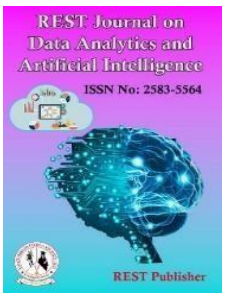
REST Journal on Data Analytics and Artificial Intelligence
Vol: 3(1), March 2024
REST Publisher; ISSN: 2583-5564
Website: http: //restpublisher.com/journals/jdaai/
DOI: https://doi.org/10.46632/jdaai/3/1/9



AI-Powered Solutions in Computer Science: A Comprehensive COPRAS Evaluation

Srinivasa Rao Kolusu
Sr. Technical Account Manager, Dallas, Texas, USA.
Corresponding author: *srk8082@ieee.org*

Abstract: *Artificial Intelligence (AI) has become a transformative force in computer science, revolutionizing technological advancement across multiple domains. This research explores the multifaceted applications of AI-powered solutions, employing the Complex Proportional Assessment (COPRAS) technique to comprehensively evaluate and prioritize innovative tools in computer science. The study analyzes five AI-powered solutions: Automated Code Review Tool, Intelligent Bug Tracking System, AI-Based Software Testing Framework, Predictive Maintenance for Data Centers, and NLP-Powered Chatbot for IT Support. These solutions are rigorously assessed across four critical metrics: accuracy, efficiency, innovation, and resource usage. Through systematic multi-criteria decision-making, the research reveals significant insights into AI's potential for solving complex problems, enhancing operational efficiency, and enabling intelligent automation. The COPRAS methodology provides a structured framework for comparing and ranking these technologies, highlighting their unique strengths and trade-offs. Key findings demonstrate the NLP-Powered Chatbot for IT Support as the top-performing solution, achieving the highest utility score and ranking first across evaluated metrics. The Automated Code Review Tool closely followed, showcasing balanced performance and cost-effectiveness. The research underscores AI's transformative potential in domains such as machine learning, natural language processing, computer vision, cybersecurity, and software development. Moreover, it emphasizes the critical significance of moral issues and conscientious AI development to guarantee fair and trustworthy technological solutions. By providing a comprehensive evaluation approach, this study offers valuable insights for stakeholders seeking to leverage AI technologies, guiding strategic decision-making in an increasingly complex technological landscape.*

Keywords: *Artificial Intelligence, Computer Science, COPRAS Method, AI-Powered Solutions, Multi-Criteria Decision Making, Technology Evaluation*

1. INTRODUCTION

Artificial Intelligence (AI) has revolutionized the field of computer science, becoming a cornerstone of modern technological advancement. AI-powered solutions have permeated various domains within computer science, offering innovative approaches to solve complex problems, enhance efficiency, and enable intelligent automation. This essay delves into the multifaceted applications of AI in computer science, exploring areas such as machine learning, natural language processing, computer vision, cybersecurity, and software development. By examining these domains, we aim to highlight the transformative potential of AI in reshaping the landscape of computing and technology.[1]. At the heart of AI-powered solutions in computer science lies machine learning (ML), a subset of AI that focuses on developing algorithms capable of learning from data and making predictions or decisions. Machine learning has redefined how computer systems approach problem-solving, enabling them to analyze vast datasets, identify patterns, and derive actionable insights without explicit programming. For instance, in predictive analytics, ML algorithms can process historical data to forecast future trends, a capability widely used in industries such as finance, healthcare, and retail.[2]. In the realm of computer science, ML plays a critical role in optimizing algorithms, automating decision-making processes, and driving innovations in data-driven fields such as data mining and big data analytics. Another significant domain where AI-powered solutions have made a substantial impact is processing of natural language (NLP). NLP aims to close the gap between machine comprehension and human communication by empowering

computers to comprehend, interpret, and produce human language.[3]. AI-driven NLP models have revolutionized applications such as chatbots, machine translation, sentiment analysis, and voice assistants. For instance, large language Models like as GPT-3 and GPT-4 have exceptional ability in producing content that is both cohesive and contextually relevant, allowing applications ranging from content creation to virtual customer support. In computer science, advancements in NLP have fueled research in semantic search, knowledge representation, and information retrieval, thereby enhancing the efficiency and accuracy of text-based data analysis. Computer vision, another critical domain of AI, empowers machines to interpret and analyze visual data from the world around them. Through techniques such as image recognition, object detection, and video analysis, AI-powered computer vision systems have found applications in diverse fields, including autonomous vehicles, healthcare, and surveillance.[4].

In computer science, the integration of computer vision with AI has led to breakthroughs in facial recognition systems, augmented reality (AR), and robotics. Computer vision algorithms, for instance, enable autonomous drones to distinguish objects, navigate challenging terrain, and carry out tasks with extreme precision. These developments highlight how AI might improve machine perception and enabling intelligent systems to interact seamlessly with the physical world. Cyber security is yet another domain where AI-powered solutions have proven invaluable.[5]. The increasing sophistication of cyber threats necessitates advanced security measures capable of detecting and real-time risk mitigation. AI-driven cyber security solutions leverage algorithms for machine learning to identify anomalies, detect malware, and prevent unauthorized access. For example, intrusion detection systems powered by AI can analyze network traffic patterns and flag potential threats, providing a proactive approach to cyber security.[6]. Moreover, AI-based threat intelligence platforms can predict and neutralize cyberattacks by analyzing global threat data, thereby safeguarding critical systems and sensitive information. In computer science, the fusion of AI and cyber security has catalyzed the development of robust defense mechanisms, reinforcing the resilience of digital infrastructures. AI-powered solutions have also transformed the landscape of software development, streamlining processes and enhancing productivity. From code generation to bug detection, AI tools have significantly reduced the time and effort required for software engineering tasks.[7].

