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RigMaker: An Intelligent System for Custom PC Configuration and Compatibility Analysis

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Abstract - *The rapid advancement of computer hardware technologies has made personal computer (PC) building more complex for users, especially beginners who lack sufficient technical knowledge about component compatibility, performance optimization, and budget management. This research introduces* ***RigMaker – an AI-powered PC Building Assistant****, a web-based intelligent system designed to help users build customized personal computers through automated recommendations, compatibility verification, and interactive visualization.*

RigMaker AI leverages artificial intelligence and modern web technologies to provide users with personalized PC component suggestions based on their requirements such as budget, performance expectations, and intended use cases including gaming, content creation, programming, and AI/ML workloads. The system incorporates an AI conversational assistant that understands natural language queries and provides intelligent guidance throughout the PC building process.

***Key Words*: Artificial Intelligence, PC Building Assistant, Hardware Compatibility, Recommendation System, 3D Visualization, Web Application**

1.Introduction

Building a custom personal computer has become increasingly popular among users who require high-performance systems tailored to specific tasks such as gaming, software development, content creation, or artificial intelligence workloads. However, assembling a PC requires significant knowledge about hardware components including processors, graphics cards, motherboards, memory modules, storage devices, and power supplies. Users must also ensure compatibility among these components while maintaining a balance between performance and budget constraints.

Many users face difficulties when selecting appropriate hardware due to the wide range of available components and rapidly evolving technology. Selecting incompatible parts may result in system instability, hardware damage, or performance bottlenecks. Traditional PC building resources such as forums, guides, and online configurators provide some assistance but often lack intelligent automation and personalized guidance.

RigMaker AI then generates optimized component recommendations by analyzing the user's requirements and selecting compatible hardware from a predefined database of PC components. The system also includes a compatibility checker that verifies whether selected components can work together without conflicts.

2. Literature Review

Several studies have explored the development of recommendation systems and intelligent assistants for technical decision-making processes. Recommendation systems are widely used in e-commerce platforms, where algorithms analyze user preferences and suggest products that match their needs. These systems utilize data analytics, machine learning techniques, and knowledge-based models to improve decision accuracy and user satisfaction. In the context of computer hardware selection, various online platforms provide PC configuration tools that allow users to select components manually while checking compatibility constraints. These platforms often rely on predefined compatibility rules to prevent incompatible hardware combinations. However, most of these systems require users to have prior knowledge about PC hardware specifications, limiting their usability for beginners. Research in artificial intelligence has demonstrated the potential of conversational agents in assisting users with complex tasks. AI-powered chatbots are capable of understanding natural language queries and providing context-aware responses. By integrating natural language processing techniques, such systems enable intuitive interaction between users and machines. Additionally, visualization technologies have become increasingly important in improving user experience in digital applications. Three-dimensional visualization tools allow users to interact with digital models and explore complex structures in an intuitive manner. In hardware-related applications, 3D visualization can help users understand system layouts and component arrangements more effectively than traditional text-based interfaces. Another important area of research involves **compatibility analysis systems**, which are used in engineering and system design to ensure that different components function together properly. Compatibility checking systems typically rely on

rule-based validation mechanisms that evaluate parameters such as socket type, power consumption, and physical dimensions. Previous research also emphasizes the importance of user interface design in complex applications. Modern user interfaces incorporate interactive animations, responsive layouts, and visually engaging design elements to improve usability and user engagement. The integration of artificial intelligence, recommendation systems, and visualization technologies presents significant opportunities for improving PC building tools. By combining these technologies into a unified platform, users can receive automated guidance, detect compatibility issues, and visualize system configurations in real time. RigMaker AI builds upon these concepts by integrating **AI-based recommendations, compatibility validation, and interactive 3D visualization**, thereby creating a comprehensive platform that enhances the PC building experience for users with varying levels of technical expertise.

3. System Design

Overview:-

The system design of RigMaker AI focuses on creating an intelligent and interactive platform for building custom PCs. The architecture of the system is composed of multiple modules that work together to deliver AI-powered recommendations, compatibility analysis, and visual representation of PC builds. At the core of the system lies the **AI recommendation engine**, which processes user inputs and generates hardware suggestions based on predefined rules and performance considerations. Users can describe their requirements such as budget range, intended usage, and performance priorities. The AI engine analyzes these parameters and recommends suitable PC components accordingly. Another major module of the system is the **PC Builder module**, which allows users to manually select or modify components within their build. This module provides access to a comprehensive database of hardware components including CPUs, GPUs, motherboards, RAM, storage devices, and power supplies.

