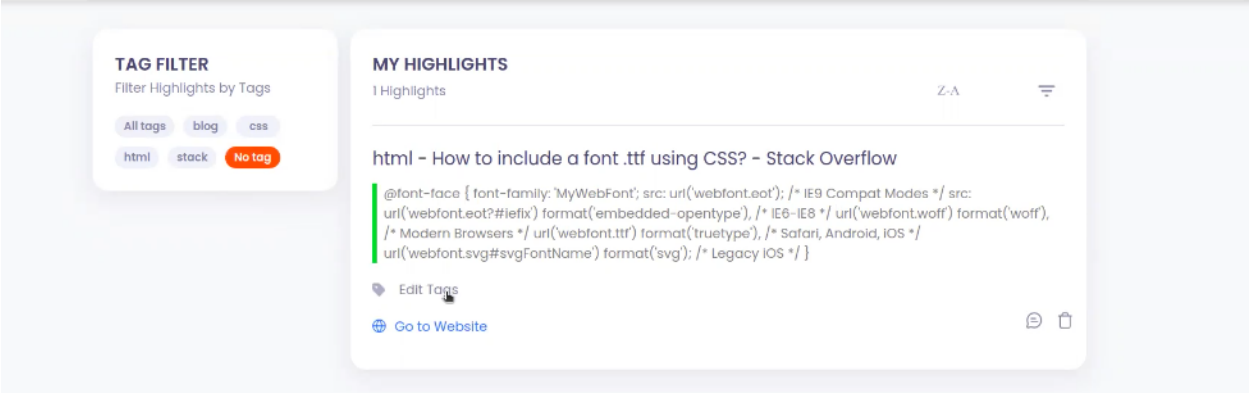
Tag Filter : Tag Filter on the left hand side can be used to filter highlights based on the selected tags. If any of the selected tags is associated with a highlight, it will be displayed in **MY HIGHLIGHTS** section.



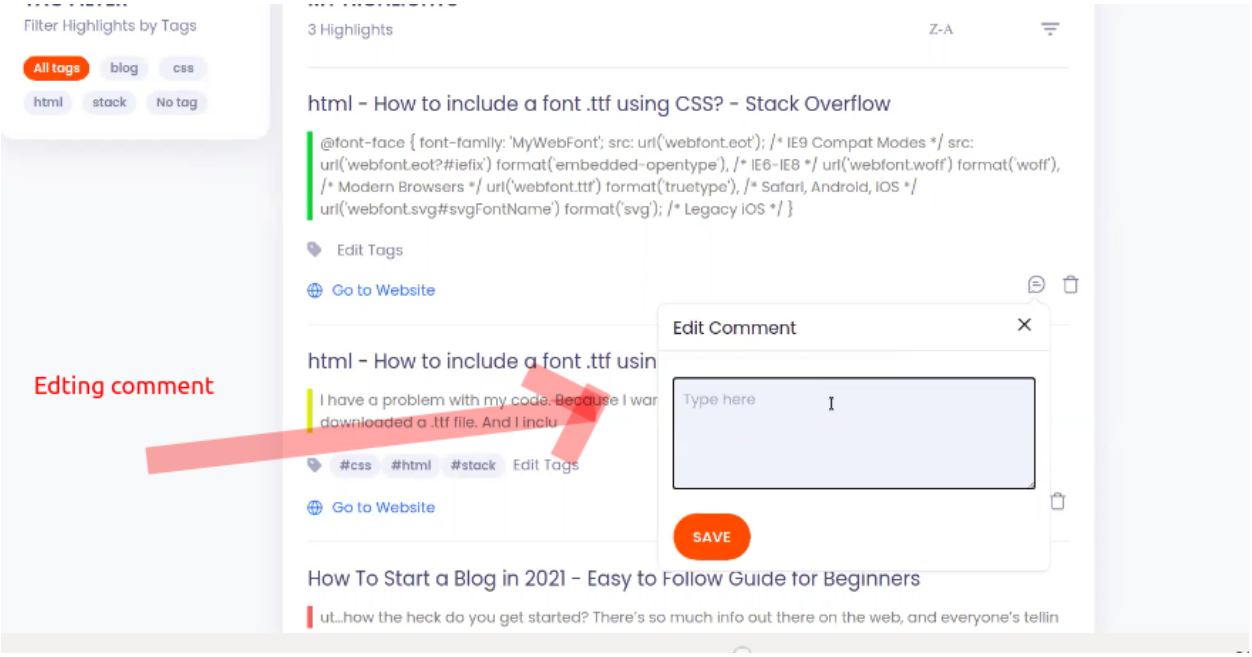
In the above picture the user has selected **blog** and **stock** tag as a response to which highlights which have at least one of the selected text is show in **MY HIGHLIGHTS** section.

- User has the option to view all highlights by selecting **All tags** from tag filters. This will remove the current selection of tags from the tag **filter** as a result all highlights will be shown in **MY HIGHLIGHTS** section.

