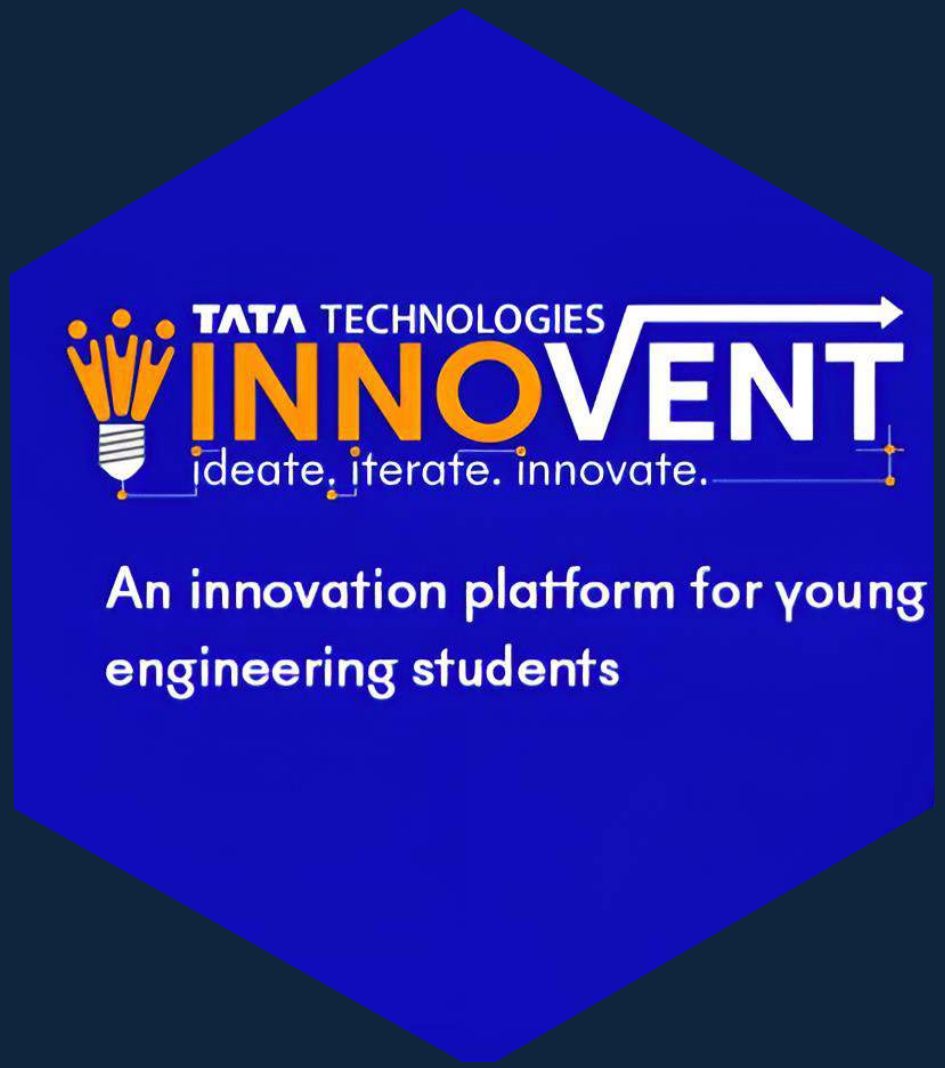


Basic Details

- **Team Name :** Team SpeedSage
- **Project Name :** Car Cognition AI
- **Team Leader Name :** Animesh Patra
- **Institute Name :** Institute of Technical Education & Research (ITER) , SOA University , Bhubaneswar
- **Theme Name :** Automotive Verticals
- **Topic Name :** Generative AI for Delivering Great Product Experience

Car Cognition AI

- **Project Topic :** Generative AI for Delivering Great Product Experience
- **Project Subtopic :** Generative AI solutions for customer engagement during pre-sales – Enhances customer interactions during the pre-sales phase with AI applications.
- **Project Theme :** Automotive verticals
- **Project Idea :** An interactive website where an AI powered virtual assistant provides personalized tours of different automotive products. Customers can ask questions, receive tailored recommendations, and even see AI-generated simulations of products in various use-case scenarios.
- **Virtual Assistant :** **Auto**Sensei

Agenda

1. Introduction
2. Problem Statement
3. Objective & Approach
4. **Solution Overview**
5. Chllenges Faced
6. Technical Implementation
7. Results & Achievements
8. Demonstration
9. Future Enhancement
10. Project Plan

Introduction

Discover a revolutionary way to explore automotive products with our interactive website, featuring an AI-powered virtual assistant that offers personalized tours, tailored recommendations, and immersive AI-generated simulations. Enhance your car-shopping experience by asking questions and seeing vehicles in real-world scenarios like never before.

