Site: http://sdmay22-40.sd.ece.iastate.edu/
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HandRaise

Interactive & engaging learning platform for large classrooms

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Problem

- In large classrooms, it can be hard for students to ask questions and stay engaged or receive personalized attention
- Being called out in a large lecture hall can be intimidating
- It is difficult for professors to gauge how involved students are in lectures as well as get valuable feedback on topics

Design Requirements / Use cases

Professors:

- Create different types of polls that can be answered by students
- View student questions and resolve them
- Create discussions for a class section
- View student participation metrics and grades

Teaching Assistants:

- Respond to students' questions in class without interrupting class
- View students' poll responses

Students:

- Ask anonymous questions in a large lecture hall
- Respond to class discussions and live polls

Solution

- Dynamic web application to create an interactive lecture
- Professors can create polls or discussions to gauge students' progress
- Students can engage by asking questions or discussing course topics

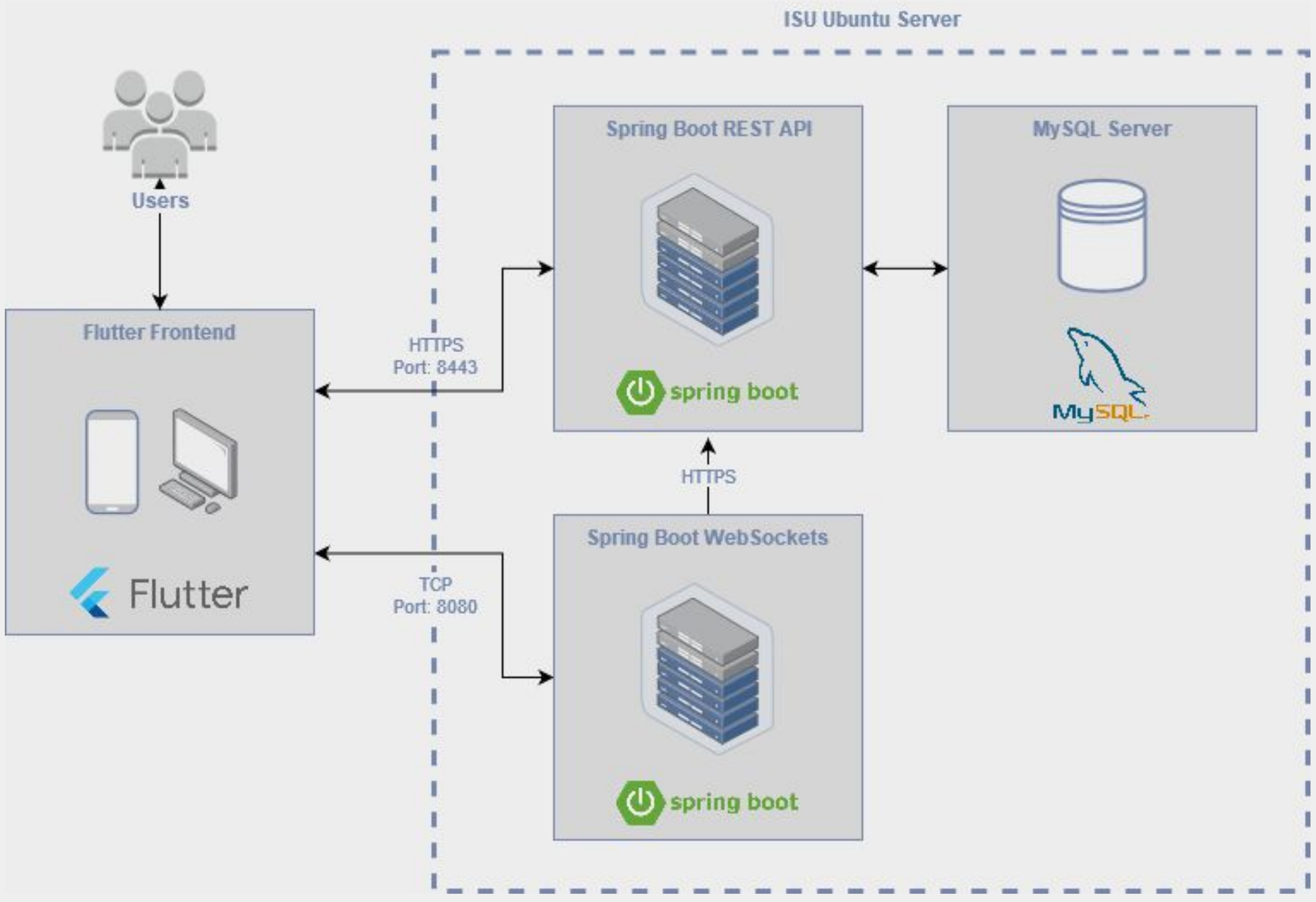
Technical Concerns

- Frontend
  - Learning a new language (Dart) and framework (Flutter)
- Backend
  - Ability to timely handle users' requests on ISU servers
  - Security of user data
  - Future maintenance / development

