FixIT

An AI based car preventative maintenance solution brought to you by:

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Berk Gulmezoglu: Advisor

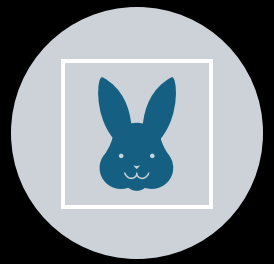
Problem/Motivation

Cars are convenient — until something breaks and you're left stranded or stressed

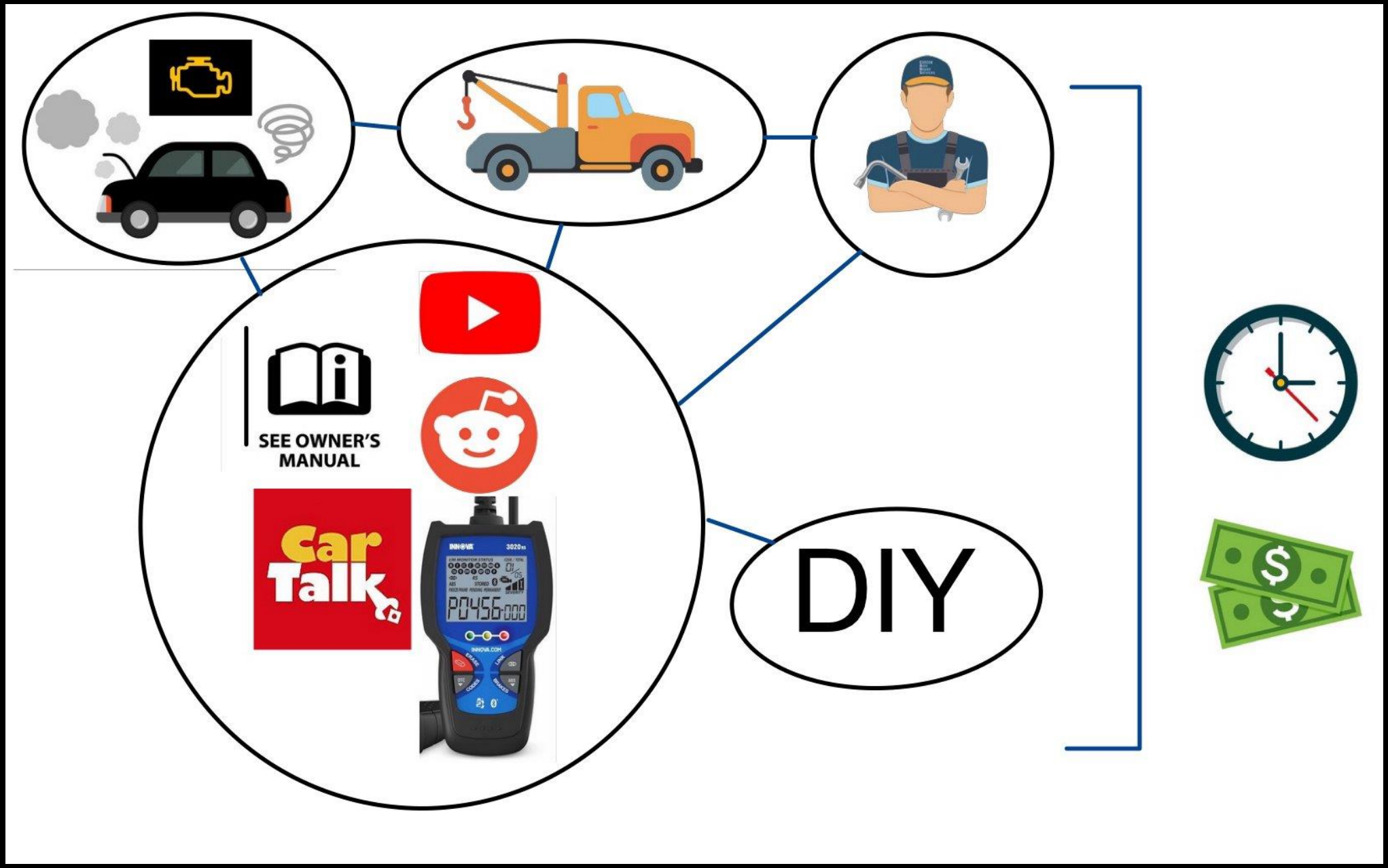
When the check engine light comes on, most people have no idea what it means

This creates frustration, confusion, and unnecessary costs for car owners.

Solutions often exist, but it would’ve been nice to catch the issue earlier, before the damage or cost escalated.



Drivers are forced down internet rabbit holes, or they leave it all up to a mechanic — risking overcharges or unnecessary repairs.