Team

- Team Member 1 : Animesh Patra [B.Tech(CSE)] (III Year)
- Team Member 2 : Aiswarya Patra [B.Tech(CSE)] (III Year)
- Team Member 3 : Debadarshi Omkar [B.Tech(CSE)] (III Year)
- Team Member 4 : G.Praveen Kumar Rao [B.Tech(CSE)] (III Year)
- Team Member 5 : Satyajit Jenamani [B.Tech(CSE)] (III Year)
- Faculty Advisor : Aditi Panda

Meet our team

Animesh Patra

G.Praveen Kumar Rao

Aiswarya Patra

Satyajit Jenamani

Debadarshi Omkar

Problem Statement

Problem or Challenge

- **Complex Decision-Making:** Customers struggle to understand and compare advanced features of modern automotive products.
- **Limited Personalized Assistance:** Traditional online resources lack personalized, interactive engagement for potential buyers.
- **Inadequate Visual Simulations:** Current platforms fail to provide immersive, AI-generated simulations of automotive products in real-world scenarios.

Market Size

- **Global Automotive Market:** Estimated at $3.5 trillion in 2023 with a projected CAGR of 6.77% from 2023 to 2033. (Source: https://www.sphericalinsights.com/)
- Digital Transformation in Automotive Sales: Increasing demand for online car shopping experiences, with a growing focus on virtual showrooms and AI-driven customer support
- **AI in Customer Experience:** AI-powered virtual assistants market expected to reach $11.2 billion by 2026, driven by advancements in NLP and machine learning. (Source: www.marketsandmarkets.com)
- **Competitive Edge:** Companies leveraging AI for personalized customer engagement and immersive simulations are poised to capture a significant market share, enhancing customer satisfaction and sales conversion rates.

Future Potential

- **Scalable Platform:** Expansion into other sectors like real estate, retail, and electronics, providing personalized virtual tours and simulations.
- **Integration with Emerging Technologies:** Incorporation of AR/VR for enhanced immersive experiences, further revolutionizing online shopping and product exploration.

Objective & Approach

Objectives

- Provide an innovative, interactive platform for automotive product exploration through an AI-powered virtual assistant.

Approaches

- **User-Centric Design:** Develop a user-friendly interface to ensure seamless interaction and engagement.
- **Conversational AI:** Implement advanced NLP models to enable natural, context-aware conversations with users.
- **Personalized Recommendations:** Utilize machine learning algorithms to analyze user preferences and provide tailored product suggestions.
- **Immersive Simulations:** Create AI-generated simulations to showcase vehicles in various real-world scenarios.
- **Integration of APIs:** Leverage automotive APIs for real-time data on product specifications and features.
- **Continuous Improvement:** Employ user feedback and analytics to iteratively enhance the virtual assistant's capabilities and user experience.
- **Scalable Architecture:** Design a robust backend to support future expansions and integrations with emerging technologies like AR/VR.

Solution Overview

Key Components and Functionalities

- **Interactive Website Interface**
  - User-Friendly Design: Intuitive navigation and visually appealing layout for seamless user experience.
  - Responsive Design: Optimized for desktop and mobile devices to ensure accessibility across all platforms.
- **AI-Powered Virtual Assistant**
  - Natural Language Processing (NLP): Advanced NLP models enable natural, context-aware conversations with users.
  - Conversational Interface: Allows customers to ask questions and receive instant responses about automotive products.
  - Multilingual Support: Provides assistance in multiple languages to cater to a global audience.
- **Personalized Recommendations**
  - User Profiling: Analyzes user preferences and interaction history to generate personalized car recommendations.
  - Machine Learning Algorithms: Continuously improve recommendation accuracy based on user feedback and behavior.
- **AI-Generated Simulations**
  - Real-World Scenarios: Visualize vehicles in various use-case scenarios such as different driving conditions and environments.
  - High-Quality Visuals: Utilize advanced AI techniques and computer vision to create realistic and engaging simulations.
- **Comprehensive Data Integration**
  - Automotive APIs: Integrate data from multiple automotive databases to provide detailed and up-to-date information on car models, features, and specifications.
  - Real-Time Updates: Ensure that the latest data is always available to users.
- **Scalability and Performance**
  - Cloud-Based Infrastructure: Deployed on scalable cloud platforms to handle high traffic and ensure reliability.
  - Modular Architecture: Designed to easily incorporate future enhancements and integrations with emerging technologies.

Solution Overview

Solution Novelty:

- **Innovative AI Integration**
  - Combines cutting-edge NLP and machine learning technologies to create a highly interactive and personalized user experience.
  - Utilizes AI-generated simulations to offer an unprecedented level of detail .
- **Enhanced Personalization**
  - Leverages user data to deliver highly tailored recommendations, setting it apart from traditional car-buying platforms.
  - Continuously adapts to user preferences, providing a dynamic and engaging experience.
- **Immersive Visual Experience**
  - Offers realistic simulations, allowing users to explore vehicles in various scenarios and environments.
  - Bridges the gap between online research and in-person showroom visits, making car shopping more convenient and informative.
- **Global Accessibility**
  - Multilingual support ensures that users from different regions can access and benefit from the platform.
  - Responsive design guarantees a consistent experience across all devices.
- **Future-Proof Design**
  - Scalable and modular architecture allows for easy integration of future technologies like AR/VR, enhancing the platform's capabilities and staying ahead of market trends.
  - This detailed overview highlights the comprehensive and innovative approach of the interactive website with an AI-powered virtual assistant, emphasizing its key components, functionalities, and the unique value it brings to the automotive market.

