SMART TIMETABLE MANAGEMENT SYSTEM

DATABASE ENGINEER MONGODB (UCS661)

PROJECT REPORT

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ABSTRACT

STMS (Smart Timetable Management System) is a user-friendly solution designed to help educational institutions manage their schedules efficiently. By taking into account the number of lectures and the type of students and teachers, STMS generates the best possible timetable for administrators, teachers, and students.

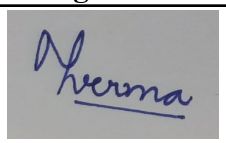
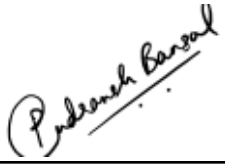
Our platform is built using new technologies and the semantic web to make data-driven recommendations based on user profiles and expectations. With STMS, we aim to provide a reliable and efficient system that helps educational institutions manage their timetables effectively while also preserving data for future generations.

However, challenges still exist in building a complete framework that predicts highly accurate data. To address these challenges, we have developed a hybrid recommender system that is versatile and can work with any kind of data. Our ultimate goal is to provide a robust platform that assists prospective users in recommending the most suitable services, regardless of their field of interest.

DECLARATION

We hereby declare that the design principles and working prototype model of the project entitled STMS is an authentic record of our own work carried out in the Computer Science and Engineering Department, TIET, Patiala, during 6th semester (2023).

Date: 7th May 2023

Roll No.	Name	Signature
102017192	Nivedita Verma	
102197022	Kartik Srivastava	
102197023	Rudransh Bansal	

LIST OF FIGURES

LIST OF ABBREVIATIONS

STMS	Smart Timetable Management System
ML	Machine Learning

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1. INTRODUCTION

1.1 Project Overview

STMS is a data-driven solution that simplifies the management of schedules for educational institutions. By taking into account the number of lectures and the type of students and teachers, STMS generates the best possible timetable to help administrators, teachers, and students manage their time efficiently.

At STMS, we recognize the value of data in improving our lives and businesses. However, we also understand that not everyone has extensive knowledge about machine learning or algorithms. That's why our platform is designed to bridge the gap between data and useful data for the common people. By using STMS, educational institutions can manage their schedules efficiently while also leveraging the power of data to make informed decisions.

1.2 Problem Definition and Scope

The problem that STMS addresses is the inefficiency of traditional methods used by educational institutions to manage their schedules. These methods often rely on manual processes that can be time-consuming, error-prone, and lack flexibility. STMS aims to solve this problem by using data-driven algorithms to generate the best possible timetable for administrators, teachers, and students.

The scope of the STMS project includes the development of a web-based platform that takes into account the number of lectures and the type of students and teachers to generate the most efficient timetable. The platform will include features such as real-time updates, schedule customization, and user-friendly interfaces for administrators, teachers, and students.

STMS will also include ML models that use previously collected user data to predict outcomes and provide valuable insights that can help educational institutions manage their schedules more effectively. The system will be designed to work with any kind of data and can be customized to meet the unique needs of different institutions. The ultimate goal of STMS is to provide a reliable

and efficient solution that simplifies the management of schedules for educational institutions while also leveraging the power of data to make informed decisions.

1.3 Assumptions and Constraints

Assumptions and constraints are crucial elements that must be taken into account when developing a project like the STMS (Smart Timetable Management System). In terms of assumptions, the STMS assumes that the educational institution has a defined curriculum and set of courses with pre-determined durations that can be used to generate a timetable. The system also assumes that the information provided by the institution regarding the number of lectures and the type of students and teachers is accurate and up-to-date. Lastly, it is assumed that the system will be used by individuals with a basic understanding of technology and web-based applications.

STMS will be constrained by the availability of resources, including time, budget, and manpower. The system will also be constrained by the availability and quality of data provided by the educational institution. If the data provided is incomplete or inaccurate, it can lead to errors in the generated timetable and create scheduling conflicts. Additionally, the system may be constrained by the limitations of the ML models used to predict outcomes. These models may not always provide accurate predictions due to the complexity of the data or the inherent noise and bias in the data.

1.4 Methodology

The STMS methodology had been implemented using the MERN stack based website, and MongoDB had been used as the database. The first step had been taken to gather and analyze the requirements of the educational institution to understand the scope of the project. This had involved identifying the courses, their durations, and the number of students and teachers for each course. Once the requirements had been analyzed, the design phase had been initiated, where the wireframe and architecture of the system had been created.

The development phase had been started, which had involved the use of the MERN stack to build the website and MongoDB for the database. The backend had been developed, which had been responsible for handling data processing and analysis, while the frontend had been responsible for

displaying the generated timetable to the users. The machine learning models that had been used to predict the best possible timetable had also been developed.

After the development phase had been completed, the testing and deployment phase had been initiated. This phase had involved rigorous testing of the system to ensure that it met the requirements of the educational institution and was free from bugs and errors. Once the testing had been completed, the system had been deployed and made available to the educational institution. The STMS team had also provided support and maintenance to ensure that the system continued to function smoothly and met the evolving needs of the educational institution.

1.5 Project Outcomes and Deliverables

Project Outcomes for a Smart Timetable Management System using MongoDB:

1. To design and develop a web-based smart timetable management system that can automate the process of creating, managing, and updating timetables.
2. To utilize MongoDB as the primary database for the system due to its flexible and scalable nature, which will allow for efficient storage and retrieval of timetable data. 3. To provide a user-friendly interface that can be accessed by administrators, teachers, and students for managing timetables.
3. The project delivers a comprehensive solution for timetable management that can help educational institutions streamline their operations and provide an efficient learning experience for their students.
4. The key outcomes of the project include the generation of an error-free and optimized timetable based on input data, a user-friendly web application, and detailed reports and analytics.
5. The STMS project aims to provide an optimized timetable management system for educational institutions.

