Project Title
Illini CMS (Classroom Management System)

Project Track 1: Stage 1
CS 411: Database Systems, Spring 2024

TEAM 108: SQLScholars
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Project Summary

The Classroom Management System (CMS) - Illini CMS represents a sophisticated platform tailored to meet the diverse needs of educational institutions, teachers, students, and parents. By centralizing classroom management tasks and facilitating seamless communication among stakeholders, the CMS streamlines administrative processes and enhances the teaching and learning experience. Administrators wield powerful tools for user management and system configuration, ensuring secure access and customization to suit the unique requirements of their educational environment. Teachers benefit from a comprehensive suite of features designed to optimize instructional workflows, from creating and managing classrooms to marking attendance and uploading class videos. The CMS also fosters transparent communication between teachers and students, enabling the sharing of live Zoom links and assignment submissions via Google Forms. Additionally, the system empowers teachers to track student progress effectively through visualizations, enabling them to identify trends, provide targeted support, and celebrate student achievements.

Parents are integral beneficiaries of the CMS, gaining access to a wealth of information and resources related to their child's academic journey. Through the system, parents receive timely notifications for student absences, enabling them to stay informed and engaged in their child's educational progress. Moreover, parents can access historical attendance records, review student grades and academic performance, and explore visualizations depicting their child's progress over time. This transparency and accessibility empower parents to participate in their child's education actively, fostering a collaborative partnership between home and school that supports student success. Overall, the Classroom Management System simplifies administrative tasks, enhances communication within educational institutions, and strengthens the connection between teachers, students, and parents, ultimately fostering a supportive and enriching learning environment.

Project Description

The adoption of classroom management platforms in schools, even in primary and secondary schools, is on the rise. The current educational setup for primary schools is lacking in many ways. The following are the **main problems**:

- **Inefficiency in Classroom Management**: Traditional classroom management methods often result in inefficiencies and time-consuming administrative tasks.
- **Lack of Transparency**: Parents and students may need more visibility into attendance records, grades, and overall academic progress, leading to disconnects between home and school.
- **Communication Challenges:** Communication between teachers, students, and parents may be fragmented or inconsistent, hindering collaboration and support for student learning.

We hope to solve these issues through our project, a consolidated Classroom Management System (CMS). Our focus is on providing a centralized platform for managing classrooms, assignments, attendance, and communication. We name our platform **Illini CMS**. This will be a web application developed using Node.js for the backend, React.js for the frontend using MySQL for the database. Our project includes the following **features**:

- **User-friendly Interface:** The CMS offers an intuitive interface for administrators, teachers, students, and parents to access relevant information and functionalities.
- **Visualisations for Progress Tracking:** Innovative visualizations allow users to track attendance, grades, and academic progress through interactive graphs and charts.
- **Timely Notifications:** Parents receive timely notifications for student absences, ensuring they stay informed and engaged in their child's educational journey.
- **Comprehensive Classroom Management:** Teachers can create and manage classrooms, mark attendance, upload class videos, and share live Zoom links for classroom sessions.
- **Assignment Management:** The CMS enables teachers to create and delete assignments, add Google Form links for student submissions, and record grades and remarks.
- **Access to Historical Data:** Parents can access historical attendance records, review student grades and academic performance, and explore visualizations depicting their child's progress over time.

- **Customization and Security:** Administrators have powerful tools for user management and system configuration, ensuring secure access and customization to suit the unique requirements of their educational environment.
- **Promotes Collaboration:** By facilitating transparent communication and providing valuable insights into student progress, the CMS promotes collaboration and support among teachers, students, and parents.

Advanced Features

The following features are what make our project stand apart from the currently available solutions in the market.

- **Informative Visualisations:** Through dynamic visualizations, the CMS offers transparent tracking of student progress, enabling educators and parents to monitor academic performance effectively.
- **Seamless Communication**: The CMS fosters seamless communication channels between teachers, students, and parents, promoting collaboration and engagement in the educational process.
- **Advanced Notification System:** Parents get enabled notifications for every attendance posted and grades updated by the teachers. Additionally, students get notified of every new assignment posted on the platform.
- **Teacher Remarks Classification:** The remarks added by teachers on the assignments are classified as Positive, Negative, and Neutral by the use of Machine Learning algorithms. Parents will be notified by email about the nature of the remark so that immediate attention can be given to students performing poorly.