The **compatibility checking module** plays a critical role in ensuring that selected components work together correctly. This module performs real-time validation of hardware specifications such as processor socket compatibility, motherboard form factors, RAM support, and power requirements. The system also includes a **3D visualization module** that provides an interactive representation of the selected PC configuration. Using Three.js and React Three Fiber, the application renders a virtual PC case where individual components are displayed in their respective positions. Users can rotate, zoom, and explore the 3D model to inspect the arrangement of components and understand the internal structure of their system.

This feature significantly enhances the user experience by providing visual feedback during the PC building process. The front-end of the system is developed using **Next.js and React**, enabling efficient rendering and responsive performance across devices. Tailwind CSS is used for styling the user interface, incorporating modern design principles such as glassmorphism and neon color accents. State management within the application is handled using **Zustand**, ensuring efficient communication between different components of the system. This architecture allows the application to maintain real-time updates as users modify their PC configurations. Overall, the system design emphasizes modularity, scalability, and usability, enabling RigMaker AI to provide a seamless and intelligent PC building experience.

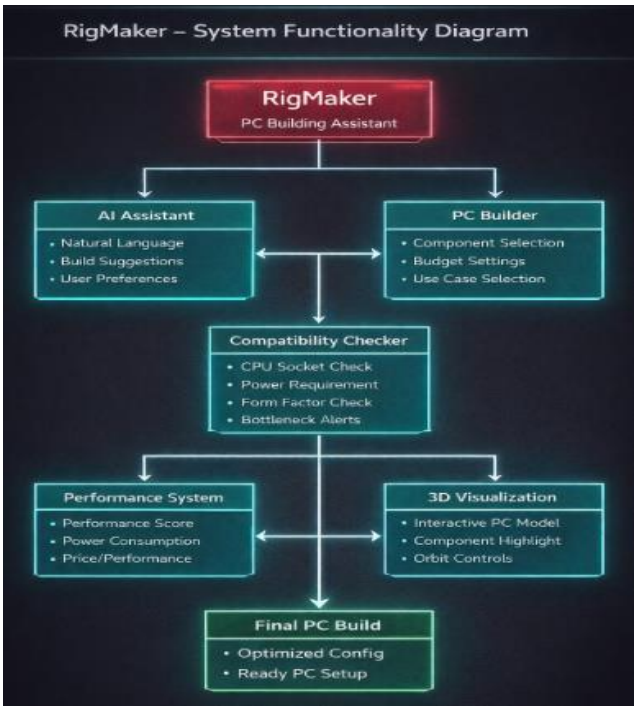
4. Functionality of the System

RigMaker AI provides a wide range of functionalities designed to assist users in building optimized PC configurations efficiently. These functionalities are organized into several core modules that handle AI interaction, component selection, compatibility validation, and visualization. The **AI assistant module** allows users to interact with the system using natural language. Users can describe their requirements, such as budget limits or performance goals, and the AI assistant generates appropriate component recommendations. This conversational interface simplifies the process for users who may not be familiar with technical hardware specifications. The **PC builder module** enables users to manually configure their systems by selecting components from a structured database. Users can browse through different categories of hardware and customize their build according to their preferences.

The system also includes a **budget management feature**, which ensures that selected components remain within the user's specified budget range. If the configuration exceeds the budget, the system provides alternative component suggestions that maintain similar performance levels while reducing cost. Another key functionality is the **compatibility checking system**, which automatically verifies whether the selected components are compatible with each other. The system identifies potential issues such as mismatched processor sockets, insufficient power supply capacity, or incompatible motherboard form factors.

RigMaker AI also provides **performance analytics**, which evaluate the overall capability of the PC build. The system calculates metrics such as estimated power consumption, price-to-performance ratio, and suitability for specific use cases including gaming, programming, and content creation. The **3D visualization module** allows users to view their PC configuration in an interactive environment. Users can rotate the model, zoom into specific components, and visually explore how the system is assembled. Additionally, the

application includes modern UI features such as smooth animations, responsive layouts, and real-time notifications. These features enhance usability and provide a visually engaging user experience.



5. Database Design

The database design of RigMaker AI is structured to store and manage information related to hardware components, user preferences, and PC configurations. The database serves as the backbone of the recommendation and compatibility analysis system.

The primary data entity in the database is the **component table**, which stores detailed information about hardware components such as processors, graphics cards, motherboards, memory modules, storage devices, and power supplies. Each component entry includes attributes such as model name, manufacturer, specifications, price, and compatibility parameters.