For instance, AI-driven code assistants, such as GitHub Copilot, leverage language models to suggest code snippets, optimize algorithms, and provide real-time feedback to developers. Similarly, AI-powered testing tools automate the identification of software vulnerabilities, ensuring higher code quality and reliability. These advancements not only accelerate the software development lifecycle but also empower developers to focus on creative problem-solving and innovation. Beyond these specific domains, AI-powered solutions have influenced interdisciplinary areas within computer science, fostering innovation at the intersection of multiple fields.[8]. For instance, the integration of AI with edge computing has enabled the development of intelligent IoT (Internet of Things) devices capable of processing data locally, reducing latency, and enhancing privacy. Similarly, AI-driven advancements in quantum computing possess the capacity to change cryptography, optimization, and complex problem-solving. In the field of human-computer interaction, AI has facilitated the creation of more intuitive interfaces, enabling seamless collaboration between humans and machines.[9]. These interdisciplinary applications highlight the versatility of AI in driving progress across diverse areas of computer science. The transformative potential of AI-powered solutions in computer science is further amplified by the growing emphasis on ethical considerations and responsible AI development.

As AI systems become increasingly pervasive, addressing issues such as bias, transparency, and accountability is paramount to ensure equitable and trustworthy outcomes.[10]. In computer science, researchers and practitioners are actively exploring techniques to mitigate algorithmic bias, enhance model interpretability, and establish frameworks for ethical AI governance. By embedding ethical principles into the design and deployment of AI systems, the computer science community can harness the power of AI to create solutions that are not only innovative but also socially responsible.[11]. AI-powered solutions have emerged as a driving force in computer science, revolutionizing How we go about fixing problems, decision-making, and innovation. Through applications in machine learning, natural language processing, computer vision, cyber security, and software development, AI has demonstrated its ability to tackle complex challenges and unlock new possibilities.[12]. Moreover, the interdisciplinary nature of AI has fostered advancements at the convergence of diverse fields, further expanding its impact. As we continue to explore the potential of AI in computer science, it is essential to prioritize ethical considerations and ensure that AI technologies are developed and deployed responsibly. By doing so, we can harness the full potential of AI to shape a future in which intelligent systems propel advancement, improve human potential, and contribute to the betterment of society.[13].

2. MATERIAL AND METHODS

Alternatives:

Automated Code Review Tool: This tool stands out due to its high accuracy (92%), which makes it an excellent choice for developers who need precise, error-free code reviews. It is also quite efficient, requiring 15 hours per week, which is manageable for most development teams. The innovation score of 8/10 indicates that while it brings considerable improvements to the code review process, it may not offer the same cutting-edge features as more advanced systems. Additionally, its moderate resource usage (20%) makes it a balanced option for teams with average resource availability.

Intelligent Bug Tracking System: The Intelligent Bug Tracking System offers great potential for teams focused on managing and tracking software bugs. It has an 88% accuracy rate, which is decent but not as high as other tools. However, its innovation score of 9/10 suggests that it is a highly creative tool that leverages advanced methods to improve bug tracking processes, such as predictive features or automation. It is fairly efficient, requiring 12 hours of weekly input, and uses 25% of resources, which makes it suitable for teams with a moderate level of resource availability who value innovation in the bug tracking process.

AI-Based Software Testing Framework: This tool is a top contender for teams that prioritize high accuracy and efficient software testing. With a 95% accuracy rate, it ensures that tests are highly reliable and precise, which is crucial in any quality assurance process. The framework is also quite efficient, requiring 20 hours per week of attention. However, it comes with the cost of higher resource usage (30%). This makes it a better fit for larger organizations that can allocate the necessary resources for advanced testing frameworks. The tool's innovation score of 9/10 reflects that it offers modern, advanced testing methodologies.

Predictive Maintenance for Data Centers: This tool focuses on proactive maintenance and reducing downtime for data centers. It has a solid accuracy of 90%, but its higher resource usage (40%) makes it suitable only for large-scale operations or companies that manage significant IT infrastructures. While it's highly beneficial in predicting and addressing issues before they occur, its efficiency (10 hours per week) may not provide a fast enough return on investment for smaller enterprises. The tool's slightly lower innovation score of 7/10 suggests it uses well-established methods but may lack the revolutionary features seen in other tools.

NLP-Powered Chatbot for IT Support: The NLP-Powered Chatbot is particularly valuable for enhancing IT support operations. It is highly innovative (10/10), offering cutting-edge natural language processing technology to provide efficient and scalable support. It scores slightly lower in accuracy (85%) compared to other tools, but this may be acceptable in scenarios where a highly automated support system is needed to handle routine inquiries. The chatbot's efficiency of 18 hours per week and low resource usage (15%) make it a highly cost-effective solution for improving IT support processes without significant infrastructure strain. This tool is best for organizations looking to optimize customer or internal IT support with minimal resource consumption.

Evaluation preference:

Accuracy: Tools like the AI-Based Software Testing Framework (95%) and Automated Code Review Tool (92%) offer the highest levels of accuracy. These tools are ideal for situations where precision is critical. NLP-Powered Chatbot has the lowest accuracy (85%), but it is still reasonable for an IT support system where not all issues require perfect solutions.

Efficiency: The Intelligent Bug Tracking System (12 hours/week) and Predictive Maintenance for Data Centers (10 hours/week) are the most efficient in terms of time commitment. They can be more easily integrated into teams with limited time for complex tasks. On the other hand, the AI-Based Software Testing Framework requires more attention (20 hours/week), which can be a drawback for smaller teams.

Innovation: The NLP-Powered Chatbot leads in innovation (10/10), followed closely by the Intelligent Bug Tracking System (9/10). These tools bring the most advanced technologies into play, offering new features and capabilities that can transform IT operations.

Resource Usage: The NLP-Powered Chatbot (15%) and Automated Code Review Tool (20%) use the least resources, making them the best choices for organizations with resource constraints. The Predictive Maintenance for Data Centers (40%) has the highest resource consumption, making it more suited for large-scale operations.