Project Usefulness

The online learning application is primarily aimed at building an interactive learning ecosystem between teachers, students, and parents. The application will be integrated with diverse features mimicking the environment of a physical classroom interaction with the added advantage of parents keeping track and being notified of student activities and progress.

The application can be used as a medium by various schools to promote interactions between parents and teachers concerning their children's performance and progress during their school journey. The parents will have better access to their children's records and understanding of their academic activities, through regular notification status.

The application will also enable teachers to better organize class activities and conduct engagements with their students in an ordered manner. This application will further assist in distance learning for teachers who could not attend physical classroom sessions due to unavoidable situations and promote continued learning through interaction. There exist similar applications like Google Classroom and PrairieLearn. However, neither of them focuses on the interaction and involvement of parents. So, the added advantage of our platform will be the interactive nature of the CMS system with teachers and parents. Parents will receive timely notifications on the negative progress of their children which will prompt them to be extra alert and keep track of their child's progress since our target audience is primary and secondary schools. This novel feature will ensure parents are continuously engaged in tracking their child's progress.

Project Realness

Education has changed dramatically in recent years, moving towards a more digital-centric model, especially in reaction to the COVID-19 pandemic's issues. There has been a noticeable change from a mostly conventional, in-person learning approach to a more hybrid or online structure. As a result of the pandemic, educational institutions all around the world were forced to close, and classrooms quickly shifted to online learning environments like Zoom. Important aspects of education, such as assignment distribution, attendance tracking, and grading, were also moved to web-based platforms. Even while face-to-face instruction has gradually returned, the effects of this digital transition are still noticeable. Thus, we strive to build our platform to sustain such impacts and ensure continued learning.

Our project will be using multiple database tables mimicking an online school portal. We will be using multiple .csv files as our data source to store values within our database tables, including the use of student first names, last names, StudentId, CRN, and multiple other tables containing information about their parents, teachers, and their subjects. The students inside the student table will be populated using the Names Dataset made publicly available. The dataset contains first and last names, gender, and country of residents of different countries. We will be using the first name, last name, and gender columns from the above data source as well as details for teacher names, and parents, and we will generate their respective StudentId. The dataset contains 491,655,925 full names, however, we will be using 1500 rows and at least 5 columns (StudentId, FirstName, LastName, CRN, gender) to meet our data requirements.

We will also be populating attendance data, which will contain first name, last name, day, and present or absent fields. The grades/assignments will be generated using a .csv containing name/id, assignment, and grade. This will be loaded into the database and displayed when checking/updating grades. A standout feature of our application is that there will be visualizations summarizing this data.

Project Functionality and User Experience

Our project has four types of users:

- **Administrators** - Administrators will enjoy full access to all the classrooms present in the school. They can **add, update, delete, and search** the required classrooms. They will be responsible for **creating** the classrooms for every course and section.

- **Teachers** - They will have access to **view** classrooms in which they can integrate one Zoom link for the classroom. They can **add/remove** students from their classrooms and provide them links to Google form assignments which can be graded with remarks in the future. They can **add and update** the attendance for students. Additionally, Teachers can **upload** the URL for Zoom recordings of the previous classes and mark students as Present/Absent for the class.