2. METHODOLOGY ADOPTED

2.1 Proposed Solution

The proposed solution for STMS is a web-based application that uses a machine learning model to generate the best possible timetable for educational institutions. The system takes into account various factors such as teacher availability, student preferences, and the number of lectures to create an optimized timetable that ensures efficient resource allocation and maximum student participation. The application is designed to be user-friendly and scalable, making it suitable for use in educational institutions of all sizes. Additionally, the system provides detailed reports and analytics to help educational institutions make informed decisions related to scheduling and resource allocation.

2.2 Work Breakdown Structure

Project management- The initial phase of our work breakdown structure (WBS) for software project involves planning, defining scope, schedule, risk management, and change control.

Analysis- At this stage, challenge groups behavior required interviews, focus on necessities and specifications, and put together use cases.

Design- It is one of the crucial elements of our software program which will be visible to our user for interaction and where the user will judge the website in a glance. Here, we oversee the prototype design, structure design, and keep on refining our website's overall performance.

Development- In general, this is one of the most active stages of software development, so you have to work hard to create an interactive site and handle all the details including graphics and interfaces, content creation, database implementation, data flow structure and other important issues.

Testing and production- Here we add final touches to our project and make sure it is working fine without bugs for the end-user to complete the process. This is when configuration testing, design reviews, site releases, final meetings, and preparation of closing documents are performed.

2.3 Tools and Technology

The website's frontend will be designed with React JS. The website will just take user inputs in the frontend and will be using Node.js in the backend to manage request and retrieve data from Mongo Atlas Database connected using URI.

All the teachers, subjects, classes, labs, periods and users and stored in Mongo DB and CRUD operations are performed on it for generating and storing the Time-table.

3. Design Specifications

3.1 System Architecture

In a nutshell, a block diagram (Fig 1) is a less detailed form of a flowchart that is meant to demonstrate how a new system or an improved version of an existing one would work to get a particular task done. A block diagram is mostly used in the engineering domain, where every aspect of a process needs a dry run before it is implemented practically.

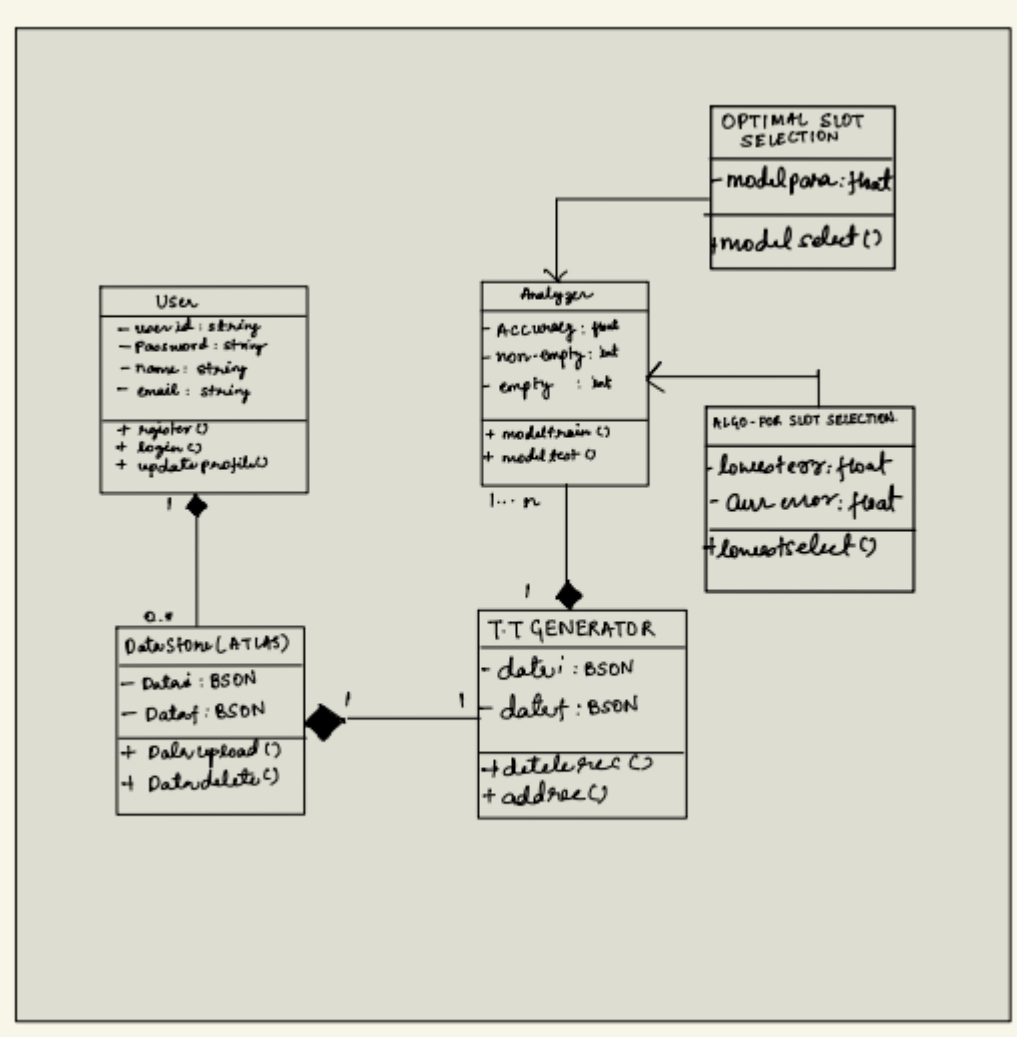


Fig 1. Block diagram

3.2 Design Level Diagrams

Levels or layers are used in DFDs(Fig 2 and Fig 3) to represent progressive degrees of detail about the system. These levels include:

DFD Level 0

Also known as a "context diagram," this is the highest level and represents a very simple, top-level view of the travel mate finding system being represented.

