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Artificial Intelligence for Monitoring Computer Hardware Performance: A Systematic Literature Review

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ABSTRACT

Advances in Artificial Intelligence (AI) have significantly contributed to the development of smarter, more adaptive, and data-driven computer hardware performance monitoring systems. The application of AI enables real-time monitoring, anomaly detection, and the prediction of potential device failures through a predictive maintenance approach. Although research on this topic continues to grow, there has not yet been a study that systematically integrates the findings of previous research. Therefore, this study aims to analyze the development of Artificial Intelligence applications in computer hardware performance monitoring systems through a Systematic Literature Review (SLR). The study was conducted in accordance with the PRISMA 2020 guidelines, using articles obtained from the Scopus, IEEE Xplore, ScienceDirect, and SpringerLink databases published between 2020 and 2026. The results of the selection process showed that 58 articles met the inclusion criteria and were analyzed further. The study found that Random Forest was the most widely used algorithm, followed by Convolutional Neural Networks (CNNs), Long Short-Term Memory (LSTMs), Support Vector Machines (SVMs), and Transformers. The most frequently monitored hardware parameters include CPU, temperature, RAM, GPU, power consumption, and SSD. Additionally, this study identifies various implementation challenges as well as opportunities for the development of Artificial Intelligence through integration with the Internet of Things (IoT), Edge Computing, and Explainable Artificial Intelligence (XAI). The results of this study are expected to serve as a reference for researchers and practitioners in developing more effective and reliable Artificial Intelligence-based hardware monitoring systems.

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1. INTRODUCTION

Advances in Artificial Intelligence (AI) over the past few years have brought about significant changes in various fields, including computer systems, networks, cloud computing, the Internet of Things (IoT), and data centers. AI's ability to process large amounts of data, recognize patterns, detect anomalies, and make predictions automatically makes this technology one of the primary solutions for improving the efficiency and reliability of modern computing systems. As the complexity of information technology infrastructure increases, the application of AI is no longer limited to automation processes but has also evolved into a supporting technology for data-driven decision-making capable of improving the performance and availability of computer system services (Sikki et al., 2026).

On the other hand, computer hardware has also seen rapid advancements. The emergence of multicore processors, Graphics Processing Units (GPUs), Solid State Drives (SSDs), high-

capacity memory, and various Internet of Things (IoT)-based devices has resulted in computing systems with increasingly powerful capabilities. However, these improvements in hardware performance have also been accompanied by greater complexity in managing computer resources. Various parameters—such as CPU usage, memory usage, device temperature, fan speed, storage device activity, and power consumption—need to be continuously monitored to ensure the system continues to operate optimally and to prevent disruptions that could lead to performance degradation or hardware failure (Hadriani et al., 2025).

Hardware performance monitoring is a critical aspect of computer system management because it plays a key role in maintaining system stability, reliability, and operational continuity. In modern computing environments—such as servers, data centers, cloud computing, and edge computing—monitoring is conducted to obtain real-time information about device status, enabling administrators to take swift action when disruptions occur. Advances in automated monitoring technology have led to the integration of Artificial Intelligence into monitoring systems to enhance the ability to analyze sensor data, detect abnormal conditions, and predict potential device failures before more serious damage occurs. This approach supports the implementation of predictive maintenance, thereby minimizing system downtime (F. A. Ramadhan & Sulistyanto, 2026).

Although various monitoring software solutions are available, most conventional systems still rely on threshold-based monitoring methods, which are reactive in nature (Pakpahan, 2026). These systems only issue notifications when a parameter's value exceeds a certain threshold, meaning administrators only become aware of a disruption after the problem has already occurred. Furthermore, the complex interrelationships among hardware parameters make conventional methods less capable of recognizing hidden patterns that could serve as early indicators of performance degradation or hardware failure. These conditions have spurred the development of various research studies that utilize artificial intelligence as a more adaptive and proactive approach to monitoring computer hardware performance (Wibowo et al., 2023).

Various studies have developed a wide range of artificial intelligence algorithms to improve the effectiveness of computer hardware monitoring. Machine learning algorithms, such as Support Vector Machines (SVMs), Random Forests, Decision Trees, and K-Nearest Neighbors, are widely used to classify device conditions and predict hardware failures. In addition, Deep Learning approaches, such as Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), and Long Short-Term Memory (LSTM) networks, are increasingly being applied due to their ability to analyze complex, sequential (time-series) monitoring data. More recent research has also begun to utilize Reinforcement Learning, Explainable Artificial Intelligence (XAI), and Large Language Models (LLMs) to enhance the capabilities of analysis, interpretation, and decision-making in hardware monitoring systems (Riyanto et al., 2026).