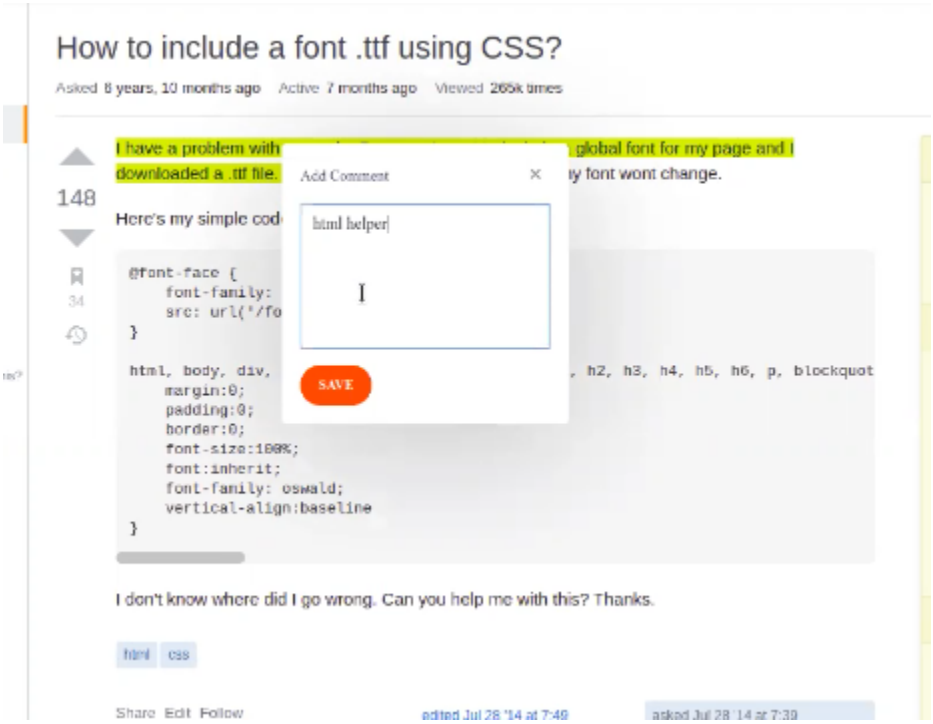
- It might happen that the user doesn't want to give any tag to a highlight. In order to see those highlights which have no tags associated with them select **no tag** option from **tag filters.** This will remove current selection of tags from the **tag filter** and will only show highlights, which have no tag associated with them.



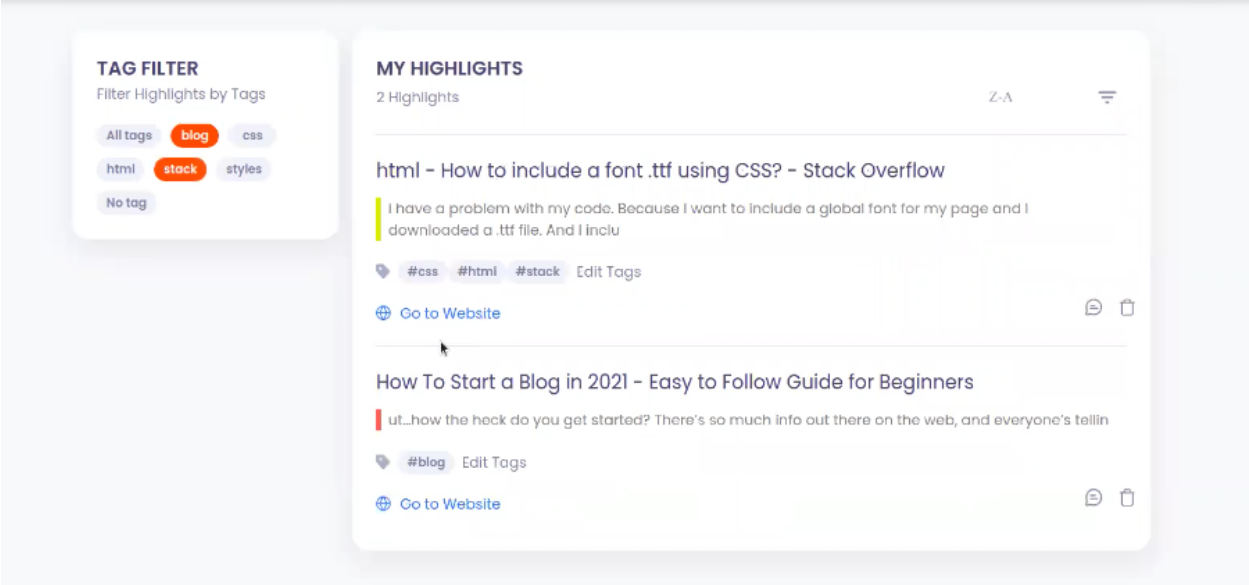
8. Users can edit a comment to a highlight from the dashboard.



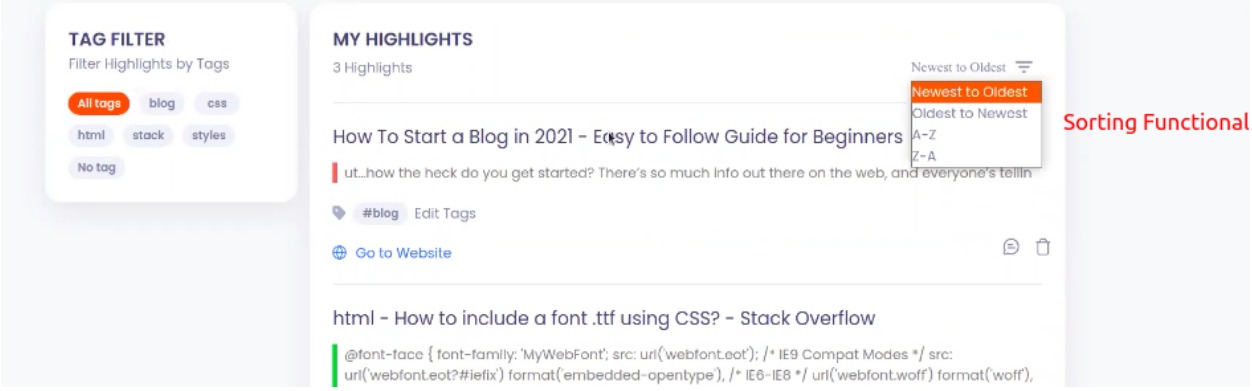
9. Editing comment and tag from the website itself.