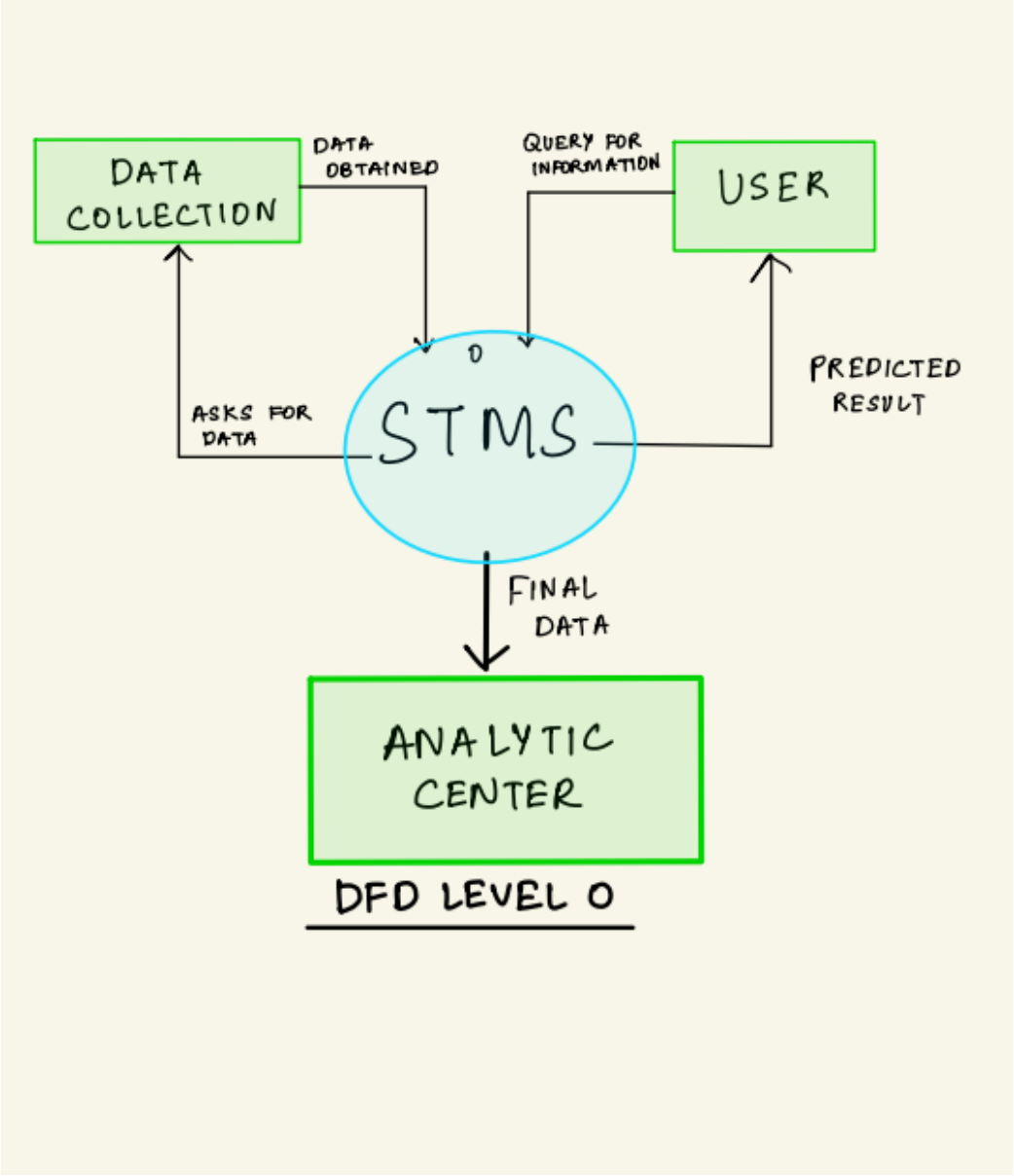


Fig 2. DFD level 0

DFD Level 1

Still a relatively broad view of the system, but incorporates subprocesses like User details management, Travel Details management and processing , User-to user interaction and databases D1 and D2 to store data.