SEE OWNER'S MANUAL
Car Talk
DIY

Our Vision

Identify Issue Late

Identify Issue Early

DIY

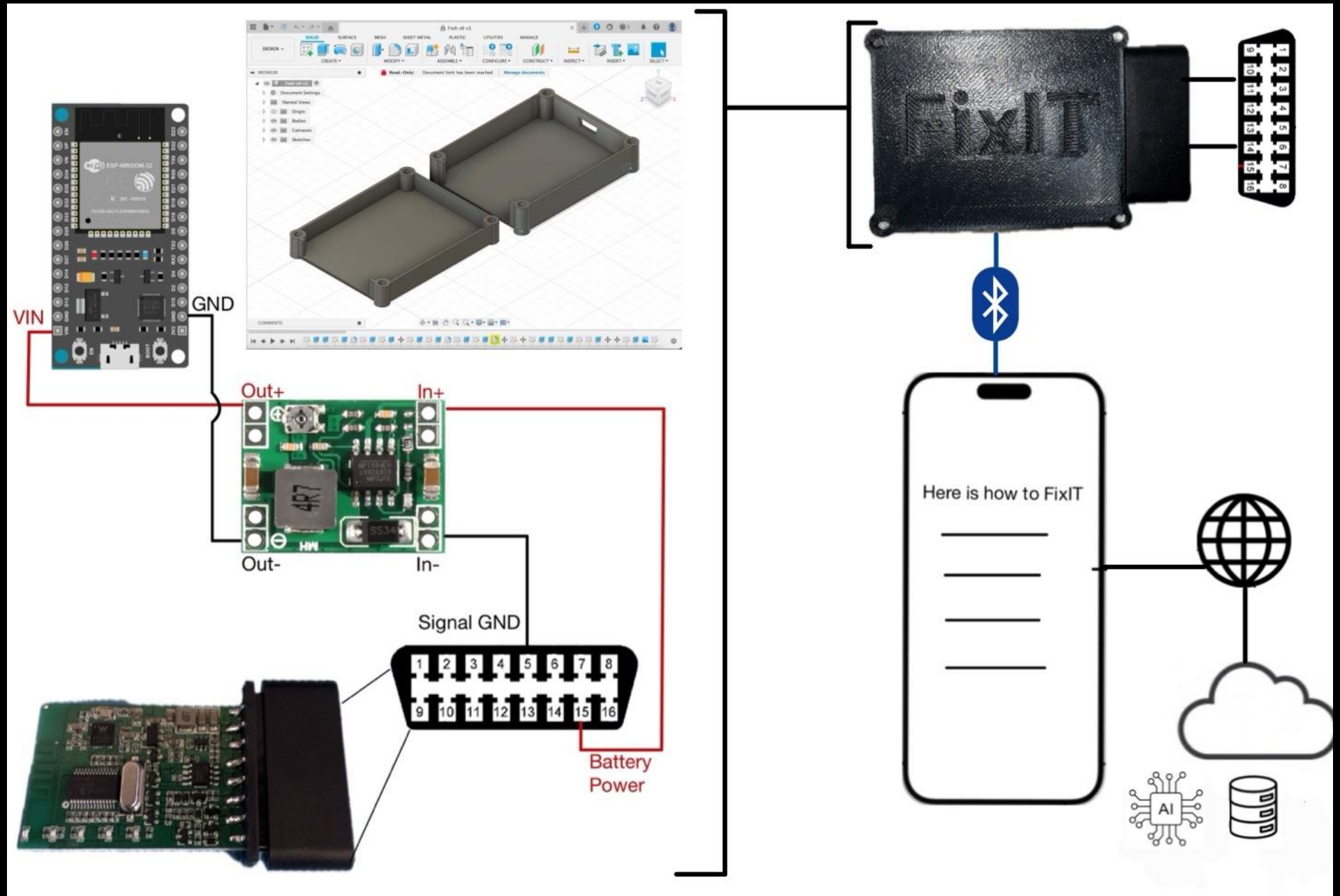
How can we make it easier?

Proposed Solution:
An AI based OBD-II that will tell you what's wrong and how to:

FixIT

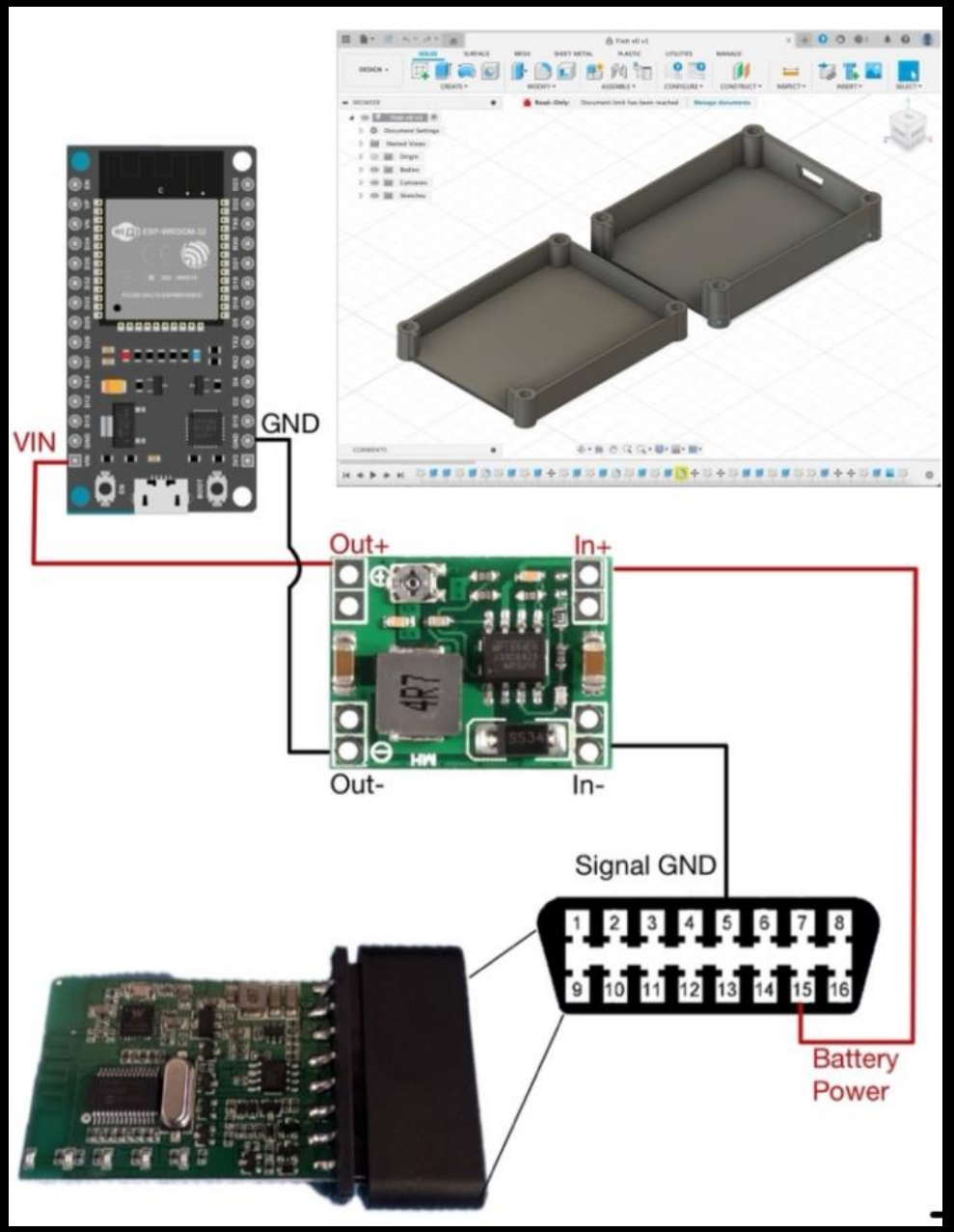
Prototype/Design

Design Overview



Hardware

- ESP32 Microcontroller
  - Powered by OBD-II pins 15(+) and 5 (-)
  - Buck converter to step down voltage 12V to 5V
  - Connects to ELM327 via Wi-Fi
  - Transmits BLE signal to smartphone
- ELM327
  - Connects to car and transmits CAN data via Wi-Fi
- ECUSIM-2000
  - Used to simulate a vehicle
- Custom 3D printed casing
  - Logo
  - Debug Port



Software

Embedded

- .ino file built and compiled on ESP32
- ELMduino library
- Decipher DTCs and other data from the car (ex: temp)
- Send chunked JSON packets to frontend

Frontend

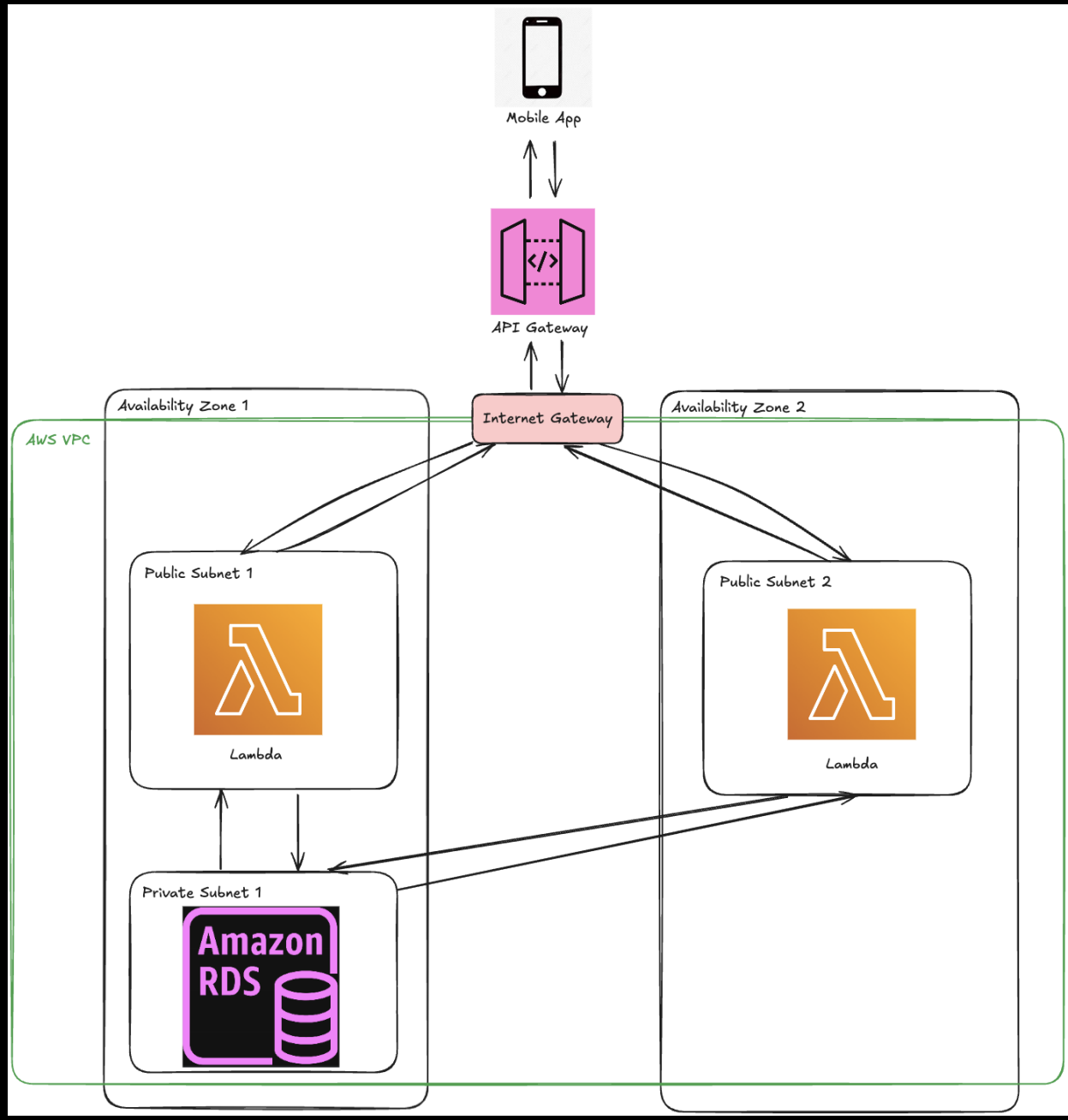
- React Native
- TypeScript
- AsyncStorage for local data persistence
- BLE connection manager (react-native-ble-plx)
- OpenAI service integration

