University Event Management System Using Data Visualization

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Abstract: Our initiative presents a centralized platform that streamlines participation and improves data-driven insights in response to the many obstacles university students encounter while accessing extracurricular activities. In addition to offering students simple access to information about different student clubs, such as club types and event registrations, the platform acts as a comprehensive center and includes a secure payment method for paid events. Gathering student interests allows student organizations/clubs as well as university management to understand what students are interested in technically as well as in cultural type of events. By utilizing data visualization specific to each event's category and student interests, the platform derives actionable insights that successfully inform university management and student organizations/clubs by exposing trends of student interest. In conclusion, the goal of our initiative is to facilitate club involvement, maximize event participation for students through having their preferred events in the university.

Keywords: Centralized Platform, Event Management, Event registration, Student Clubs/Organizations, University Management, Students Interests, Data Visualization, Data-Driven Insights, React+Vite, Firebase, D3.js, Razor-Pay API

I. INTRODUCTION

University students frequently find themselves through various obligations in the fast-paced academic atmosphere of today. Many people look for extracurricular activities to do in addition to their education, such as attending events that suit their interests or joining student clubs. It can be difficult to navigate the wide range of extracurricular activities available, which frequently results in missed opportunities, unsatisfied interests, and a lack of involvement in the campus community. Seeing these challenges, our initiative offers a centralized platform with the goal of completely changing how students engage with and obtain extracurricular activities. By giving them easy access to information about different student clubs, it tackles the basic problems that students face. Our platform is made to make the process simple and effective. By proactively gathering and evaluating student interests, the platform uses in-depth data visualization customized to the theme of each event, offering insightful information that benefits student organizations and university administration alike. Through the disclosure of student interest trends, we facilitate evidence- based decision-making, which in turn produces more engaging and successful events. Our initiative presents a centralized plat- form that streamlines participation and improves data-driven visualizations in response to the many obstacles university students encounter while accessing extracurricular activities. In addition to offering students simple access to information about different student clubs, such as club types, duties, recruiting, and event registrations, the platform acts as a comprehensive centre and includes a secure payment method for paid events.

The goal is to facilitate effective and continuous communication within the university community by making it easier for students to interact student organizations. A dynamic and involved campus community, informed decision-making, and customized experiences are among the goals. Students can participate and explore in ways that best suit their interests thanks to our initiative. University Management and student organizations/clubs can also understand useful insights that will influence how students experience their extracurricular life in the campus.

II. LITERATURE REVIEW

Hariprasad et al. [1] discussed about the importance of having a club management system in universities where it could be useful for organizing and managing various aspects of student organizations such as events, communication, memberships and so on. A. Rahmat et al. [2] provided an overview about the importance of having a platform for managing student organizations in the university. Focus on using Kanban which is a part of agile software development method for implementing this centralized platform for the student organizations in universities.

R. Khatipov et al. [3] published a paper about the necessity of having a platform which could manage and create events where users can easily access them with the required group of people. Developed an application which helps in resolving

the need to use various social media platform for events. P. Afsar et al. [4] proposed a system which could make the process of finding events and managing them. They try to address the problem of finding the right type of events for individuals as well as the problem of managing an event.

N. L. Adam et al. [5] gave an overview about the importance of record-keeping and has developed a prototype which records event data as well as other documents which could be utilized for keeping a track over important documents as well as past events. D. B. Remot et al. [6] discusses about the importance of maintaining a platform for communities and student organizations in a university. They have conducted research over how having a platform which caters student organizations can help in having effective communication among students.

P. J. A. Reusch et al. [7] provided insights about how event management is not entirely related to project management. Event management itself has many domains and each type of event has their own way of conducting it and a single method cannot be applied for every event. Y. Yurui [8] discuss about some the challenges and obstacles with using big data platforms with management of university student and it provides optimization measures for integrating university with big data.

J. Li [9] talks about the new innovation of big data with universities where student details can be utilized for a better understanding of their goals and aspirations. Focuses on the utilizing data of university students for better campus connectivity. K. S. Lakshmi et al. [10] Talks about the difficulty of reaching students via social media platforms and introduces an android application for sending notifications to student over various university events utilizing firebase.

M. Islam et al. [16] Discuss about how visualization of data is very crucial since, data can be in any form where in excel we view the data in not so representative form. This doesn't appeal users and is often seen as bland. However we can visualize the data through various methods and using various software's which are more appealing for the user to view and interact with, which ultimately results in better engagement and utilization of the data among the users.

I Pawełoszek [17] talks about understanding the require- ments and proceeding accordingly is crucial step in tackling various problems which might occur during the development of the platform. Y. Demir et al. [18] Focus on how implementing several modules such as in-class activities, into student club activities can help students understand better rather than traditional classrooms. Implementing workshops and projects as student club activities engages students to be involved in the subject.