Security Measures

- SSL certificate for ISU server
- Encrypted connections over HTTPS and WebSockets
- Provide encrypted JSON Web Tokens to users for user authentication
  - Required for every HTTPS request in Authorization header
  - One valid, active token per user
  - Expiration dates for every token

Architecture Diagram



Design Approach

- Frontend
  - Flutter (Dart)
    - UI development kit by Google
    - Allows for building web, iOS, and Android apps with one code base
- Backend
  - Spring Boot Applications (Java)
    - REST API (HTTPS)
    - Live polls and discussions (TCP / WebSockets)
  - MySQL Server (SQL)
  - ISU server (Ubuntu)

Engineering Standards

- IEEE 1008-1987 (Standard for Software Unit Testing)
- IEEE 23026-2006 (Standard for Website Software Engineering, Website Management, and Website Life Cycle)
- Java and Dart coding standards, Git standards

Testing

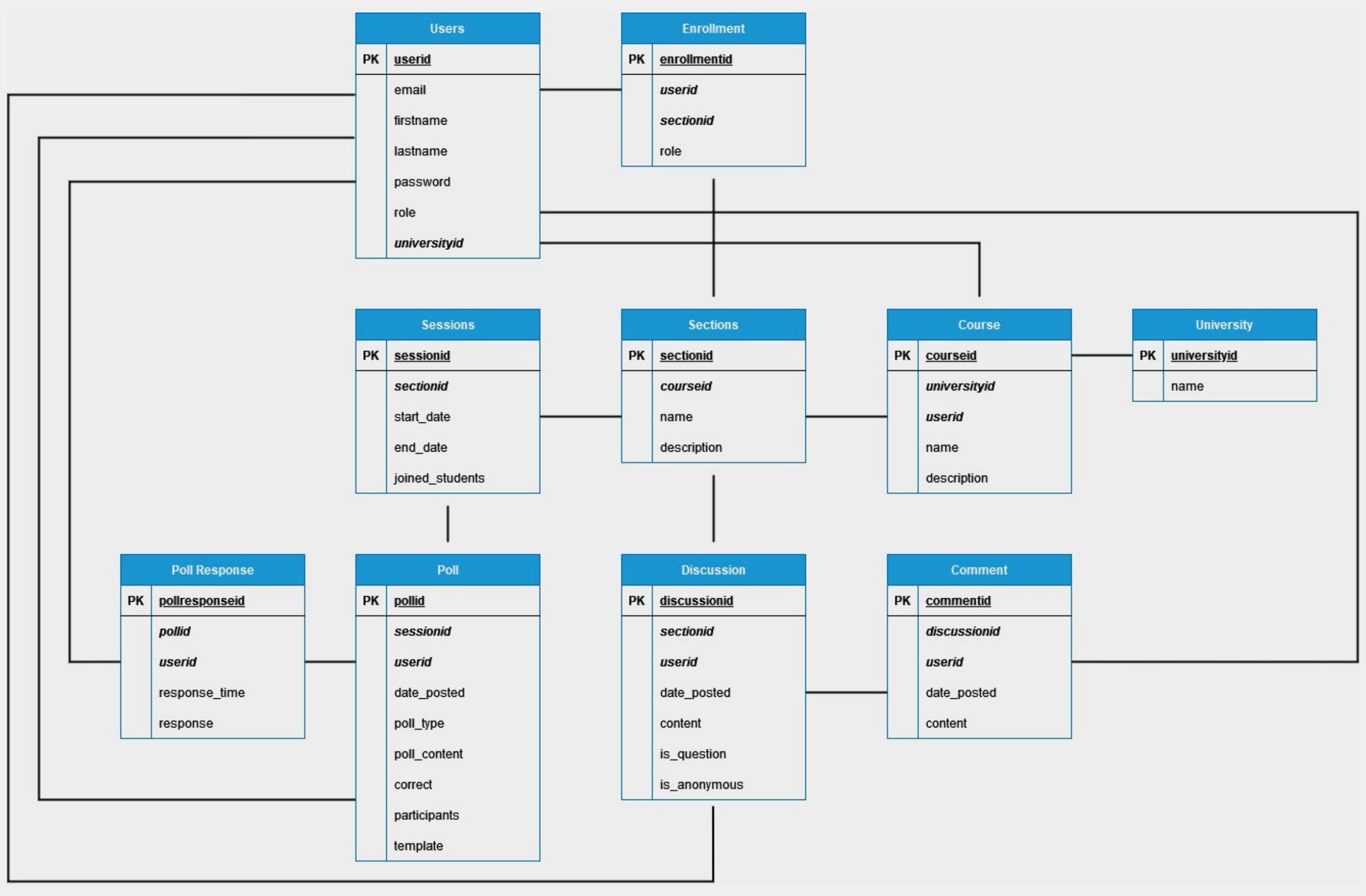
- Frontend
  - Unit testing
  - Widget testing
  - Integration testing
  - Manual testing
  - Postman for manual testing
- Backend
  - Mockito to mock Spring controllers and repositories
  - JUnit testing
  - Postman for manual testing