Backend

- (Python) endpoints to serve API requests, returned in JSON
- Flask library
- Bruno for API testing
- PostgreSQL database to store user data

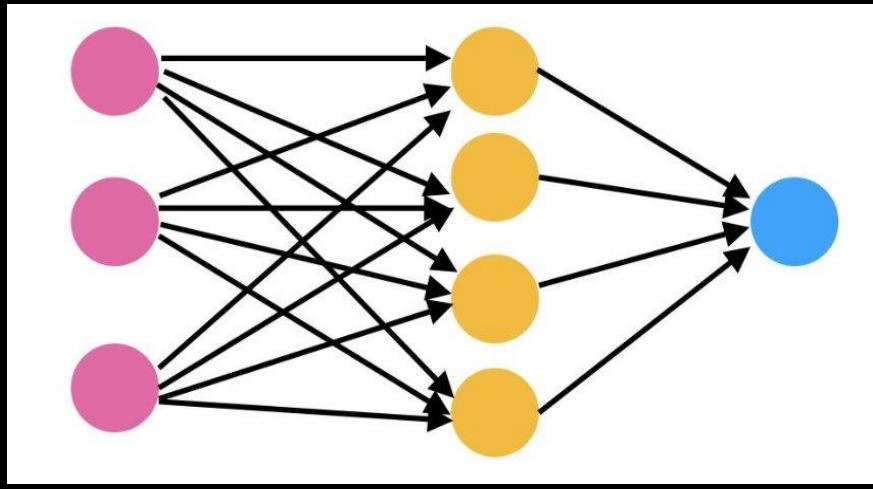
Cloud Infrastructure

- API gateway: API hosting
- AWS VPC
  - Internet Gateway
  - Availability Zones
  - Subnets
- Lambda: Compute
- RDS: Database
- Terraform: Infrastructure as Code
- Cloudwatch: Logging



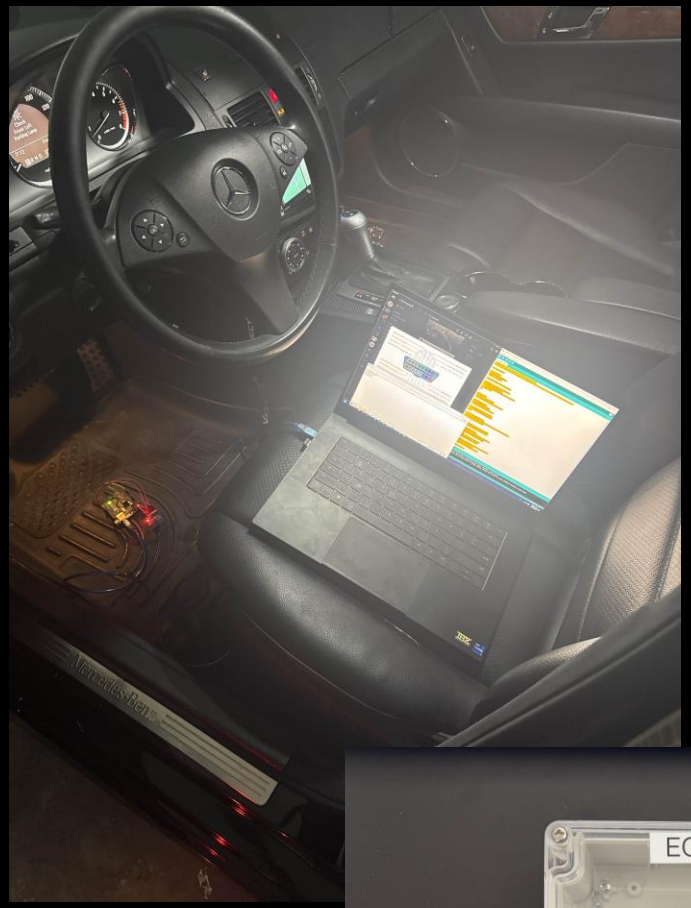
AI

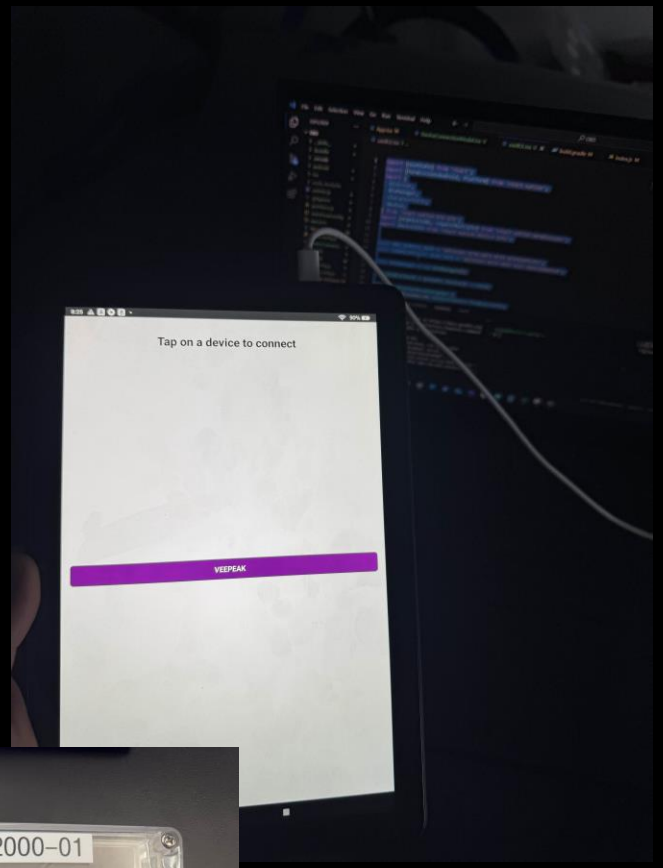
- Original Plan: make our own ML Model
  - Multi-Label Classification
  - Not enough data
  - Potentially not enough compute
  - Opted to use an LLM instead
- On-phone model vs just calling an API
  - On-phone is not feasible due to hardware constraints
- Pre-prompting

