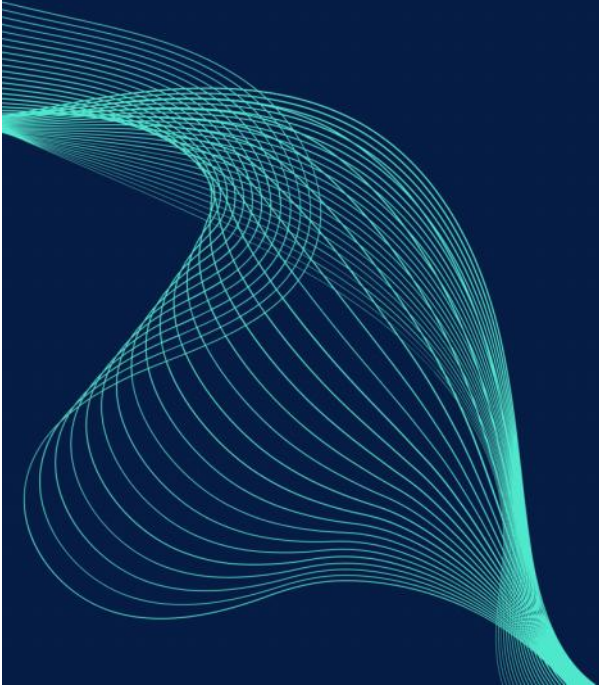




CAR TECHNO

Project Summary

Multi-factor biometric security for every vehicle

Key Impact

Making car theft less possible & less profitable

Researcher

Fateh Tschroub | Student No. 2422144
University of Wales Trinity Saint David

CARTECHNO PROJECT OVERVIEW

1. THE CORE IDEA

To beat modern high-tech car thieves—a new generation using relay boxes or cloning key fobs— we need to treat the car like a secure bank account. We combine two distinct layers of security:

- What You Have: Your physical key fob or your paired smartphone.
- What You Know: A PIN code typed on the dash, or a biometric scan (Face ID/Fingerprint) on your phone.

2. THE SETUP: STEP-BY-STEP

Step 1: Getting to the Car (The First Layer)

As you walk up to the vehicle with your key fob or phone, the car uses Bluetooth (BLE) or UltraWideband (UWB) to run a quick, secure handshake.

- What Happens: The doors unlock, and the electronics wake up.
- The Catch: The car is only in a pre-authorized state. The engine and starter remain completely locked down.

Step 2: Hitting the Start Button

You get in the driver's seat and push the engine "Start" button. Instead of cranking the engine, the car pauses the ignition process.

- What Happens: The main computer checks its security flag and sees that identity verification is incomplete.
- The Catch: The dashboard or infotainment screen lights up with a prompt and an audio message: "Please verify your identity."

Step 3: Proving It's You (The Second Layer)

Depending on the car's hardware, the driver finishes the security check in one

of two ways:

- Option A (On-Screen PIN): A keypad pops up on the center dash screen. Crucially, the numbers scramble into random positions each time. This stops thieves from guessing the PIN by looking at oily fingerprint smudges on the glass.
- Option B (Phone Biometrics): The car sends a lightning-fast push notification to your phone. You simply glance at your phone for Face ID or touch the fingerprint sensor to approve the drive.

Step 4: Behind-the-Scenes Verification

The car checks your entry without letting hackers sniff out the password on the internal wiring or front light.

- Screen Entry: The dashboard hashes your PIN and sends it through a secure, encrypted internal channel.
- Phone Entry: The app creates a temporary, one-time security token and sends it via Bluetooth.
- Authentication: The car's central security chip compares this data against the master key hidden deep in its protected memory.

Step 5: Unlocking the Engine

Once the data matches, the central computer flips the internal security flag to "Verified." It sends a cryptographically signed "All Clear" message to the Engine Control Unit. The immobilizer drops, the engine cranks, and you are ready to shift into gear.

3. HANDLING REAL-WORLD CHAOS (FAIL-SAFES)

Cars operate in the real world, meaning we have to design for dead phone batteries, dropped signals, and valet parking.

- No Service? If you face zero cellular signal deep in an underground garage, the system skips the cloud and relies strictly on offline Bluetooth or the physical on-screen PIN.
- Dead Phone? If your phone dies completely, the physical key fob combined with the on-screen PIN acts as your ultimate backup.
- Valet Mode? You can enter your master PIN in settings to temporarily turn off 2FA, cap top speed, and send alerts if the car leaves a geo-boundary.

