International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

SMART GPU: WORKLOAD BASED COMPATIBILITY & SELECTION TOOL

[1]Dr. A. PRANAYANATH REDDY, [2]P. SAIVARUN, [3]S. SHIVA TEJA,

[4]K. SANDEEP SAGAR, [5]K. MADHU SUDHAN REDDY

[1](Associate Professor) , CSE. Teegala Krishna Reddy Engineering College, Hyderabad.

[2,3,4,5]B,tech , scholar , CSE. Teegala Krishna Reddy Engineering College, Hyderabad.

ABSTRACT

In the rapidly evolving landscape of computing, the critical challenge of aligning the right GPU (Graphics Processing Unit) with specific workloads has become increasingly complex. The abstracted focus on the innovative "Workload-based Compatibility and Selection Tool" is particularly timely, as the demands on GPUs vary across a spectrum of tasks, including 3D-designing, VFX, game development, AI/ML, gaming, and streaming. Recognizing this multifaceted challenge, the project introduces a groundbreaking solution designed to streamline the selection process for users. By integrating workload-specific criteria, the tool aims to provide a user-friendly interface where individuals can input their system specifications, budget constraints, and preferences for specific workloads. This collaborative approach ensures that the tool caters to the unique needs and priorities of each user, offering a personalized experience in GPU selection.A key strength of the project lies in its reliance on a comprehensive dataset that encompasses GPU attributes and compatibility mappings. This wealth of information empowers the tool to filter and recommend GPUs based on their eligibility for specific workloads, thereby offering users a curated list of options tailored to their requirements. Furthermore, the tool incorporates a sophisticated compatibility-checking function to safeguard against potential performance bottlenecks. This feature ensures that the selected GPU not only meets the workload requirements but also optimizes performance, providing users with a seamless and efficient computing experience. In essence, the project proposes an integrated and holistic approach that addresses both performance needs and budget constraints. By doing so, it not only simplifies the decision-making process for users but also empowers them to make informed choices aligned with their computing endeavors. As the abstract outlines, the tool is poised to make a significant impact in navigating the intricate landscape of GPU selection, offering a practical and efficient solution to a pervasive challenge in modern computing.

1. INTRODUCTION

In the ever-evolving landscape of computing, the selection of Graphics Processing Units (GPUs) poses a significant challenge for users seeking to build or upgrade their computer systems. The GPU problem stems from the diverse array of options available in the market, with varying specifications, capabilities, and price points. As technology advances, the intricacies of GPU architectures and their

compatibility with other system components, particularly Central Processing Units (CPUs), become increasingly complex. This complexity often leads to a scenario where users, both novice and experienced alike, face difficulties in identifying the optimal GPU that aligns with their specific needs and system configurations.

Users encounter a myriad of issues while navigating the GPU market. The sheer diversity of GPU models, each tailored to different workloads and preferences, can be overwhelming. Determining the compatibility of a chosen GPU with the existing or planned CPU, considering factors such as brand, generation, and workload requirements, is a common stumbling block. Furthermore, the budgetary constraints of users introduce an additional layer of complexity, as finding a GPU that not only meets performance expectations but also fits within a specified price range is a delicate balancing act.

To address these challenges and provide a comprehensive solution, our project endeavors to create a user-friendly and data-driven tool. This tool aims to streamline the GPU selection process by offering tailored recommendations based on user inputs, encompassing CPU brand and generation, RAM capacity, workload type, and desired price range. By integrating a robust dataset of GPU and CPU compatibility, the tool ensures that users receive recommendations that not only meet their performance expectations but also align with the intricate nuances of their system configurations. Through a thoughtful and accessible interface, our project seeks to empower users in overcoming the complexities of GPU selection, making the process both informed and efficient.

2. LITERATURE SURVEY

The literature review for the System for GPU and CPU Bottleneck Analysis and Recommendation project underscores the foundational research in the field of computer hardware optimization. Previous studies have extensively explored the intricacies of CPU and GPU compatibility, recognizing the critical role of aligning these components to achieve peak system performance. These investigations have emphasized the need for workload-specific hardware configurations, acknowledging the diverse computing tasks ranging from gaming to artificial intelligence, each demanding tailored solution. The importance of a user-friendly interface in facilitating complex hardware decisions has been consistently highlighted, influencing the tool's design, which leverages the Tkinter library to provide an intuitive and accessible platform.