G. Eichler et al. [19] Discussed about how having a centralized platform where students can utilize that platform for learning would impact their academic. What existing platforms provide for students and what can be improved. S. P. Babu et al. [20] spoke about how in the current world data is everywhere and it is up to on how we are going to utilize it and draw insights according to our needs.

III.   EXISITNG SYSTEM

Many universities promote the idea of establishing various student organizations in the university, this helps in creating vibrant student communities in the university. Individual student organizations host various events in multiple domains and try to get students registered for those events through various modes such as email's, WhatsApp groups, social media pages or traditional poster and pamphlets in the university. Students' participation only depends over the number of students interested in that event's domain. University Management is involved only in providing resources to the student organizations for conducting their events. This system brings in various problems such as –

Fragmented Information - Students checking various platforms of various student organizations making the information about events/workshops fragmented.
Lack of Personalization - Students Interests aren't known to the student organizations and university management making the events/workshops forced upon them.
Data Driven Insight Gap - Student organizations have students participation record of attended students over conducted events, but that information isn't being utilized for drawing insights over students interests.

Limited Information of Student Interests - University Administration who are responsible for guiding students aren't equipped with information over students interests and their participation in extracurricular activities.
This makes it difficult for both students and university management to be on a single page about a student's choice in extra-curricular activities in the university.

IV. PROPOSED SYSTEM

The proposed system uses a series of precise and clear objectives in order to tackle the recognized issues and actualize the intended vision of our initiative.

These goals direct the creation and execution of a platform, guaranteeing that it successfully meets the requirements of university students and the larger campus community along with providing valuable insights to the university administration and student organizations. Following are the proposed objectives –

Streamlined Information Access – One place where students can view various student clubs functioning in the university and register themselves for various events/workshops conducted by them without the hassle of checking various platforms for events information.
Personalized Engagement – Students can input their interests, based on that it helps students in letting student organizations and university management to understand what their current interests are in technical as well as in cultural events, making it a personalized experience rather than a general event about a distant topic.

Data Driven Insights – Student organizations and university management can view the participation of students in various events ranging in a cluster of domains, which help them in identifying key domains in which students are interested in and provide them with more events/workshops over those. It also helps in understanding the current interests of students in general along with their domain interests which help in establishing more events/workshops based on that information which will be fruitful.

V. SYSTEM METHODOLOGY AND ARCHITECTURE

The system methodology was started with UML Diagrams along with flow diagram and system architecture which gave the overall view and functionality of the platform. This approach allowed us to identify key actors in the platform who communicate with each other and actions being performed in the platform which helped to have a connected and effective student organization environment in the university [11].