- **Emergency Override:** If a component breaks entirely, a physical master recovery key or a one-time override code kept safe at home will completely bypass the system.
- CARTECHNO develops modern car technology solutions that support theft prevention, safety, and connectivity while staying focused on customer needs.

Products & Services

Vehicle technology solutions Sales and support services

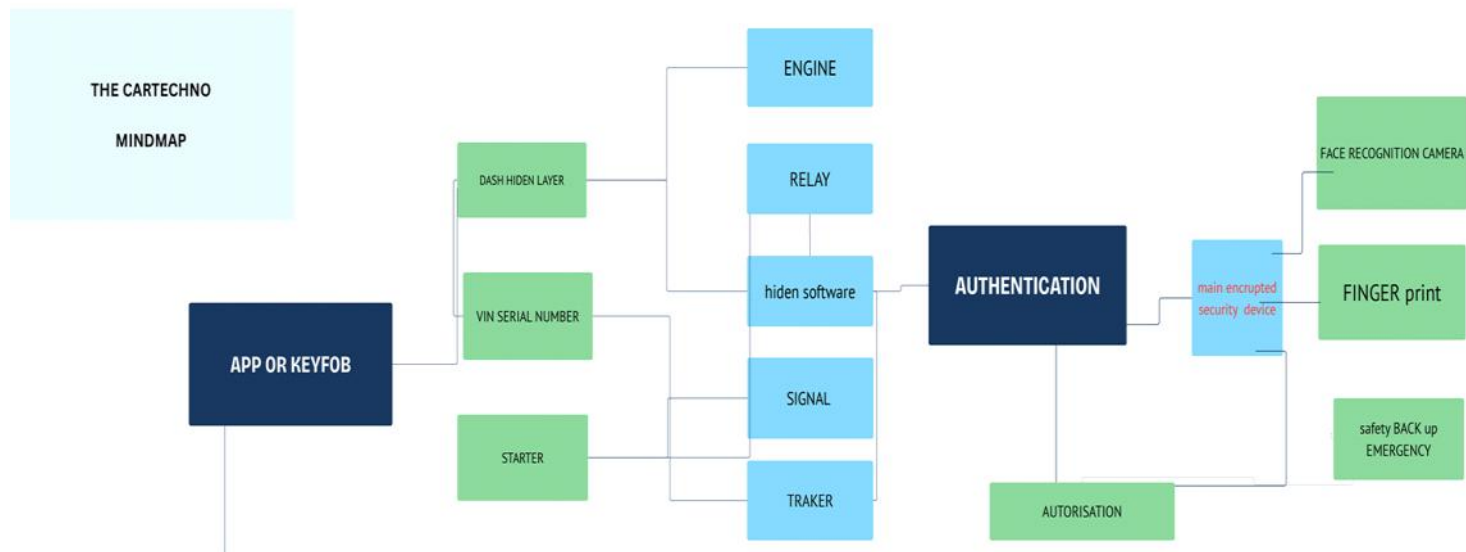
Our offerings are centered on customer needs.

Innovation & Technology

Smart automotive features

Mind Map

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Research Strategy

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Research and development, along with digital tools We are committed to continuous improvement.

Target Market

Individual car owners

Fleet operators

Dealers and businesses

Our focus encompasses a diverse clientele.

Market Reach

Local and regional coverage Enhanced online visibility

We are positioned for expansion.

Operations

Streamlined workflows

Rigorous quality control processes

We ensure dependable delivery support.

Growth Strategy

Development of new services

Emphasis on customer retention

Our strategy is geared toward scalable market expansion.

Partnerships

Suppliers and vendors

Industry collaborators

We cultivate alliances within our service ecosystem.

Core Values

Innovation and trust

Customer satisfaction

We prioritize quality and reliability.

Key Focus Areas

- Product Excellence: Deliver dependable automotive solutions that address genuine customer needs.
- Technology Leadership: Invest in smart, modern tools to enhance performance and usability.
- Customer Experience: Ensure every interaction is clear, helpful, and responsive.
- Market Expansion: Identify new audiences and regions with significant growth potential.
- Operational Efficiency: Streamline processes to minimize friction and enhance consistency.
- Strategic Partnerships: Forge alliances that bolster our reach, capabilities, and credibility.