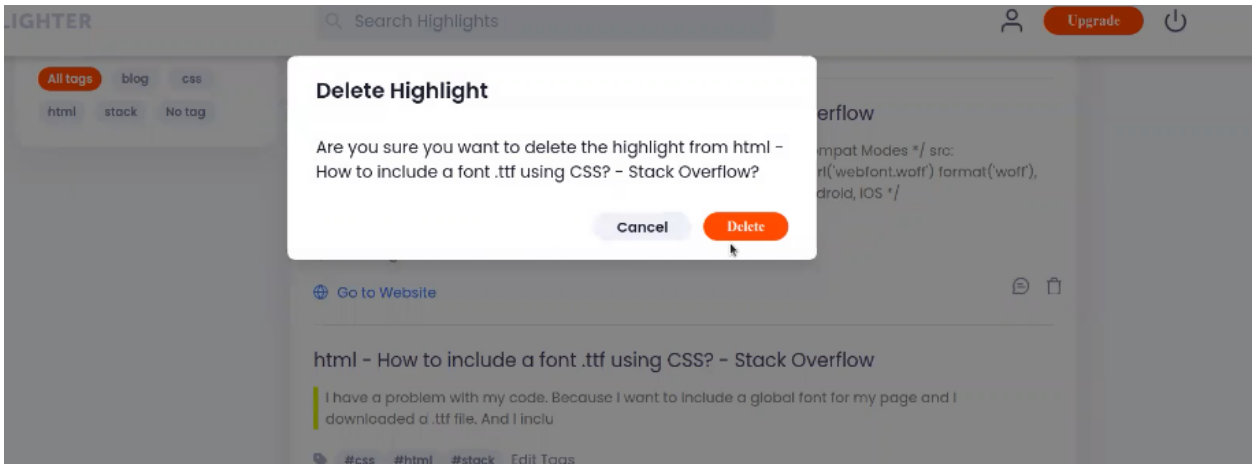
10. Users can go to the website just by clicking the “Go to website” link corresponding to any highlight and can see his/her highlights.



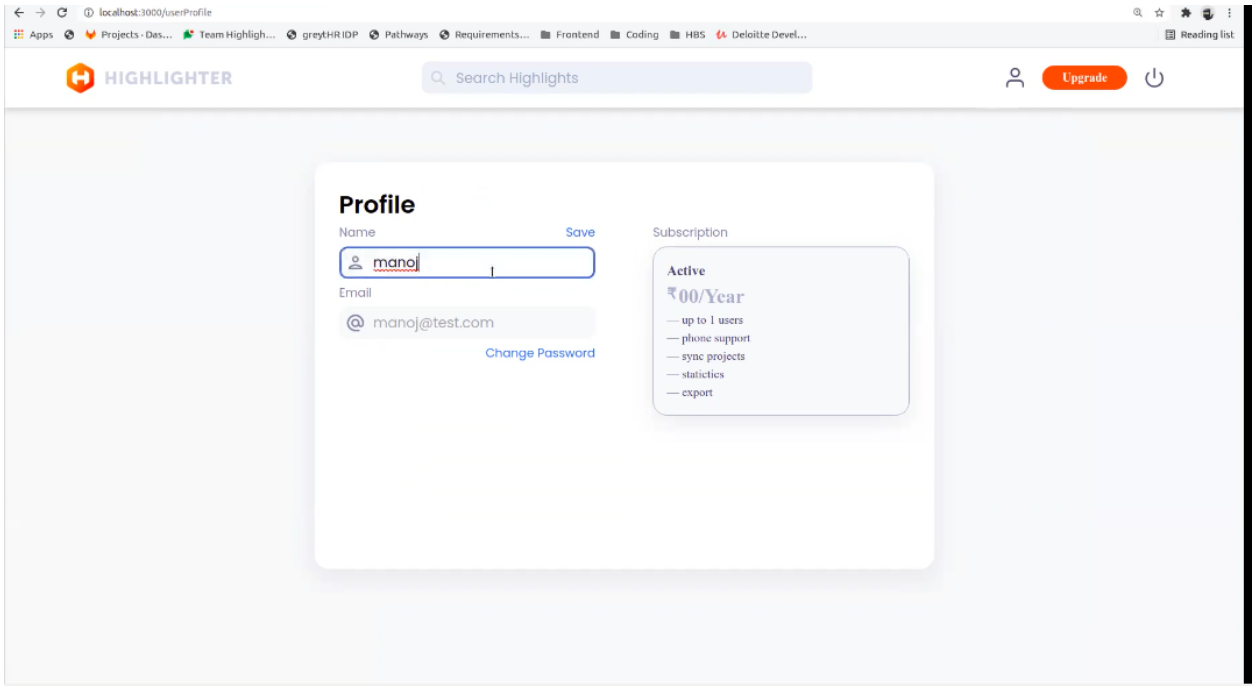
11. Users can sort highlights as per the options available.



12. Users can delete a highlight if they want to. After deleting highlight will be removed from the database.



13 Profile Page Section



From the profile section users can edit their details.

Chapter 7
Analysis Work

Security

There are various approaches available to implement security in applications like us. We have used JWT (Json web tokens) for authentication and authorization and while maintaining sessions at the backend in order to give logout facility to the user, so that at logout we can de-associate the token number from the user and thus for further requests with that token will be considered as authenticated.