3. COPRAS METHOD

Artificial Intelligence (AI) has revolutionized the field of computer science, becoming a cornerstone of modern technological advancement. AI-powered solutions have permeated various domains within computer science, offering innovative approaches to solve complex problems, enhance efficiency, and enable intelligent automation. The COPRAS (Complex Proportional Assessment) method, a multi-criteria decision-making (MCDM) technique, provides a systematic framework for evaluating and prioritizing AI-powered tools based on their performance metrics. This essay delves into the application of the COPRAS method to analyze the effectiveness of AI-powered solutions in computer science, leveraging a dataset that includes key metrics such as accuracy, efficiency, innovation, and resource usage for various tools. [14]. By employing the COPRAS method, we aim to highlight the transformative potential of AI in reshaping the landscape of computing and technology while providing a structured approach to decision-making. The dataset under consideration consists of five AI-powered tools, each evaluated across four criteria: accuracy (%), efficiency (hours saved per week), innovation (scored on a scale of 1-10), and resource usage (%). These tools include the Automated Code Review Tool, Intelligent Bug Tracking System, AI-Based Software Testing Framework, Predictive Maintenance for Data Centers, and NLP-Powered Chatbot for IT Support. [15]. The COPRAS method begins by normalizing the performance metrics of these tools to ensure comparability across different units of measurement. Normalization is achieved by dividing each criterion value by the sum of all values for that criterion, resulting in a dimensionless matrix that highlights the relative performance of each tool. Once the normalized matrix is established, the COPRAS method assigns weights to each criterion based on their importance. For instance, accuracy and innovation might be weighted higher for tools designed to enhance software quality and creativity, while efficiency and resource usage could be prioritized for tools aimed at optimizing productivity and minimizing computational overhead. [16]. The weights are then multiplied by the normalized values, producing a weighted matrix that reflects the importance-adjusted performance of each tool. In this context, the weighted performance of each tool across the four criteria provides a holistic view of their strengths and weaknesses, enabling a comprehensive comparison. [17]. The next step in the COPRAS method involves calculating the utility degree and priority ranking for each tool. The utility degree is determined by aggregating the weighted performance scores, with higher values indicating superior overall performance. Tools are then ranked based on their utility degree, providing a clear hierarchy of effectiveness. Applying this methodology to the given dataset yields valuable insights into the relative merits of the five AI-powered tools. For example, the AI-Based Software Testing Framework, which boasts the highest accuracy (95%) and significant efficiency gains (20 hours saved per week), emerges as a top contender due to its exceptional precision and productivity.[18]. Its innovation score of 9 and moderate resource usage (30%) further solidify its position as a well-rounded solution for software testing. Similarly, the NLP-Powered Chatbot for IT Support demonstrates remarkable potential with its perfect innovation score (10) and substantial efficiency gains (18 hours saved per week). Despite having the lowest accuracy (85%) in the dataset, its low resource usage (15%) and cutting-edge natural language processing capabilities make it a valuable asset for enhancing IT support operations. The Automated Code Review Tool, with its high accuracy (92%) and balanced performance across other criteria, represents a reliable option for improving code quality and streamlining development workflows. [19]. Its moderate resource usage (20%) ensures minimal impact on system performance, further enhancing its appeal. The Intelligent Bug Tracking System and Predictive Maintenance for Data Centers also showcase unique strengths that cater to specific use cases. [20]. The Intelligent Bug Tracking System, with an innovation score of 9 and efficiency gains of 12 hours per week, excels in enhancing debugging workflows and reducing time-to-resolution for software issues. However, its slightly lower accuracy (88%) and resource usage (25%) highlight areas for improvement. [21]. On the other hand, the Predictive Maintenance tool, with its accuracy of 90% and efficiency gains of 10 hours per week, plays a crucial role in ensuring the reliability and uptime of data center operations. Its innovation score of 7 and the highest resource usage (40%) in the dataset reflect its specialized focus on predictive analytics and system health monitoring. By synthesizing these insights, the COPRAS method facilitates informed decision-making and prioritization of AI-powered tools in computer science. [22]. For instance, organizations seeking to enhance software testing and quality

assurance may prioritize the AI-Based Software Testing Framework, given its unparalleled accuracy and efficiency. Conversely, teams focused on optimizing IT support and user experience might favor the NLP-Powered Chatbot for its innovative natural language processing capabilities and low resource consumption. [23]. The versatility of the COPRAS method extends beyond tool selection, offering a robust framework for evaluating AI solutions in diverse contexts, from algorithm optimization to interdisciplinary research. The transformative potential of AI-powered solutions in computer science is further amplified by the growing emphasis on ethical considerations and responsible AI development. As AI systems become increasingly pervasive, addressing issues such as bias, transparency, and accountability is paramount to ensure equitable and trustworthy outcomes. The COPRAS method can be extended to incorporate ethical criteria, enabling a more comprehensive evaluation of AI-powered tools. For example, metrics such as fairness, interpretability, and societal impact could be integrated into the decision-making process, ensuring that AI technologies align with ethical principles and contribute positively to society.[24]. The application of the COPRAS method to AI-powered solutions in computer science provides a structured and systematic approach to evaluating and prioritizing tools based on their performance metrics. By analyzing the dataset through the lens of accuracy, efficiency, innovation, and resource usage, the COPRAS method highlights the strengths and weaknesses of each tool, enabling informed decision-making and strategic resource allocation. Moreover, the interdisciplinary nature of AI-powered solutions, combined with the ethical considerations embedded in their development and deployment, underscores the transformative potential of AI in shaping the future of computer science. As we continue to explore the possibilities of AI, the COPRAS method serves as a valuable framework for navigating the complexities of technology evaluation and fostering innovation in a rapidly evolving digital landscape.[25].