Results

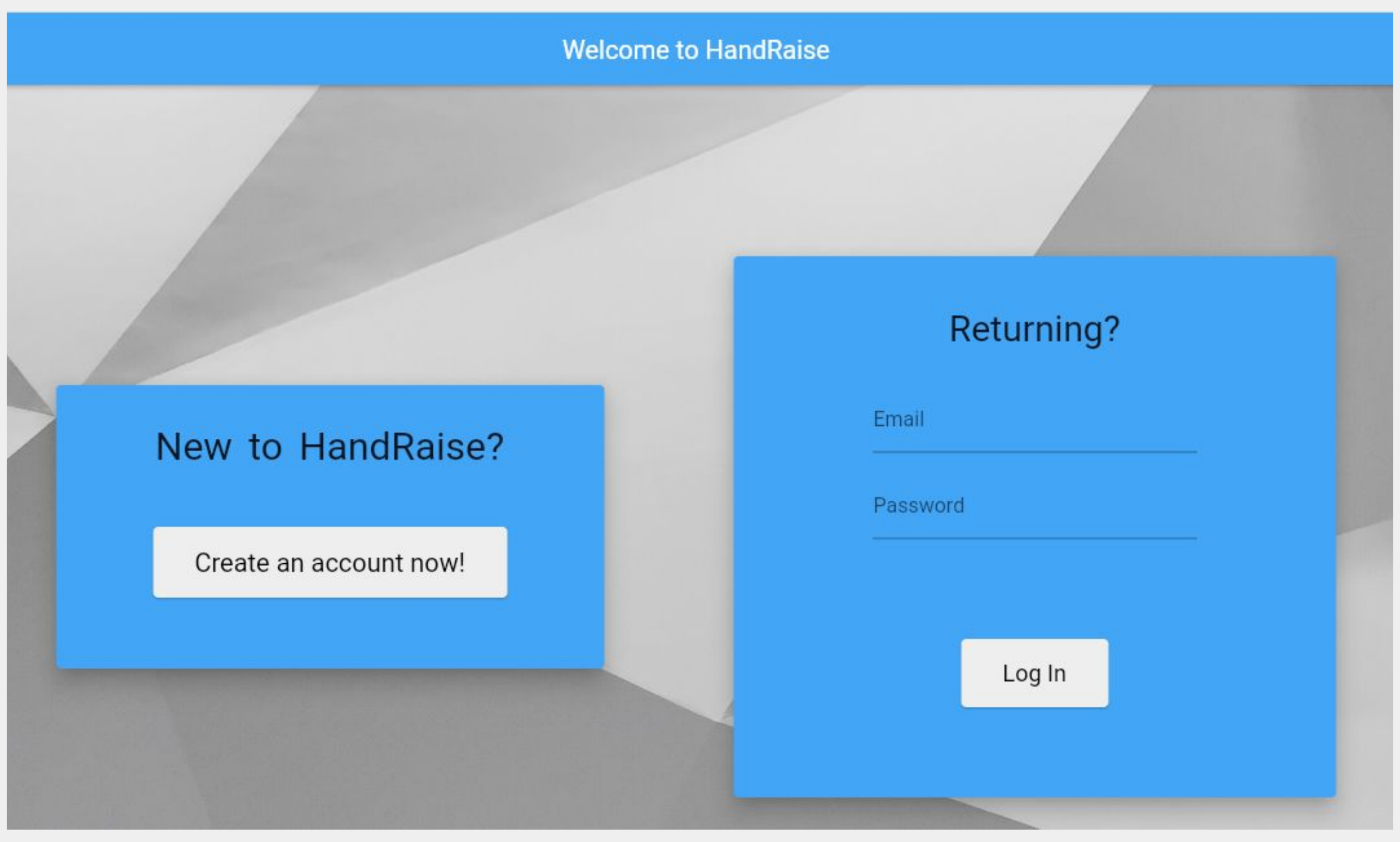
This project is implemented with students, TAs, and professors and their convenience and accessibility as the priority. Our group did not seek to compete with previous classroom apps, but instead to produce a high-quality solution that would be free of cost for ISU.