- **Flow Process -** The flow process allows you to understand how each actor is performing their tasks and how they are interconnected with other processes. Flow Diagram can be seen in Fig 1.
- **System Architecture -** The System Architecture provides the overall view of the platform and how each component is connected with each other. It helps in understanding the need of each component and how they are interconnected with each-other [11]. System architecture diagram can be seen in Fig 2.
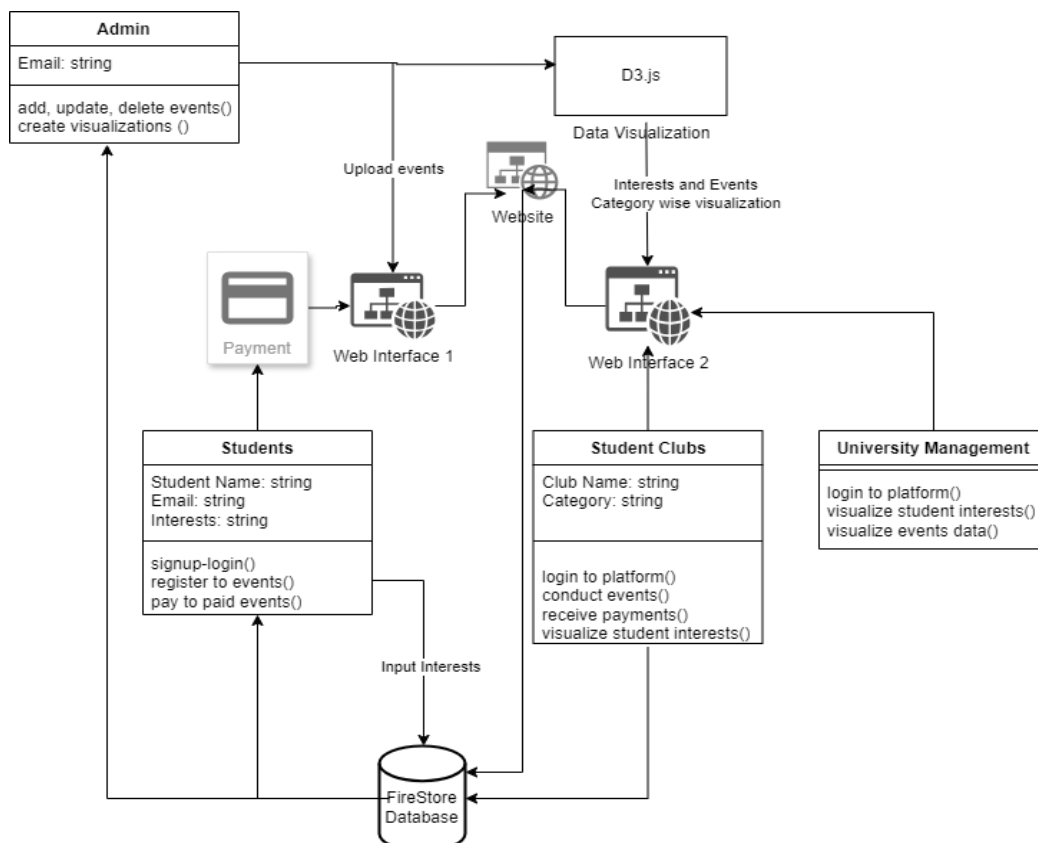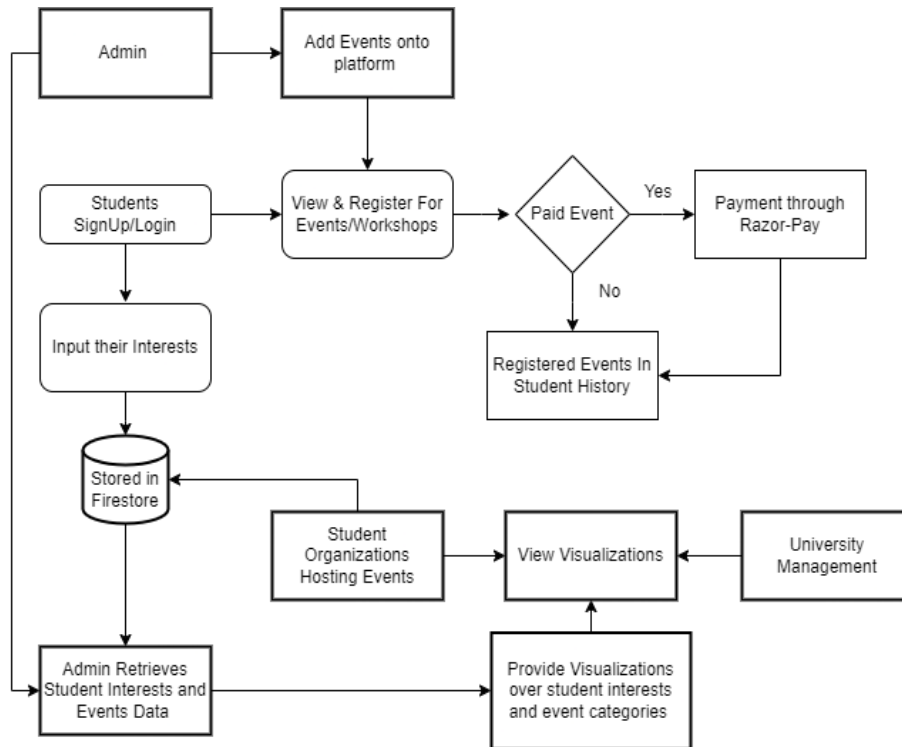

Fig. 1 Flow Diagram

Fig 2. System Architecture

VI. TECHNOLOGIES IMPLEMENTED

The platform being a web-application, the technologies used for front-end of the platform are React along with Vite and Tailwind CSS styling and responsive pages. Considering the back-end of the platform, Firebase is used which was a provider for authentication and database of the platform. The integrating technologies involve using Razor-Pay API for payment and D3.js for visualizations.

A. Front-End Technologies

1. **React+Vite:** React's component-based design and cre- ating modular components that can be reused, Vite's quick server startup time and native support for ES modules speed ups the iteration and make it easier to integrate cutting-edge web development techniques like TypeScript and hot module replacement (HMR) within the platform. Vite's quick server helps in loading virtual dom faster making it easy while developing applications [12].

2. **Tailwind CSS:** Styling web applications can be done using Tailwind CSS which helps in faster creation of styling utilizing pre-made css styles. We need to specify the required style category in the classname of the tags and it automatically implements the style without creating any additional files. Quick development along with effortless customization are possible by Tailwind's framework, and Vite's quick development server improves workflow by providing prompt feedback. With the help of these we can create responsive interfaces quickly than conventional CSS frameworks.