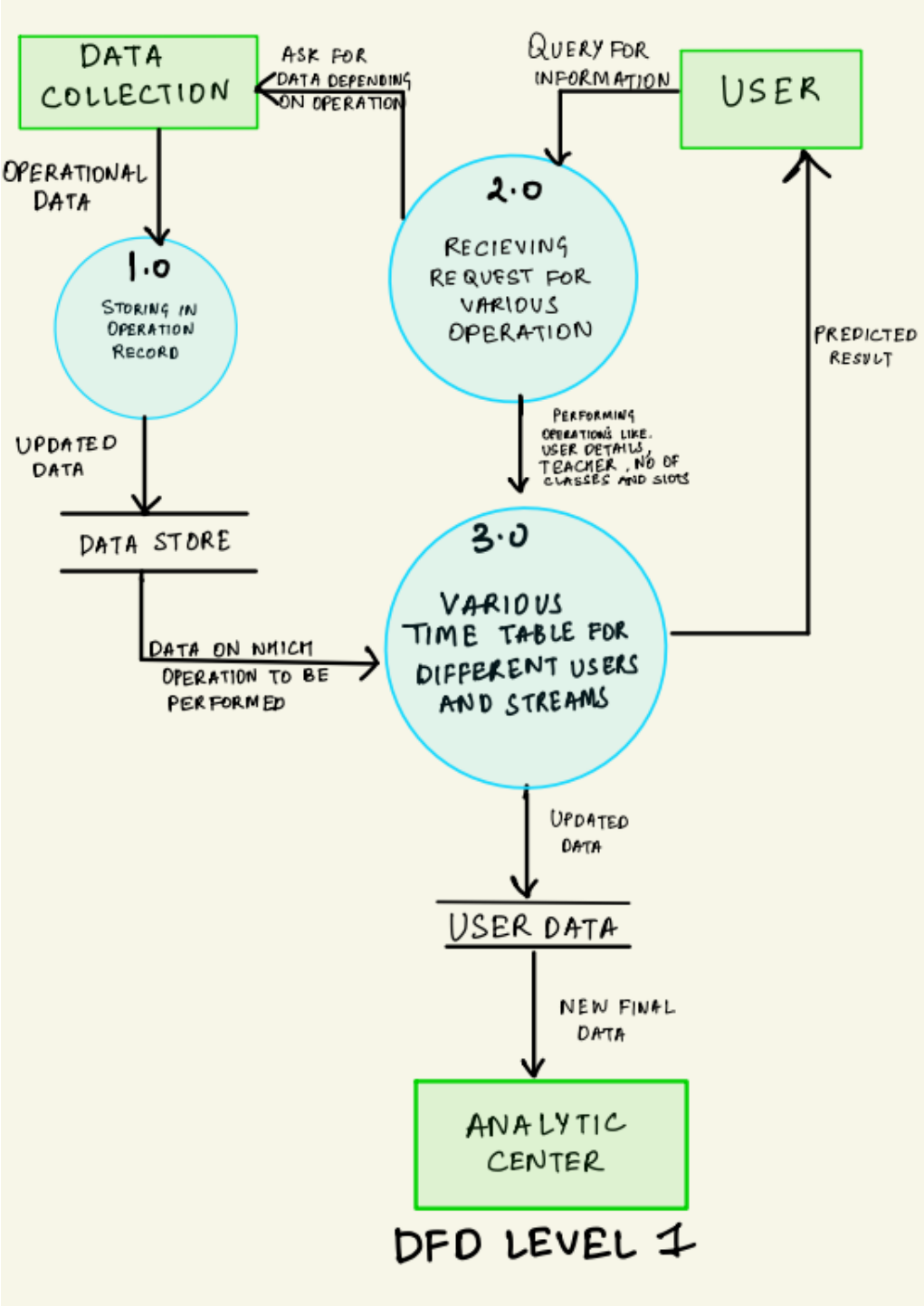


Fig 3. DFD level 1

3.3 User Interface Diagrams

User interface diagram(Fig 4) depicts the various pages / actions a user can choose from to carry out the specific task.

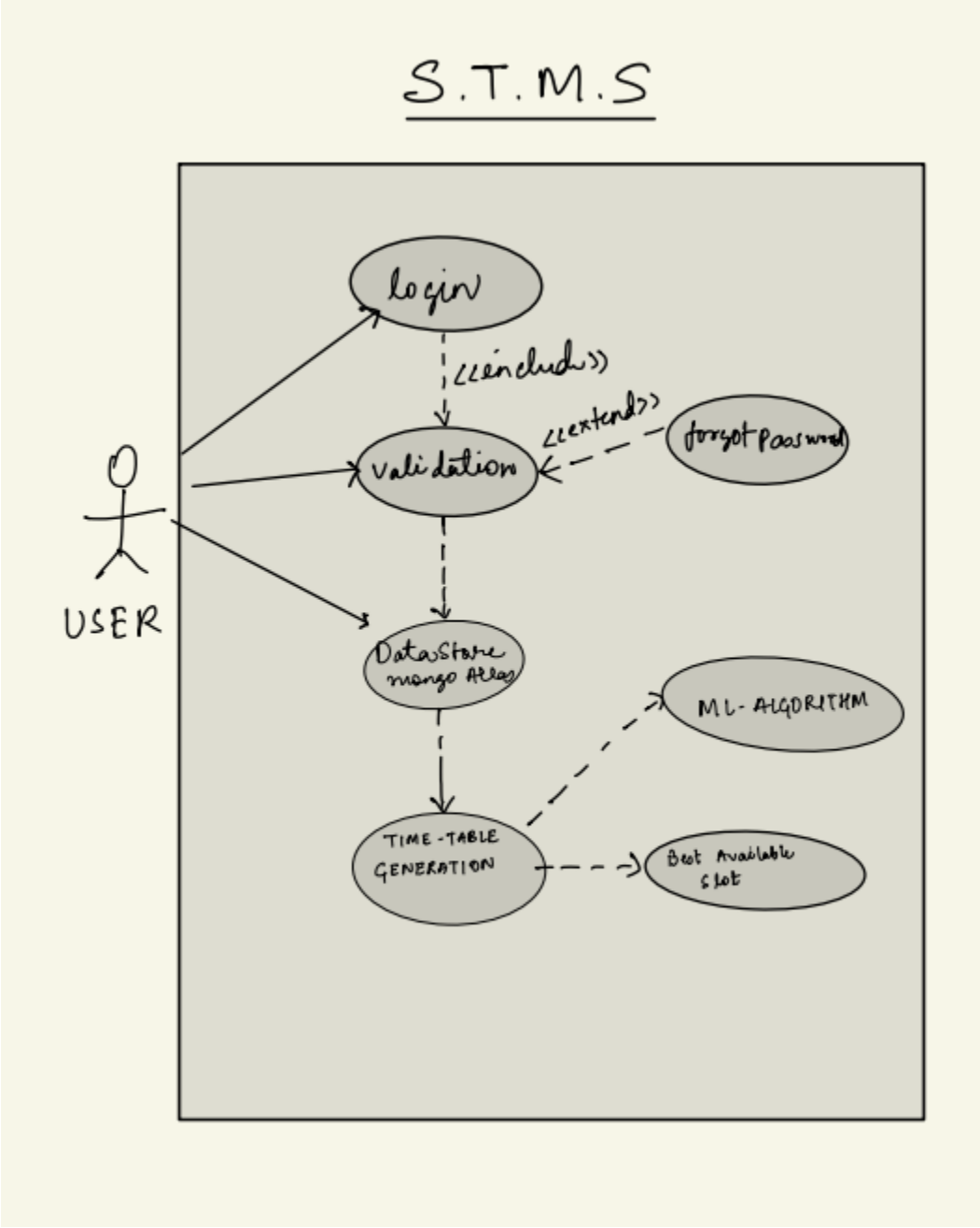


Fig 4.Use case diagram

4. Conclusions

4.1 Work Accomplished

The work accomplished for STMS includes the development of a web-based application using the MERN stack and MongoDB as the database. The application provides a user-friendly interface for inputting data related to courses, teachers, and students. The input data is used by a machine learning model to generate an optimized timetable based on various factors such as teacher availability, course requirements, and student preferences.