Although we were unable to test the application in a large-scale classroom environment, we believe that the application is in a good place to move forward and with some further versions can be used in a university setting.

Entity Relationship Diagram



Screenshots

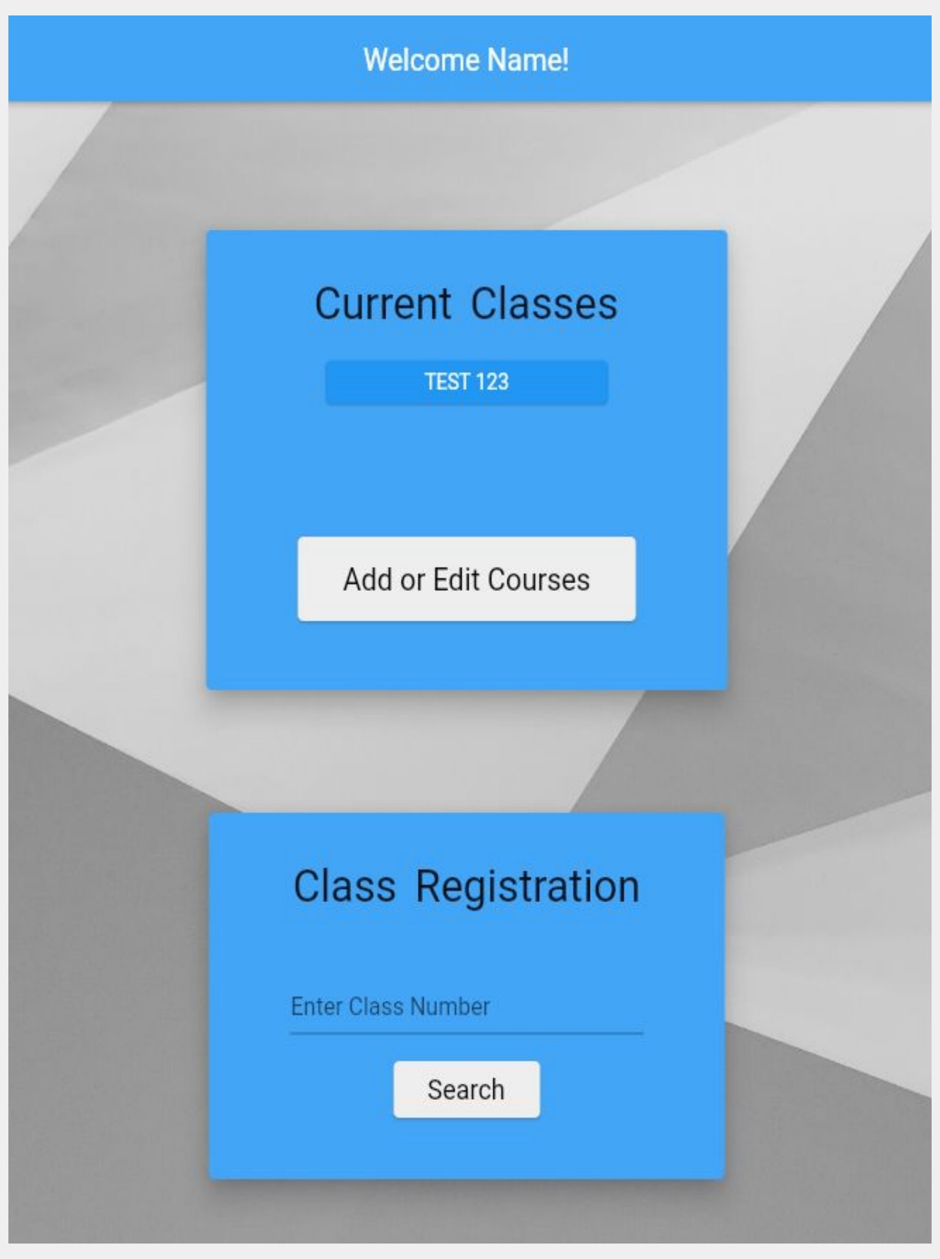