B. Back-End Technologies
Firebase offers various service such as database, authentication and integration for various other applications which make the process efficient and easy to use. It is a backend cloud computing service, hence it can be used for scalability of resources as per the requirements rather than investing resources right away [13].

1. **Firebase Authentication:** Safe and user-friendly authentication services are offered by Firebase Authentication, which supports many authentication methods such as Google, Face- book etc.. along with, email and password, and third-party providers. We can ensure secure access control to the platform by easily implementing user authentication capabilities, such as user sign-up, login, password reset with Firebase Authentication. It helps in creating multiple interface login for the users. For this platform we have utilized authentication with email and password.

2. **Firebase Firestore:** Storing and retrieving data is no difficulty with the use of Firebase Firestore, a scalable NoSQL database solution with offline support and real-time synchronization. Because of its cloud capabilities it can be used for creating dynamic, responsive applications that call for respond in real-time. Firestore stores the data in collections and documents format making it easy to access through collection method and addDoc methods. Firebase firestore can be easily accessed by other applications for utilizing the data [13].

C. Integrating Technologies

1. Razor-Pay API: Razor-Pay API allows students to securely pay for the events. It provides multiple payment options such as wallets, card payments etc.. which help in having alternative options to pay. Razor-pay has a secured process of payment which makes it easy to implement in the platform through its API [14].

2. D3.js: D3.js is a java-script library which is used for making visualizations of data. Unline many 3rd-party applications such as PowerBI or Tableau which require license for visualizing data onto webpages, we can directly connect Fire- store with D3 which allows us to make dynamic visualizations directly onto the web-pages. This allows in making informed decisions through those visualizations. D3 visualizations are created as svg's which give out scalable images without losing the details [15].

VII.   IMPLEMENTATION

A. Front-End

An empty React+Vite Project was created. Tailwind CSS dependencies were added for styling of the pages. Students Interface of the website was initially created with several components such as navbar, header, footer etc.. to be utilized in multiple pages. Pages such as HomePage, ClubsPage, EventsPage, EventInfoPage, ClubInfoPage, Cart, HistoryPage were created and routes for each page were connected through react-router-dom in App.jsx file. Coming to the Admin Inter- face, AdminPage and VisualizePage were created where in Admin can add, update and delete events in the AdminPage along with viewing details of the students who have registered for events. VizualizePage is where visualizations can be viewed which are created through D3.js library.
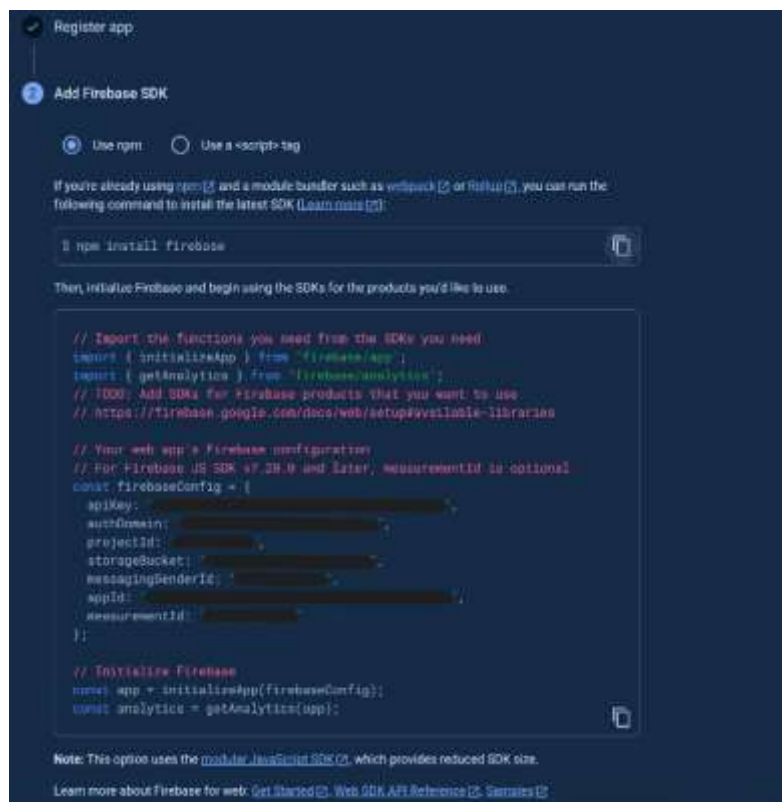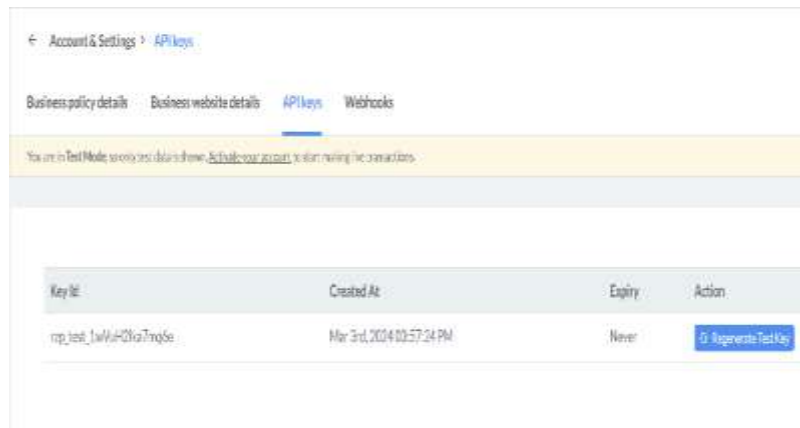

