PROJECT ROADMAP

1. Research and Planning (1-2 weeks)

   - Understand RF Protocols: Study how key fobs communicate with cars, focusing on common frequencies (433 MHz or 315 MHz).
- Compliance & Security: Research regulations around keyless entry devices and potential legal implications (e.g., hacking or security vulnerabilities).

2. Component Selection and Procurement (1 week)

  - RF Modules: Choose appropriate RF receiver and transmitter modules operating at the required frequency. - Microcontroller: Select a microcontroller like Arduino or ESP32 that supports RF communication libraries. - Power Supply: Choose reliable, portable power options like lithium-ion batteries.

   - Antenna: Research antennas for range enhancement, focusing on compact but effective designs.

3. Signal Capture Development (2-3 weeks)

  - RF Receiver Setup: Use an RF receiver to capture key fob signals. Program your microcontroller to listen for the signal. - Tools: Utilize tools like SDR (Software Defined Radio) for analyzing and decoding RF signals. - Software: Develop initial scripts to capture the key fob signal and decode it for further processing.

4. Signal Amplification and Transmission (2-3 weeks)

  - Amplifier Design: Use RF amplifiers to strengthen the captured signal. Design circuits for clean amplification.

- Transmitter Setup: Program the RF transmitter module to send the amplified signal back to the car.

5. Microcontroller Programming and Optimization (2-4 weeks)
  - Code Development: Write and test a program that listens for the key fob signal, amplifies, and retransmits it. - Libraries: Utilize specific libraries for RF communication and encoding.

   - Testing: Test transmission and reception in a controlled environment to ensure proper signal replication.

6. Prototype Assembly and Enclosure Design (2 weeks)
   - Signal Encryption: Implement mechanisms to ensure the device doesn't compromise the car's security.
- User Authentication: Consider adding user authentication to prevent unauthorized access.

7. Final Testing and Optimization (2-3 weeks)
   - Field Testing: Test the prototype by walking away from the car with the key fob and using the repeater.
   - Range Optimization: Fine-tune the antenna and transmission power to maximize range while maintaining signal integrity.

8. Documentation and Handover (1-2 weeks)
  - 3D Design: Design a portable and durable enclosure using 3D modeling software. - Materials: Choose lightweight materials like ABS plastic or aluminum for the final build. - Assembly: Assemble the device inside the enclosure, ensuring it's functional, compact, and easy to handle.

9. Final Testing and Optimization (1-2 weeks)

   - Performance: Test in real-world scenarios, including various distances and environmental

conditions.

- Battery Life: Optimize the device for power efficiency to extend operation time.

10. Documentation & Handover (1-2 weeks)

   - User Manual: Prepare detailed documentation, including setup, usage instructions, and safety

precautions.

   - Proof of Experience: Gather and present evidence of successful RF communication or

car-related prototypes for the client.