Another important entity is the **build configuration table**, which records the PC configurations created by users. This table stores references to the selected components and allows users to save and revisit their builds.

Compatibility relationships between components are managed using specification fields such as CPU socket type, RAM type, motherboard chipset, and power requirements. These attributes are used by the compatibility checking module to verify whether components can function together properly.

The system also maintains a **user interaction dataset**, which stores user preferences and previous configuration data. This information helps the AI assistant generate more accurate recommendations based on user behavior and requirements.

Indexes and optimized queries are used to ensure efficient retrieval of component data during the recommendation process. This design enables the system to quickly analyze hardware specifications and generate compatible configurations in real time. Overall, the database architecture ensures efficient data storage, fast retrieval, and scalability for handling large hardware component datasets.

6. Problem Statement

Selecting compatible hardware components for building a custom personal computer can be challenging, particularly for users with limited technical knowledge. The large variety of available PC components and rapidly evolving technology often make it difficult for users to identify suitable configurations that meet their performance requirements and budget constraints. Existing PC configuration tools typically require users to manually select hardware components and verify compatibility themselves. These tools often lack intelligent guidance, making the process confusing for beginners. Furthermore, many platforms do not provide interactive visualization or detailed performance analysis.

Another major challenge is the absence of intelligent systems capable of understanding user requirements through natural language interaction. Users often need to research extensively before selecting appropriate components, which increases the time and effort required for building a system.

Additionally, compatibility errors such as mismatched processor sockets, insufficient power supplies, or incompatible form factors can lead to hardware failures or system instability. Without proper validation mechanisms, users may unknowingly create configurations that cannot function properly.

Therefore, there is a need for an intelligent platform that simplifies the PC building process by providing automated recommendations, compatibility validation, and interactive visualization tools. RigMaker AI aims to address these challenges by integrating artificial intelligence, recommendation systems, and visualization technologies into a unified PC building assistant.

7. Advantages

RigMaker AI offers several advantages that improve the overall PC building experience for users.

First, the system simplifies the hardware selection process by providing AI-powered recommendations based on user requirements. This feature allows users to quickly generate

optimized PC configurations without extensive technical knowledge.

Second, the compatibility checking system reduces the risk of hardware conflicts by automatically validating component specifications. This ensures that selected components can function together properly.

Another significant advantage is the **interactive 3D visualization feature**, which allows users to explore their PC builds in a virtual environment. This visual representation enhances understanding of system architecture and component placement.

The platform also includes **performance analytics**, which help users evaluate the efficiency and value of their configurations. Users can compare different builds and make informed decisions regarding performance and cost optimization.

Additionally, the modern and responsive user interface improves usability and accessibility across multiple devices. The application provides smooth animations, intuitive navigation, and visually appealing design elements.

Overall, RigMaker AI provides a comprehensive solution that combines automation, visualization, and compatibility analysis to simplify the PC building process.