Fig. 3. Adding Firebase SDK

Fig. 4. Generate Keys

B. Back-End

A new project is created in Firebase and Firebase provides us with code for adding Firebase SDK into our platform (can be seen in Fig 3). Later we utilized products such as firebase authentication and firbase firestore using getAuth() and getFirestore() meth- ods. We implemented authentication by importing auth into signup and login pages for securely authenticating users and logging them into the platform. Whenever data should be sent to database we utilized the getFirestore() method to add collections or documents into the firestore database.

C. Integration with Razor-Pay and D3

1.   Razor-Pay API: Razor-Pay provides API keys (key and secret key), which are used in order to connect the transactions of students and student organizations. We can generate keys on the Razor-Pay website (Fig 4).

2.   D3.js: React is a javascript library and D3 also beinga javascript library it is fairly easy to itegrate them. Using command - npm install d3 we can import d3 onto our pages and using exisiting data from firestore database wecreated visualizations.

VIII.   RESULTS

The platform created is able to allow students to signup/login. Allows students to view various student organization/clubs and events being conducted in the university (Fig 5 and Fig 6). Students can utilize Razor-Pay for paid events registration (Fig 7).

Admin can use the to add, update and delete events (Fig 8). Admin can also view details of students who have registered to events in the Admin dashboard. Admin, student organization, university management can view visualizations of students interests, categorical event data for drawing action- able insights, which could help in having better community engagement in the university(Fig 9, Fig 10, Fig 11, Fig 12).
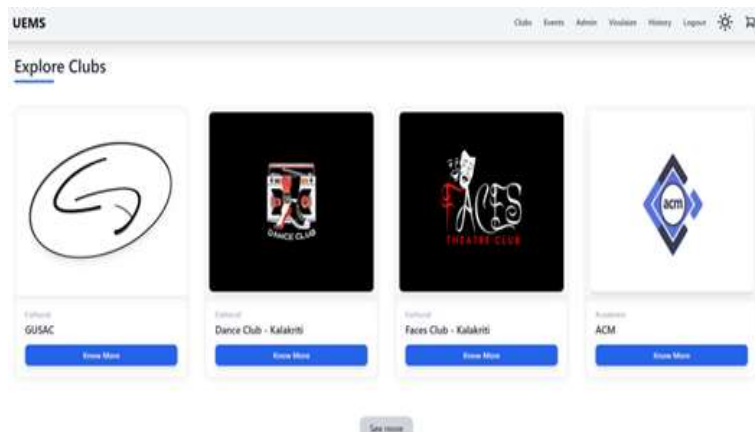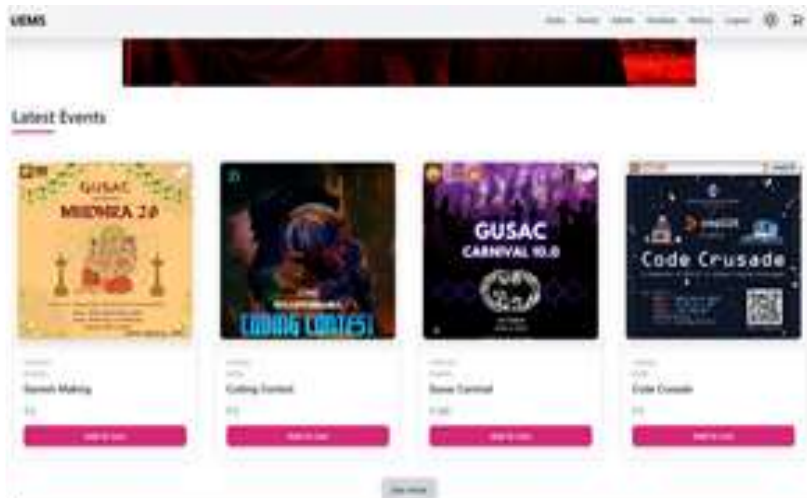

