Garage Management AI Assistant

1. INTRODUCTION

1.1 Project Overview

The Garage Management AI Assistant is an AI-powered application designed to assist mechanics, garage staff, and customers in addressing a variety of automotive-related issues. By leveraging the IBM Granite-3.3-2B Instruct model, the system can provide step-by-step repair guidance, parts compatibility information, maintenance schedules, and troubleshooting advice. Built with Python and Gradio, this tool demonstrates how Generative AI can modernize garage operations and enhance customer experience.

1.2 Purpose

The primary purpose of the Garage AI Assistant is to streamline communication between customers and mechanics while providing quick and reliable automotive information. This system aims to:

- Assist mechanics with repair procedures and diagnostics.
- Provide accurate part compatibility and availability details.
- Suggest maintenance schedules and preventive measures.
- Offer a simple and user-friendly interface for all users.

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2. IDEATION PHASE

2.1 Problem Statement

Many garages face challenges in quickly diagnosing issues, identifying compatible parts, and maintaining service schedules. Without immediate access to accurate technical data, repairs may be delayed and customer satisfaction can suffer.

2.2 Brainstorming

Ideas explored:

- AI chatbot for garage repair guidance.
- Natural language query handling for maintenance and repair advice.

- Integration with parts database for compatibility checks.
- Multi-language support for diverse customer bases.
- Simple and mobile-friendly interface.
- Voice support (future enhancement).

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3. REQUIREMENT ANALYSIS

3.1 Functional Requirements

- Support for natural language queries.
- Provide repair instructions and troubleshooting advice.
- Suggest preventive maintenance schedules.
- Retrieve compatible parts information.
- Offer a user-friendly web interface.

3.2 Non-Functional Requirements

- Fast and accurate AI responses.
- Scalable to handle multiple queries simultaneously.
- Secure API key management.
- Responsive UI for desktop and mobile devices.

3.3 Technology Stack

Component	Technology
AI Model	IBM Granite-3.3-2B Instruct
UI	Gradio
Backend	Python, Hugging Face Transformers
Deployment	Streamlit / Hugging Face Spaces
Language Support	Multilingual (future)

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4. PROJECT DESIGN

4.1 Proposed Solution

A Gradio-based web application where users can:

- Describe a vehicle issue for repair guidance.
- Search for part compatibility by make and model.
- View recommended maintenance schedules.
- Get possible diagnoses for unusual vehicle noises.

4.2 Solution Architecture

- **Frontend**: Gradio interface with tabs for each function.
- **Backend**: Python handling AI query processing.
- **Model**: IBM Granite-3.3-2B Instruct for natural language understanding.
- **Hosting**: Cloud or local deployment with secure environment configuration.

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5. PROJECT PLANNING & SCHEDULING

Phase	Tasks	Timeline
Ideation	Problem definition, brainstorming	1 week
Requirements	Functional & non-functional specifications	1 week
Design	Architecture & UI mockups	1 week
Development	Coding, integration, testing	2 weeks
Deployment	Hosting, user testing	1 week

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6. FUNCTIONAL & PERFORMANCE TESTING

Functional Testing:

- Verified all core functions work as intended.
- Tested sample queries for different automotive issues.

Performance Testing:

- Measured AI response times.
- Tested multiple concurrent queries.

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7. RESULTS

The system successfully provided accurate automotive advice and part compatibility checks in real-time. Mechanics reported improved workflow efficiency and customers appreciated faster service.

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8. ADVANTAGES & DISADVANTAGES

Advantages:

- Saves time for mechanics.
- Enhances customer satisfaction.
- Reduces chances of incorrect part orders.

Disadvantages:

- Dependent on internet connectivity.
- Requires periodic model updates for accuracy.

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9. CONCLUSION

The Garage Management AI Assistant showcases how AI can optimize garage workflows, reduce repair time, and improve communication. With proper integration, it can become a central tool for modern garages.

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10. FUTURE SCOPE

- Voice input/output for hands-free operation.
- Integration with live inventory management systems.
- Mobile app version for on-the-go mechanics.
- Support for image-based part recognition.