JPA

Learning JPA is easy initially or in short getting started with JPA is easy but to write performance effective JPA is not very easy. Programmer has to learn how JPA executes your query internally. There can be a lot of issues that JPA can create easily if you would use it without looking into how it will work internally, like the n**+1** fetch problem which increases the latency unnecessarily. This kind of problem generally occurs when you don't know how my input / output operations a single JPA query will do with a database. In order to get rid of these kinds of problems you have to dive deep and think in terms of JPA what will JPA query do to execute its query.

We have worked upon our database input/output operations with JPA effectively to ensure minimum latency possible so that the user experience remains enhanced.

Highlighter Algorithm

Highlighting a content on a website modifies the webpage. Taking another highlight from the modified webpage due to highlighted contents can sometimes create issues. Like you do not want to save the content and position of currently highlighted content that users want to save with respect to the modified webpage, you just want to save the content and position with respect to the original document.

And later if you want to highlight a highlighted content to a webpage. It will not be any issue if the page is not modified, but if the page is modified then this might create issues for example while finding the position of the highlighted content the extension may find something else or may not find anything, this behaviour is due to modified webpage by chrome extension.

This problem was not there initially. But later when it came in front of us we realized that we have to write our highlighting algorithm independent of the current modified page (modified by our chrome extension). It created a lot of challenges for us and we really learnt a lot from this.

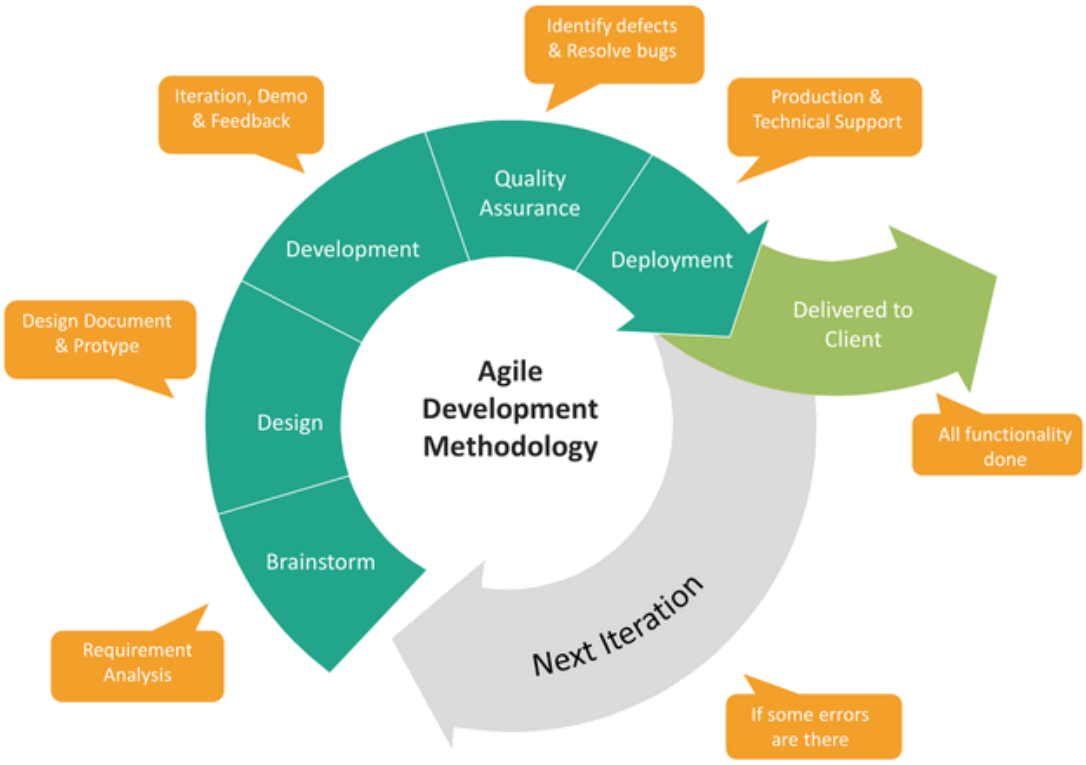
Chapter 8

Tools and Techniques Used For Project Management

Tools, Languages which we have used for developing this software are present in the Software Requirement section of SRS.

Agile Development

Agile software development refers to software development methodologies centered around the idea of iterative development, where requirements and solutions evolve through collaboration between self-organizing cross-functional teams. The ultimate value in Agile development is that it enables teams to deliver value faster, with greater quality and predictability, and greater aptitude to respond to change. Scrum and Kanban are two of the most widely used Agile methodologies.



JIRA Agile

The **JIRA Agile** tool adds a layer for agile project management that interacts with the other major tools from Atlassian. The team creates a list of project tasks with a tool called Confluence

and then tracks them on an interactive Kanban board that developers can update as they work. The Kanban boards become the center of everyone's focus in planning how to attack the code.

Chapter 9
FUTURE PLAN

- Expansion of extension availability to other browsers (Firefox, edge etc.)
- Users can save Image and video snippets from any website.
- We are planning to incorporate AI/ML for features like suggestions of personalized newsletter through emails and in the dashboard based on the user saved content.
- We are planning to incorporate AI for features like extracting text from images and extracting subtitles from video tracks. This process is still in research work.
- We are planning to incorporate a mobile app so that the user can launch the mobile application and read any saved content any time using mobile.
- We are planning to incorporate collaboration so that two or more users can organize common highlights at a single place.
- Users should be able to download pdf, doc or excel file (based upon what user has chosen) of the selected highlights from the dashboard.
- Collaboration features along with any AI/ML feature will be in premium features.
- We will first focus on students as our Users and then gradually focus on working professionals etc.