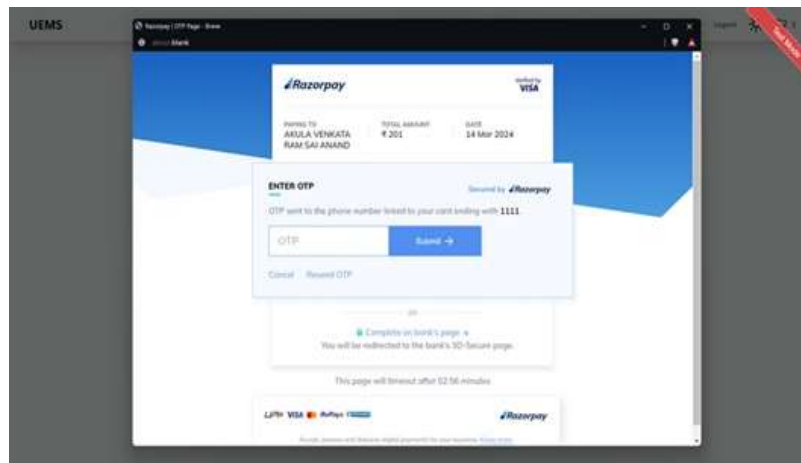Fig. 5. Clubs View on HomePage

Fig. 6. Events view on HomePage

Fig. 7. Payment through Razor-Pay

Fig. 8. Admin Dashboard

IX. CONCLUSION AND FUTURE SCOPE

The developed platform can be scaled into a LMS (Learning Management System) software, where we can provide seamless integration between academic and extra-curricular activities. Additionally integrating attendance management system which allows students attending events/workshops to not miss- out on attendance.

This will provide an overall University Student Management System. Further this platform can be used by various universities which cater student clubs and have students showing active interest in them. Integrating Alumni Engagement can provide valuable insights for pursuing students and add as a real-time experience for them to interact with them and get to understand the real competitive world.
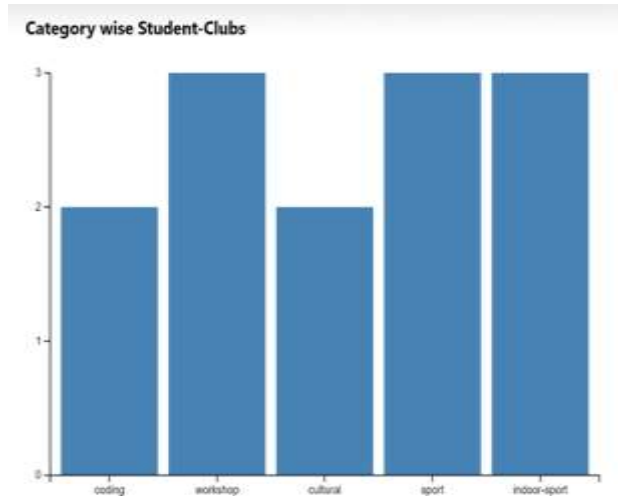

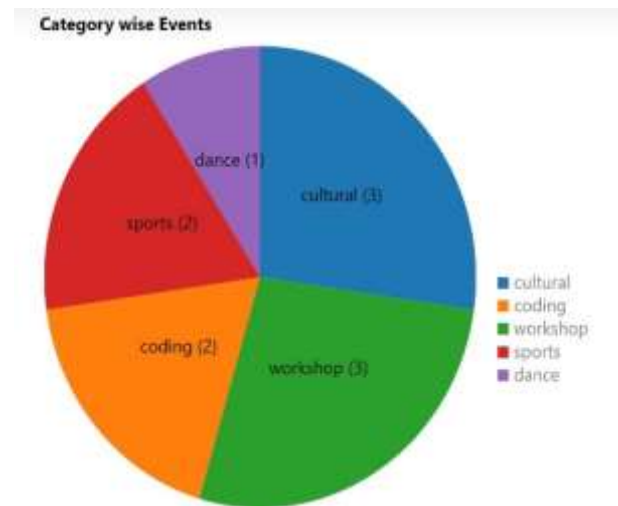Fig. 9. Category wise Student Organization
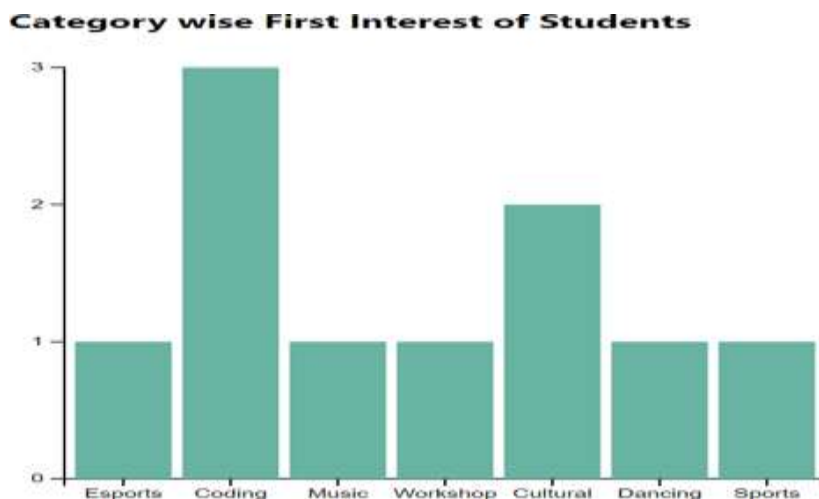