The system also includes a reporting and analytics module that provides detailed insights into the scheduling process. The application has been tested extensively to ensure that it is scalable, error-free, and meets the specific requirements of educational institutions. The work accomplished also includes documentation and training materials to facilitate the implementation and adoption of the system by educational institutions. Overall, the work accomplished provides a comprehensive solution for timetable management that can help educational institutions streamline their operations and provide an efficient learning experience for their students.

4.2 Environmental / Economic/ Social Benefits

The STMS project can provide significant social benefits by improving the efficiency and effectiveness of educational institutions. By generating optimized timetables, the system can help institutions allocate resources more effectively, reduce conflicts in scheduling, and increase student participation. This can lead to a better learning experience for students and a more productive environment for teachers.

In addition, the project can help reduce the workload of educational administrators by automating the timetable generation process. This can free up their time and allow them to focus on other important tasks such as curriculum development and student support. The system's reporting and analytics capabilities can also provide valuable insights into the scheduling process, allowing institutions to make data-driven decisions to improve their operations.

Overall, the STMS project has the potential to make a positive impact on the education sector by improving the efficiency, effectiveness, and productivity of educational institutions. This can lead

to a better learning experience for students, more productive environment for teachers, and ultimately contribute to the betterment of society as a whole.

4.3 Future Work Plan

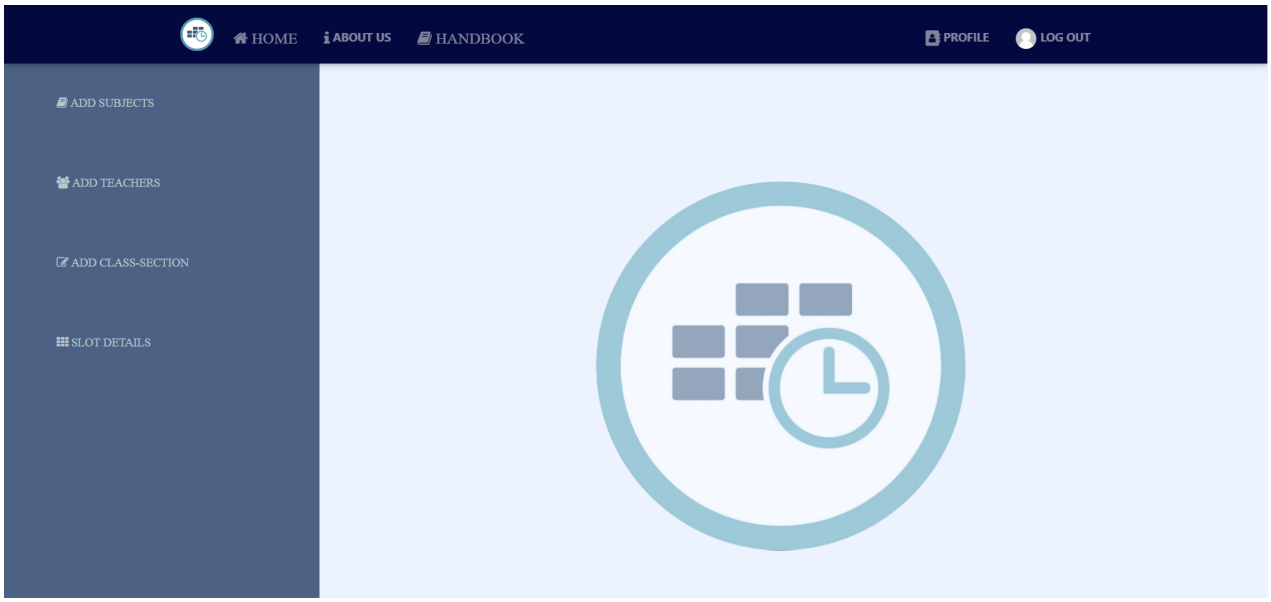
The future work plan for the STMS project is focused on enhancing the system's functionality and usability to better serve the needs of educational institutions. One of the key objectives is to integrate the system with other educational systems such as Learning Management Systems (LMS) and Student Information Systems (SIS). This will provide a seamless experience for users and enable data exchange between systems. To achieve this, APIs and connectors will be developed to enable data exchange between systems.

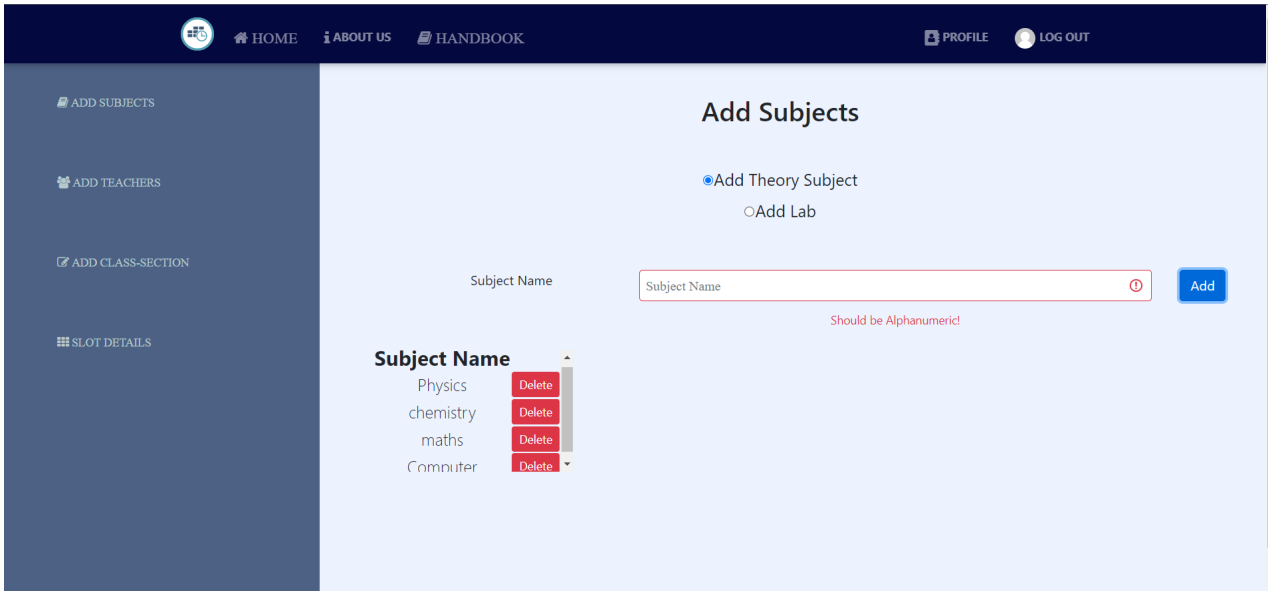
Another objective is to develop a mobile application that will allow students and teachers to access their schedules on-the-go. The mobile application will be designed to work on both iOS and Android devices and will provide real-time updates to users. This will improve accessibility and enable users to stay up-to-date on their schedules at all times.