Chapter 10

REFERENCES

Spring Boot

Spring Boot

- Documentation : https://spring.io/projects/spring-boot
- Spring Core : **Selenium Express** YouTube Channel. https://www.youtube.com/channel/UCpUYkSDJpHug-vfC5S-NXRA
- Tutorials : https://vladmihalcea.com/tutorials/spring/
- JPA : https://thorben-janssen.com/
- JPA : https://vladmihalcea.com/trainings/high-performance-java-persistence/

Gitlab

- Gitlab
- Gitlab Basics : https://docs.gitlab.com/ee/gitlab-basics/

Security

- Real-world cryptography
- **Java Brains** YouTube Channel

Extension

- Range and Selection in HTML : https://javascript.info/selection-range

Demo Videos Link

https://drive.google.com/drive/folders/13nO1nPNy3k-RcrDWa6igZhA1cDxaeMFh?usp=sharing

Mutual Fund Portfolio Analyzer

Acknowledgement

A formal statement of acknowledgement is hardly sufficient to express my gratitude towards the personalities who have helped me to undertake and carry out this project. I hereby convey my thankfulness and obligation to all those who have provided me valuable help, support and guidance for my seminar.

First and foremost, I express my profound gratitude and deep regards to my External Guide Mr. Sumatra Ghosh (Tech Lead of our project) and Priyadarshi-Track Helper. Their keen interest and encouragement has been of immense help to me. They gave me unending support and helped me in numerous ways. Their stimulating suggestions helped me to coordinate my project. I would also like to thank my Internal Guide Mr. Mohinder Singh Negi for his valuable time for their suggestions regarding this project.

Vishal

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HashedIn Technologies Private Limited
#36/5, Somasundarapalya,
27th Main Road End,Sector 2,
HSR Layout, Bangalore- 560102

TO WHOMSOEVER IT MAY CONCERN

Date: 17 May 2021

Dear Sir / Madam,

This is to inform you that Mr. Vishal Rana MCA , 6th Semester Student from Panjab University , is currently pursuing his 6 Month internship at Hashedin by Deloitte, Bangalore (Intern ID - IN2021 47) since February 2021 to May 2021 and has completed 3 months to date on below project:

Project Title: Mutual Fund Portfolio Analyzer

Mentor Name: Sumantra Ghosh

Number of working days per week: 5

Mr. Vishal Rana is in his training period and is being assessed on intervals. Performance details will be shared pursuant to completion of internship.

Regards,

Suchitra Indukuri

(HR Executive)

HashedIn by Deloitte

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Mutual Fund Portfolio Analyzer

Introduction

Mutual Fund Portfolio Analyzer is one of its kind easy to use online platform where a person/investor can easily compare various mutual funds present in his/her portfolio in order to diversify risk.

Mutual Fund Portfolio Analyzer is a web-based application that can be run on any web-browser. This application is useful for investors who invest in Mutual Funds.
This application has the following two main features.

- Change Over Time : An investor can see how a mutual fund changed over time. By change over time we mean how it's stocks contribution is affected for a given period of time, what are the new stocks that are added, and which stock have been deleted.
- Overlap : An investor can see how a mutual fund overlaps with another mutual fund. Since it would be useless to buy a mutual fund which overlaps a lot with other mutual funds that they have in their portfolio. So this tool can be used to diversify an investor's investments.

Objectives

Write now at the time of writing this document we are working on three Mutual Fund Houses as follows:

- HDFC
- ICICI Prudential
- UTI MF

Business Problem :

There is no user-friendly platform where one can compare mutual funds. Platforms which exist are in the form of excel extensions which are tough to use for laymen.

Companies do disclose their portfolios every month in the form of excel sheets but to go through them and create reports is a cumbersome process.

Goal :

As a backend developer we have to build a pipeline such that if at one end we add an excel file that contains Mutual Fund data for a particular month of a particular Mutual Fund House then it should be automatically added to the database.

Implement business logic for two main features mentioned in the Introduction section.

Build and expose APIs so that the front-end application can get required structured data from the backend so that it can display visually on the front-end.

Usefulness of the Project

Before discussing benefits of the project we should first look at the pain points from a user perspective.

Pain Points

Context : Providing some background information about which to think upon.

Above mentioned three Mutual Fund Houses generate excel sheets every month that contain all their mutual Fund data for that particular month.

An investor would like to see how a Mutual Fund is performing over a given period of time. They would like to see some analytics over the mutual fund.

They would like to compare a mutual fund with another mutual fund for a particular month so that they can check how much diversity would they gain if they would add them to their portfolio.

- An investor has to go manually to Mutual Fund House's website (in which they are interested) to download an excel sheet having Mutual Fund data of the house for a particular month.
- An investor has to be aware of when a Mutual Fund House generally releases their excel sheet. So that they can make decisions as fast as possible before the market gains momentum due to the new report.
- Although the excel sheet is human readable, it generally contains a lot of data that may be unnecessary for an investor. Like if an investor wants to see only Equity related funds but an excel sheet would have equity related funds, loans, derivatives etc. This makes the size of the excel sheet big that may be overwhelming to the investor and hard to cope up with.
- It is a very time consuming task to compare effectively a mutual fund over a given period of time or with another mutual fund by reading excel data manually. It can take from days to a week. And it is not what everyone knows about how to produce effective analytical reports.
- An investor needs software to view those excel sheets in his computer or in his/her mobile device.