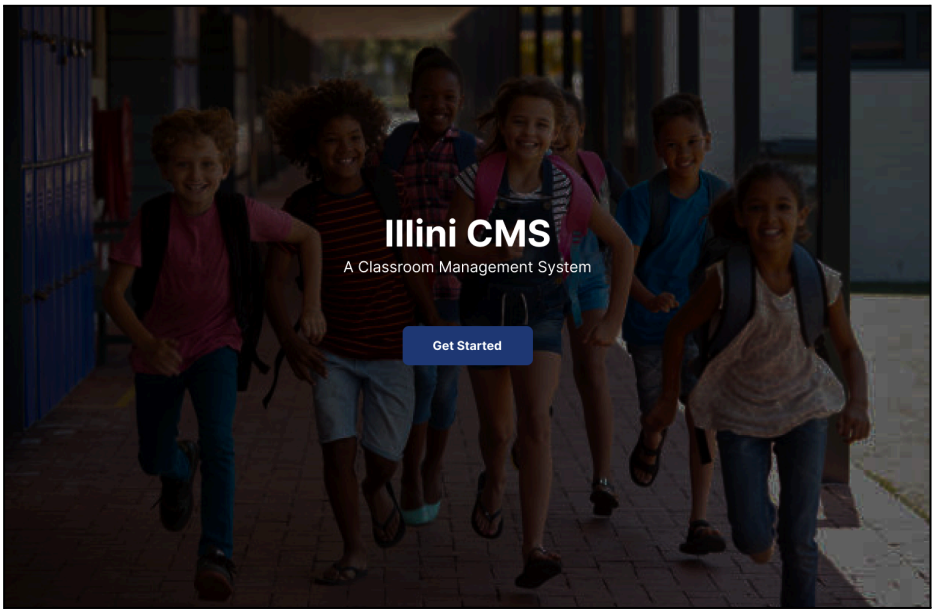
- **Students** - Students can **view** the details of all the classrooms they enrolled in. Zoom recordings are available for each class to access online learning. They can **view** the links for their assignments and check previously assigned grades.

- **Parents** - Parents will be provided with access to their children's grades to stay updated with their academic performance. They will receive **email notifications of absenteeism** of their child, to prevent the child from providing them misleading information and can access all the records of the student.

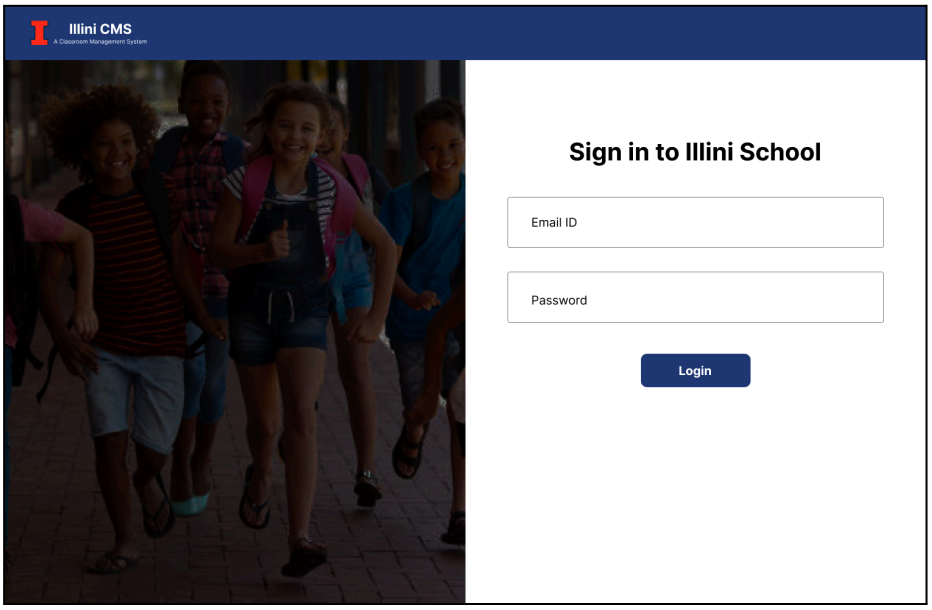
Low-Fidelity UI Mockup

https://www.figma.com/file/2GsniBCEW5eu9BwZmlo8bi/Low-Fidelity-UI-Mockup?type=design&node-id=0%3A1&mode=design&t=kn44HK7Rov9bHIAb-1

