Instructor Review Meeting 1: 4910 Project Review

Spring 2025 – SE 4920

Team sdmay25-44

1) Summarize your team's progress thus far. What major milestones have you accomplished?

Current Project Status

Our team has made progress on the **FixIt** app, focusing on hardware communication and foundational software development. While we successfully demonstrated an early prototype, there is still significant work to be done.

Completed Milestones

✅ **Hardware & Connectivity:**

- **ESP32 successfully communicates** with an OBD-II reader via Bluetooth.
- **Basic data transmission established** between ESP32 and the mobile app.
- **Tested with an OBD-II emulator**, verifying initial connectivity.

✅ **Mobile App Development (Early Stages):**.

- **Basic home page created**, but lacks full functionality.
- **Bluetooth connection setup started**, but requires more testing.

✅ **Backend & Infrastructure:**

- **Cloud backend set up** for basic data processing.
- **API endpoints created**, but need further development.
- **Database structure outlined**, but not fully functional.

Work Still Needed in 4920

🚧 **AI Integration (Not Yet Implemented)**

- AI-based DTC interpretation **not yet functional**.
- Web scraping for repair insights **still in early development**.
- Requires integration with backend to provide meaningful diagnostics.

🚧 **Mobile App Development (Needs Significant Work)**

- Only **home page exists**, with minimal functionality.
- Needs **DTC display, user vehicle profile, and diagnostic history**.
- UI/UX improvements required for better user experience.

🚧 **Testing & Validation (Limited so Far)**

- Only **basic connectivity tests completed** for ESP32 and OBD-II.
- No **comprehensive testing on different vehicle models** yet.
- Need **unit tests for API endpoints** and mobile app features.

🚧 **Hardware & Performance Improvements**

- **Bluetooth stability issues** need to be resolved.
- **ESP32 power efficiency** improvements needed.
- Consider **creating a compact casing** for hardware components.

Next Steps & Action Plan

📌 **Develop and implement core mobile app features** (DTC display, vehicle profiles, notifications).
📌 **Integrate AI for automated diagnostics and repair suggestions**.
📌 **Expand API functionality and refine cloud infrastructure**.
📌 **Conduct more extensive testing** (vehicle compatibility, data accuracy, performance).
📌 **Optimize Bluetooth communication and hardware efficiency**.

2) Summarize the feedback you received from the faculty panel and others at the end of 4910.

1️⃣ *Contextualization & Documentation Quality*

- The **problem statement and project context** were well-introduced in the presentation.
- The **design document needs significant improvement** to match the clarity of the presentation.
- Missing elements:
    - Figures need **proper captions and references** in the text.
    - **Section 9 (9.4, 9.5, etc.)** appears unfinished.
    - Formatting inconsistencies (font sizes, mix of formats, and typos).

2️⃣ *Project Planning & Report Formatting*

- The **design document format is inconsistent** (different font sizes, formatting issues).
- Figures and tables need **labels, captions, and references** in the text.
- Too many **bulleted lists**—paragraphs with explanations should be prioritized.
- The **entire document needs a uniform format**—start updating it now to avoid issues in 4920.

3️⃣ *Design, Testing, & Implementation*

- A **software architecture diagram** is missing—this should be added to clarify system structure.
- Some document sections are **blank or incomplete**, despite having implementation results.
- **Team roles should include a documentation editor** to ensure quality, consistency, and completeness.
- AI integration is **not well-defined**—explanation needed on what AI will actually do in the system.
- Avoid vague statements like **"most likely" or "less likely"**—be specific about the system's classification and recommendation capabilities.
- Suggested reading: *"Deep learning-based vehicular engine health monitoring system utilizing a hybrid CNN/bi-GRU"* (Expert Systems with Applications Journal).

🗲 *Presentation Quality & Project Scope*

- The **team was enthusiastic and professional** during the presentation.
- The **project scope is large**—make sure to manage expectations for senior design.
- Documentation is **equally important** as implementation—dedicate time to improving it.
- Consider **performance and cost aspects** of the system in relation to users and computational resource requirements.

Actionable Next Steps Based on Feedback

📌 **Revise and improve the design document** (consistent formatting, captions, and full section completion).