Challenges Faced

Challenges

- **Complexity of NLP:** Ensuring accurate understanding of user queries and natural conversation flow.
- **Data Integration:** Aggregating and normalizing data from various automotive APIs.
- **Personalization Accuracy:** Providing highly relevant recommendations based on diverse user preferences.
- **Realistic Simulations:** Generating convincing AI-driven simulations of automotive products in different use-case scenarios.
- **Scalability:** Designing a system capable of handling high traffic and future expansions.
- **User Experience:** Creating an intuitive and engaging interface that users find easy to navigate.

Solutions

- **Advanced NLP Models:** Leveraged pre-trained models from Hugging Face Transformers and fine-tuned them for our specific domain.
- **Robust Data Pipeline:** Built a comprehensive ETL (Extract, Transform, Load) process to seamlessly integrate and standardize data from multiple sources.
- **Machine Learning Algorithms:** Implemented sophisticated recommendation algorithms and continuously refined them with user feedback and interaction data.
- **AI & Computer Vision:** Used state-of-the-art AI techniques and OpenCV to develop realistic simulations, ensuring high visual fidelity.
- **Cloud Infrastructure:** Deployed on scalable cloud platforms like AWS, enabling dynamic scaling to meet varying demand.
- **User Testing & Feedback:** Conducted extensive usability testing and iteratively improved the UI/UX based on user feedback and behavior analytics.

Technological Implementation

Creating an interactive virtual showroom with an AI assistant requires a combination of technologies across various areas such as web development, AI, and interactive simulations. Here are the frameworks, languages, and libraries you might need:

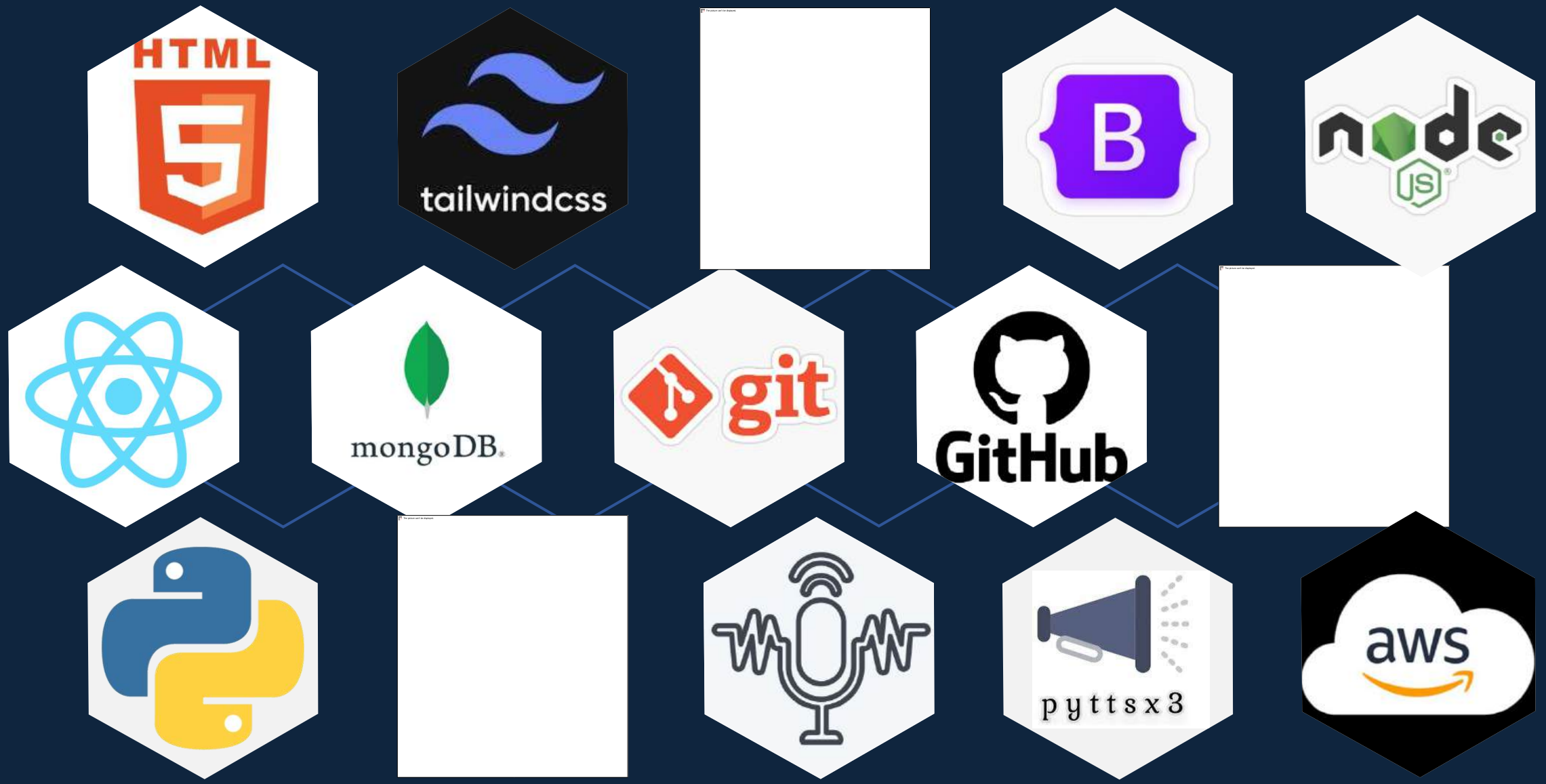
- **Frontend Development**
  - HTML/CSS (Tailwind): For structuring and styling the website.
  - JavaScript: For adding interactivity to the website.
    - React.js: A popular JavaScript library for building user interfaces.