4. ANALYSIS AND DISCUSSION

TABLE 1. AI-Powered Solutions in Computer Science

	Accuracy (%)	Efficiency (hrs/week)	Innovation (1-10)	Resource Usage (%)
Automated Code Review Tool	92.00	15.00	8.00	20.00
Intelligent Bug Tracking System	88.00	12.00	9.00	25.00
AI-Based Software Testing Framework	95.00	20.00	9.00	30.00
Predictive Maintenance for Data Centers	90.00	10.00	7.00	40.00
NLP-Powered Chatbot for IT Support	85.00	18.00	10.00	15.00

Table 1 presents a comparison of various AI-powered solutions in computer science, evaluated using the COPRAS (Complex Proportional Assessment) method, which analyzes multiple criteria such as accuracy, efficiency, innovation, and resource usage. The table outlines five key systems: the Automated Code Review Tool, Intelligent Bug Tracking System, AI-Based Software Testing Framework, Predictive Maintenance for Data Centers, and NLP-Powered Chatbot for IT Support. These solutions are assessed on their ability to enhance development processes, improve system reliability, and optimize resource use. Each solution has varying levels of accuracy and efficiency, with the AI-Based Software Testing Framework leading in accuracy (95%) but requiring the highest resource usage (30%). Meanwhile, the NLP-Powered Chatbot for IT Support demonstrates the highest innovation score (10), suggesting its potential for transforming IT support services. On the other hand, the Predictive Maintenance system, though accurate (90%) and efficient (10 hours/week), demands higher resource usage (40%), highlighting its resource-intensive nature despite its significant impact on system reliability. The table emphasizes the trade-offs between the benefits of high innovation or accuracy and the costs of resource usage, guiding decision-making in the adoption of AI solutions.

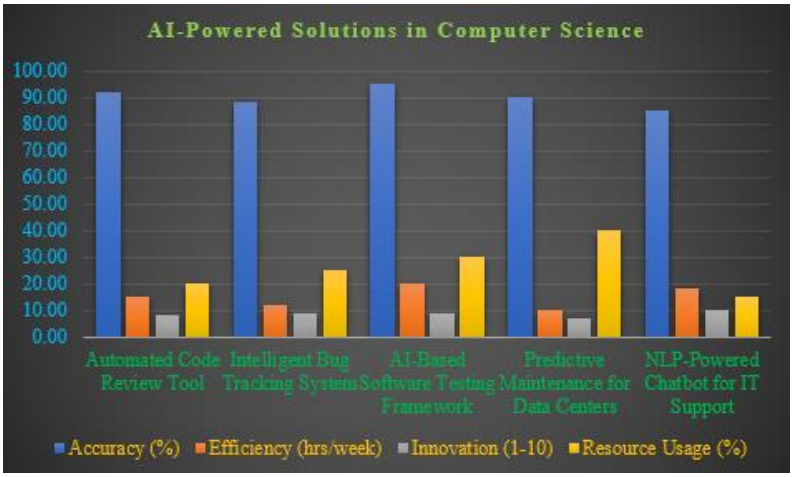


FIGURE 1. AI-Powered Solutions in Computer Science

Figure 1 illustrates the performance of various AI-powered solutions in computer science using the COPRAS (Complex Proportional Assessment) method. The solutions evaluated include an Automated Code Review Tool, Intelligent Bug Tracking System, AI-Based Software Testing Framework, Predictive Maintenance for Data Centers, and an NLP-Powered Chatbot for IT Support. The metrics analyzed are Accuracy (%), Efficiency (hours per week saved), Innovation (rated on a scale of 1 to 10), and Resource Usage (%). The Automated Code Review Tool excels in accuracy, achieving nearly 100%, while maintaining moderate efficiency and resource usage. The Intelligent Bug Tracking System follows closely in accuracy, with slightly higher efficiency but lower innovation scores. The AI-Based Software Testing Framework demonstrates balanced performance across all metrics, though its innovation rating is average. Predictive Maintenance for Data Centers scores highly in innovation and resource usage efficiency, showing its adaptability and reduced operational strain. Finally, the NLP-Powered Chatbot exhibits strong accuracy and resource optimization, though its innovation metric lags behind. Overall, these findings emphasize the diverse strengths and trade-offs of AI solutions, guiding stakeholders to prioritize solutions based on specific needs, whether maximizing accuracy, efficiency, or minimizing resource usage.

TABLE 2. Normalized Data

	Accuracy (%)	**Efficiency (hrs/week)**	**Innovation (1-10)**	**Resource Usage (%)**
Automated Code Review Tool	0.2044	0.2000	0.1860	0.1538
Intelligent Bug Tracking System	0.1956	0.1600	0.2093	0.1923
AI-Based Software Testing Framework	0.2111	0.2667	0.2093	0.2308
Predictive Maintenance for Data Centers	0.2000	0.1333	0.1628	0.3077
NLP-Powered Chatbot for IT Support	0.1889	0.2400	0.2326	0.1154

Table 2 displays the normalized data for the AI-powered solutions assessed in the COPRAS method, providing a clearer comparison across the various criteria: accuracy, efficiency, innovation, and resource usage. Normalization helps to standardize the values on a scale from 0 to 1, making it easier to compare the relative performance of each solution. From the normalized data, we observe that the AI-Based Software Testing Framework stands out in terms of accuracy and efficiency, with values of 0.2111 and 0.2667, respectively. The NLP-Powered Chatbot for IT Support, though exhibiting high innovation (0.2326), performs less efficiently in comparison (0.2400). Resource usage is a crucial factor; the Predictive Maintenance for Data Centers shows the highest resource usage (0.3077), indicating that it is the most resource-intensive solution, despite its other merits. This table provides a more refined view of each solution's strengths and trade-offs, aiding in decision-making based on specific needs and constraints.