📌 **Clearly define AI integration** and its specific role in the system.

📌 **Assign a documentation editor role** for consistency in writing and formatting.

📌 **Create a software architecture diagram** for better clarity.

📌 **Manage project scope carefully** to balance implementation and documentation efforts.

📌 **Consider system performance and cost implications** for users.

3) What did your team do well (e.g., technical design, working as a team, meeting user needs)?

🗹 *Strong Team Collaboration & Communication*

- Maintained **consistent teamwork and coordination**, ensuring that all members contributed effectively.

- Communicated openly through **meetings, Slack, and GitHub**, keeping everyone informed on progress and challenges.
- Successfully **delegated tasks based on team strengths**, improving efficiency and productivity.

☑ *Technical Progress & Problem-Solving*

- Established **successful ESP32 communication** with the OBD-II reader via Bluetooth.
- Developed a **functional login system** for the mobile app as a foundation for future features.
- Set up an **initial cloud infrastructure** for handling vehicle data and API requests.
- Demonstrated the **core concept** of FixIt during the final presentation.

☑ *Presentation & Professionalism*

- Delivered a **clear and engaging presentation** with enthusiasm, effectively conveying the project's purpose and progress.
- **Received positive feedback** on problem contextualization and project significance.
- Answered **faculty panel questions professionally**, showcasing our understanding of the system.

☑ *Adaptability & Growth Mindset*

- Showed **flexibility in troubleshooting issues**, especially with hardware communication and software integration.
- Actively **sought and implemented faculty feedback**, demonstrating a commitment to improvement.
- Balanced workload and adapted to **unexpected challenges**, such as debugging connectivity problems.

4) What does your team need to improve upon in 4920?

🔌 Areas for Improvement in 4920

While we made solid progress in 4910, several aspects of our project need improvement as we move into 4920:

🚧 *1. Mobile App Development (Needs Significant Work)*

- Currently, only the **login system and basic home page** are implemented.
- The app lacks **essential features**, such as:
  - **DTC code display** and user-friendly interpretation.
  - **Vehicle profile creation & history tracking**.
  - **Real-time notifications and alerts** for detected issues.
- The **UI/UX needs improvement** to enhance user experience and ease of navigation.

🚧 *2. AI Integration & Data Processing (Still in Early Stages)*

- AI-based diagnostics and **code interpretation are not yet functional**.
- The **web scraping module is incomplete** and needs to be refined for retrieving repair suggestions.
- Need to define **how AI will contribute** to the system (classification, recommendation, predictive maintenance, etc.).

🚧 *3. Hardware & Connectivity Optimization*

- **Bluetooth communication needs refinement** to improve stability and reduce connection issues.
- Power management for the ESP32 must be optimized for **efficiency and reliability**.
- Consider **creating a compact hardware casing** for user-friendly deployment.

🚧 *4. Testing & Validation (Limited So Far)*

- **No comprehensive testing** has been done beyond basic connectivity checks.
- Need to conduct:
  - **Unit tests** for API endpoints and app functionality.
  - **Integration tests** to ensure proper communication between hardware, backend, and frontend.
  - **Vehicle testing** with real OBD-II data across different car models.

🚧 *5. Documentation & Report Quality*

- The **design document needs major revisions**, including:
  - Formatting consistency (fonts, figures, captions).
  - More in-depth explanations (especially AI functionality and system architecture).
  - Reducing excessive bullet points and improving readability.
- Assigning a **team member to oversee documentation** will ensure clarity and completeness.

🚧 *6. Project Scope & Timeline Management*

- The project **has a large scope**, and balancing **feature development vs. refining existing work** is crucial.
- **Better milestone tracking** will help keep progress on schedule and prevent last-minute scrambles.