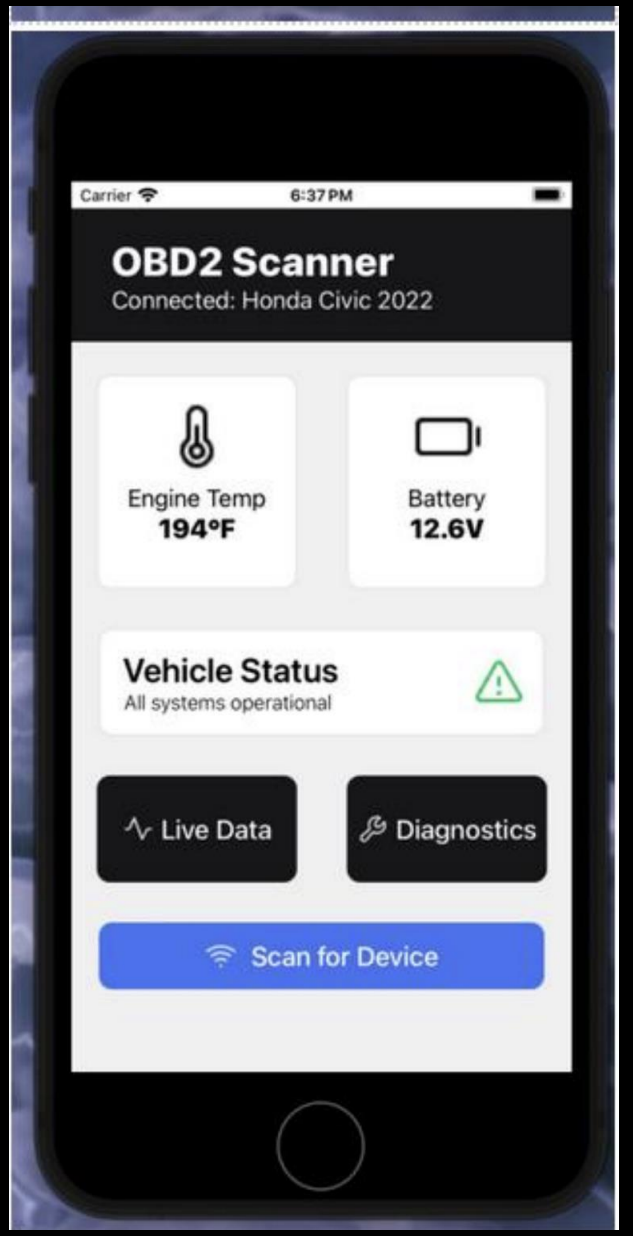


Design roadmaps

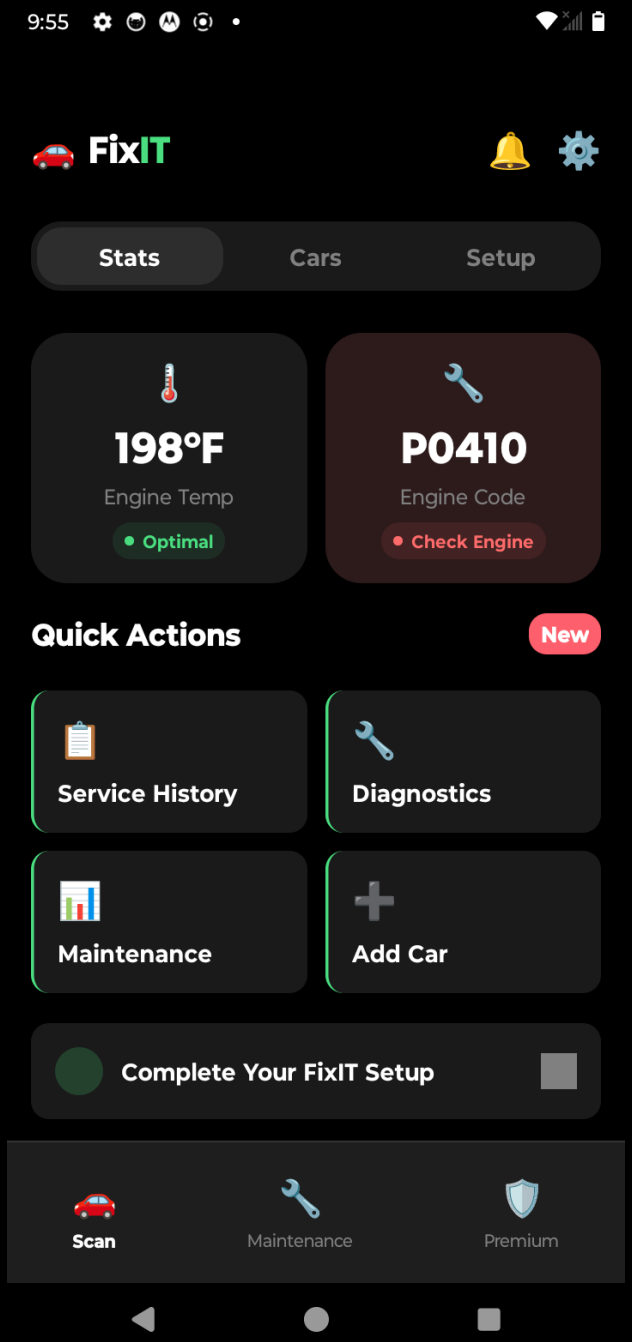
First Semester Design & early development