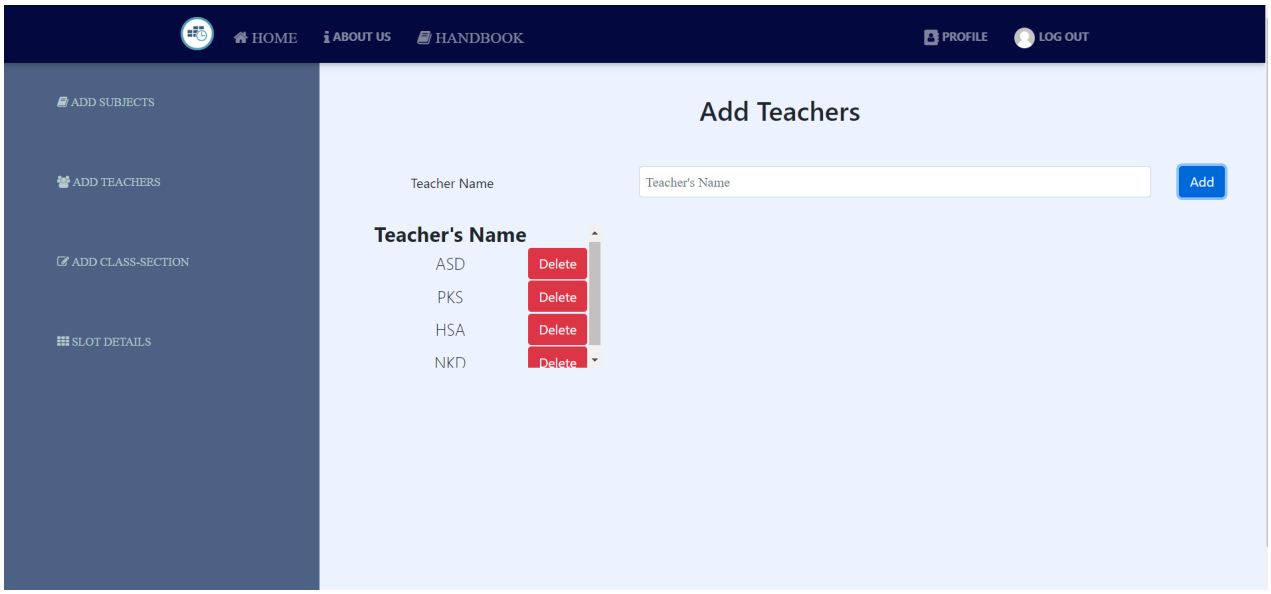
In addition, the machine learning models used for timetable generation will be continuously improved to enhance the accuracy and efficiency of the system. This will involve incorporating new data sources and refining the algorithms used to generate schedules. The user interface will also be continuously improved to make it more intuitive and user-friendly, incorporating user feedback and conducting usability testing to identify areas for improvement.

Overall, the future work plan for the STMS project is focused on continuous improvement and ensuring that the system continues to meet the evolving needs of educational institutions. The integration with other systems, development of a mobile application, and improvements to the machine learning models and user interface will enhance the functionality and usability of the system, making it an even more valuable tool for educational institutions.

