MICHIGAN STATE UNIVERSITY

Project Plan Presentation

Data-Driven Mechanic: Applications and Infrastructure

The Capstone Experience

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From Students…
…to Professionals

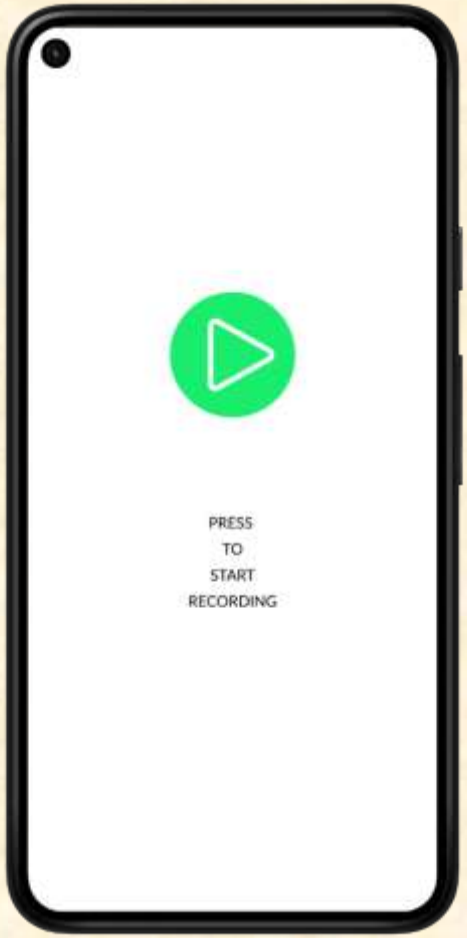
Functional Specifications

- 290 million cars operate below optimal efficiency due to delayed maintenance
- Maintenance can be difficult due to cost and accessibility
- By analyzing sound cues to detect current and upcoming failures, car owners can better anticipate needed maintenance
- This theory can be expanded to analyze failures in a range of devices