Although the number of studies on artificial intelligence for hardware monitoring continues to increase, most research still focuses on model development, improving algorithm accuracy, or testing performance on specific datasets. These studies generally evaluate only a single algorithm or a single type of hardware parameter, making it difficult to directly compare their results with those of other studies. Furthermore, the use of different datasets, testing environments, and evaluation metrics has prevented the formation of a comprehensive picture of research progress in this field. These conditions indicate that a study is still needed to integrate the results of various studies, thereby providing a more comprehensive understanding of the development of Artificial Intelligence in monitoring computer hardware performance (Alamsyah et al., 2026).

Based on these conditions, there are several research gaps that form the basis for this study. First, there has been little research that systematically synthesizes the development of Artificial Intelligence applications in computer hardware performance monitoring. Second, there is no comprehensive overview of the most widely used AI algorithms, the hardware parameters that are the focus of research, the evaluation methods applied, and the challenges of implementing Artificial Intelligence in hardware monitoring systems. Third, the direction of future research and opportunities in this field have not yet been fully identified through a systematic approach. Therefore, a study is needed to identify, evaluate, and synthesize published research findings to provide a more comprehensive overview of developments in this field (Bancong, 2025).

Based on this research gap, this study aims to conduct a Systematic Literature Review (SLR) of various studies on the application of Artificial Intelligence in monitoring computer hardware performance. This study is expected to identify trends in publications, the Artificial Intelligence algorithms used, the hardware parameters being monitored, the evaluation methods applied, implementation challenges, and opportunities for future research. The results of this study are

expected to provide an academic contribution as a reference for future researchers, as well as serve as a practical guide for developers of AI-based hardware monitoring systems (Razilu, 2025).

To achieve these objectives, this study formulates six Research Questions (RQs), namely: RQ1) How has research on Artificial Intelligence for monitoring computer hardware performance evolved? RQ2) Which Artificial Intelligence algorithms are most widely used in monitoring computer hardware performance? RQ3) Which computer hardware parameters are most frequently monitored using Artificial Intelligence? RQ4) What evaluation methods are used to measure the performance of Artificial Intelligence-based monitoring systems? RQ5) What are the challenges in implementing Artificial Intelligence for monitoring computer hardware performance? and RQ6) What are the research opportunities and future directions for the development of Artificial Intelligence in computer hardware monitoring? The answers to these questions are expected to provide a comprehensive overview of research developments and serve as a foundation for determining the direction of future research (Pasaribu et al., 2026).

2. METHODS

Research Design

This study employs a Systematic Literature Review (SLR) method to identify, evaluate, and synthesize research on the application of Artificial Intelligence in computer hardware performance monitoring systems. The SLR method was chosen because it provides a comprehensive overview of research developments, the algorithms used, the hardware parameters being monitored, evaluation methods, as well as research challenges and opportunities in this field. The research process adheres to the PRISMA 2020 guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), which consist of the following stages: identification, screening, eligibility, and inclusion. This approach ensures that the literature selection process is conducted systematically, transparently, and in a replicable manner, thereby producing a valid and accountable research synthesis (Sari et al., 2025).

Research Methodology

This research methodology was developed based on a Systematic Literature Review (SLR) approach, in accordance with the PRISMA 2020 guidelines. The research process was conducted systematically through several stages, beginning with the determination of the research topic, the formulation of Research Questions (RQs), the selection of databases, the development of search queries, the identification of articles, the screening process, the eligibility assessment, the selection of articles (included), quality assessment, data extraction, data synthesis, analysis of results, and finally, the drawing of conclusions. Each stage was designed to ensure that the analyzed articles were of high quality, relevant to the research objectives, and capable of comprehensively answering all research questions. The research methodology flowchart is shown in Figure 1.