- **Backend Development**
  - Node.js: A JavaScript runtime for building scalable server-side applications.
    - Express.js: A web application framework for Node.js.

- **AI and Machine Learning**
  - Python Libraries:
    - Pyaudio: Frameworks for building and training machine learning models.
    - Pyttsx3: Convert text to speech.
    - Tkinter: React to user input, changes from your program and even refreshes the display only when actively running an event loop.
    - For natural language processing (NLP) tasks.
    - PIL/PILLOW - Python image library (deals with images).
  - Pre-trained Models:
    - Hugging Face Transformers: For leveraging pre-trained NLP models for the AI assistant.

Technological Implementation

- **Databases**
  - MongoDB: A NoSQL database for storing user interactions and product data.
- **Cloud Services**
  - AWS: For hosting, scalable storage, and machine learning services.
    - AWS Lambda: For running backend functions.
- **APIs and Integrations**
  - RESTful APIs: For communication between frontend and backend.
  - GraphQL: An alternative to REST for more efficient data fetching.
- **DevOps and Deployment**
  - Docker: For containerizing applications.
  - Kubernetes: For orchestrating containerized applications.
  - CI/CD Tools: Such as Git and GitHub Actions for automated testing and deployment.
- **Putting It All Together**
  - Frontend: React.js for UI, communicating with the backend via REST or GraphQL.
  - Backend: Node.js/Express.js for handling requests, processing data, and serving the AI models.
  - AI: Python with Pyaudio for building the AI models, using NLP libraries for understanding customer queries.



Technological Implementation

Results & Achievements

Predictions on AI in automotive adoption

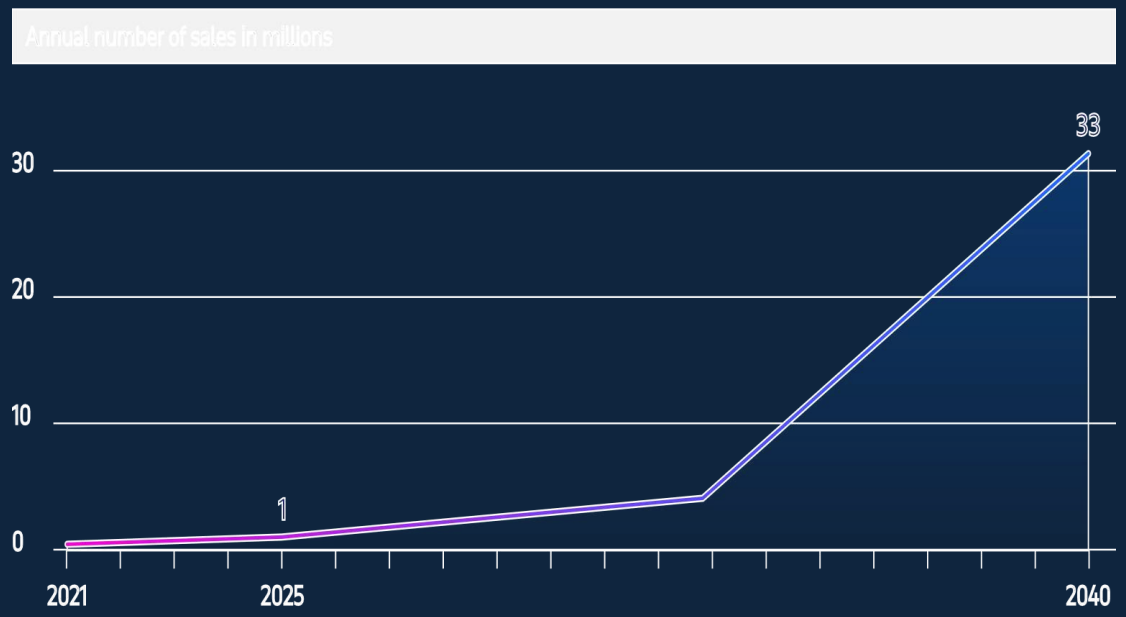
estimated CAGR of the Automotive AI market from 2022 to 2030

