MICHIGAN STATE UNIVERSITY

Project Plan Presentation

Modernizing Robotic-Surgery Education

The Capstone Experience

Team Henry Ford Innovations RSE

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From Students…
…to Professionals

HENRY FORD HEALTH
Innovations

Project Sponsor Overview

- Henry Ford Health is a healthcare organization headquarted in Detroit, MI
- Responsible for operating 46 medical centers within Michigan, including five hospitals
- The innovation team continues to research and innovate new healthcare technologies like robotic surgeries

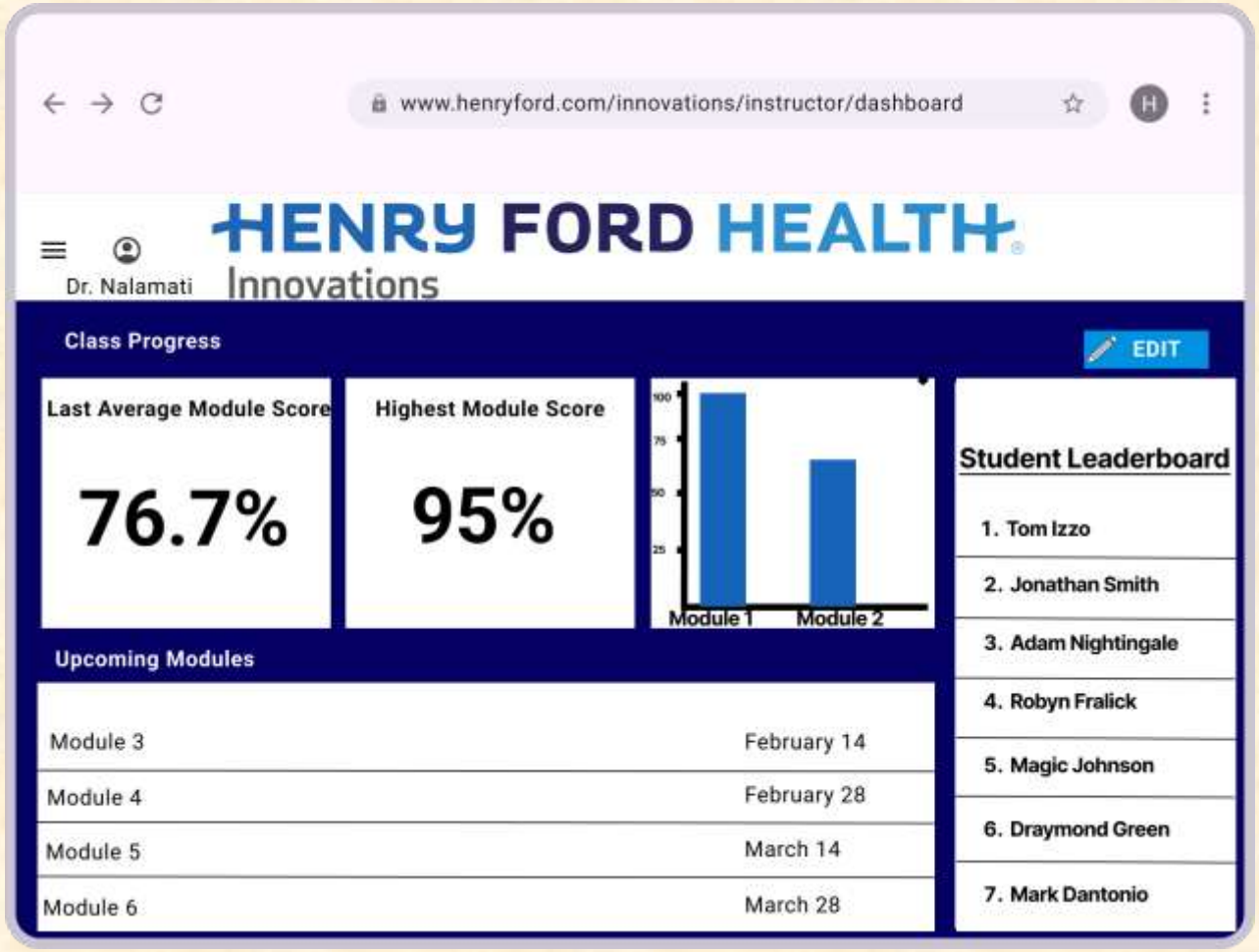
Project Functional Specifications

- Provide an analytical dashboard for medical students and educators to help visualize learning progress
- Designed to track and improve training performance in robotic assisted surgery
- Supplies real-time insights on skill proficiency, engagement, and learning patterns
- System will analyze performance metrics and offers personalized learning recommendations