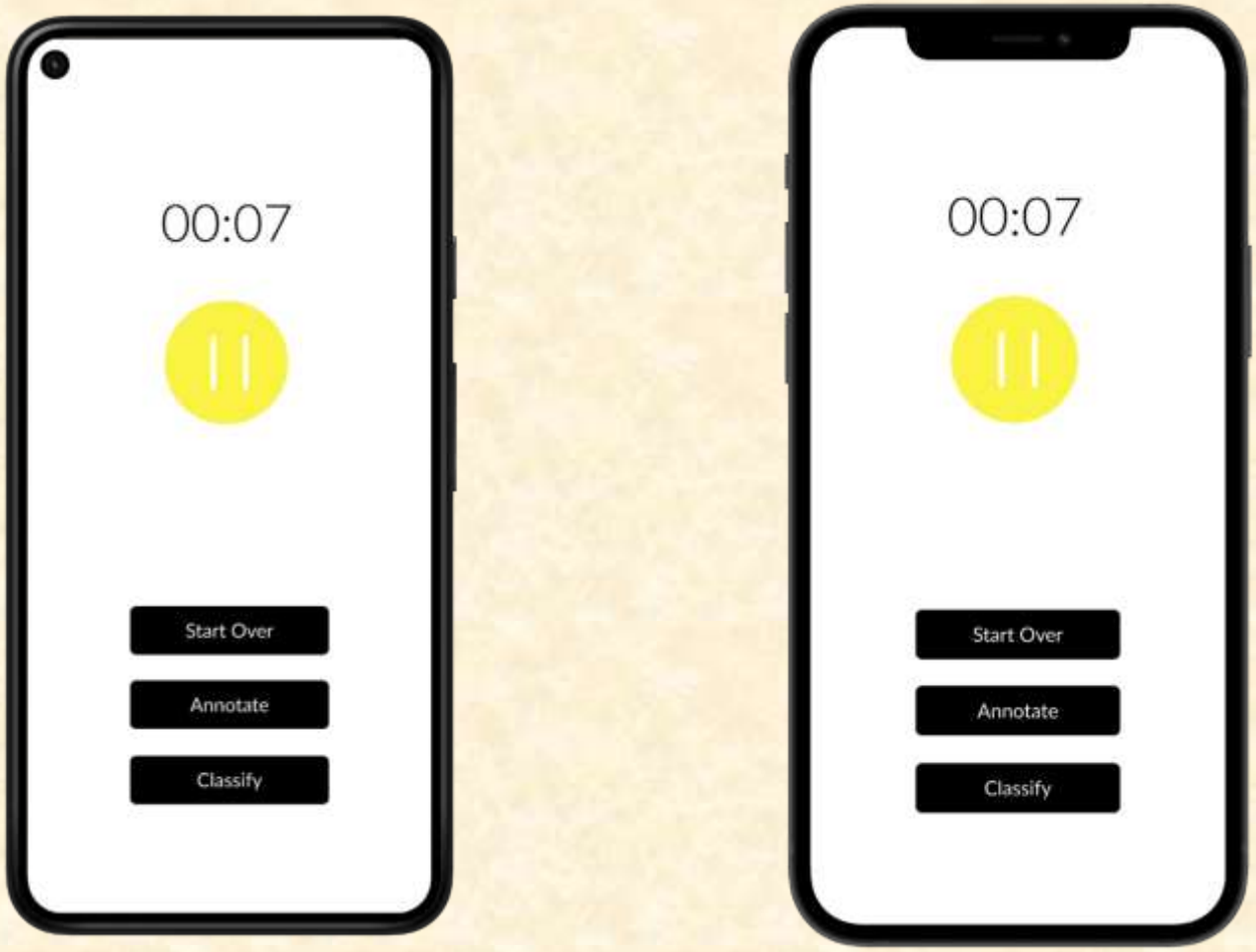
Design Specifications

- Minimalist design philosophy was used in the design of our iOS and Android applications
- Simple, easy-to-use UI to focus user's attention on functionality
- Annotation of the collected audio and accelerometer data for future model training
- Classification is the other feature to enable the user to use the previously trained models