Precedence research

of licensed drivers in the US will drive a connected vehicle by 2025

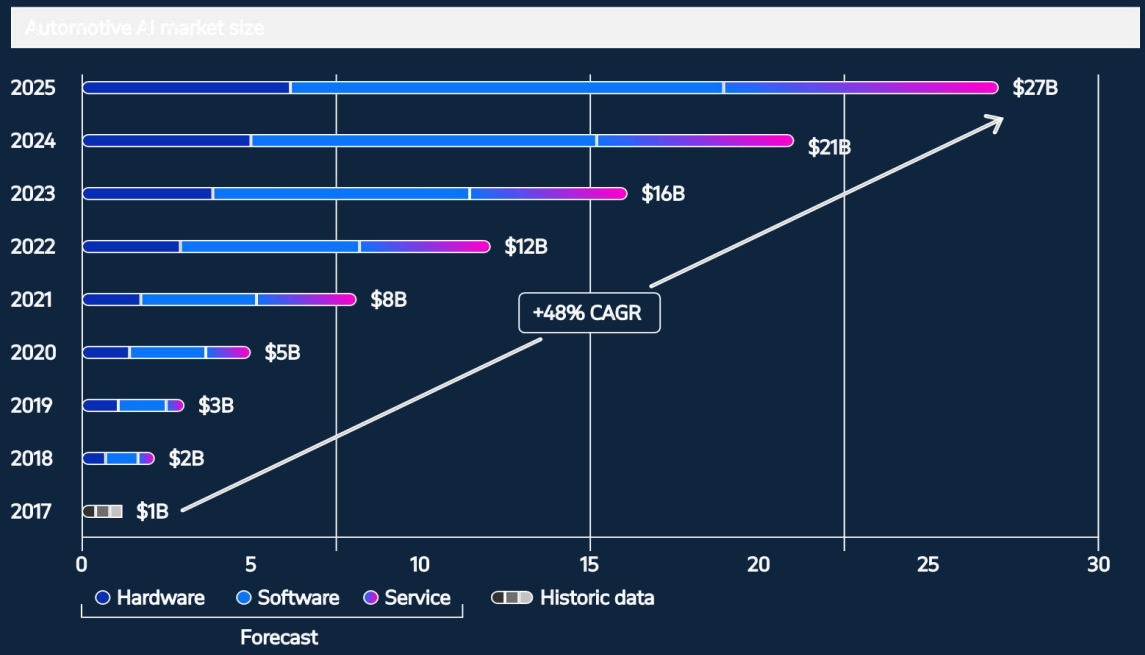
eMarketer

Global autonomous vehicle sales



Data source: deloitte.com—Autonomous Driving. Moonshot Project with Quantum Leap from Hardware to Software & AI Focus

Global automotive AI market forecast



Data source: deloitte.com—Autonomous Driving. Moonshot Project with Quantum Leap from Hardware to Software & AI Focus, 2019

Results & Achievements

❑ Outcomes

- ❑ The global AI automotive market size is expected growth of CAGR 48% from 2017 to 2025.
- ❑ By 2025 , the market size of AI in the automotive industry forecast up to reach $27 billion.
- ❑ AI is expected to save the automotive industry $160 billion in costs by 2025.

❑ Achievements

- ❑ AI technology is expected to lead to 22.3% increase in automotive industry revenues by 2030.
- ❑ Global autonomous vehicle annual sale would increase to 33 million till 2040.
- ❑ AI-powered automotive software could save $1.3 trillion in accident-related costs by 2027.

❑ Impacts

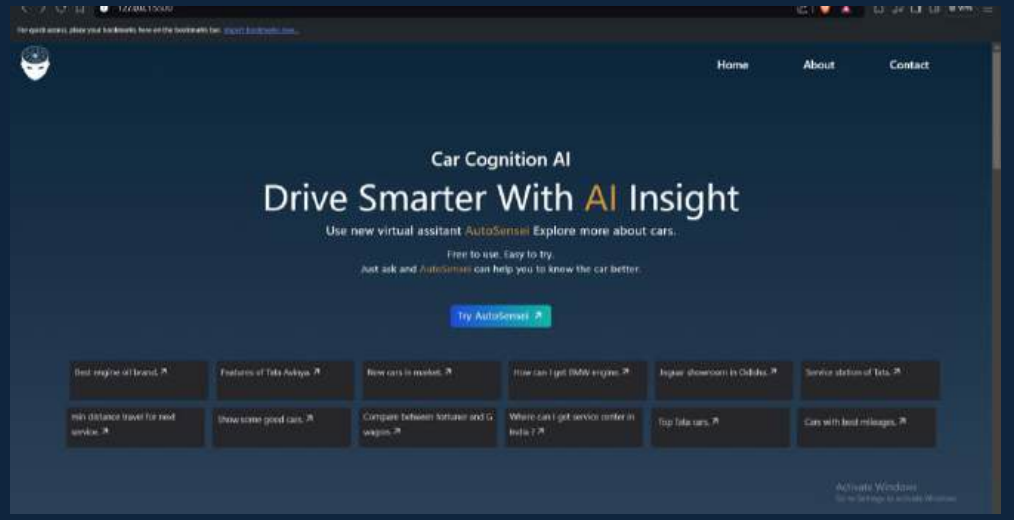
- ❑ AI-powered automotive software could save $1.3 trillion in accident-related costs by 2027.
- ❑ AI-driven predictive maintenance in cars can reduce maintenance costs by 40%.