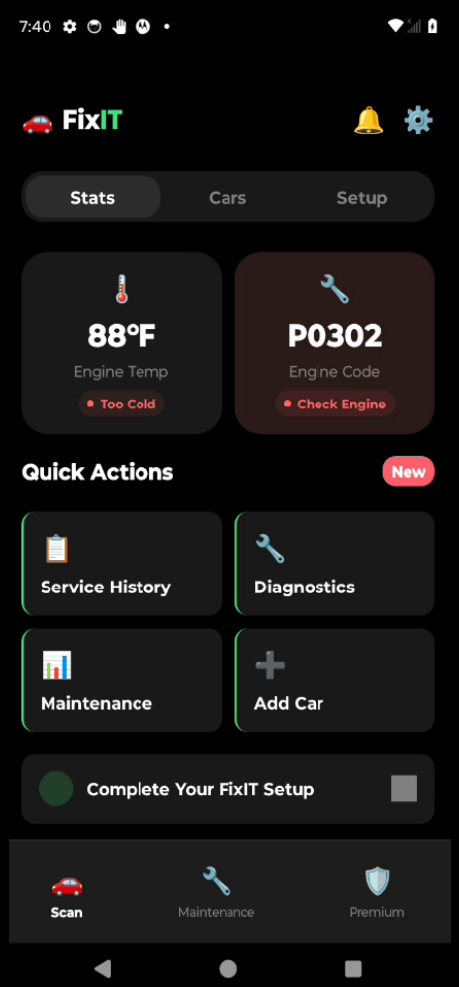


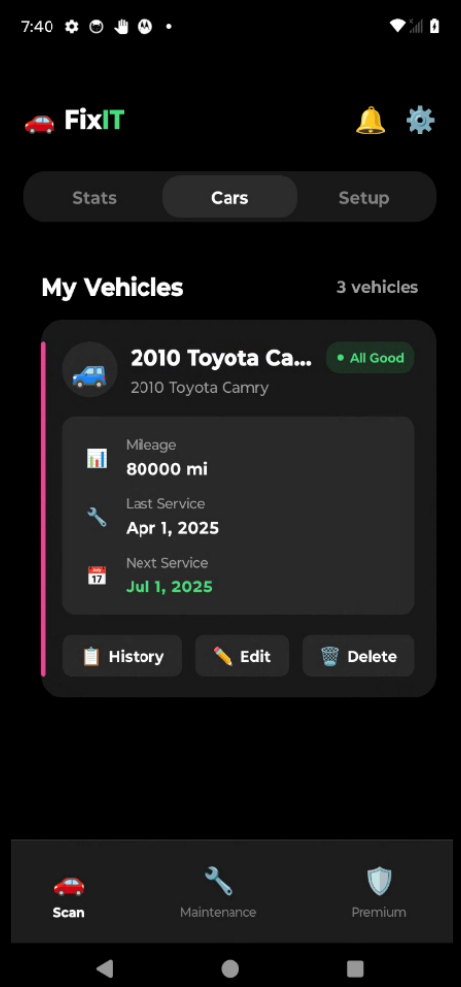


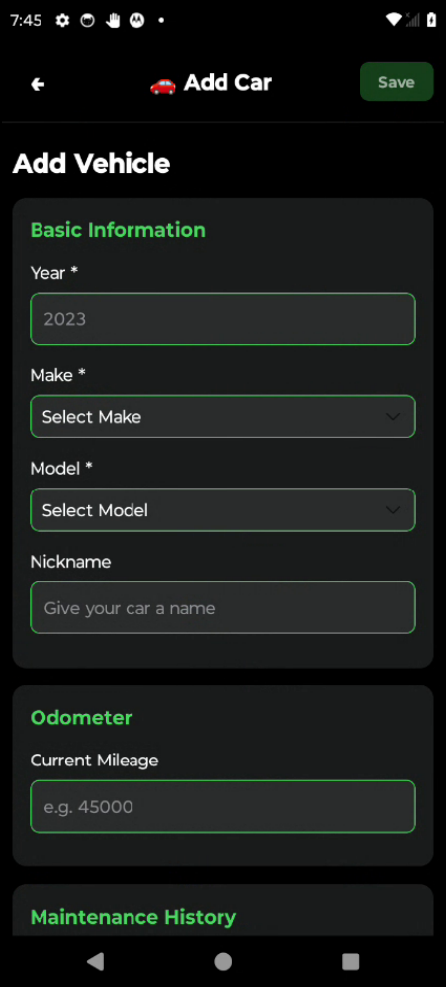


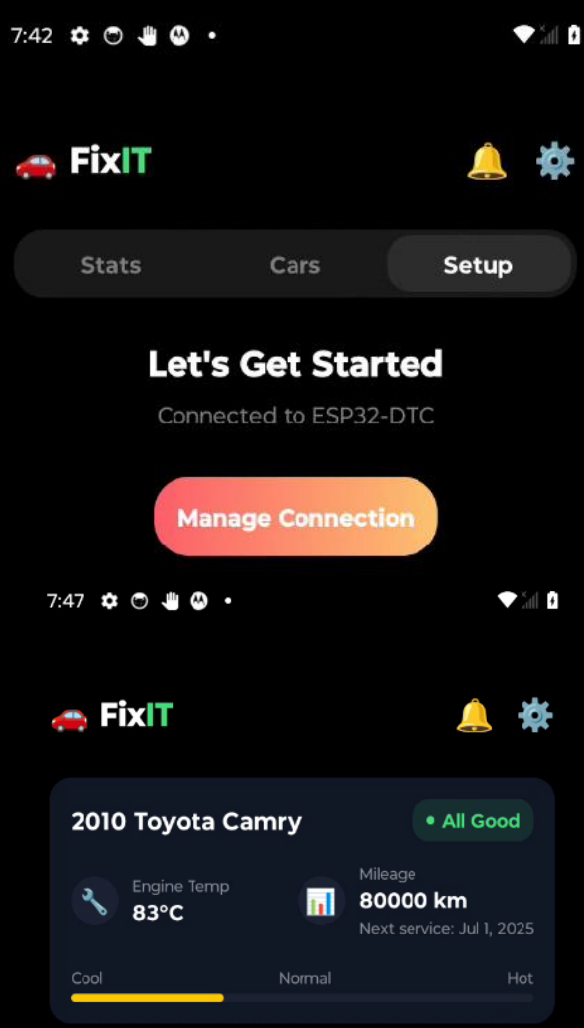
Results:
Final Design

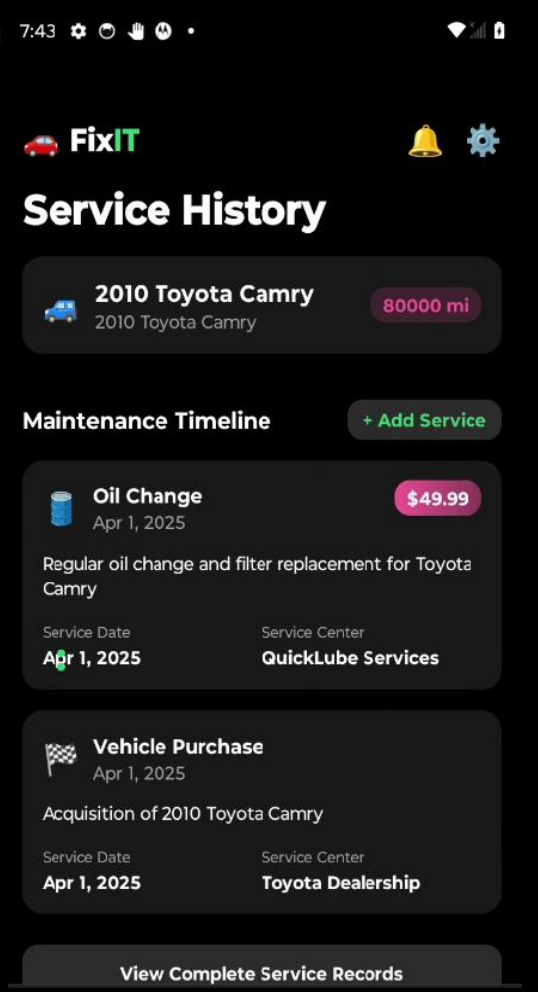




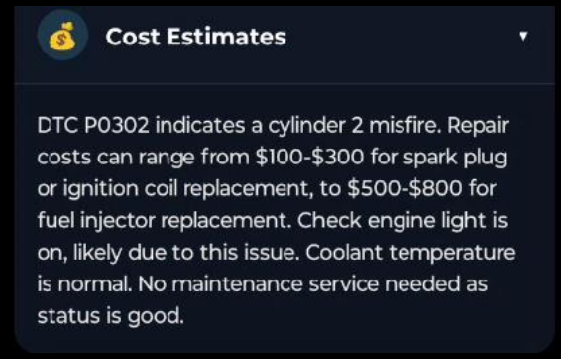






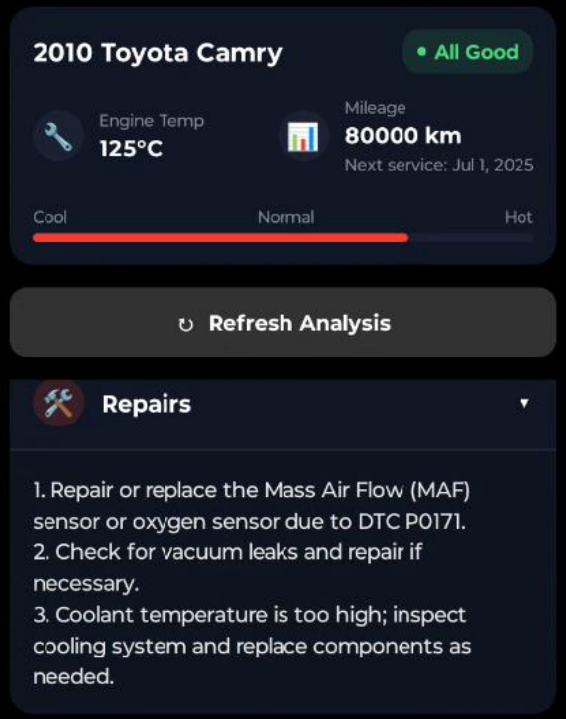


Introducing FixIT

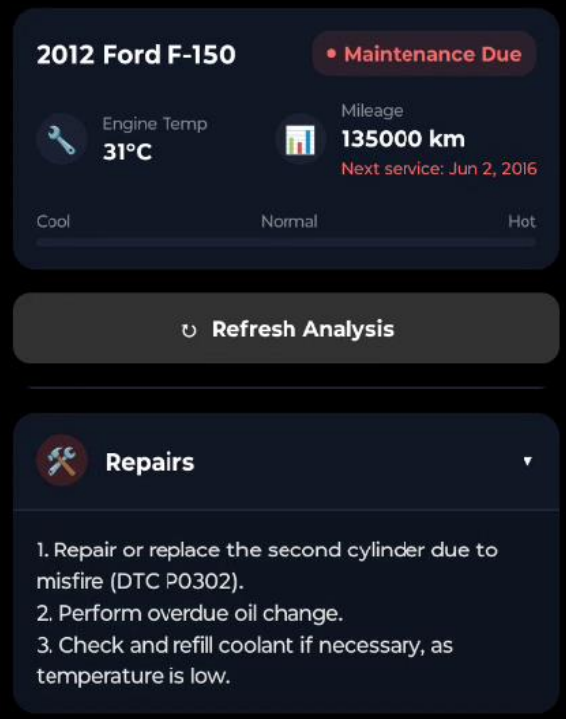