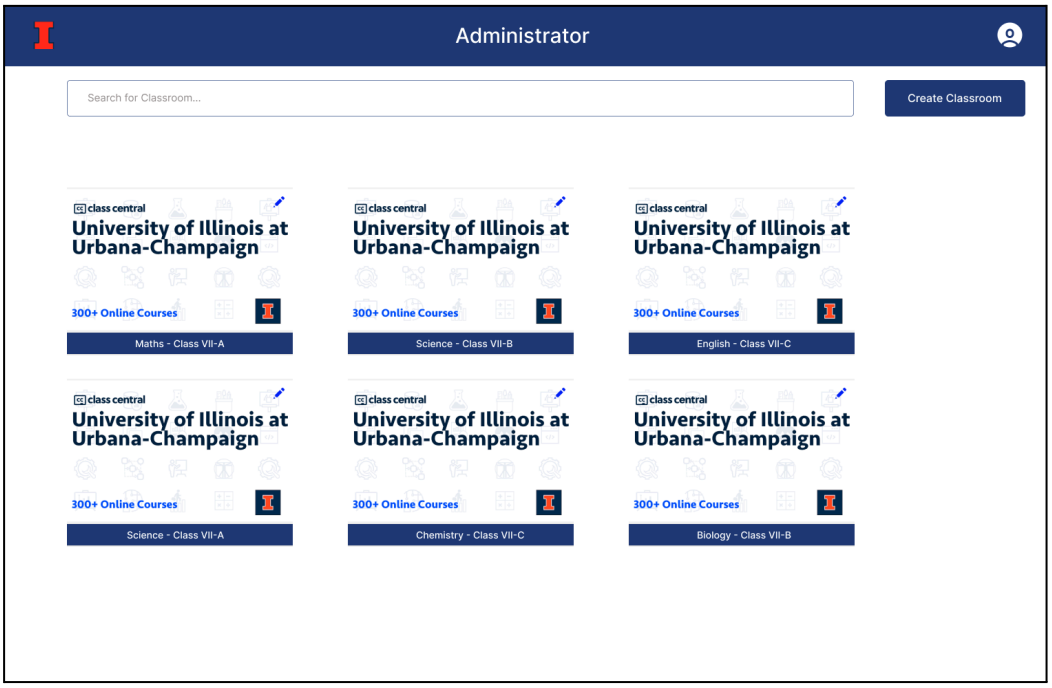
Landing Screen



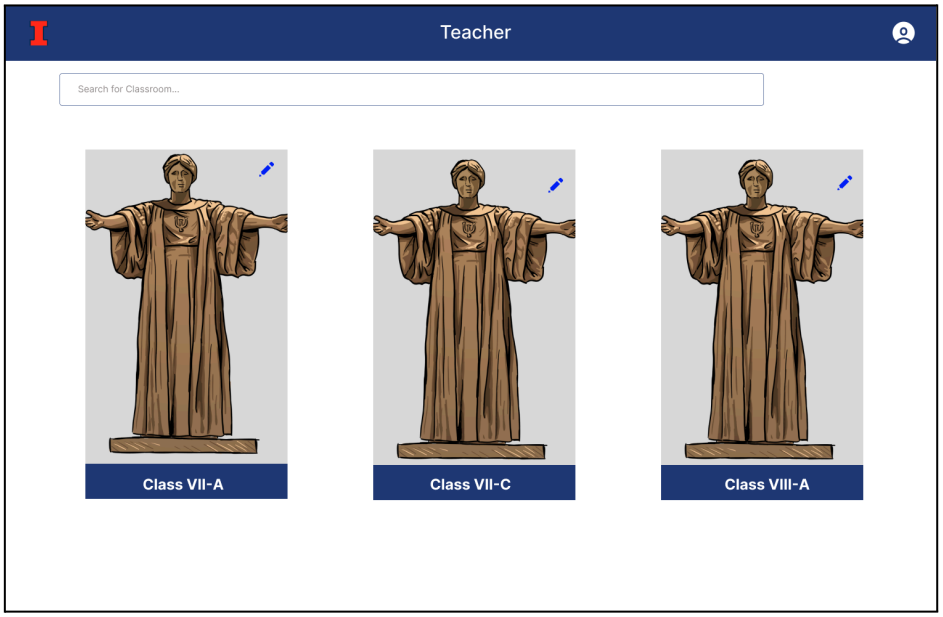
Login/Signup Flow



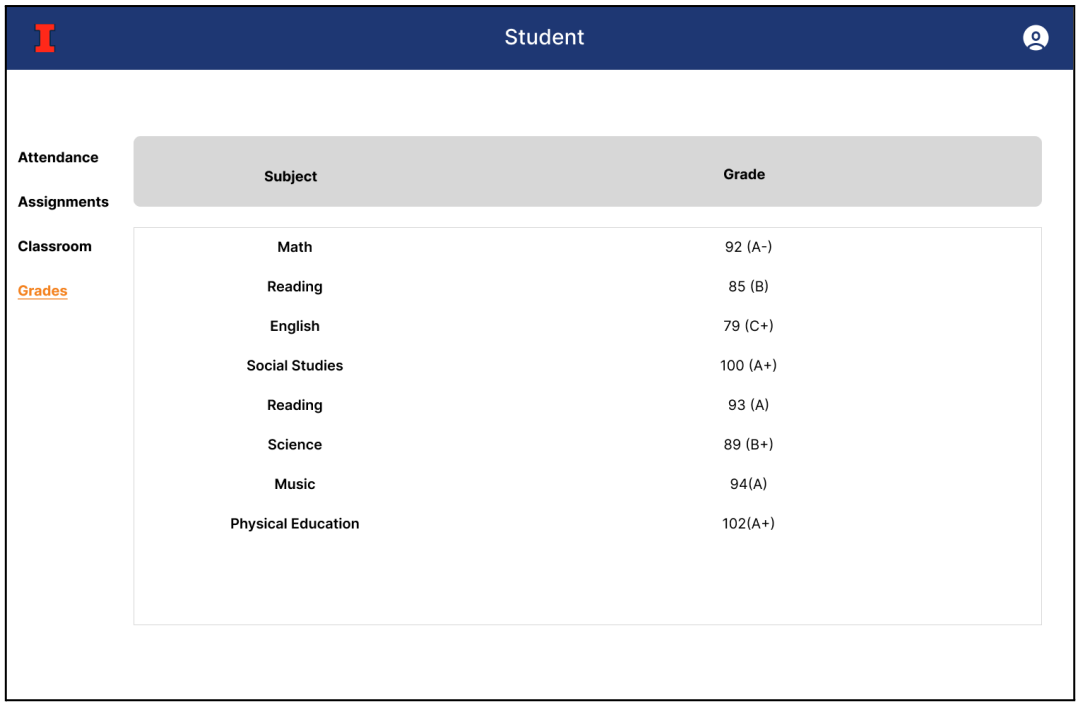
Admin View

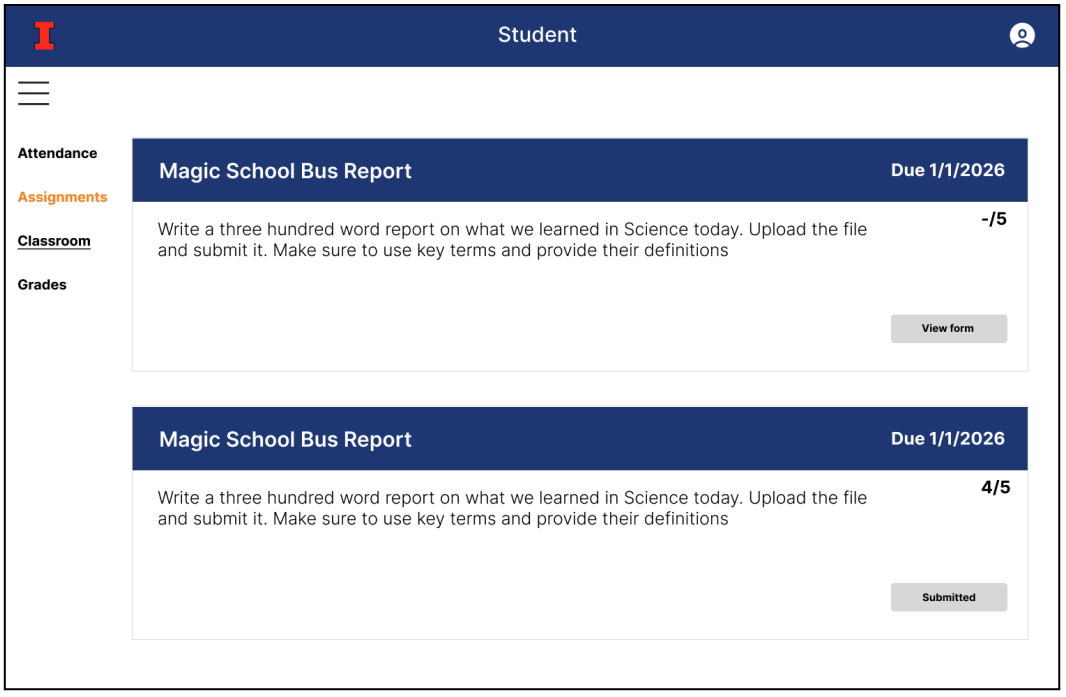


Teacher View



Student View





Work Distribution

The main components of our project are divided into 2 broad categories:

1. Frontend

- **Jimmy** will be focused on creating components using HTML and CSS
- **Ketaki** will be working on all the API Integrations and visualizations

2. Backend

- **Ketaki** will be working on database connections and integrations with the server.
- **Jimmy** will be working on APIs for add/update of student attendance.
- **Pranav** will be responsible for using Machine learning techniques to classify the teacher's remarks. He will also be working on APIs for searching/adding/removing students from the classroom, and adding/updating Zoom links for previous classes.
- **Panshul** will be responsible for setting up routers using Express. He will be working on an authentication API for different users, creating/editing/deleting/viewing assignments, developing notification system queues for emailing users, and server deployment.
- **Pranav and Panshul** will be working on deploying the MySQL server on Google Cloud Platforms.