Welcome to HandRaise

New to HandRaise?

Returning?

Email

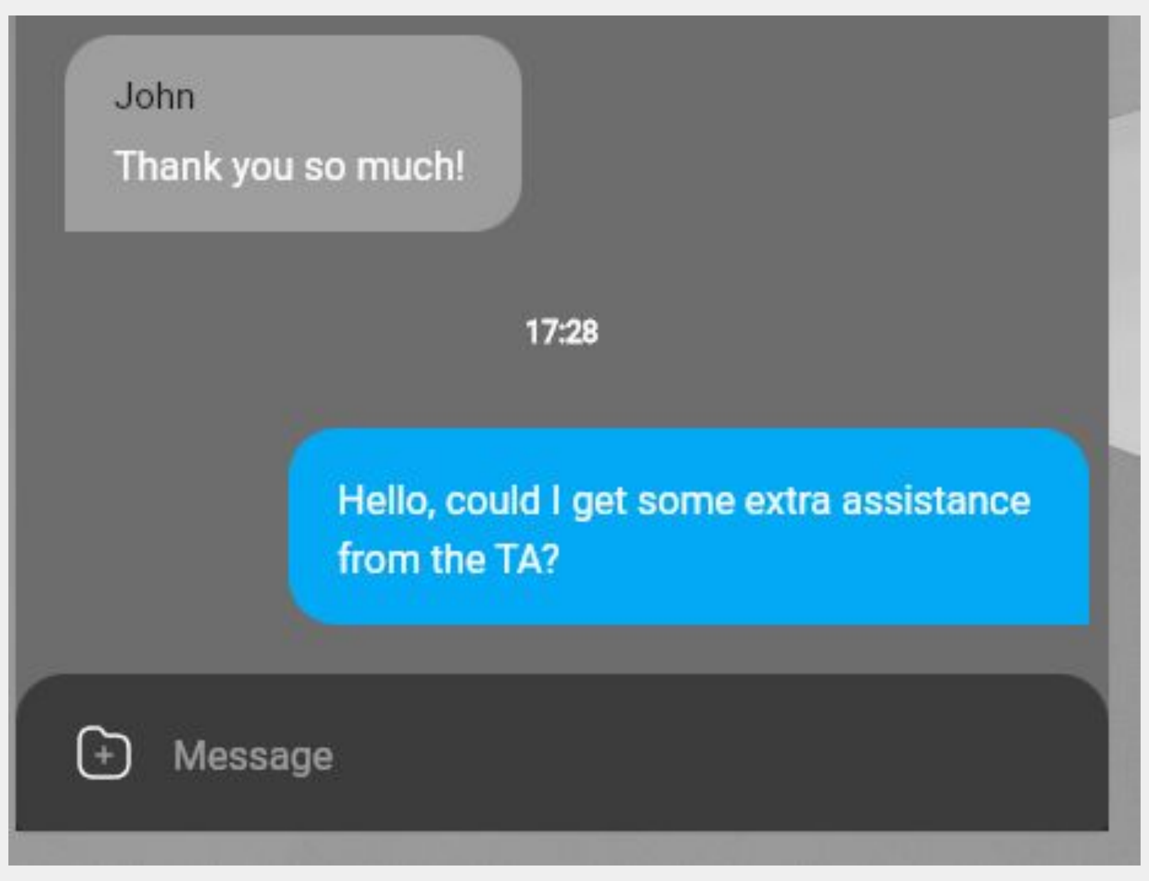
Password


Welcome Name!

Current Classes

Class Registration

Enter Class Number


John
Thank you so much!

17:28

Hello, could I get some extra assistance from the TA?

Message