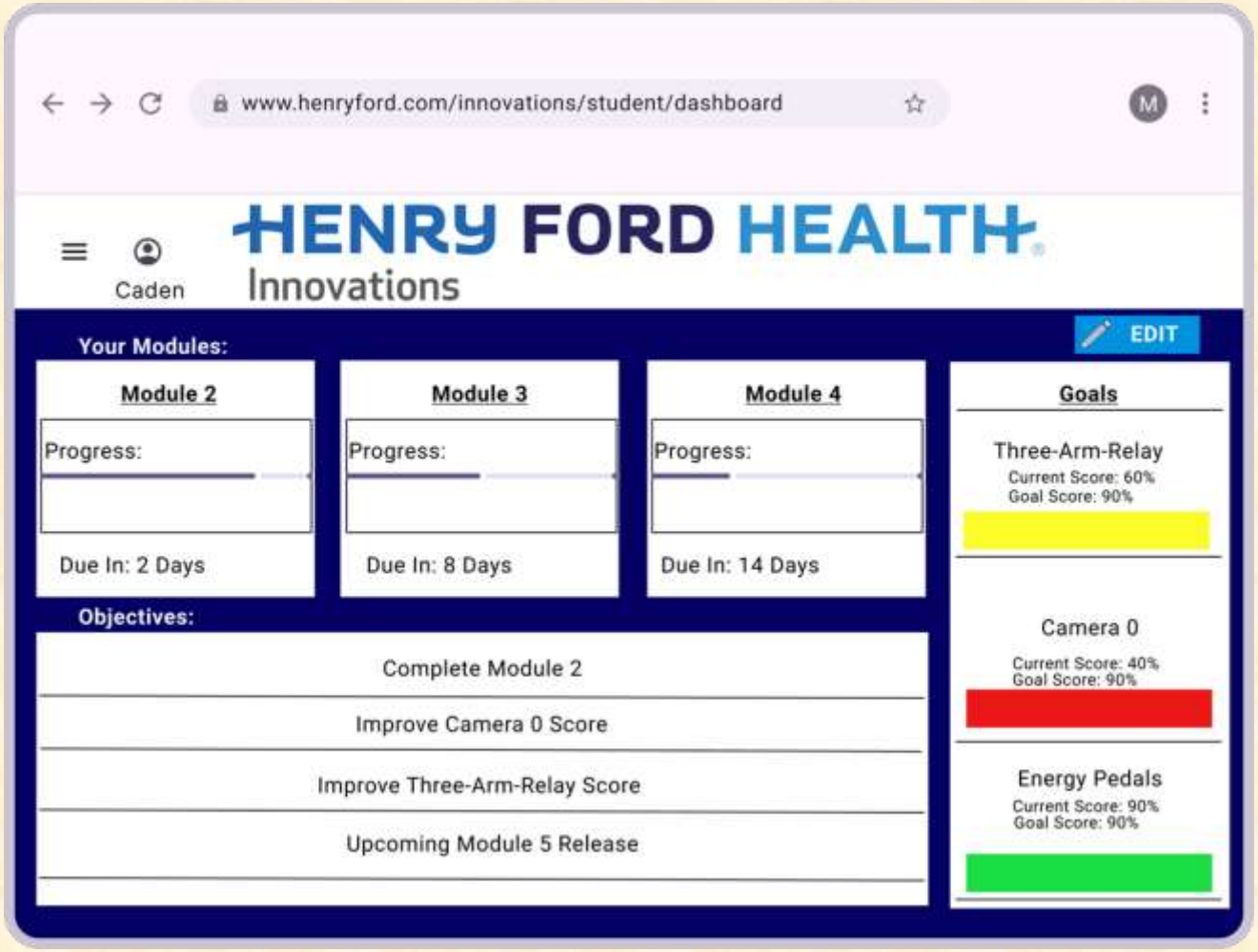
Project Design Specifications

- Analytical Dashboard – Web and iOS app with interactive insights on proficiency, engagement, and progress
- ML with PyTorch – Predict trainee performance and time to mastery
- Cloud-Based Data Storage – Scalable server for real-time trainee metrics, engagement, and cost tracking
- Role-Based User Access – Secure user roles for trainees and educators with controlled data visibility