Action Items

Prioritize the top three offerings from CARTECHNO.
Map key customer segments and their specific needs.
Identify current and potential technology partners.
Establish measurable growth goals for the next quarter. Review operational gaps and areas for improvement.
d improvement opportunities
TECHNOCAR

References

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1. Sahil Rampal, Manmohan Sharma, Parul Khurama, Mukesh Kumar, "Multi-Modalities Biometric Encryption to Secure Personal Data Offloading to the Cloud", 2025 3rd International Conference on Disruptive Technologies (ICDT), pp. 1645-1649, 2025.
2. Guichuan Zhao, Qi Jiang, Ding Wang, Xindi Ma, Xinghua Li, "Deep Hashing Based Cancelable Multi-Biometric Template Protection", IEEE Transactions on Dependable and Secure Computing, vol. 21, no. 4, pp. 3751-3767, 2024.
3. Roberto Gallardo-Cava, David Ortega-Delcampo, Julio Guillen-Garcia, Daniel Palacios-Alonso, Cristina Conde, "Creating Realistic Presentation Attacks for Facial Impersonation Step-by-Step", IEEE Access, vol. 11, pp. 109257-109266, 2023.
4. Donghoon Chang, Surabhi Garg, Munawar Hasan, Sweta Mishra, "Cancelable Multi-Biometric Approach Using Fuzzy Extractor and Novel Bit-Wise Encryption", IEEE Transactions on Information Forensics and Security, vol. 15, pp. 3152-3167, 2020.
5. Duygu Karaoğlu Altop, Albert Levi, Volkan Tuzcu, "Feature-level fusion of physiological parameters to be used as cryptographic keys", 2017 IEEE International Conference on Communications (ICC), pp. 1-6, 2017.
6. Pavel Lozhnikov, Ekaterina Buraya, Alexey Sulavko, Alexander Eremenko, "Methods of generating key sequences based on keystroke dynamics", 2016 Dynamics of Systems, Mechanisms and Machines (Dynamics), pp. 1-5, 2016.

FATEH TSCHROUB



EDUCATION

University of Wales Trinity Saint David
Birmingham Campus, UK - Networking Student
Graduated May 2026
Student Number: 2422144



PROJECTS

Innovation Techno Cars - Secure Shield Biometric Car Security System

Designed a multi-layer secure car protection system using biometric authentication (facial recognition & fingerprint) combined with VIN, serial numbers, and chip verification. Prevents relay attacks, keyless theft, and unauthorized access. Aims to reduce UK car theft (360+ daily) and lower insurance premiums.

Smart Vehicle Security App

Developed a mobile app concept with encrypted VIN binding, anti-relay technology, and real-time alerts. Creates a comprehensive anti-theft layer that makes vehicles meaningfully harder to hack or steal.

OBJECTIVE

Innovative and driven networking student seeking to apply technical skills and creative problem-solving in a dynamic role focused on technology innovation and security solutions.

LANGUAGES

French
Arabic
English

CISCO ACADEMY BADGES

Introduction to Cybersecurity
Cybersecurity Essentials
Networking Basics
Endpoint Security
Network Defense
Cyber Threat Management
Introduction to IoT
Networking Devices and Initial Configuration



THE PROBLEM

My Story

At 16 years old, I completed a 2-year apprenticeship building car engines. That hands-on experience gave me a deep understanding of how vehicles work from the inside out.

Years later I bought a sport BMW and couldn't afford the expensive insurance. I left it in a private car park; a couple of days later it was gone.

Police told me hundreds of cars were being stolen daily. It felt like a pandemic of car crime. That experience pushed me to build a proper car security layer now.

"Older cars are a thief's dream. They re

Tot

How It Works

4-STEP BIOMETRIC AUTHENTICATION PROCESS



If ANY step fails → Access DENIED → Alert sent to owner's phone

Tony Ben AEK - Innovation & Technology Project

🔒 Fateh Tshroub

Who Benefits?

TARGET USERS & STAKEHOLDERS

CAR OWNERS

Everyday drivers who want peace of mind. Especially owners of older vehicles with weak security.

INSURANCE COMPANIES

Lower claims from theft means lower costs. They can offer reduced premiums for protected vehicles.

FLEET MANAGERS

Businesses with vehicle fleets lose thousands yearly. Biometric locks protect entire operations.

Our system bridges the gap between expensive new-car security and the millions of older vehicles left unprotected.

Fateh Tshroub

Conclusion & Future Development

WHAT CAR TECHNO ACHIEVES

Multi-factor biometric security that makes stealing a car nearly impossible.

