Technical Documentation

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Buggy Decoders

Problem Statement: VS935 (UGC)

"In order to optimize the resource amongst the HEIs, to enhance utilization, and to share the advanced resources, the portal needs to be developed. On this, all HEIs will put their resources and applicable conditions for its use. Any HEIs can contact these HEIs for getting/using resources. This will reduce the undue financial burden on HEIs who want to use it for a short duration and give financial benefit to HEIs those are having such resources. The main focus of this problem statement is to 1. To create a platform for the HEIs to update their shareable resource details 2. Aspirant HEIs can submit their requisition for desired resources Recommendation system must be designed for the aspirant HEIs for easy search and use the resource effectively for their growth in the lab session, research, and product development, etc."

Introduction

We created a platform that allows easy sharing of various resources among HEIs. An HEI can lend help to an aspirant institute according to their requirements. Both the lending institute and the aspirant institute will benefit, as the lending institution will profit from resource lending and the aspirant institute will not have to spend money on temporary requirements. It will also aid in the reduction of the grant costs provided by the UGC. An HEI can upload a list of resources that they can provide to other institutes and aspirant institutes can choose resources as per their requirements. Following are the categories of resources: Physical Resources, Virtual Resources, and Faculty Assistance Program. Virtual resources involve sharing resources digitally through various online interactive platforms, whereas physical resources include labs, auditoriums, and playing fields.

Project Features

Digital Contracts

To ensure that all resources are used fairly, we have added digital contracts that will be signed by both institutes before allocation. The lending institute could create digital contracts based on their requirements and share them with aspirant institutes as they accept their resource request.

An e-contract is created and signed electronically. It enables Real-time collaboration which allows users to contribute to the proposal simultaneously. Eliminating the time-wasted sending documents back and forth shortens the agreement's life cycle. It also reduces errors as Human error is an inevitable consequence of reaching agreements manually. Erroneous contracts may lead to a faulty deal or, worse, a document that's not legally binding.

Scheduling Algorithm

Now, the Aspirant institute has found a suitable resource, they put a request for its access, but the lending institute already has many requests pending for the same resource. How can we ensure maximum sharing and utilization of resources?

We've added a scheduling algorithm that sorts requests in such a way that the majority of the institute's requirements are met. And, requests that are not fulfilled, are kept on the waiting list. Lending institutes can either cancel the waiting request or counter with different availability.

Faculty Assistance Program

One of the most critical aspects of our proposal is the Faculty Assistance Program, which comprises faculty from one institute giving lectures to another institute on a temporary basis in response to a request from an aspirant institute.

Recommendation System

How would Aspirant institutes find a resource which matches their requirement and budget? This is where our recommendation system comes into play, which recommends the most suitable resource based on Institute's requirements. Following are some key aspects of our recommendation system.

- The recommendation system is a user-driven Onclick system that makes recommendations based on prior searches. Budget, availability, location, and reputation are all factors in the recommendation system.
- The dataset will contain information about the tier of institute used to compute the average budget and will aid in making recommendations accordingly.
- The AI Model assesses whether or not the recommended resource is available; if it is not, it will not appear in the recommendations.
- When it comes to physically share resources, the aspect of proximity will aid the resource that is nearest to you to get priority over the one that is farther away.

Sentimental Analysis

Sentiment analysis (or opinion mining) is a natural language processing (NLP) technique used to determine whether data is positive, negative, or neutral.

Both institutes receive a feedback form at the end of the contract, and we run a sentimental analysis on that feedback, based on which we evaluate the change in reputation points. Our scheduling algorithm also takes reputation points as a parameter so institutes with higher points have a better chance of getting their future requests approved.

We used sentimental analysis as it helps in:

Sorting Data at Scale

There's too much data to process manually. Sentiment analysis helps process huge amounts of unstructured data in an efficient and cost-effective way.

Real-Time Analysis

Sentiment analysis can identify critical issues in real-time, For Example in our case Defective products, bad service, etc. Sentiment analysis models help us immediately identify these kinds of situations, so we can take action right away.

Consistent criteria

It's estimated that people only agree around 60-65% of the time when determining the sentiment of a particular text. Tagging text by sentiment is highly subjective and influenced by personal experiences, thoughts, and beliefs. Using a centralized sentiment analysis system, we applied the same criteria to all of the data, helping to improve accuracy and gain better insights.

Signature Verification Model

For Signature Verification, We have used ORB OpenCV Model which is a fusion of FAST keypoint detector and BRIEF descriptor with some added features to improve the performance. FAST is Features from Accelerated Segment Test used to detect features from the provided image. It also uses a pyramid to produce multiscale features.

Algorithm

Take the query image and convert it to grayscale. (conversion)

Now Initialize the ORB detector and detect the key points in the query image and scene.

Compute the descriptors belonging to both images.

Match the key points using Brute Force Matcher.

Show the matched images.

Email Notification

We added email notification functionality which allows institutes to subscribe to the updates of other institutes in order to get latest information about availability of resources.

Access Security

We have categorized the virtual resources into 2 sections:

One which can be accessed in a browser or any viewer and another for external softwares

To address the first one we are using tokenization for the URL and for the other we are using email access.

Discount Offers on granted resource

UGC provides grants to universities every year for building research labs and infrastructure, for such resources some 'Offer/Discount' should be provided on the renting cost of the resource.

Aadhar Integration

We integrated Aadhar Authentication for verification of faculties in faculty assistance programs.

There is a different web page for faculty signup and the verification will be done through Aadhar Card as it is accepted across the country.

Payment Gateway

As India is gradually transforming into a cashless society, hence we kept an online method of payment through **UPI** on our portal.

We enhance online mode of payment because the transaction amounts are huge and need to be done in a secure way.

Testing

We will test our blockchain smart contract with mocha and chai testing libraries. We've achieved a code coverage of more than 95%. Testing ensures that our smart contracts are robust and reliable.

Technologies Used

Frontend-

React.js: React js is a frontend javascript framework that ensures a component-based approach, well-defined life cycle, and reusability of code. Our project consists of many different pages with several components that are to be reused. For example, A resource card component is used for every resource on the dashboard, hence using react will be handy. React also ensure optimized code and a fast website.

Tailwind CSS: Tailwind CSS is used for styling UI. It provides utility classes with a defined set of options enabling easy integration of existing classes directly into the HTML code. Tailwind is also handy in ensuring responsiveness.

Redux: Redux is a library used with react to handle global state management. When states are to be shared among different child components using global state management is very handy.

Backend-

Express: Express Provide Faster Server Side development due to the support of middleware as a request handler that has access to the application's request-response cycle and due to express's faster linking with Databases.

Flask: For the integration of ML, Python has great support of libraries for the machine learning and data science approach. For Recommendation systems, Sentimental Analysis and Signature Verification APIs flask are the best ready-to-go Framework.

Database:

MongoDB: It is a NoSQL database and provides great Flexibility with High Performance. which results in less downtime for the portal.