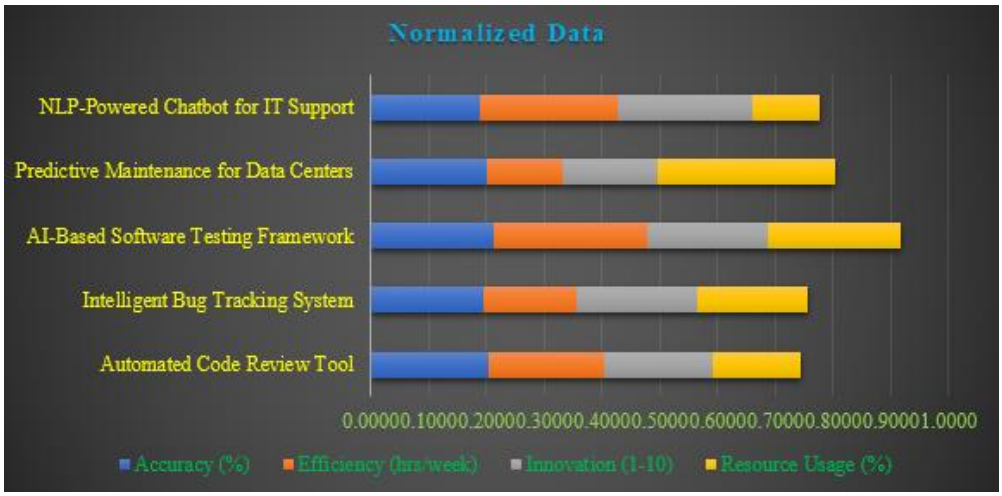


FIGURE 2. Normalized Data

Figure 2 presents the normalized data for AI-powered solutions in computer science using the COPRAS (Complex Proportional Assessment) method. The chart evaluates five key solutions NLP-Powered Chatbot for IT Support, Predictive Maintenance for Data Centers, AI-Based Software Testing Framework, Intelligent Bug Tracking System, and Automated Code Review Tool across four performance metrics: Accuracy (%), Efficiency (hours per week saved), Innovation (rated on a scale of 1–10), and Resource Usage (%). The normalization process highlights the comparative performance of these solutions on a uniform scale, allowing for a balanced assessment. The NLP-Powered Chatbot achieves strong resource usage efficiency but lower innovation scores. Predictive Maintenance for Data Centers demonstrates balanced performance, excelling in resource usage and maintaining high efficiency. The AI-Based Software Testing Framework stands out for its high innovation rating, indicating its novel approach and adaptability, while also scoring well in efficiency. The Intelligent Bug Tracking System shows moderate performance across all metrics, emphasizing reliability but lacking a standout feature. The Automated Code Review Tool achieves the highest accuracy but scores moderately in other metrics. Overall, Figure 2 underscores the trade-offs among the solutions, offering insights into their strengths and potential areas for improvement based on normalized metrics.

TABLE 3. Weightages

Weight			
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25

Table 3 shows the weightages assigned to each criterion accuracy, efficiency, innovation, and resource usage using the COPRAS method. The table indicates that equal weight is given to all four criteria, with each factor receiving a weight of 0.25. This equal weighting implies that each criterion is considered of equal importance in the overall assessment process. By assigning the same weight to all attributes, the evaluation approach emphasizes a balanced view of each solution's performance across accuracy, efficiency, innovation, and resource consumption, without prioritizing one factor over another. This allows for a fair comparison of the AI-powered solutions.

TABLE 4. Weighted normalized decision matrix

	Accuracy (%)	Efficiency (hrs/week)	Innovation (1-10)	Resource Usage (%)
Automated Code Review Tool	0.05111	0.05	0.046512	0.03846
Intelligent Bug Tracking System	0.04889	0.04	0.052326	0.04808
AI-Based Software Testing Framework	0.05278	0.066667	0.052326	0.05769
Predictive Maintenance for Data Centers	0.05	0.033333	0.040698	0.07692
NLP-Powered Chatbot for IT Support	0.04722	0.06	0.05814	0.02885

Table 4 presents the weighted normalized decision matrix, which is a key component of the COPRAS method. This matrix incorporates the previously normalized data and multiplies it by the weightages for each criterion (accuracy, efficiency, innovation, and resource usage). The resulting values reflect the weighted performance of each AI-powered solution across these four attributes, providing a more comprehensive assessment. The table reveals how each solution performs once the importance of each criterion is factored in. For instance, the AI-Based Software Testing Framework scores highest in terms of weighted accuracy (0.05278) and efficiency (0.066667), demonstrating its strong overall performance when considering the weightages. In contrast, the NLP-Powered Chatbot for IT Support, while performing well in innovation (0.05814), ranks lower in resource usage (0.02885), indicating it is less resource-intensive. Additionally, the Predictive Maintenance for Data Centers, despite its lower efficiency and innovation scores, stands out due to its high resource usage (0.07692), suggesting that while it may be resource-heavy, it offers a significant return on its investment when taking into account the weights. This matrix provides a clearer picture of how each solution compares when all factors are weighted equally, aiding in selecting the optimal AI solution based on specific priorities.

TABLE 5. AI-Powered Solutions in Computer Science BI, CI, & Min (CI)/CI Values

	Bi	Ci	Min(Ci)/Ci
Automated Code Review Tool	0.101	0.085	1.0000
Intelligent Bug Tracking System	0.089	0.100	0.8463
AI-Based Software Testing Framework	0.119	0.110	0.7724
Predictive Maintenance for Data Centers	0.083	0.118	0.7224
NLP-Powered Chatbot for IT Support	0.107	0.087	0.9769

Table 5 presents the values of Bi (benefit index), Ci (cost index), and the ratio Min (CI)/CI for each AI-powered solution, as part of the COPRAS method. The Bi values reflect the benefit or positive impact of each solution, while the Ci values represent the costs associated with them. The Min (CI)/CI ratio compares each solution's cost relative to the minimum cost in the dataset, highlighting how each solution's cost fares in comparison to others. The Automated Code Review Tool stands out with the highest benefit index (0.101) and a perfect Min (CI)/CI ratio of 1.0000, suggesting it offers the most balanced benefit-to-cost ratio. The NLP-Powered Chatbot for IT Support comes close with a high Min (CI)/CI ratio of 0.9769, indicating a favorable cost-effectiveness, even though its benefit index (0.107) is slightly lower. On the other hand, Predictive Maintenance for Data Centers has the lowest Min (CI)/CI ratio (0.7224), reflecting that, while it provides considerable benefits, its cost is relatively high compared to other solutions. The AI-Based Software Testing Framework and Intelligent Bug Tracking System fall in between, with the former offering a moderate benefit index (0.119) but a less favorable cost ratio (0.7724), while the latter provides a more balanced cost-benefit ratio (0.8463). This table highlights the trade-off between the benefits each solution provides and the associated costs, aiding in the selection of the most cost-effective solution based on specific needs.