Testing

- Ran multiple outputs testing different codes and cars
- Tweaked engine temperature (using ECUSIM) and tested AI response
- Used physical car with known issue

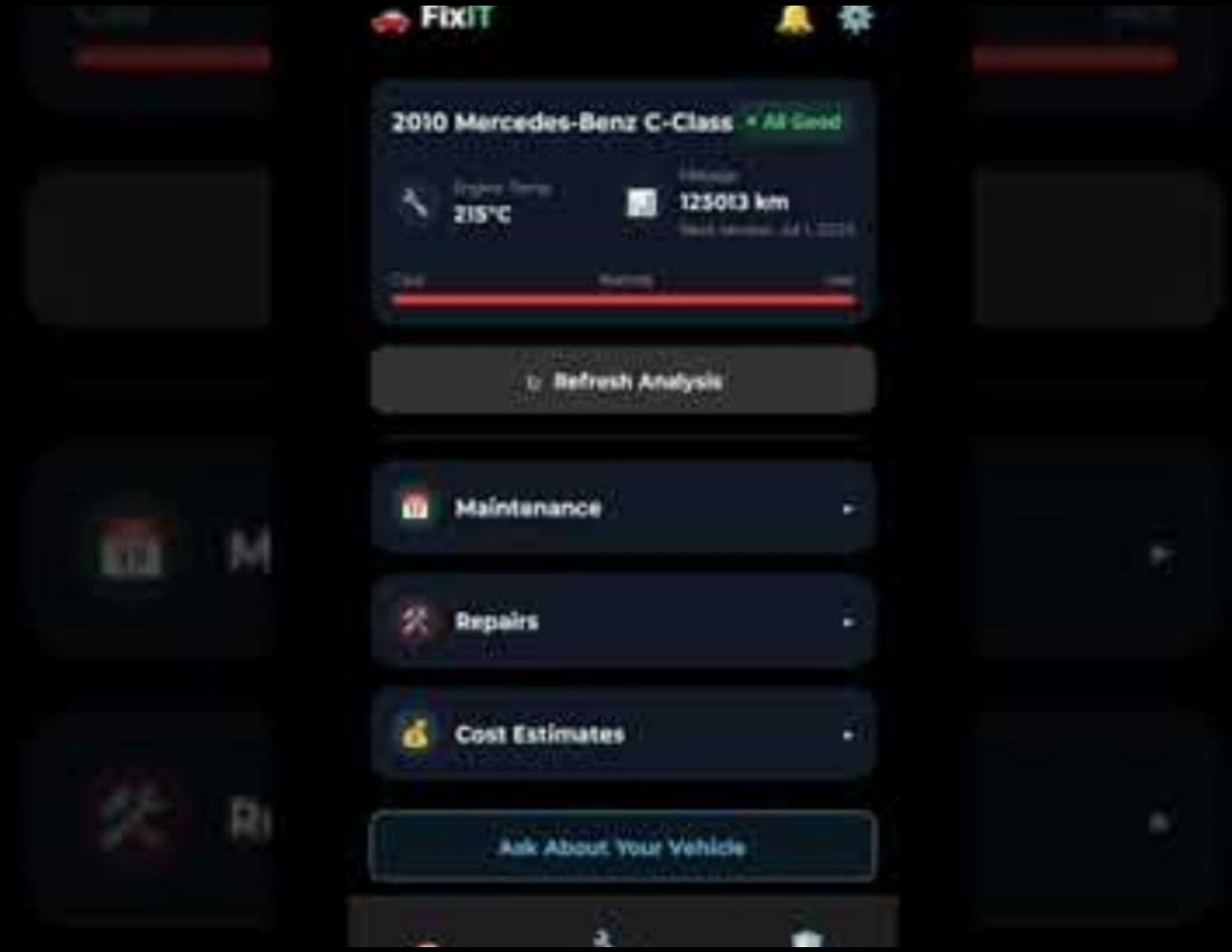


2010 Toyota Camry
DTC code: P0171



2012 Ford F-150
DTC code: P0302

Demo


FixIT
2010 Mercedes-Benz C-Class
215°C
125013 km
Refresh Analysis
Maintenance
Repairs
Cost Estimates
Ask About Your Vehicle

Future work?

- Entrepreneurship?
  - Maybe
  - More research and market analysis
  - Sell idea or continue making our own
- Transition to open-source models we can fine tune or use RAG
  - Ex: Ollama large parameter models trained with various data for specific vehicles

The FixIT team thanks you for your time!

Questions?