Benefits of MFPA

- You don’t have to download excel sheets manually on your computer. You can directly go to our website and check which mutual fund progress report you want to see.
- You don’t have to remember how to download excel sheets for a particular Mutual Fund House. The way i.e the user story they follow to download an excel sheet for a particular Mutual Fund House can vary between different Mutual Fund Houses.
- You can see the progress of a mutual fund over a given period of time in just a few seconds.
- Now you don’t have to compare them manually.
- You don’t need any extra software. You just need a web browser and internet connection.
- If you don’t know how to generate analytical reports you can use this tool to see analytical reports, you just need to learn how to use those tools.

Architectural Design

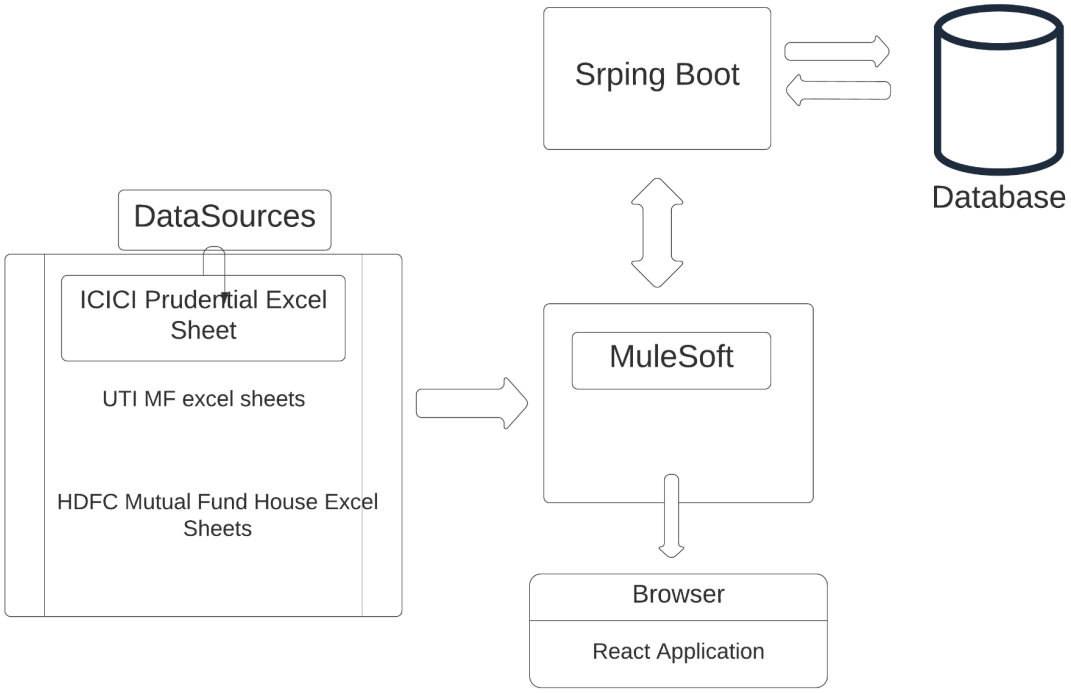
Technical Stack

- FrontEnd - React
- Backend
    - Spring Boot
    - Mulesoft
    - Postgres

Spring Boot : Spring boot application is handling the core business logic for generating reports from the data stored in the database. APIs are exposed to Mulesoft to save data and to request to generate reports from the data by giving required parameters.

Mulesoft : Mulesoft is a data integration platform built to connect a variety of data sources and applications and performs analytics and ETL processes.

Postgres : Database to save data.



The above diagram shows the high level architecture of the application.

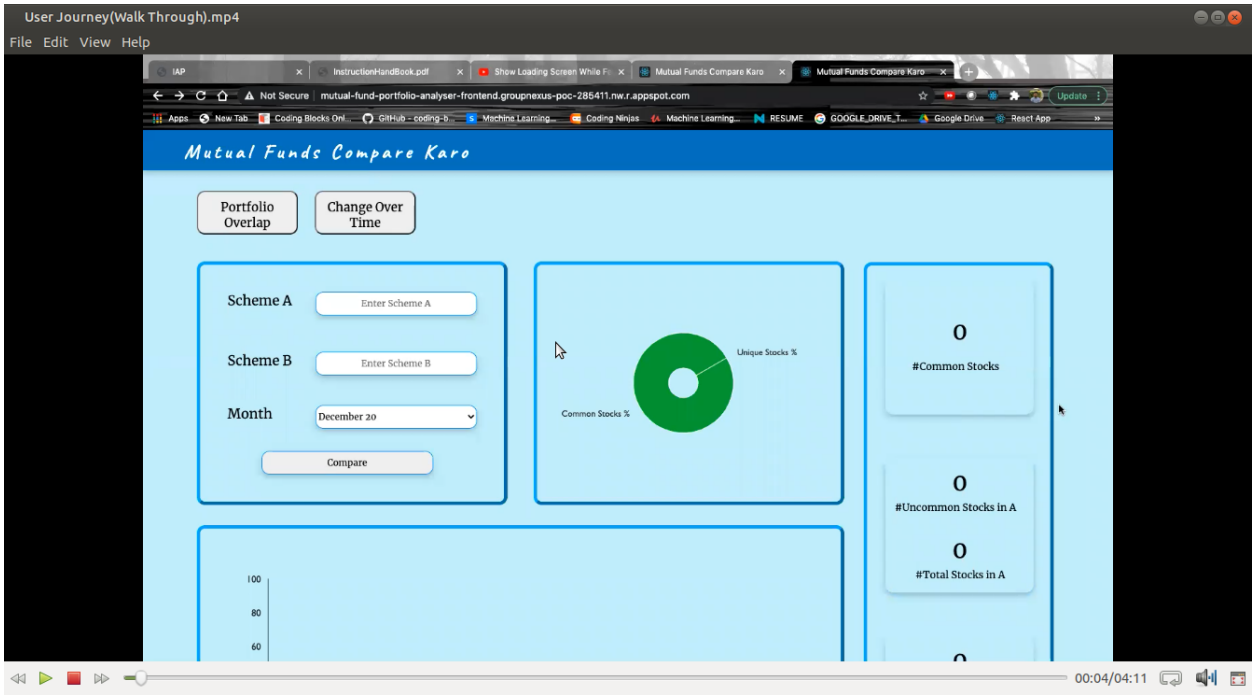
Data Sources represent excel sheets.