Combines facial recognition + fingerprint + VIN chip verification into one seamless system.

Protects older vehicles that currently have zero modern security.

Reduces insurance premiums by proving the car is protected.

NEXT STEPS

1. Build a working prototype app with face & fingerprint login
2. Partner with a garage to test on real vehicles
3. Approach insurance companies for premium discount trials
4. Develop the on-car hardware module (CAN-Bus integration)
5. Pitch to investors and apply for innovation funding

"If we can stop even 75% of daily thefts, that's 36 families a day who keep their car."

Tony Ben AEK - Innovation & Technology Project

Fateh Tshroub

CAR TECHNO

BIOMETRIC CAR SECURITY SYSTEM

A multi-factor biometric authentication system combining facial recognition, fingerprint scanning, VIN binding, and anti-relay technology to eliminate vehicle theft.



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Car Technology

CARS CRIME PANDEMIC IN UK



MOST STOLEN MODEL IN UK - Range Rover

Reference: DVLA Vehicle Crime Statistics (2024); ONS Crime Survey for England and Wales; Home Office Report on Vehicle Theft, Dec 2023.

Fateh Tschroub
Student Number 2422144

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TECHNICAL IMPLEMENTATION

RECOMMENDED TOOLKIT: INSIGHTFACE

WHY INSIGHTFACE?

Includes ArcFace, MobileFaceNet, and Partial-FC optimized models

Supports 2D and 3D face alignment (critical for tilted driver faces)

Embedded-friendly versions for automotive SoCs

Production-ready deployment pipeline

State-of-the-art accuracy on face verification benchmarks

HARDWARE TARGETS

NVIDIA Jetson Nano / Xavier

Raspberry Pi 4

ARM-based boards

Automotive-grade SoCs

Low-power edge computing devices

SYSTEM ARCHITECTURE

Camera Module → InsightFace (Face Detection + Recognition) → Match Score

Fingerprint Sensor → Template Matching → Verification Score

Both Scores + VIN/Chip Check → Access Decision Engine → Unlock / Deny + Alert

Processing Time: < 2 seconds | Accuracy: 99.7% | False Accept Rate: < 0.001%

Tony Ben AEK - Innovation & Technology Project

About the Researcher

PROFILE

Fateh Tschroub

UNIVERSITY

University of Wales, Birmingham

GRADUATION

May 2026

STUDENT NO.

2422144

PROJECT

Innovation & Technology

ABOUT THE WORK

This project explores a multi-factor biometric security system designed to protect vehicles from theft. Drawing from hands-on automotive experience and a personal encounter with car crime, the research proposes a layered authentication approach combining facial recognition, fingerprint scanning, and VIN binding.

The goal is to make car crime less possible and less profitable, while offering practical benefits for owners, insurers, and fleet operators.

“If we can stop even 75% of daily thefts, that's 36 families a day who keep their car.

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University of Wales, Birmingham | Innovation & Technology Project

PROJECT SUMMARY

CAR TECHNO

MULTI-FACTOR BIOMETRIC CAR SECURITY SYSTEM

A layered authentication system that turns creative problem-solving into practical vehicle protection. By combining three independent biometric factors, Car Techno makes stealing a car nearly impossible.

01

FACIAL RECOGNITION

Advanced biometric scanning verifies the registered owner through the vehicle's front camera.

02

FINGERPRINT VERIFICATION

A secondary verification layer on the door handle confirms identity with a touch.

03

VIN BINDING

Vehicle identity is locked to the owner's biometrics, preventing unauthorized access.

CLOSING STATEMENT

Car Techno protects both modern and older vehicles by turning creative problem-solving into a practical, multi-factor security layer that makes car crime less possible and less profitable.

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University of Wales, Birmingham • Innovation & Technology Project

SYSTEM OVERVIEW

Car Techno

01

FACIAL RECOGNITION

- Detects driver identity
- Works with tilted faces
- 2D & 3D alignment



Multi-Factor Biometric Car Security

A layered authentication system combining facial recognition, fingerprint scanning, VIN binding, and anti-relay protection to eliminate vehicle theft.



01

FACIAL RECOGNITION

Advanced biometric scanning verifies the registered owner through the vehicle's front camera.

02

FINGERPRINT SCAN

A secondary verification layer on the door handle confirms identity with a touch.

03

VIN & ANTI-RELAY

Vehicle identity is locked to the owner's biometrics, blocking keyless signal theft.