Screen Mockup: Instructor Web View



Screen Mockup: Student Web View



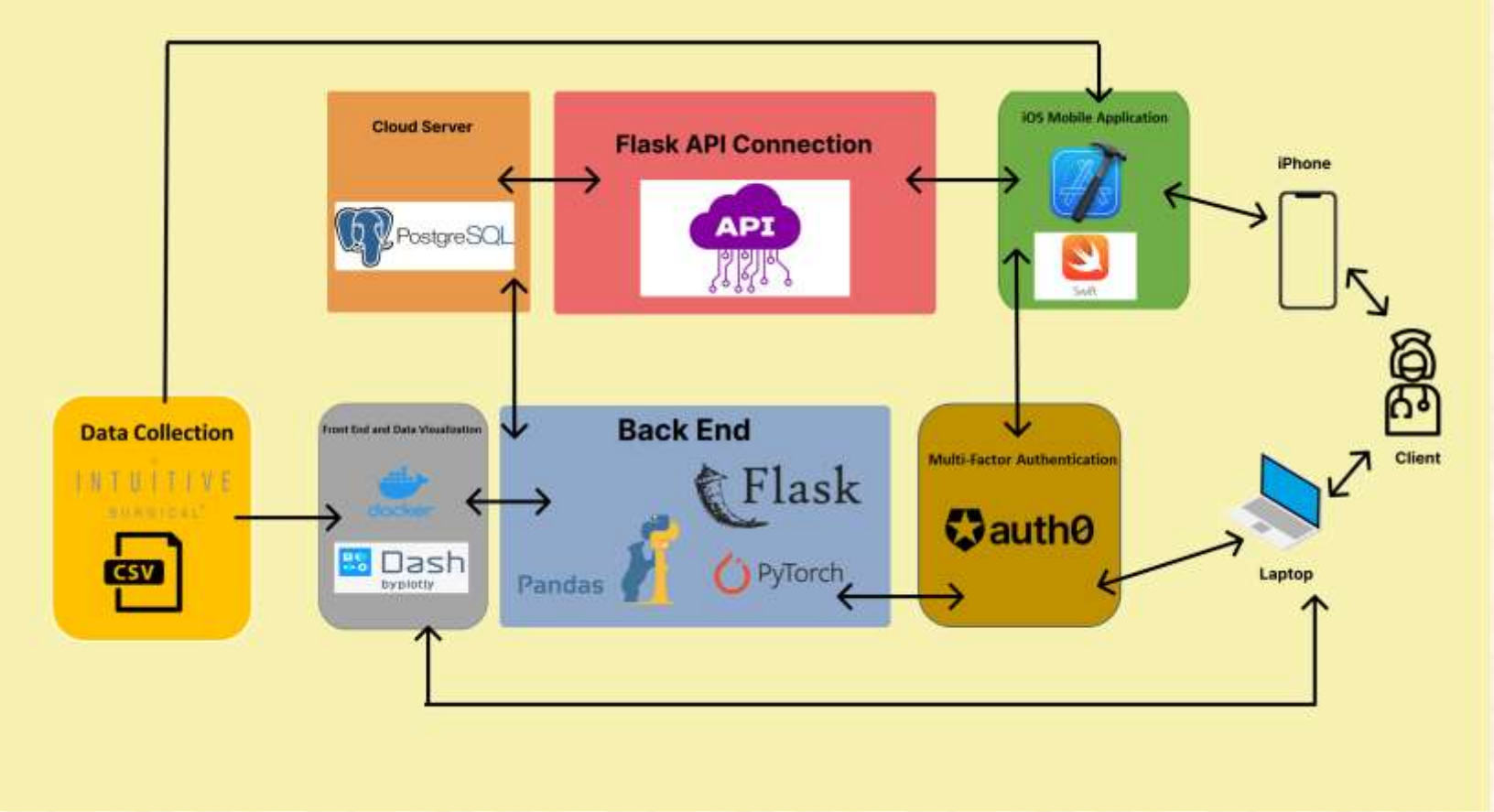
Screen Mockup: iOS Instructor View

Screen Mockup: iOS Student View

Project Technical Specifications

- Data Source – Data is collected from Intuitive surgical robots in csv format
- Cloud Storage – Processed training data is stored in PostgreSQL cloud server for scalability and security
- Machine Learning – Utilize PyTorch for neural network-based predictive modeling
- Data Visualization – Web app built with Dash and mobile app built with SwiftCharts

Project System Architecture



Project System Components

- Hardware Platforms
  - Intuitive surgical robots

Software Platforms / Technologies

- Dash – More flexible and interactive dashboard than previous visualization tool
- PostgreSQL Cloud Server – Enhance scalability and security for data management
- PyTorch – Machine Learning predictive modeling
- Flask – Lightweight web framework for routing and APIs
- SwiftUI – Framework for developing user interfaces for iOS devices
- Auth0 – Authentication system for web and mobile applications

Project Risks

- **Converting from Power BI**
  - Changing the dashboard might break other features due to it being interwoven with other features
  - Mitigation: Implement Dash software in parts to avoid losing full functionality of application
- **Data Integrity**
  - Outliers or imprecise data points could skew key performance metrics
  - Mitigation: Implement data validation and preprocessing steps
- **Data Security**
  - Within current system, anyone with the correct route URL could potentially gain access to data within SQL Server
  - Mitigation: Add additional security within each route and add firewalls to the SQL Server
- **User Security**
  - With many authentication systems, any email is able to sign up for services. Only Henry Ford Health users should gain access to applications
  - Mitigation: Implement auth0 software to add additional security measures

Questions?