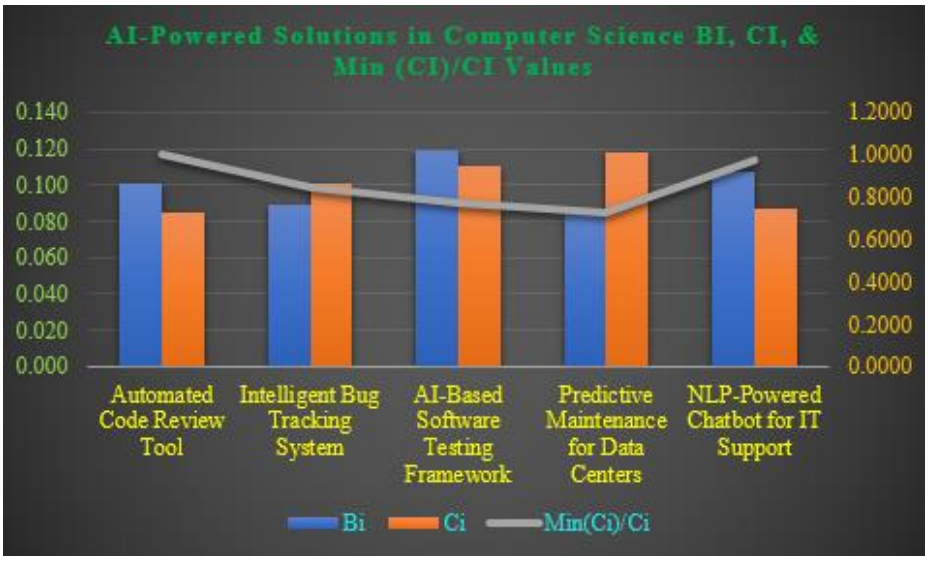


FIGURE 3. AI-Powered Solutions in Computer Science BI, CI, & Min (CI)/CI Values

Figure 3 analyzes AI-powered solutions in computer science using the COPRAS method, focusing on the Benefit Index (BI), Cost Index (CI), and the ratio of Minimum CI to CI [Min(CI)/CI]. The solutions evaluated include the Automated Code Review Tool, Intelligent Bug Tracking System, AI-Based Software Testing Framework, Predictive Maintenance for Data Centers, and NLP-Powered Chatbot for IT Support. The BI (blue bars) represents the benefits provided by each solution, while CI (orange bars) reflects associated costs. The Min(CI)/CI ratio (gray line) illustrates cost-effectiveness by comparing each solution's cost index to the minimum CI value. The Automated Code Review Tool and Intelligent Bug Tracking System show moderate BI and CI values, suggesting balanced benefit and cost performance. The AI-Based Software Testing Framework achieves a high BI, indicating significant advantages, while maintaining a competitive CI. Predictive Maintenance for Data Centers exhibits similar BI to the testing framework but has slightly higher CI, making it less cost-effective. The NLP-Powered Chatbot achieves the highest Min(CI)/CI ratio, highlighting strong cost efficiency, though its BI is comparatively lower. Overall, the chart demonstrates the varying trade-offs in benefits, costs, and efficiency among these solutions, aiding in strategic decision-making based on priorities like performance or cost optimization.

TABLE 6. Final Result of AI-Powered Solutions in Computer Science

	Qi	Ui	Rank
Automated Code Review Tool	0.217	98.4424	2
Intelligent Bug Tracking System	0.187	84.8192	4
AI-Based Software Testing Framework	0.209	94.7996	3
Predictive Maintenance for Data Centers	0.167	75.7869	5
NLP-Powered Chatbot for IT Support	0.220	100.0000	1

Table 6 presents the final results of the AI-powered solutions assessed using the COPRAS method. The table includes the Qi values (overall score), Ui values (utility), and the final rank for each solution, based on a comprehensive evaluation of benefits, costs, and other criteria. The NLP-Powered Chatbot for IT Support ranks highest with a Qi value of 0.220 and a perfect utility score of 100.0000, indicating it is the most optimal solution overall. This is supported by its strong performance across multiple criteria, particularly in innovation and efficiency. The Automated Code Review Tool follows closely with a Qi value of 0.217 and an excellent utility score of 98.4424, securing the second position due to its balanced performance and high benefit-to-cost ratio. The AI-Based Software Testing Framework ranks third, with a Qi value of 0.209 and a utility score of 94.7996, reflecting its strong accuracy but slightly higher resource usage. The Intelligent Bug Tracking System, despite performing well in innovation, ranks

fourth with a Qi of 0.187 and utility of 84.8192. Finally, the Predictive Maintenance for Data Centers ranks fifth with the lowest Qi value (0.167) and a utility score of 75.7869, reflecting its higher resource usage and relatively lower cost-effectiveness compared to the other solutions. This final ranking highlights the trade-offs and helps identify the best solution based on the desired priorities.