Action Plan for 4920

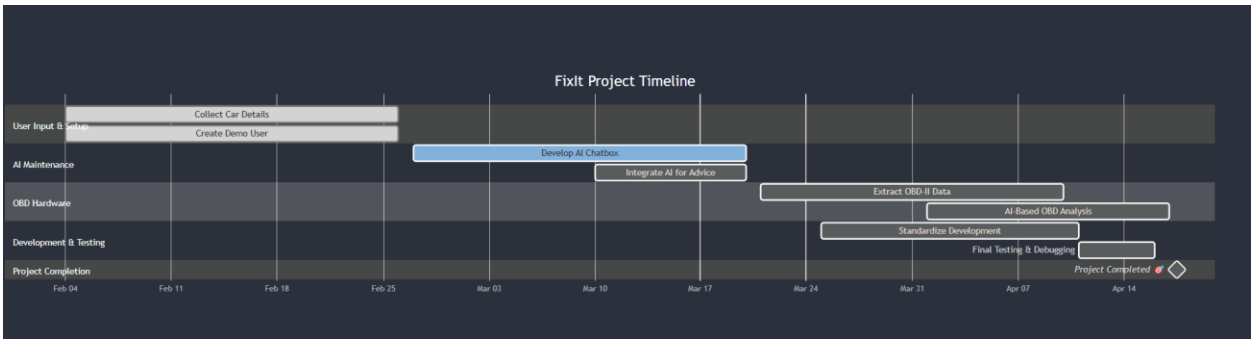
📌 Prioritize **core mobile app features** (DTC display, vehicle profiles, history tracking).
📌 Define and integrate **AI-based diagnostics** and data interpretation.
📌 Improve **Bluetooth communication & hardware efficiency**.
📌 Develop and execute **structured testing plans** (unit, integration, and real-world testing).
📌 Assign a **documentation editor** to ensure a high-quality final report.
📌 Manage **scope realistically**, focusing on essential features for a functional MVP.

By addressing these areas, we can ensure that **FixIt** becomes a reliable, user-friendly, and impactful automotive diagnostic tool.

5) What can your team do to improve upon these aspects?

- 📌 **Break down mobile app development** into smaller tasks with clear responsibilities.

- 🚀 **Prioritize core features**, including:
  - 📱 DTC code display & interpretation
  - 🚗 Vehicle profile creation & history tracking
  - 🔔 Real-time alerts & notifications
- 🎨 **Enhance UI/UX** based on user feedback for a more intuitive experience.
- 🤖 **Clearly define AI integration**, focusing on:
  - 🔍 Classification & recommendation system
  - 🛠️ Predictive maintenance insights
- 🌐 **Refine web scraping algorithms** to gather accurate repair suggestions.
- 🔗 **Optimize Bluetooth stability** for consistent ESP32-to-app communication.
- ⚡ **Improve ESP32 power management** for better efficiency & reliability.
- 🏗️ **Design & 3D print a compact hardware casing** for a more user-friendly experience.
- 🧪 **Expand testing efforts** with:
  - ✅ Unit testing for app & backend functions
  - 🔄 Integration testing for system-wide performance
  - 🚘 Real-world vehicle testing to ensure compatibility
- ⚙️ **Implement automated testing** where possible to catch issues early.
- 📝 **Assign a dedicated documentation editor** to improve formatting & consistency.
- 📊 **Standardize figures, captions, and references** for a more polished design document.
- 📖 **Provide clearer explanations** for system architecture, AI functionality, & project scope.
- ⏳ **Set realistic milestones & deadlines** to manage project scope effectively.
- 🎯 **Prioritize essential features** over extra functionality for a fully functional MVP.
- 🛠️ **Use project management tools** (e.g., GitHub boards, Trello) for task tracking & progress monitoring.
- 🔄 **Hold weekly check-ins** to assess progress, address blockers, & adjust priorities as needed.



FixIt Gantt Chart

Meeting Summary

We started the meeting with were left off and what we have been doing since the semester started which was setting goals. We talked about what was next and how planned out each goal on how we are going to achieve them by setting deadline.

We talked about how the AI role was going to be tackled on whether that was through changing the LLM we will be using.

We also talked about what each of our roles are going to be and what each of our goals are.

We also asked Berk on any advice for us this semester and he said that he should work on finishing up the minimal components ready and to focus on how correct the LLM responses will be. He encourages us to start testing the LLM to see the accuracy of its responses.

Clarification on how presentations are going to look like, showing it to faculty at the end of the semester. When presentations will be at Coover.