The literature also accentuates the challenge of striking a balance between price and performance, a consideration deeply embedded in the tool's functionality through its dynamic price range feature. Addressing bottlenecks in system performance emerges as a recurrent theme, and the tool directly contributes to mitigating these limitations by intelligently filtering out GPUs that might impede overall system efficiency. The review further elucidates emerging trends in system optimization, showcasing

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

the tool's alignment with the evolving landscape of hardware components and user requirements.

By drawing insights from and contributing to this rich body of knowledge, the tool positions itself as a cutting-edge solution for users navigating the intricate terrain of CPU and GPU compatibility analysis and system optimization. The project stands at the intersection of established principles and innovative approaches, offering a comprehensive and user-centric tool that encapsulates the collective wisdom of prior research while addressing contemporary challenges in the dynamic field of computer hardware optimization.

3. SYSTEM DESIGN

3.1 SYSTEM ARCHITECTURE

The envisioned system is meticulously crafted to prioritize user-friendliness, ensuring a seamless and effective user experience. Users can effortlessly input their CPU brand, generation, model, RAM capacity, preferred workload, and budget constraints. The Compatibility Engine, a pivotal component, processes this input against a comprehensive dataset containing CPU and workload compatibility information.

Behind the scenes, the system employs logical conditions to filter and match CPU and workload specifications, narrowing down the options to GPUs that meet the user's criteria. This intelligent filtering helps eliminate GPUs that may introduce bottlenecks, ensuring the recommended GPUs not only align with compatibility but also with the user's budget and performance expectations.

The final output is a curated list of GPU recommendations tailored to the user's unique requirements. Users can explore these recommendations with detailed information, empowering them to make well-informed decisions about their GPU selection. Additionally, the system is designed to actively seek user feedback, fostering a continuous improvement loop to enhance prediction accuracy over time. This iterative approach ensures that the system evolves as a valuable and reliable tool for users seeking the optimal GPU for their specific computing needs.

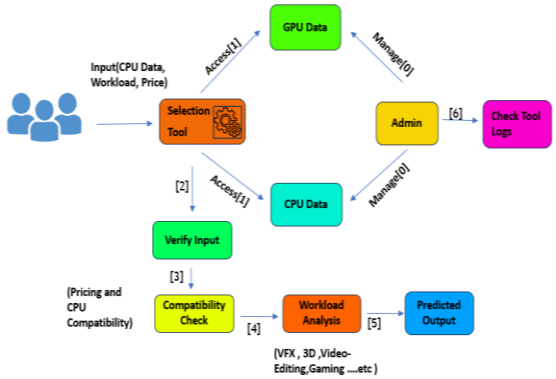

Fig 1 System Architecture

ACTIVITY DIAGRAM

Activity Diagrams in UML serve to visually represent dynamic workflows, showcasing the sequence and conditions of activities within a system or business process. The key components include nodes, representing actions or decisions, and transitions, illustrating the flow between these nodes. Initial and final nodes mark the activity's start and end. Control flows connect actions, specifying the order of execution, while decision nodes enable branching based on conditions. Forks and joins manage parallel flows, and swim lanes partition activities among different entities for clarity.

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

- **Nodes**: Represent actions or decisions.
- **Transitions:** Illustrate flow between nodes.
- **Initial and Final Nodes:** Indicate activity start and end.
- **Control Flows:** Connect actions, defining execution order.
- **Decision Nodes:** Facilitate branching based on conditions.

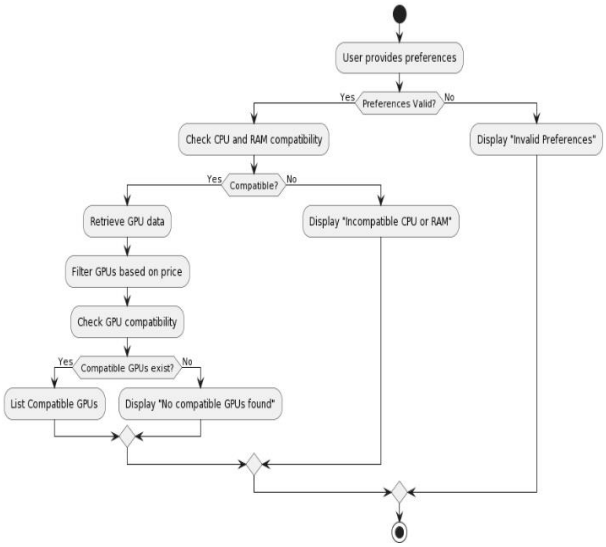

Fig 2 Represents Activity Diagram

4. OUTPUT SCREENS

Fig 3 . Represents Initial User Interface

The output screen represents the basic initial user interface shows all Input boxes that user can enter their data into.