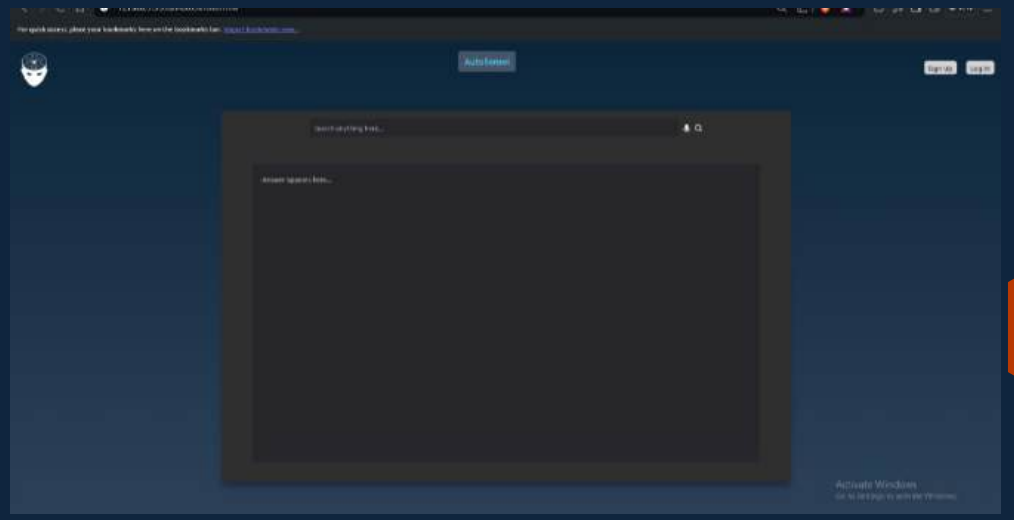
[Source: https://www.itransition.com/ai/automotive

https://gitnux.org/ai-in-the-car-industry-statistics/]

Demonstration

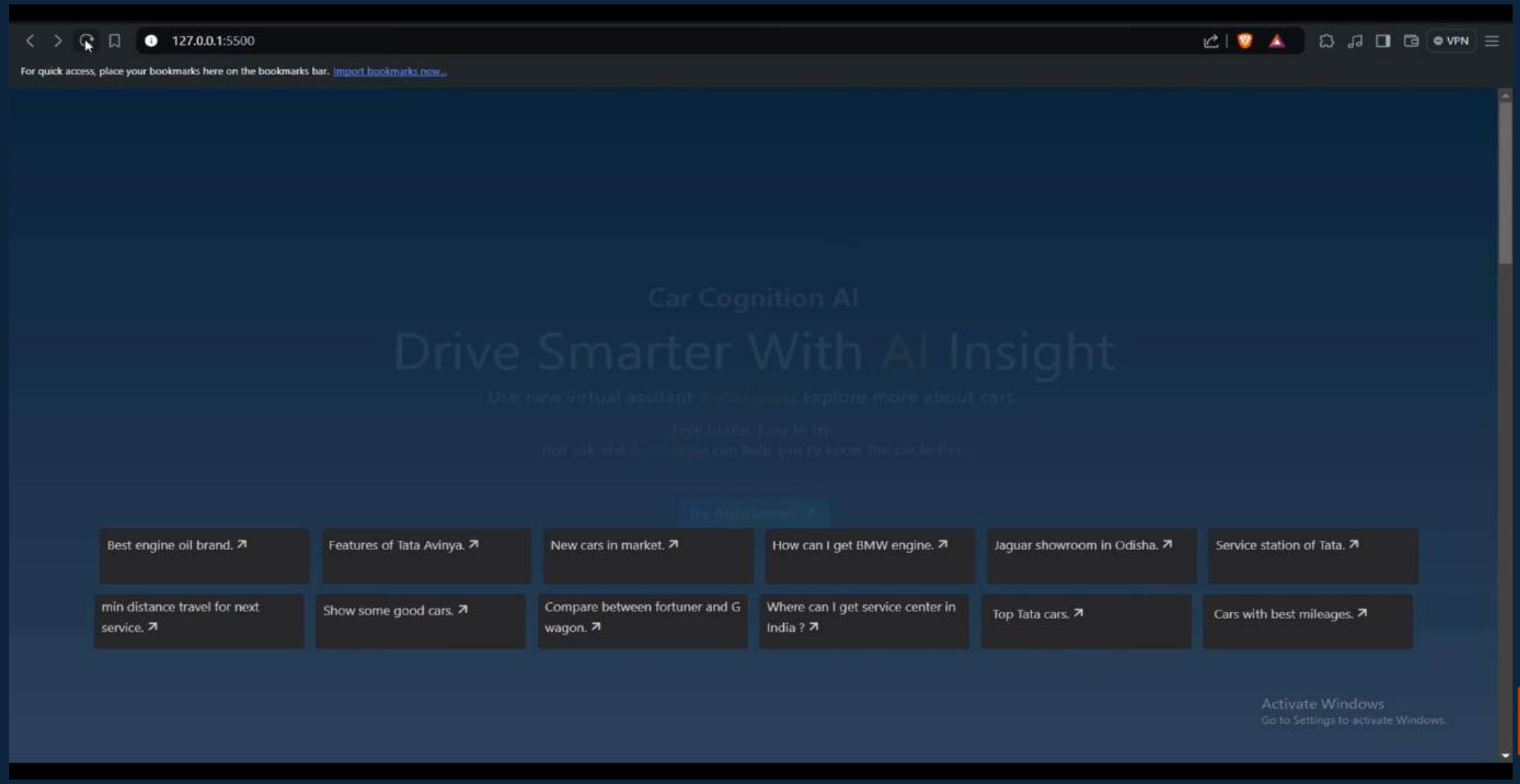
Proof of Concept:





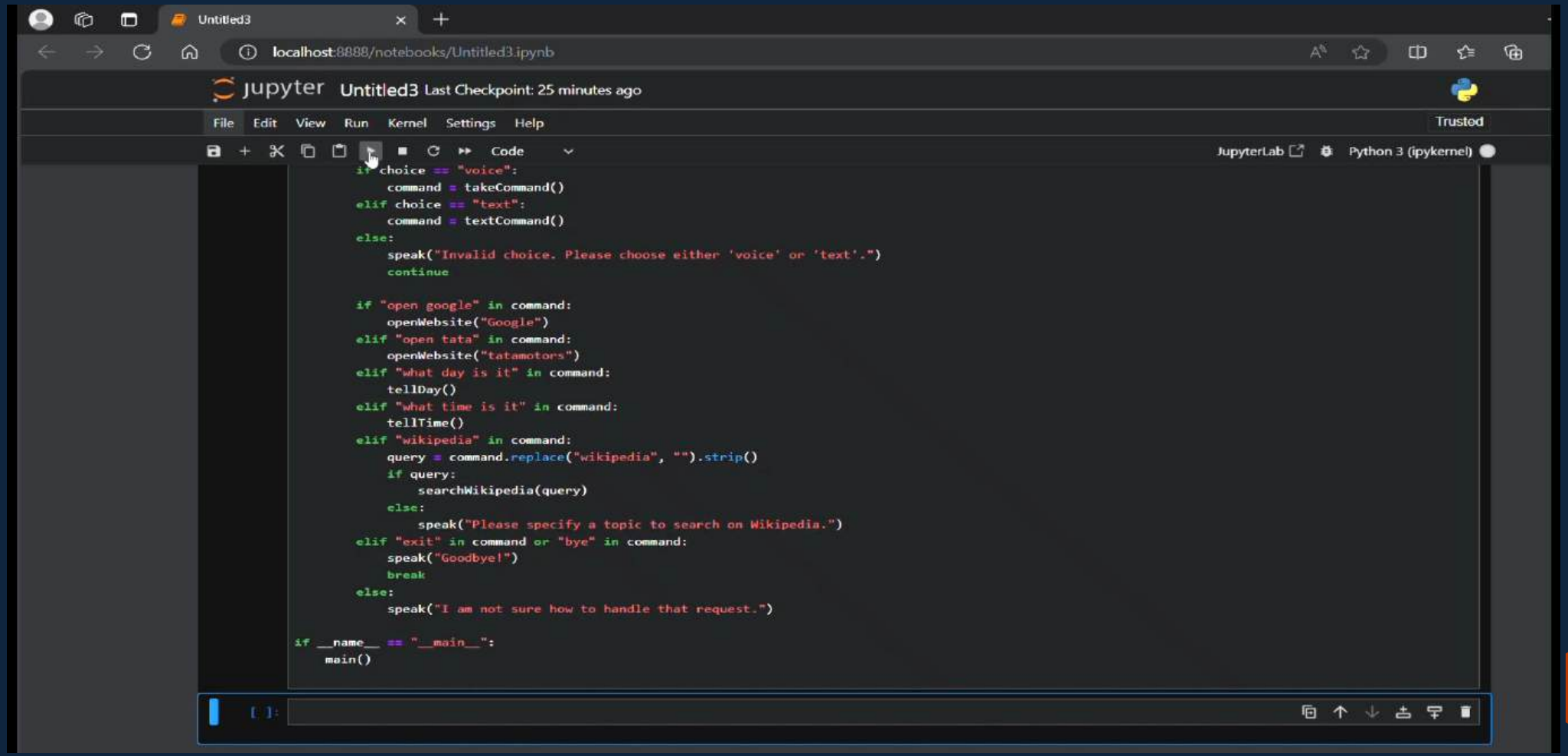
Demonstration

Website:

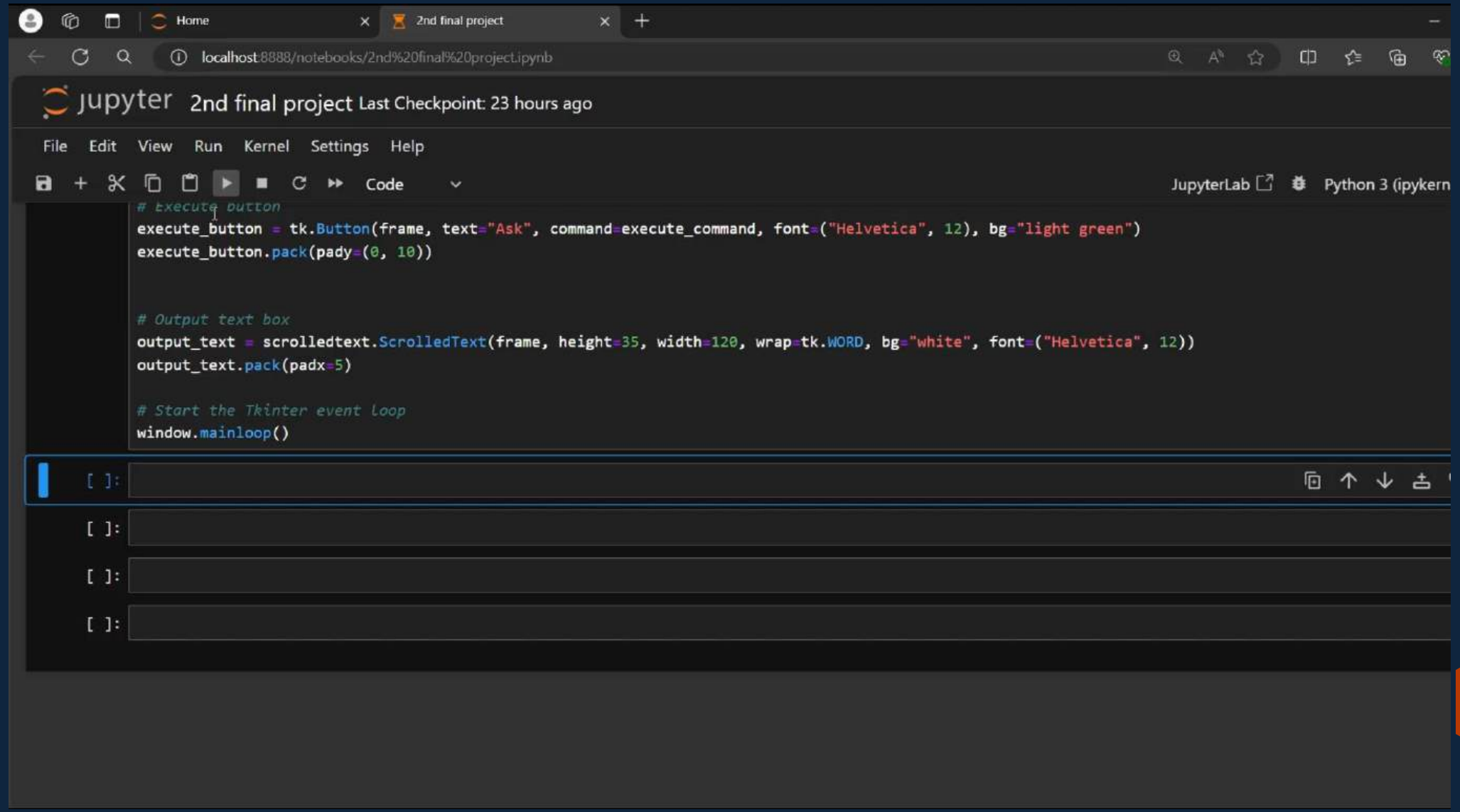


Demonstration

Virtual Assistant:



Demonstration



Future Enhancement

- **Enhanced Conversational AI:** Continuously refine NLP models to improve understanding of diverse customer queries and provide more accurate responses.
- **Augmented Reality (AR) Integration:** Implement AR features to allow customers to visualize cars in their own environment using their mobile devices.
- **Virtual Reality (VR) Showrooms:** Create immersive VR experiences where customers can explore detailed 3D models of cars and interact with features.
- **Advanced Personalization:** Leverage AI to offer even more personalized recommendations based on user behavior, preferences, and past interactions.
- **Voice Assistant Compatibility:** Integrate with popular voice assistants like Amazon Alexa and Google Assistant for seamless voice-activated interactions.
- **Real-Time Customer Support:** Implement real-time chat support with human agents to assist with complex queries and provide a hybrid AI-human customer service experience.
- **Expanded Simulation Scenarios:** Add more detailed and varied AI-generated simulations, including different driving conditions and environments.
- **Predictive Maintenance Insights:** Offer insights on vehicle maintenance and performance predictions using AI-driven analytics.
- **Multilingual Support:** Multilingual support to cater to a global audience, making the platform accessible to non-English speakers.
- **Feedback Loop Integration:** Develop a robust feedback mechanism to continuously gather user input and make iterative improvements based on real-time data and user suggestions.

Project Plan

- Requirements Gathering
  - Define project scope and objectives
  - Identify key features and functionalities
  - Gather user requirements and expectations
- Design and Planning
  - Create wireframes and HTML/CSS (Tailwind) designs.
  - Design system architecture and data flow
  - Plan project timeline and milestones
- Development
  - Frontend Development:
    - Implement interactive HTML/CSS with React.js
    - Integrate responsive design for cross-device compatibility
  - Backend Development:
    - Set up Node.js/Express server
    - Develop RESTful APIs for data handling and AI integration
  - AI Integration:
    - Implement NLP models using Hugging Face Transformers
    - Develop personalized recommendation algorithms
    - GraphQL: An alternative to REST for more efficient data fetching
- Testing
  - Conduct unit testing for frontend and backend components
  - Perform integration testing of AI models and APIs

Project Plan

- Deployment
  - Deploy the prototype on a scalable cloud platform like AWS
  - Set up continuous integration and deployment (CI/CD) Git and GitHub.
- Evaluation and Iteration
  - Collect user interaction data and feedback
  - Analyze performance metrics and identify improvement areas
  - Iterate on the design and functionalities based on insights
  - Deliverables:
    - Functional interactive website prototype
    - Frontend: React.js for UI, communicating with the backend via REST or GraphQL.
  - Backend:
    - Node.js/Express.js for handling requests, processing data, and serving the AI models.
  - AI:
    - Python with Pyaudio for building the AI models, using NLP libraries for understanding customer queries
    - AI-powered virtual assistant with NLP capabilities
    - Personalized recommendations and AI-generated simulations
    - User feedback and performance analysis report

Thank you