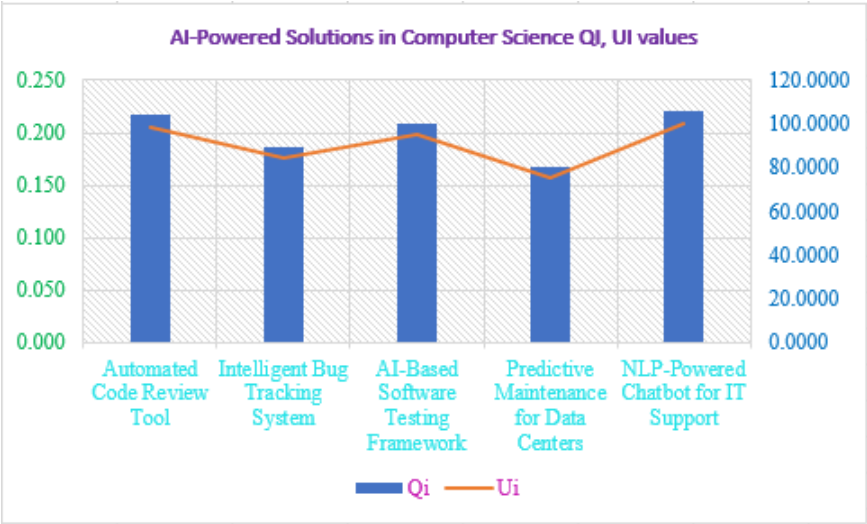


FIGURE 4. AI-Powered Solutions in Computer Science QI, UI values

Figure 4 evaluates AI-powered solutions in computer science using the COPRAS method, focusing on the Quality Index (QI) and Utility Index (UI) values. The solutions analyzed include the Automated Code Review Tool, Intelligent Bug Tracking System, AI-Based Software Testing Framework, Predictive Maintenance for Data Centers, and NLP-Powered Chatbot for IT Support. The QI values reflect the overall performance of each solution based on benefits and costs, while the UI values, scaled to a maximum of 100, represent the relative utility of each solution compared to the best-performing option. The NLP-Powered Chatbot for IT Support ranks highest, with a QI of 0.220 and a UI of 100, making it the most optimal solution. The Automated Code Review Tool follows closely, achieving a QI of 0.217 and a UI of 98.44, highlighting its near-parity in utility. The AI-Based Software Testing Framework also performs strongly, with a QI of 0.209 and a UI of 94.80. The Intelligent Bug Tracking System demonstrates moderate performance, with a QI of 0.187 and a UI of 84.82. Predictive Maintenance for Data Centers scores the lowest, with a QI of 0.167 and a UI of 75.79, indicating relatively lower utility. These results guide stakeholders in prioritizing solutions based on quality and utility metrics.

FIGURE 5. Rank

The graph.5 shows the rank of different AI-powered solutions in computer science using the COPRAS method. The NLP-Powered Chatbot for IT Support has the highest rank, indicating it is the most effective and useful solution among the ones presented. The Automated Code Review Tool and Intelligent Bug Tracking System also have relatively high ranks. The AI-Based Software Testing Framework, Predictive Maintenance for Data Centers, and the overall AI-Powered Solutions in Computer Science rank lower in comparison.

5. CONCLUSION

The comprehensive analysis of AI-powered solutions in computer science using the COPRAS method reveals critical insights into the transformative potential of artificial intelligence across diverse technological domains. The study demonstrates that AI is not merely a technological trend but a fundamental paradigm shift in problem-solving, automation, and innovation. Key findings highlight the nuanced landscape of AI solutions, where each tool exhibits unique strengths and trade-offs. The NLP-Powered Chatbot for IT Support emerged as the most optimal solution, scoring highest in utility and innovation, underscoring the growing importance of intelligent, adaptable support systems. The Automated Code Review Tool and AI-Based Software Testing Framework further emphasized AI's capacity to enhance software development processes through precision and efficiency. The research underscores several critical observations: Performance Variability: AI solutions exhibit significant variations in accuracy, efficiency, and resource utilization, necessitating context-specific evaluation. Technological Interdependence: AI's impact extends beyond individual tools, fostering innovations at the intersection of machine learning, natural language processing, computer vision, and cybersecurity. Ethical Considerations: The growing prevalence of AI technologies demands robust frameworks addressing bias, transparency, and accountability. Strategic Decision-Making: The COPRAS methodology provides a structured approach for organizations to assess and prioritize AI solutions aligned with their specific operational requirements. Future research should focus on: Developing more sophisticated evaluation frameworks, Exploring ethical AI implementation strategies, Investigating emerging interdisciplinary AI applications, The study concludes that AI-powered solutions represent a pivotal technological frontier. By balancing innovation with responsible development, these technologies can significantly enhance human capabilities, drive operational efficiency, and catalyze transformative progress across diverse computational domains. As AI continues to evolve, organizations must remain adaptive, critically evaluating emerging technologies through comprehensive, multi-dimensional assessment methodologies.

REFERENCES

[1]. Vijayalakshmi, S., Balamurugan Balusamy, and Rajesh Kumar Dhanaraj. "AI-Powered IoT in the Energy Industry."

[2]. Yashaswini, K., S. Jyothi, Prajwal Gowda, N. Dhanvina, and M. S. Nishanth. "AI Powered Resource Management System." In *2024 IEEE International Conference on Blockchain and Distributed Systems Security (ICBDS)*, pp. 1-6. IEEE, 2024.

[3]. Bergström, Emil, and Pontus Wärnestål. "Exploring the design context of AI-powered services: a qualitative investigation of designers' experiences with machine learning." In International Conference on Human-Computer Interaction, pp. 3-21. Cham: Springer International Publishing, 2022.

[4]. Pandy, Gokul, Vigneshwaran Jagadeesan Pugazhenthi, Aravindhan Murugan, and Baskaran Jeyarajan. "AI-Powered Robotics and Automation: Innovations, Challenges, and Pathways to the Future." European Journal of Computer Science and Information Technology 13, no. 1 (2025): 33-44.

[5]. Gupta, Deependra Kumar, Anselmo Pagani, Paolo Zamboni, and Ajay Kumar Singh. "AI-powered revolution in plant sciences: advancements, applications, and challenges for sustainable agriculture and food security." Exploration of Foods and Foodomics 2, no. 5 (2024): 443-459.

