

AI Driving Coach Hybrid Platform Product Requirements Document (PRD)

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1 Introduction

1.1 Document Meta and Revision History

Field	Description
Document Name	AI Driving Coach Hybrid Platform Product Requirements Document (PRD)
Version No.	V7.2 (Feature: Crowdsourced Speed Limit Integration)
Creation Date	October 2025
Product Manager	Mengfei Fan
Target Audience	R&D Team, Design Team, QA Team, Hackathon Judges
Revision History	V7.2 - Mengfei Fan - Oct 2025 - **Refined F3.4 to include Crowdsourced Speed Limit Correction Tool as a robust data source, mitigating dependency on high-access paid APIs and improving speed compliance accuracy.**

2 Product Overview and Business Model

2.1 Product Background and Goals (Context & Goals)

- **Background:** Addressing the need for learning and practicing German driving rules by utilizing **Chrome Built-in AI APIs (Gemini Nano)** to provide a personalized learning and training tool with high privacy, network resilience, and cost-efficiency advantages.
- **Business Goal:** To achieve paid user conversion under the **Freemium** model by providing professional, in-depth driving data analysis services.
- **Product Goal:** To become the ultimate **Hybrid AI platform** for users to learn, practice, and test their German driving skills, strategically leveraging Web, Mobile, and Browser Extension environments.

2.2 Core Value Proposition

- **“Resilient, Contextual AI Driving Coach”:** Leveraging the three-platform Hybrid architecture (Mobile for data collection; Extension for client-side AI; Web App for central analysis) to provide **Contextual** learning assistance and data review, maximizing both **Privacy** and **Availability**.

2.3 Business Model (Freemium)

- **Free Features (Free):** Knowledge Hub browsing, basic AI Q&A (limited usage - Hybrid mode), personal notes (Extension context linking).
- **Paid Features (Premium Subscription):** Driving Route Record (F2), recorded data review and in-depth analysis (F3), unlimited AI Q&A (Client-side/Hybrid), Exam Route Simulation (F4).

3 Detailed Functional Requirements

3.1 Core Feature 1: AI Q&A/Driving Coach (Ask the Driving Coach)

ID	Feature Name	Description/Goal	Implementation Platform/API	Access
F1.1	AI Rule Q&A/Scenario Analysis Web App (Hybrid: Prompt API → Gemini API)	Extension: Client-side RAG via Prompt API (Priority). Web App: Uses Hybrid Fallback to Gemini Developer API (Cloud) if Built-in AI fails, ensuring NFR4.2.	Extension (Prompt API)	
F1.2	Response Content Optimization	Summarize or rewrite/refine complex rule answers generated by AI, making them easier to understand.	Summarizer API, Rewriter API / Writer API	Free
F1.3	Multilingual Support	Allow users to translate rules. Language Detector API must be used to auto-detect the input language.	Translator API, Language Detector API	Free
F1.4	Q&A History	Users can view and manage history, stored via the backend service.	Backend Service	Free

3.2 Core Feature 2: Driving Route Record (Mobile App)

ID	Feature Name	Description/Goal	Collection Method	Access
F2.1	Start/Stop Recording	Mobile App records real-time driving data (GPS, timestamps, speed, etc.). Web App displays the status and map UI.	Mobile App Collection (Real-time GPS/Sensor)	Paid
F2.2	Voice Note Recording	User records Voice Notes to mark key sections/issues during the drive (Audio files stored temporarily).	Mobile App Collection (Audio)	Paid
F2.3	Data Upload and Sync	Data streams/uploads to the backend (Firebase), syncing across Web/App/Extension in real-time.	Backend Service (via Mobile App)	Paid

3.3 Core Feature 3: Recorded Data Review and Analysis

ID	Feature Name	Description/Goal	Implementation Platform/API	Access
F3.1	Data Analysis Dashboard	Display trend charts of driving metrics and route map replay on the Web App.	Web App	Paid
F3.2	AI Behavior Identification	Extension: Prioritizes Prompt API for local data analysis and generation of private, contextual suggestions, overlaid on the map. Web App: Falls back to Gemini Developer API for complex pattern analysis.	Extension/Web App (Hybrid Prompt API → Gemini API)	Paid
F3.3	Voice Note Processing	Transcribe voice notes (via Hybrid backend STT) and use the Proofreader API (Extension/Web) to verify the grammar/accuracy of the transcribed text for reliable AI input.	Proofreader API, STT (Hybrid Backend)	Paid
F3.4	Enhanced Route Review UI & Crowdsourcing	Allow user/coach to place Key Location Markers and use a dedicated tool to **add/correct temporary or missing Speed Limit Markers** on the map (Crowdsourced Speed Limit Correction Tool). This data is the highest priority input for F3.5 Speed Compliance analysis , supplementing Google Roads API data. Synchronize all events to the timeline.	Web App (New UI/Data Structure)	Paid
F3.5	AI Analysis Dashboards	Deliver General AI Overview (Macro: Learning Heatmap, Top Issues Library, Progress Curves) and Route Playback Intelligence (Micro: Structured single-session reports). Summarization and insights are derived using F3.2/F3.3 data, with Speed Compliance analysis prioritizing F3.4 Crowdsourced data .	Web App (Backend: Python Analysis/Gemini API)	Paid