Fig 4. Represents User Input Entry

The output screen shows how the user interface is accessed and input is taken.

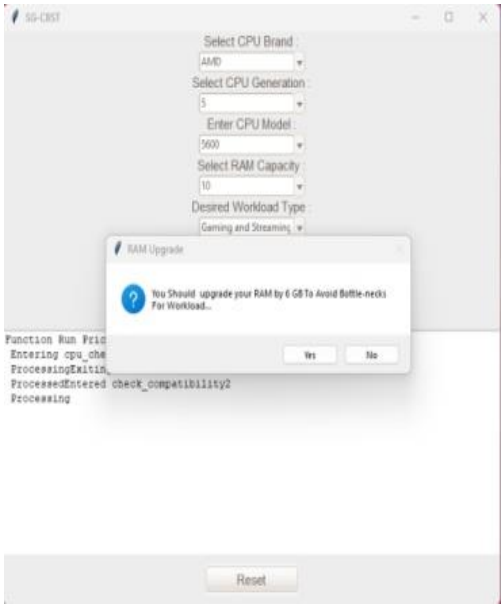

Fig 5 . Represents RAM Upgrade Suggestion

The output screen shows if users Ram is not compatible with the required workload specification, then user receives an error message showing Ram upgrade required .

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

Fig 6 . Represents Recommended List of Compatible GPU

The output screen shows all possible GPU models in the price range compatible with the user specifications.

Fig 7 . Represents Change in Price range for Various Suggestions

The above output screen shows all possible GPU models compatible with the user specifications in the changed price range for more options .

Fig 8 . Represents Price Range Exceeds More than a Range.

The above output screen shows an Error Message mentioning no compatible GPUs in the price range if it exceeds the range in compatible GPUs .

5. CONCLUSION

"Smart GPU: Workload-based Compatibility and Selection Tool (Smart GPU Tool)" is a user-friendly application that simplifies the intricate task of selecting compatible CPUs and GPUs for specific workloads. This tool provides data-driven recommendations based on user preferences, considering factors such as brand, generation, RAM capacity, workload type, and budget constraints. Leveraging a comprehensive dataset of CPU and GPU compatibility, the Smart GPU Tool ensures the seamless integration of selected components.

The system excels in evaluating CPU compatibility for diverse workloads, including AI, VR, and video editing. Its intuitive Tkinter-based interface allows users to input their preferences, generating a list of compatible GPUs and eliminating

uncertainty in hardware selection.

Furthermore, the Smart GPU Tool considers price ranges, empowering users to balance performance and cost-effectiveness. It filters out GPUs that may potentially bottleneck system performance, guaranteeing a smooth computing experience**.**

6. FUTURE ENHANCEMENTS

For future enhancements, Smart GPU: Workload-based Compatibility and Selection Tool envisions a more streamlined user experience. Integration of web scraping capabilities will automate data retrieval, eliminating manual input. A sophisticated recommendation engine, powered by machine learning, aims to provide personalized hardware suggestions. Additionally, plans include transforming the tool into a responsive web application, ensuring accessibility across various devices. These advancements promise a more intelligent, user-friendly, and widely accessible tool for optimal CPU-GPU compatibility and selection.

7. REFERENCES

1. IT Optimization: Challenges, Examples, and Strategy" - LeanIX .
2. Hardware and Software Selection - Tutorials point.
3. Web Scraping Guide: Best Practices and Guidelines" – Pluralsight.
4. Python GUI Programming with Tkinter - Real Python.
5. Create UI using Tkinter in Python – Tutorials Teacher .
6. Graphics Card Compatibility – Here's How to Check - GPU Mag (2023).
7. Safe, Seamless, And Scalable Integration of Asynchronous GPU Streams In PETSc - arXiv (2023) .