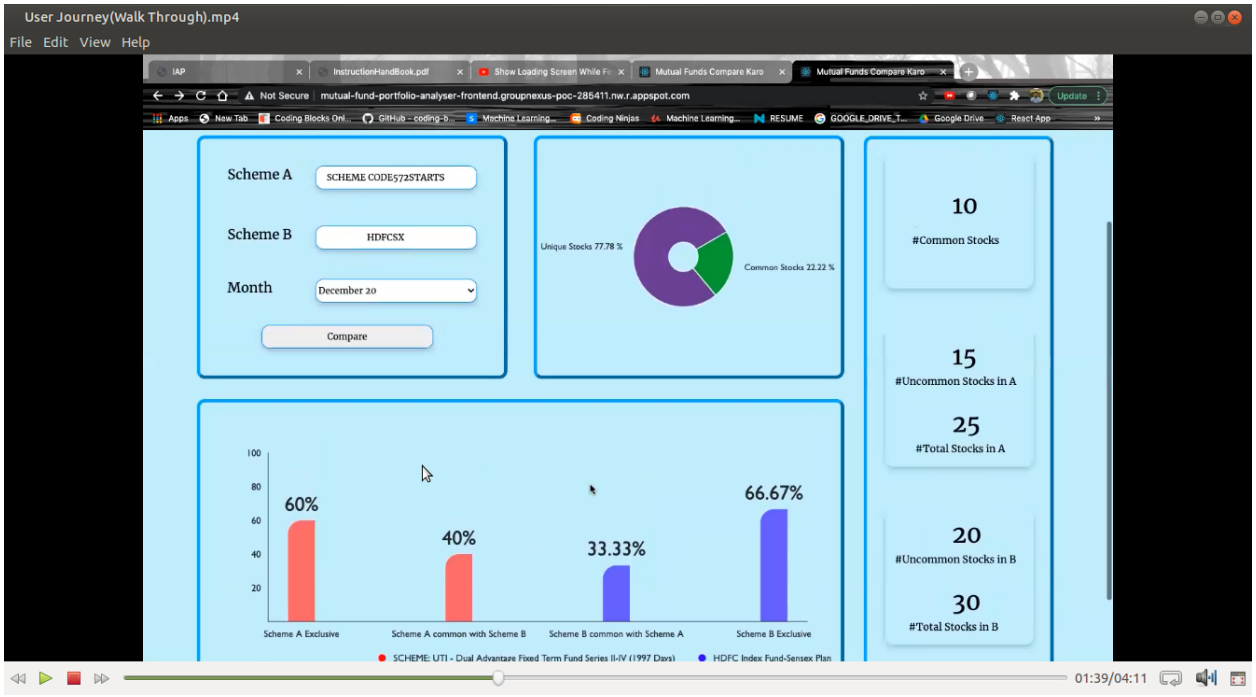
Here the Mulesoft application is responsible for taking data from excel sheet and converting that data into a specified format so that it can be saved to the database through the exposed API by Spring boot.

Usually different Mutual Fund Houses follow their own structure to provide information in excel sheets. All those abstractions are taken care of by mulesoft. Once the data is posted to the Spring boot application it validates them and then puts them into the database after successfully validating it so that it can be used for processing business logic.

When a request is generated by a user to some reports on the front-end, the front-end application requests data from the mulesoft and the mulesoft in turn requests data from Spring boot. Here the Mulesoft is acting like a pass-through, i.e it does not affect the request in any way. Using this way we can add security to our Spring Boot application using Mulesoft and in summary we can easily protect our Spring Boot's API, like it is done in Industry standard projects.

Screenshots from the Project





Description : Portfolio Overlap of two different Mutual Funds selected by the User