5. Website Screenshots and Code snippets






HOME
ABOUT US
HANDBOOK
PROFILE
LOG OUT
ADD SUBJECTS
ADD TEACHERS
ADD CLASS-SECTION
SLOT DETAILS
Add Teachers
Teacher Name
Teacher's Name
Add
Teacher's Name
ASD
Delete
PKS
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HSA
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NKD
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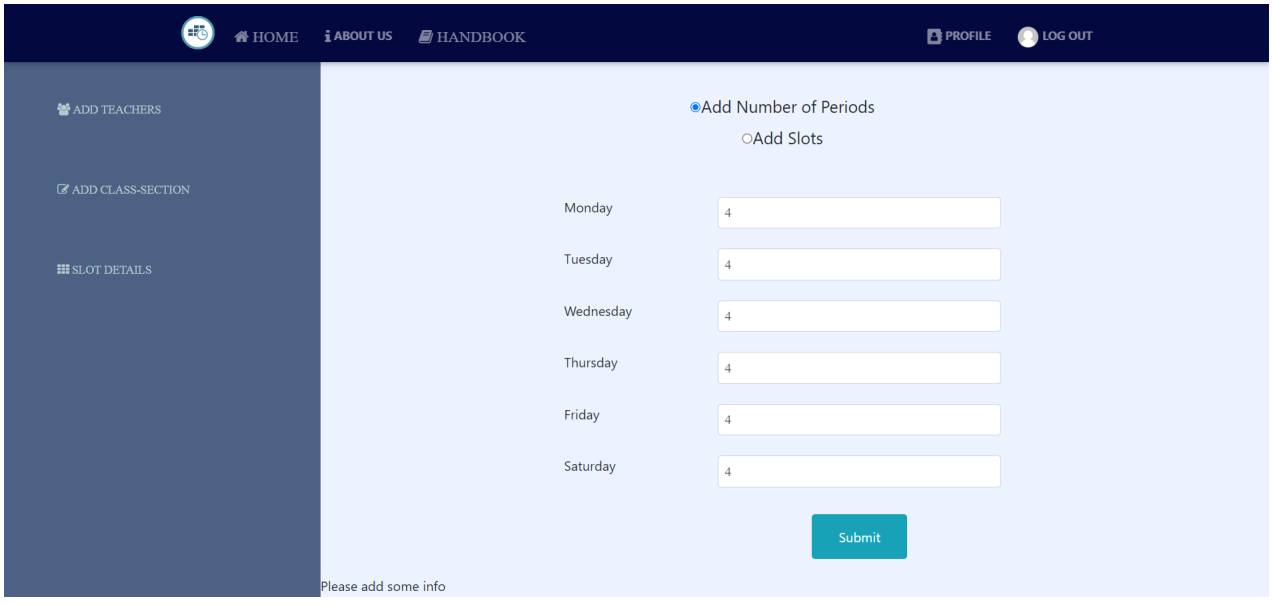
HOME
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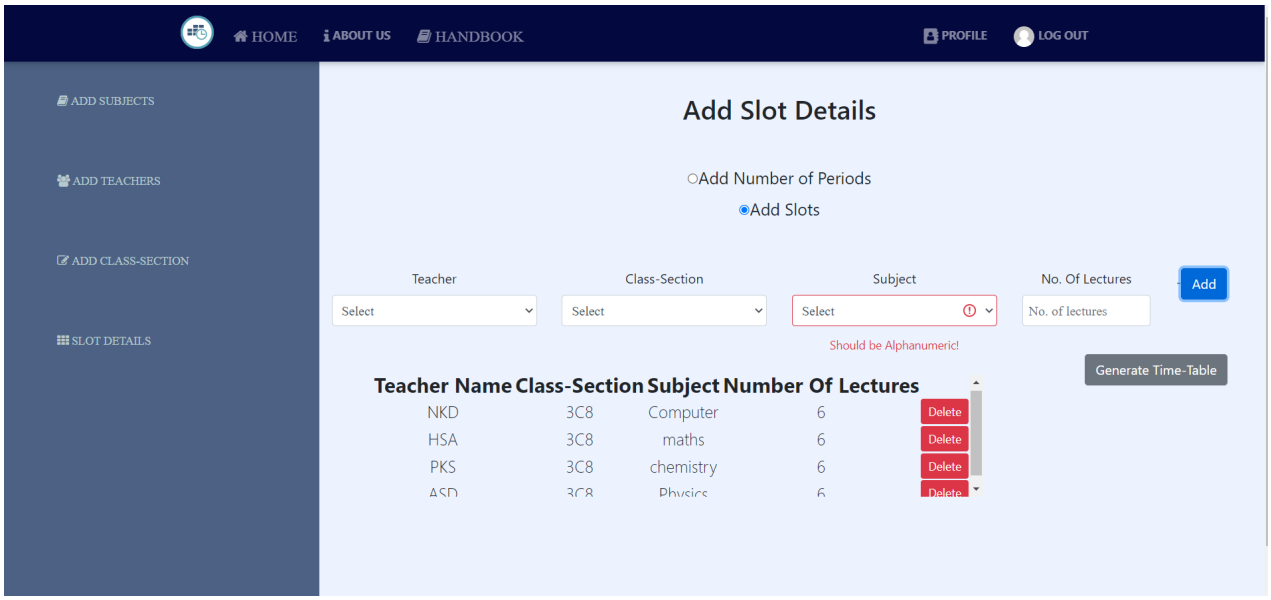
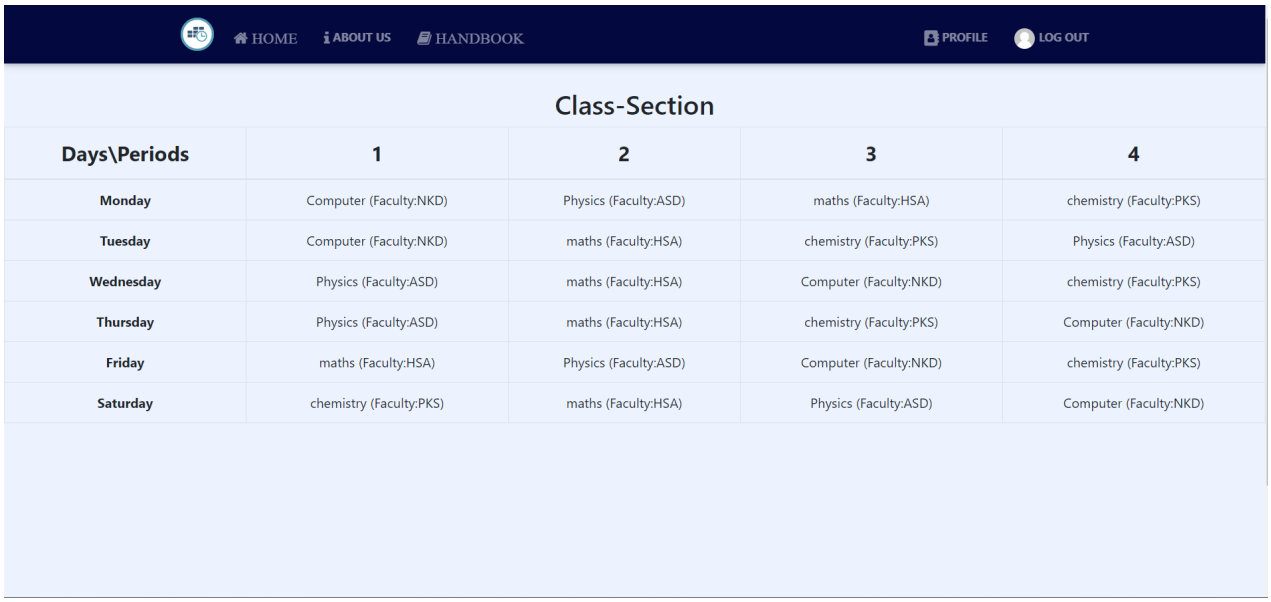
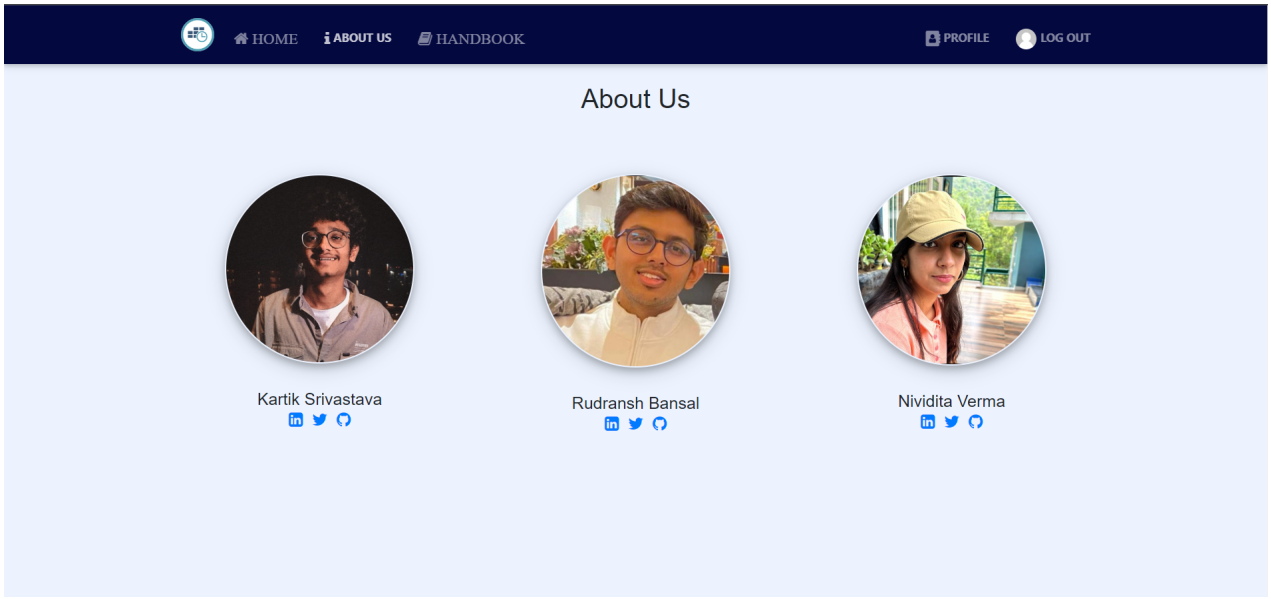
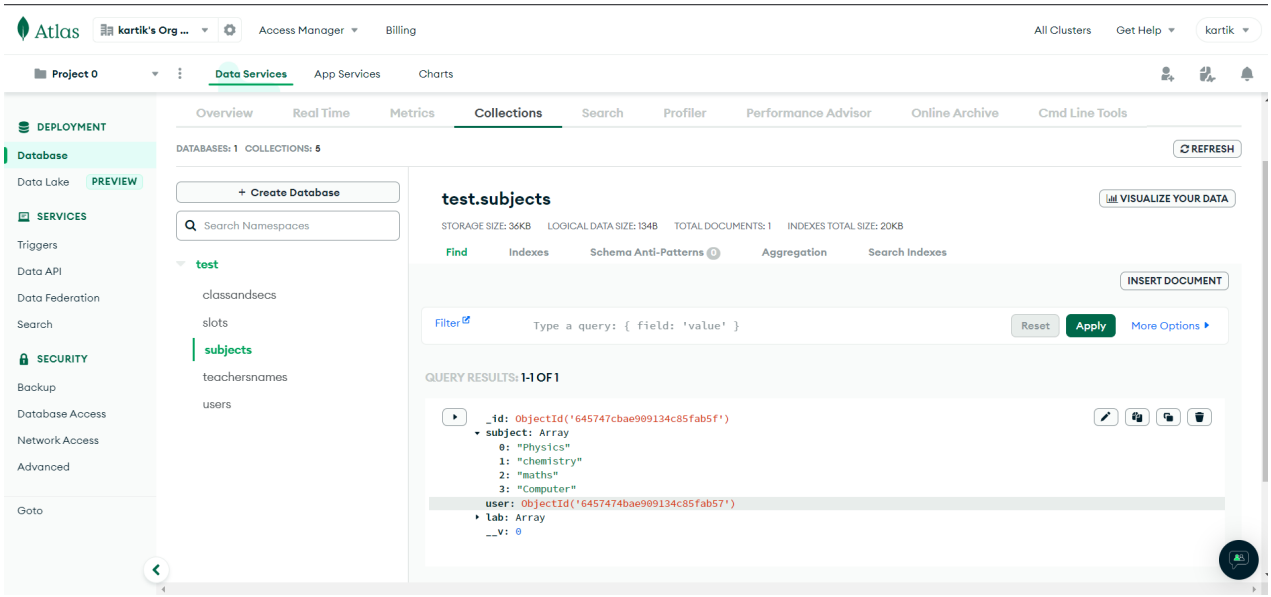




Days\Periods	1	2	3	4
Monday	Computer (Faculty:NKD)	Physics (Faculty:ASD)	maths (Faculty:HSA)	chemistry (Faculty:PKS)
Tuesday	Computer (Faculty:NKD)	maths (Faculty:HSA)	chemistry (Faculty:PKS)	Physics (Faculty:ASD)
Wednesday	Physics (Faculty:ASD)	maths (Faculty:HSA)	Computer (Faculty:NKD)	chemistry (Faculty:PKS)
Thursday	Physics (Faculty:ASD)	maths (Faculty:HSA)	chemistry (Faculty:PKS)	Computer (Faculty:NKD)
Friday	maths (Faculty:HSA)	Physics (Faculty:ASD)	Computer (Faculty:NKD)	chemistry (Faculty:PKS)
Saturday	chemistry (Faculty:PKS)	maths (Faculty:HSA)	Physics (Faculty:ASD)	Computer (Faculty:NKD)





Github Code Repository Link :

https://github.com/KARTIK5667/S.T.M.S

6. References

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[4] Okman, Lior & Gal-Oz, Nurit & Gonen, Yaron & Abramov, Jenny. (2011). Security Issues in NoSQL Databases. 10.1109/TrustCom.2011.70.