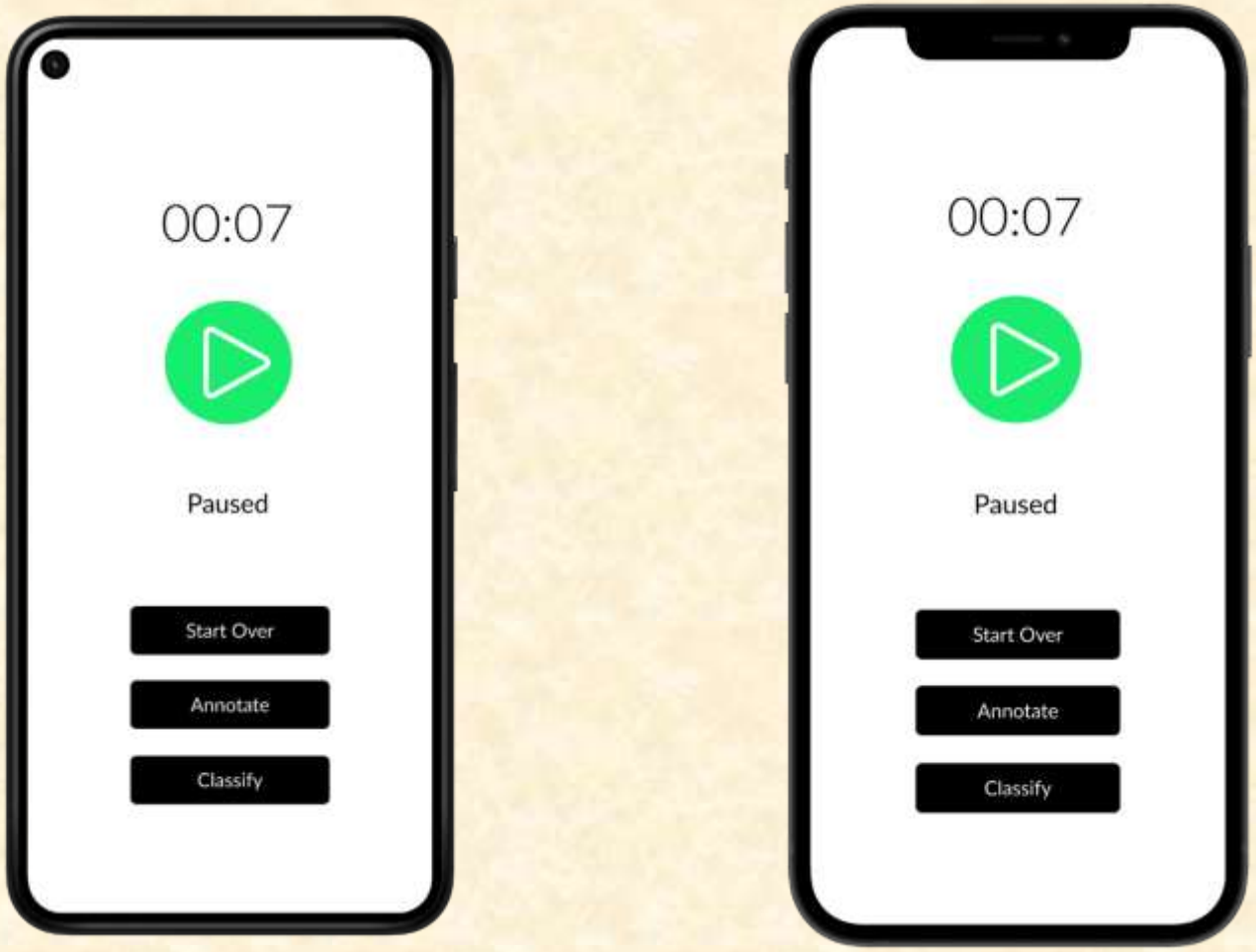
Screen Mockup: Home Screen



Screen Mockup: Recording Screen

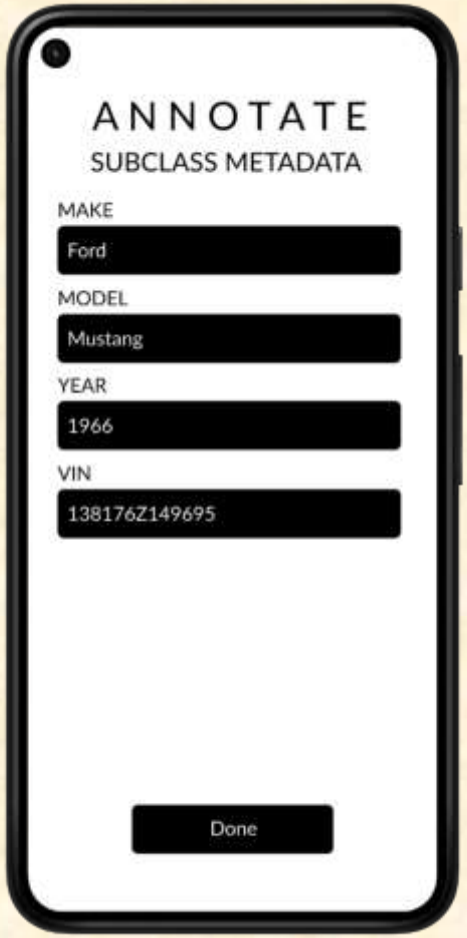


Screen Mockup: Paused Screen



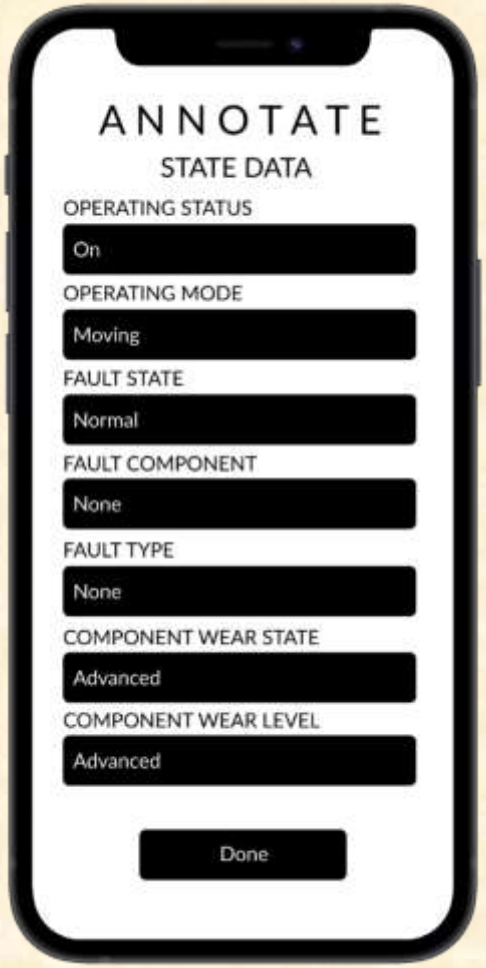
Screen Mockup: Annotate Screen

Screen Mockup: Annotate Subclass Metadata Screen



Screen Mockup: Annotate Screen

Screen Mockup: Annotate State Data Screen



Screen Mockup: Annotate Screen

Screen Mockup: Annotate Submission Screen

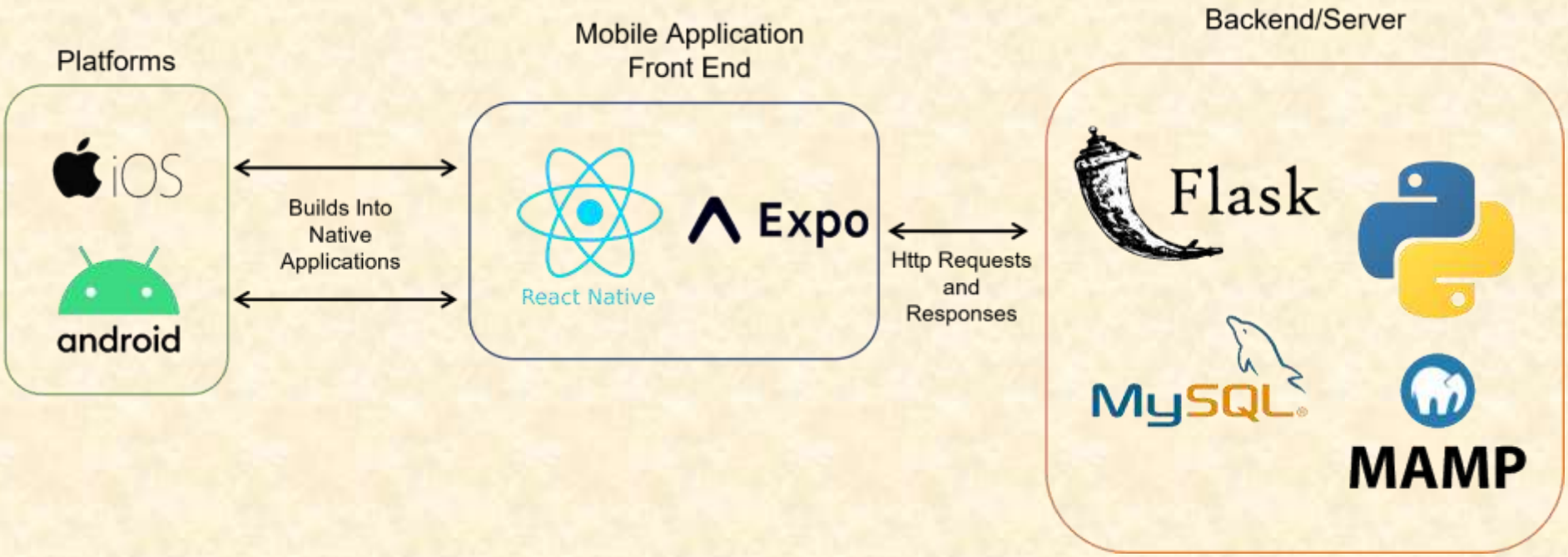
Screen Mockup: Classify Screen

Screen Mockup: More Classify Screen

Technical Specifications

- iOS and Android applications built with React Native Expo
  - GUI for users to record, annotate, and view classifications results
  - Captures audio and accelerometer data using built-in sensors and microphone
  - Communicates with the backend through HTTP requests
- Flask server hosted at a specific web URL to run the classification algorithm
- SQL database serves the applications with dynamic annotation labels and stores all data from the users

System Architecture



System Components

- Hardware Platforms
  - Microphone in iOS and Android device
  - Accelerometer in iOS and Android device
- Software Platforms / Technologies
  - React Native Expo
  - Python Flask
  - MySQL
  - MAMP

Risks

- Poorly Annotated Data Collection
  - It is possible that malicious or inexperienced users may annotate samples incorrectly
  - Application access will only be given to trusted users
- Reverse Engineering of Algorithms
  - Machine learning can be used to reverse engineer the algorithm
  - Authentication will be used to prevent unwanted requests
- Annotation Schema Expandability
  - As the number of classifiable systems grows the number of annotation labels also grows
  - Ability to manage the current label numbers is okay for now
- Keeping Track of User Data without Login
  - The database needs to keep track of who sent which audio file when they are being stored without a user login system
  - A unique token or string can be used instead

Questions?