3.4 Core Feature 4: Exam Route Simulate

ID	Feature Name	Description/Goal	Access
F4.1	Route Planning and Voice Navigation	System plans the route and provides voice prompts mimicking the examiner's instructions.	Paid

3.5 Core Feature 5: Knowledge Hub and Notes

ID	Feature Name	Description/Goal	Implementation Platform/API	Access
F5.1	Knowledge Hub Browsing	Structured repository of driving rules. Supports F1.3 translation/summarization.	Web App	Free
F5.2	Personal Notes	Users can add, edit, and manage notes. The Extension enables contextual linking and annotation on external web pages.	Web App / Extension	Free

4 Non-Functional Requirements

Type	ID	Description	Goal/Metric	Hackathon Key Advantage
AI Privacy	NFR4.1	Local Data Processing Guarantee	F1.1/F3.2 in the Extension must default to client-side processing. Cloud fallback clearly indicates data leaves the device.	Inherent privacy
Network	NFR4.2	Network Resilient UX	Web App's core F1.1 Q&A must use Hybrid Fallback to guarantee service availability (Server-side Gemini API) if built-in AI fails.	Network resilient UX
Performance	NFR4.3	AI Q&A Response Time	Client-side Q&A response ≤ 3 seconds. Hybrid Fallback ≤ 5 seconds.	Cost-efficiency
Payment	NFR4.4	Payment Module	Integrate a payment gateway, handling subscriptions and access control.	N/A
Deployment	NFR4.5	Stable/Extension Prioritization	Core features rely on the Chrome Extension platform (Prompt API) for reliable activation, or Stable APIs (Translator, Summarizer).	N/A

5 Technical Architecture and Stack

5.1 Frontend (Web App, Mobile, Extension)

- **Web App Framework:** Next.js / React (Serves as the data and analysis center, including new **F3.4/F3.5 Dashboards**).
- **Mobile App Stack:** React Native / Expo (Recommended for F2 data collection, maximizing code reuse).
- **Chrome Extension:** Manifest V3, essential for **client-side AI priority** calls (Prompt API, F1.1/F3.2) and **contextual** UI augmentation (F5.2).

5.2 Backend and Hybrid Strategy (Backend & Hybrid AI Strategy)

- **Purpose:** Authentication, subscription, data synchronization, and complex reporting (Now includes **F3.5 complex metric calculation and persistence**).
- **Hybrid Platform:** **Firebase AI Logic / Gemini Developer API (Cloud)** used for Web App's F1.1/F3.2 **Server Fallback**. This ensures **NFR4.2** while maintaining cost control through the free tier. **Roads API** is a supplemental source for speed limits.

5.3 AI/Toolchain

- **Core AI Model:** **Gemini Nano** (Accessed via Chrome Built-in AI APIs).
- **Core APIs (Extension Priority):** **Prompt API** (F1.1, F3.2), **Translator API** (F1.3), **Summarizer API** (F1.2), **Language Detector API** (F1.3), **Proofreader API** (F3.3).
- **STT Solution:** Utilized by Hybrid Backend service (e.g., dedicated STT service or Gemini API for audio processing) for F3.3 voice note transcription.

6 Hackathon Submission Strategy

Submission Requirement	How PRD Supports	Task/Status
Application/Features	F1.1 (Hybrid Q&A), F3.4 (Crowdsourced Data) , F3.5 (AI Analysis Dashboards), F5.2 (Extension Annotation) are core demo features. Our key strength is the Hybrid Architecture demonstrating robustness and multi-platform reach and a **solution to real-world data decay (Crowdsourcing)** .	Focus on Hybrid AI
Text Description	Clearly state the use of a Hybrid Architecture (Web + Extension + Mobile data collection) to solve the Built-in AI compatibility challenges , and strategically utilize Prompt, Translator, Summarizer API to address privacy and efficiency, **while using Crowdsourcing (F3.4) to guarantee data accuracy over external paid APIs.**	Pending Writing
3-Min Video	Script must highlight: 1. Network Resilience: Show the F1.1 Hybrid Fallback on the Web App; 2. Client-Side AI: Demonstrate successful Prompt/Summarizer calls on the Extension (F1.1 or F5.2); 3. F3.4/F3.5 Enhanced Review/Analysis UI , focusing on the custom speed limit markers .	Pending Production

GitHub Repository	Must include an open-source license and complete installation, running, and testing instructions for the Web App and the Extension.	Pending Creation
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7 Open Items and Next Steps

- **Extension Implementation:** Initiate the basic framework setup for the **Chrome Extension (Manifest V3)** and prioritize testing the **Prompt API** activation status.
- **STT (Speech-to-Text) Solution:** Finalize whether to use the Gemini API or other cloud service for voice note transcription (F3.3).
- **UI/UX Design Mockups:** Initiate design work for the main screens and core feature cards, including the Extension sidebar/popup UI, and especially the new **F3.4 Review UI (including the Crowdsourcing tool)** and **F3.5 Analysis Dashboards**.