Improvements to Stage-1

1. For the dataset, I feel the current ones are insufficient, lacking real-world data. It is a serious issue as synthetic data does not contain useful knowledge.

Dataset 2 Link: https://www.kaggle.com/datasets/septa97/100k-courseras-course-reviews-dataset

The second dataset we will be using is a dataset from Kaggle which contains reviews of different courses on Coursera. Since, we will perform an analysis of Teacher's assignment reviews given to students and prompt parents when the review is negative, so that they can be more involved in their child's academic development, the nearest dataset in the education domain for reviews is the *100K-courseras-course-reviews* dataset. The dataset contains nearly 100,000 individual rows with 3 columns including an index-based ID, Review, and Label. The label value assigned is based on the review given to the course, on a scale of 1-5, 1 being the lowest and 5 indicating an excellent review. Since we will be performing sentiment analysis of Teacher reviews given to students on assignments, we require keywords that could indicate the performance in the educational context, and for these reasons, the chosen dataset best aligns with our requirement. We will be utilizing nearly 10,000 rows to train a machine learning model, which will contain a normalized distribution of all labels, ensuring the model does not become biased or overfit the training data. We will be notifying parents if the score of the review given by the student's professor is less than 3 since it is strongly encouraged to perform better.

Parents could also have been notified based on merely the grades received, however, professors do tend to provide reviews based on the performance of a student over a series of assessments. Underperforming in merely one of ten assignments doesn't need to be highlighted crucially to parents since it could further demotivate the student, however, continuous low scores demand a need for better vigilance.

2. I am also concerned that you can find 5 entities from the dataset.

We've pinpointed over five key entities pertinent to our project: Users, Classroom, Courses, ClassroomGroup, Assignment, and ClassGroupRecordings.

3. When visualizing data, if figures/diagrams are used, then they are considered creative (challenging) components.

We will offer parents dynamic visual representations showcasing comprehensive statistics about their child, including attendance and grades which will be query-dependent.