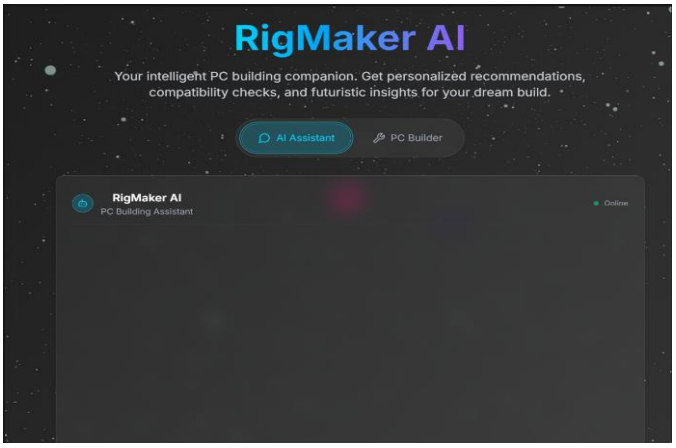


Fig 1: AI Chatbot Section Page

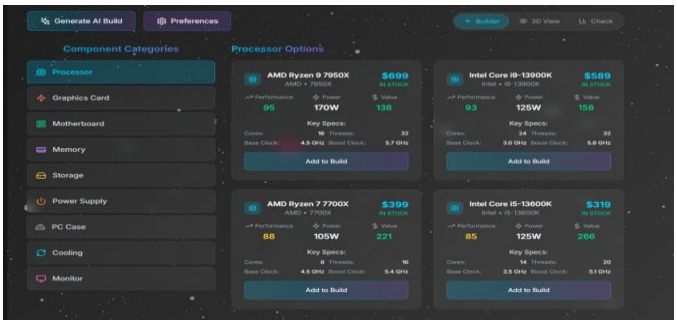


Fig 2: Custom PC Builder Page

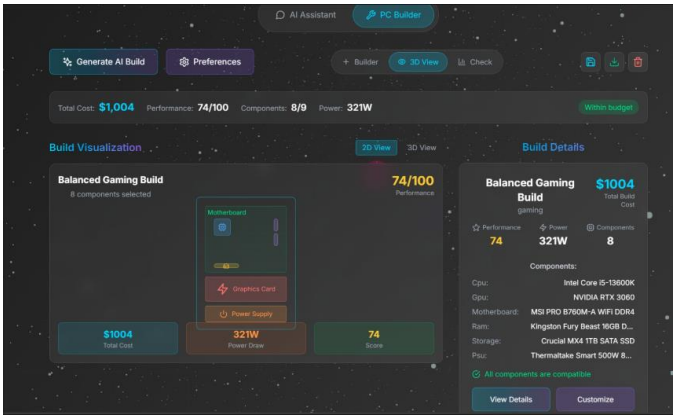


Fig 3: 2D View Page

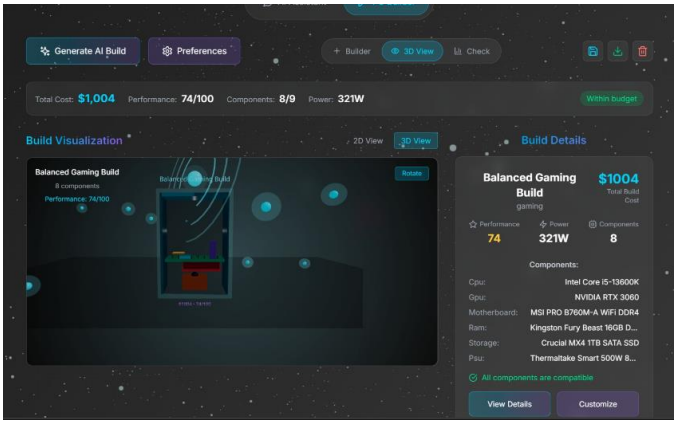


Fig 4: 3D View Page

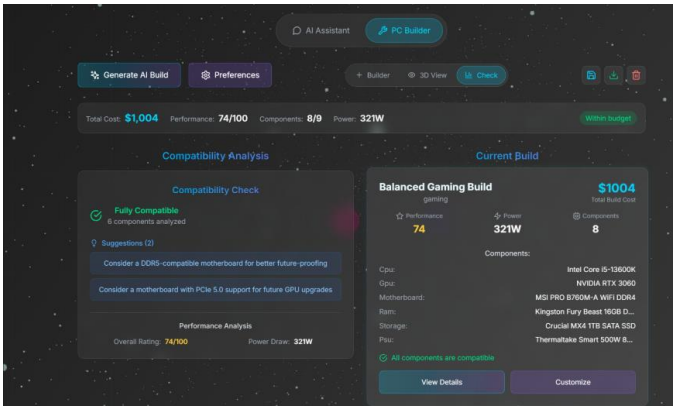


Fig 5: Current PC Build Overview Page

8. Conclusion

The development of RigMaker AI demonstrates the potential of artificial intelligence and modern web technologies in simplifying complex technical tasks such as PC building.

By integrating AI-powered recommendations, compatibility analysis, and interactive visualization, the system provides a comprehensive platform that assists users in creating optimized PC configurations.

The platform enables users to describe their requirements using natural language and receive intelligent suggestions

tailored to their budget and performance goals. The compatibility checking system ensures that selected components work together without conflicts, reducing the risk of configuration errors.

Furthermore, the interactive 3D visualization module enhances user engagement by providing a realistic representation of the PC build. This feature helps users better understand system architecture and component placement.

The use of modern technologies such as Next.js, React, TypeScript, and Three.js ensures high performance, scalability, and an engaging user interface. These technologies enable RigMaker AI to deliver a responsive and visually appealing user experience.

In conclusion, RigMaker AI serves as an innovative solution for PC configuration and hardware selection. The integration of artificial intelligence, real-time compatibility analysis, and advanced visualization techniques significantly improves the efficiency and accessibility of the PC building process.

Future enhancements may include integration with real-time hardware price tracking, advanced machine learning models for recommendation optimization, and expanded component databases to further improve the system's capabilities.

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