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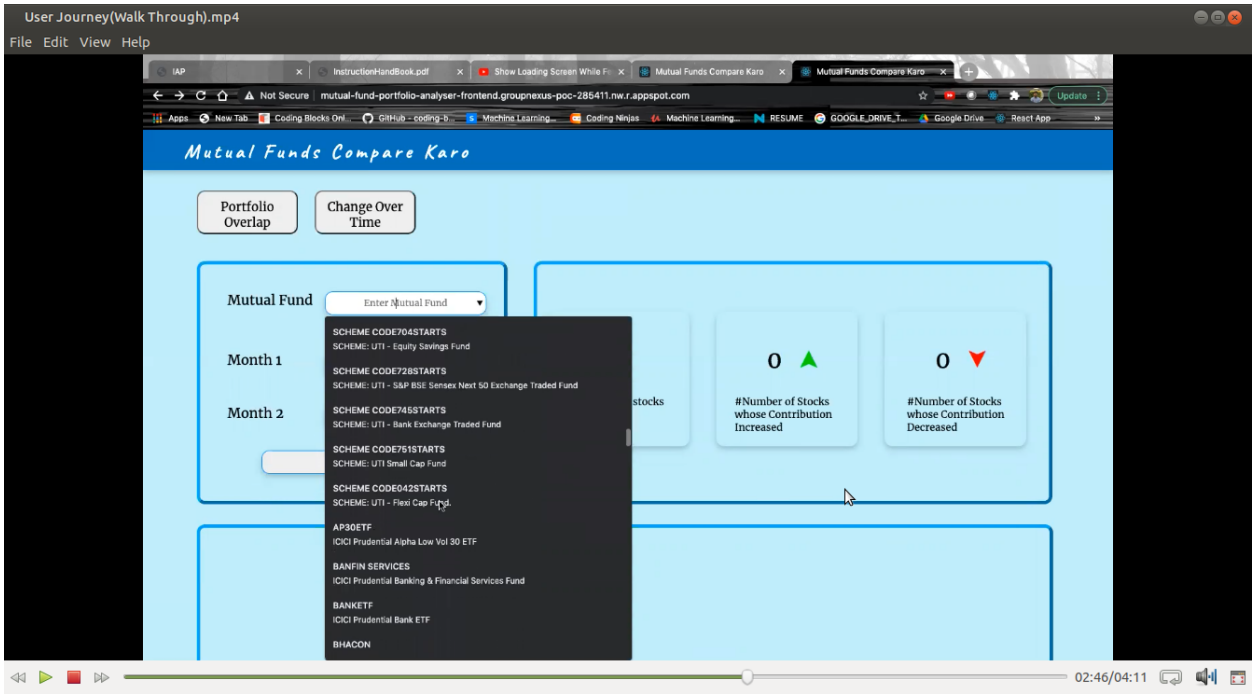

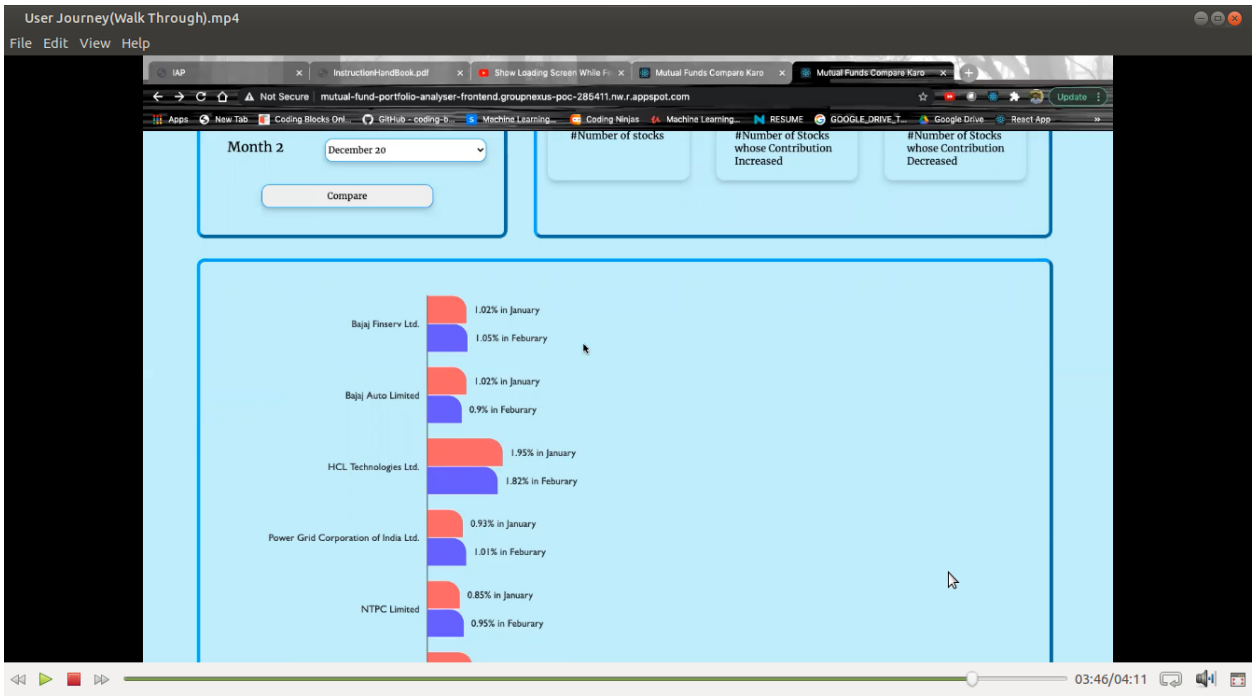

Description : Change over time of a particular Mutual Fund selected by the User.

Tools and Languages Used

Anypoint Studio Platform
IntelliJ IDEA
Gitlab

PgAdmin

Languages Used

Dataweave expression Language - Mulesoft
Java - Spring Boot
JPA - Postgres

System Requirements for Developers:

- 16GB RAM
- I7 processor
- Windows OS
- Postgresql
- JDK 11

Future Plan.

- We are planning to in-corporate data science to predict performance of various mutual funds w.r.t its previous performance.
- We are planning to make a newsletter to which a user can subscribe to, to get mail notification of selected mutual funds's progress of the current month compared to the previous month as soon as the excel sheet is generated by their respective Mutual Fund House.
- Now we are working with only three Mutual Fund Houses that we have mentioned in the Introduction. Trying to incorporate other mutual fund houses.
- Planning to make the user interface more rich by adding graphs, charts and other tools.
- We are planning to create an interface through which a user can make his/her portfolio and see how its portfolio is progressing over the time.

References :

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    - Tutorials : https://vladmihalcea.com/tutorials/spring/
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4. JUnit
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