From Students…
…to Professionals

Project Plan Presentation
Data-Driven Mechanic: Applications and Infrastructure
The Capstone Experience
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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: Recording Screen
Screen Mockup: Paused Screen
Screen Mockup: Annotate Subclass Metadata Screen

![Mockup Image]

- **MAKE**: Ford
- **MODEL**: Mustang
- **YEAR**: 1966
- **VIN**: 138176Z149695

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The Capstone Experience

Team [Team Name] Project Plan Presentation
Screen Mockup: Annotate Screen

**ANNOTATE**

- **ASSET CLASS**
  - Transportation

- **ASSET SUBCLASS**
  - Passenger Vehicle

- **SUBCLASS METADATA**
  - Done

- **STATE DATA**
  - Done

- **NOTES**
  - The vehicle was involved in an accident

Submit
Screen Mockup: Annotate State Data Screen
Screen Mockup: Annotate Screen
Screen Mockup: Annotate Submission Screen

Successfully Annotated

Start Over

Successfully Annotated

Start Over
Screen Mockup: Classify Screen

![Screen Mockup](image)
Screen Mockup: More Classify Screen

CLASSIFY

ASSET CLASS
Transportation

ASSET SUBCLASS
Passenger Vehicle

MAKE
Ford

MODEL
Mustang

ENGINE
Config: V
Cylinders: 8
Displacement: 289
Aspiration: N

Start Over

CLASSIFY

ASSET CLASS
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Start Over
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?