Fig. 10. Category wise Events

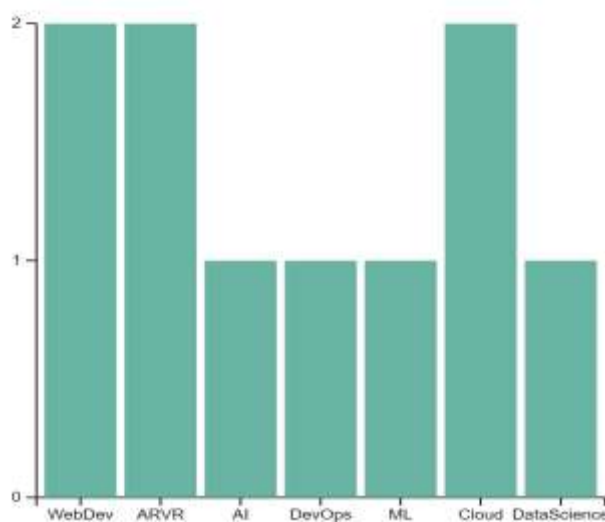Fig. 11. Category wise Student Interests

Fig. 12. Category wise Domain Interest of Students

REFERENCES

[1]. M. Hariprasad, N. N, N. Dey, P. D and R. Kumar P, "College Club Activity Management System," 2023 7th International Confer- ence on Computation System and Information Technology for Sus- tainable Solutions (CSITSS), Bangalore, India, 2023, pp. 1-5, doi: 10.1109/CSITSS60515.2023.10334208.

[2]. Rahmat and N. A. M. Hanifiah, "Usability Testing in Kanban Agile Process for Club Management System," 2020 6th International Conference on Interactive Digital Media (ICIDM), Bandung, Indonesia, 2020, pp. 1-6, doi: 10.1109/ICIDM51048.2020.9339668.

[3]. R. Khatipov, A. Negimatzhanov, I. Zamaleev, A. Zakirov, M. Mazzara and V. Rivera," Hikester - The Event Management Application," 2018 32nd International Conference on Advanced Information Networking and Applications Workshops (WAINA), Krakow, Poland, 2018, pp. 462- 468, doi: 10.1109/WAINA.2018.00129.

[4]. P. Afsar, M. Faizudheen, M. Jasim Anikkadan, P. Mohammed Rashad and U. Mohammed Shabeer," Intelligent Event Finder and Management System," 2021 Fifth International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), Palladam, India, 2021, pp. 1191-1195, doi: 10.1109/I-SMAC52330.2021.9640719.

[5]. N. L. Adam, M. Akmal Hakim Che Mansor, M. F. Pauzi and S. Cik Soh, "Document and Event Record Management System: A Prototype," 2022 IEEE 12th Symposium on Computer Applications Industrial Electron- ics (ISCAIE), Penang, Malaysia, 2022, pp. 223-227, doi: 10.1109/IS- CAIE54458.2022.9794525.

[6]. B. Remot, W. A. Ordejan, N. B. J. Cortez and B. J. S. C. Arpon, "EVSU Student Organizations and Community Platform," 2019 IEEE 11th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment, and Management (HNICEM), Laoag, Philippines, 2019, pp. 1-6, doi: 10.1109/HNICEM48295.2019.9072799.

[7]. P. J. A. Reusch and P. Reusch, "Event management - A spe- cial kind of project management," 2013 IEEE 7th International Conference on Intelligent Data Acquisition and Advanced Comput- ing Systems (IDAACS), Berlin, Germany, 2013, pp. 555-559, doi: 10.1109/IDAACS.2013.6662986.

[8]. Y. Yurui, "Innovation of Intelligent Management Information Sys- tem on Students in the Era of Big Data," 2022 International Conference on Education, Network and Information Technology (ICENIT), Liverpool, United Kingdom, 2022, pp. 366-368, doi: 10.1109/ICENIT57306.2022.00090.