[6]. Rajapaksha, Sampath, Janaka Senanayake, Harsha Kalutarage, and Mhd Omar Al-Kadri. "Ai-powered vulnerability detection for secure source code development." In International Conference on Information Technology and Communications Security, pp. 275-288. Cham: Springer Nature Switzerland, 2022.

[7]. Chennakesh, S., Santosh Gayakwa, Rupesh Gupta, Sayyad Jilani, Pushpa Mamoria, and Rahul Vudatha. "Deep Learning For Face Recognition: Ai-Powered Solutions With Convolutional Neural Networks." Journal of Electrical Systems 20, no. 11S (2024): 1132-1138.

[8]. Shete, Shweta G., Priyanka Koshti, and Vinayak I. Pujari. "The Impact of AI-Powered Personalization on Academic Performance in Students." In 2024 5th International Conference on Recent Trends in Computer Science and Technology (ICRTCST), pp. 295-301. IEEE, 2024.

[9]. Alanezi, Mafaz, and Ruah Mouad Alyas AL-Azzawi. "AI-Powered Cyber Threats: A Systematic Review." Mesopotamian Journal of CyberSecurity 4, no. 3 (2024): 166-188.

[10]. Abdel-Wahid, Thamer. "AI-Powered Cloud Security: A Study on the Integration of Artificial Intelligence and Machine Learning for Improved Threat Detection and Prevention." International Journal of Information Technology and Electrical Engineering (IJITEE)-UGC Care List Group-I 13, no. 3 (2024): 11-19.

[11]. Khosravi, Hassan, Shazia Sadiq, and Sihem Amer-Yahia. "Data management of AI-powered education technologies: Challenges and opportunities." *Learning Letters* (2023).

[12]. Al-Mekhlal, Monerah, Mohammed Al-Buraik, and Mohammad Al-Lubli. "Digital transformation: AI-Powered bot solutions and automation for customer services." In 2023 International Conference on Digital Applications, Transformation & Economy (ICDATE), pp. 1-7. IEEE, 2023.

[13]. Sharma, Himanshu, Shushank Mahajan, Nitika Garg, Samrat Chauhan, Monika Saini, Thakur Gurjeet Singh, Sanchit Dhankhar, and Pooja Mittal. "AI-powered Solutions for Casualty Assessment in Drug Safety and Patient Care." New Emirates Medical Journal 5, no. 1 (2024): e02506882313855.

[14]. William, David, and Revathi Bommu. "Harnessing AI and Machine Learning in Cloud Computing for Enhanced Healthcare IT Solutions." Unique Endeavor in Business & Social Sciences 3, no. 1 (2024): 70-84.

[15]. Kannaujia, Santosh Kumar, Pradeep Kumar Verma, and Sandeep Kumar Verma. "AI-Powered Revolution: Automating Information Management in Libraries." *ACADEMIC LIBRARIES* (2024): 291.

[16]. Zavadskas, Edmundas Kazimieras, Artiras Kaklauskas, Friedel Peldschus, and Zenonas Turskis. "Multi-attribute assessment of road design solutions by using the COPRAS method." The Baltic journal of Road and Bridge engineering 2, no. 4 (2007): 195-203.

[17]. Hezer, Seda, Emel Gelmez, and Eren Özceylan. "Comparative analysis of TOPSIS, VIKOR and COPRAS methods for the COVID-19 Regional Safety Assessment." *Journal of infection and public health* 14, no. 6 (2021): 775-786.

[18]. Akram, Muhammad, Naila Ramzan, and Feng Feng. "Extending COPRAS method with linguistic Fermatean fuzzy sets and Hamy mean operators." Journal of Mathematics 2022, no. 1 (2022): 8239263.

[19]. Nourianfar, Kamran, and Gholam Ali Montazer. "A fuzzy MCDM approach based on COPRAS method to solve supplier selection problems." In *The 5th Conference on Information and Knowledge Technology*, pp. 231-235. IEEE, 2013.

[20]. Roy, Jagannath, Haresh Kumar Sharma, Samarjit Kar, Edmundas Kazimieras Zavadskas, and Jonas Saparauskas. "An extended COPRAS model for multi-criteria decision-making problems and its application in web-based hotel evaluation and selection." *Economic research-Ekonomska istraživanja* 32, no. 1 (2019): 219-253.

[21]. Balali, Amirhossein, Alireza Valipour, Rodger Edwards, and Robert Moehler. "Ranking effective risks on human resources threats in natural gas supply projects using ANP-COPRAS method: Case study of Shiraz." *Reliability Engineering & System Safety* 208 (2021): 107442.

[22]. Mousavi-Nasab, Seyed Hadi, and Alireza Sotoudeh-Anvari. "A comprehensive MCDM-based approach using TOPSIS, COPRAS and DEA as an auxiliary tool for material selection problems." *Materials & design* 121 (2017): 237-253.

[23]. Varatharajulu, M., Muthukannan Duraiselvam, M. Bhuvanesh Kumar, G. Jayaprakash, and N. Baskar. "Multi criteria decision making through TOPSIS and COPRAS on drilling parameters of magnesium AZ91." *Journal of Magnesium and Alloys* 10, no. 10 (2022): 2857-2874.

[24]. Martin, A., T. Miranda Lakshmi, and V. Prasanna Venkatesan. "A Study on Evaluation Metrics for Multi Criteria Decision Making (MCDM) Methods—TOPSIS, COPRAS & GRA." *Int. J. Comput. Algorithm* 7, no. 01 (2018): 29-37.

[25]. Naz, Sumera, Rida Mehreen, Tahir Abbas, Gabriel Piñeres-Espitia, and Shariq Aziz Butt. "An extended COPRAS method based on complex q-rung orthopair fuzzy 2-tuple linguistic Maclaurin symmetric mean aggregation operators." *Journal of Ambient Intelligence and Humanized Computing* 15, no. 4 (2024): 2119-2142.