[9]. J. Li, "Research on the Management Mode of Graduate Students in Colleges and Universities Based on Big Data," 2020 Interna- tional Conference on Intelligent Transportation, Big Data & Smart City (ICITBS), Vientiane, Laos, 2020, pp. 617-620, doi: 10.1109/IC- ITBS49701.2020.00136.

[10]. K. S. Lakshmi, C. L. P. S. Sudha, Y. V. Bharathi, M. Divyanjali and M. Suneetha, "Android Application on e- notifier for College Events Man- agement using Firebase," 2021 5th International Conference on Electron- ics, Communication and Aerospace Technology (ICECA), Coimbatore, India, 2021, pp. 1-5, doi: 10.1109/ICECA52323.2021.9676084.

[11]. S. R. Kumar, R. Sharma and K. Gupta, "Strategies for web application development methodologies," 2016 International Conference on Com- puting, Communication and Automation (ICCCA), Greater Noida, India, 2016, pp. 160-165, doi: 10.1109/CCAA.2016.7813710.

[12]. J. Tong, R. R. Jikson and A. A. S. Gunawan, "Comparative Perfor- mance Analysis of Javascript Frontend Web Frameworks," 2023 3rd International Conference on Electronic and Electrical Engineering and Intelligent System (ICE3IS), Yogyakarta, Indonesia, 2023, pp. 81-86, doi: 10.1109/ICE3IS59323.2023.10335250.

[13]. R. Kesavan, D. Gay, D. Thevessen, J. Shah and C. Mohan, "Fire- store: The NoSQL Serverless Database for the Application De- veloper," 2023 IEEE 39th International Conference on Data Engi- neering (ICDE), Anaheim, CA, USA, 2023, pp. 3376-3388, doi: 10.1109/ICDE55515.2023.00259.

[14]. R. Bygari, A. Gupta, S. Raghuvanshi, A. Bapna and B. Sahu, "An AI- powered Smart Routing Solution for Payment Systems," 2021 IEEE International Conference on Big Data (Big Data), Orlando, FL, USA, 2021, pp. 2026-2033, doi: 10.1109/BigData52589.2021.9671961.

[15]. L. Chen and H. Zhou, "Research and application of dynamic and inter- active data visualization based on D3," 2016 International Conference on Audio, Language and Image Processing (ICALIP), Shanghai, China, 2016, pp. 150-155, doi: 10.1109/ICALIP.2016.7846608.

[16]. M. Islam and S. Jin, "An Overview of Data Visualization," 2019 International Conference on Information Science and Communications Technologies (ICISCT), Tashkent, Uzbekistan, 2019, pp. 1-7, doi: 10.1109/ICISCT47635.2019.9012031.

[17]. Pawełoszek, "Approach to analysis and assessment of ERP system. A software vendor's perspective," 2015 Federated Conference on Computer Science and Information Systems (FedCSIS), Lodz, Poland, 2015, pp. 1415-1426, doi: 10.15439/2015F251.

[18]. Y. Demir and A. Uc¸ar, "Project based learning using student clubs and short online videos, in-class activities," 2016 15th Interna- tional Conference on Information Technology Based Higher Educa- tion and Training (ITHET), Istanbul, Turkey, 2016, pp. 1-5, doi: 10.1109/ITHET.2016.7760737.

[19]. G. Eichler, C. Erfurth and K. -H. Lu¨ke, "Centralized student learn- ing platform," 2015 15th International Conference on Innovations for Community Services (I4CS), Nuremberg, Germany, 2015, pp. 1-7, doi: 10.1109/I4CS.2015.7294487.

[20]. M. S. P. Babu and S. H. Sastry, "Big data and predictive analytics in ERP systems for automating decision making process," 2014 IEEE 5th International Conference on Software Engineering and Service Science, Beijing, China, 2014, pp. 259-262, doi: 10.1109/ICSESS.2014.6933558.

[21]. Rambarki Sai Akshit; Konduru Hema Pushpika; Rambarki Sai Aashik; Dr. Ravi Bhramaramba; Sayala Manjith; Paladugu Madhav. (Volume. 10 Issue. 1, January - 2025) "Brain Tumor Classification Using CNN on MRI Data: A PyTorch Implementation." International Journal of Innovative Science and Research Technology (IJISRT), www.ijisrt.com. ISSN - 2456-2165 , PP :-103-109, https://doi.org/10.5281/zenodo.14621403

[22]. Rambarki Sai Akshit, Konduru Hema Pushpika, Rambarki Sai Aashik, Dr. Manda Rama Narasinga Rao, J. Uday Shankar Rao, V. Pavan Pranesh, 2024, Automated Traffic Ticket Generation System for Speed Violations using YOLOv9 and DeepSORT, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) Volume 13, Issue 12 (December 2024),