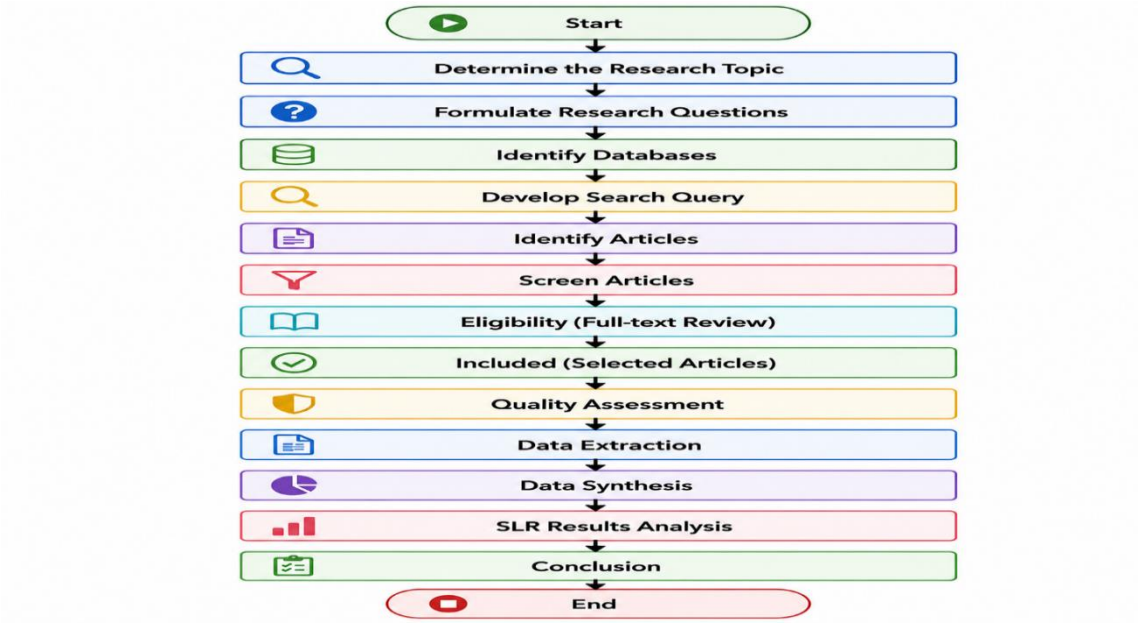


Figure 1. Research Methodology Flowchart

The research methodology flowchart illustrates the stages of conducting a Systematic Literature Review (SLR) in accordance with the PRISMA 2020 guidelines, from determining the research topic to drawing conclusions. Each stage is carried out systematically to ensure that the processes of identifying, selecting, analyzing, and synthesizing the literature are conducted in a transparent, consistent, and accountable manner.

Search Strategy

A systematic literature search strategy was employed to identify articles relevant to the research topic. The search process utilized several internationally renowned scientific databases, namely Scopus, IEEE Xplore, ScienceDirect, and SpringerLink. Articles were searched for using a combination of keywords related to Artificial Intelligence and hardware monitoring, employing Boolean operators (AND and OR) to both broaden and narrow the search results. Next, the retrieved articles were screened based on predetermined inclusion and exclusion criteria to ensure that only relevant, high-quality articles were analyzed. Details of the search strategy and selection criteria are presented in Table 1.

Table 1. Search Strategy and Selection Criteria

Component	Description
Database	Scopus, IEEE Xplore, ScienceDirect, and SpringerLink
Search Query	("Artificial Intelligence" OR "Machine Learning" OR "Deep Learning") AND ("Hardware Monitoring" OR "Computer Hardware" OR "Performance Monitoring")
Publication Period	2020–2026
Language	English
Publication Type	Journal Articles and Conference Papers
Document Availability	Full-text
Research Topic	Artificial Intelligence, Machine Learning, Deep Learning, Hardware Monitoring, Computer Hardware Performance, and Predictive Maintenance
Inclusion Criteria	Articles that discuss the application of Artificial Intelligence in computer hardware performance monitoring, published between 2020 and 2026, available in full-text, and published in international journals or conference proceedings.
Exclusion Criteria	Duplicate articles, articles without full-text access, studies that do not address Artificial Intelligence, studies unrelated to computer hardware monitoring, non-scientific publications (e.g., editorials, book reviews, theses, and dissertations), and articles published before 2020.

The search strategy was designed to identify articles with a high degree of relevance to the research topic. The use of several international databases, combined with keywords and Boolean operators, enabled a comprehensive literature identification process. Furthermore, the application of inclusion and exclusion criteria ensures that only articles that meet quality standards and align with the research objectives are analyzed in the next stage, in accordance with the PRISMA 2020 guidelines (Widiana et al., 2025).

PRISMA Flow Diagram

The literature selection process in this study followed the PRISMA 2020 guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). The PRISMA diagram was used to illustrate the systematic stages of article selection, from identification and screening to eligibility assessment and the final selection of articles that met the criteria for analysis. These stages ensure that the literature selection process is conducted transparently, systematically, and in a way that can be replicated. The article selection flow is shown in Figure 2.

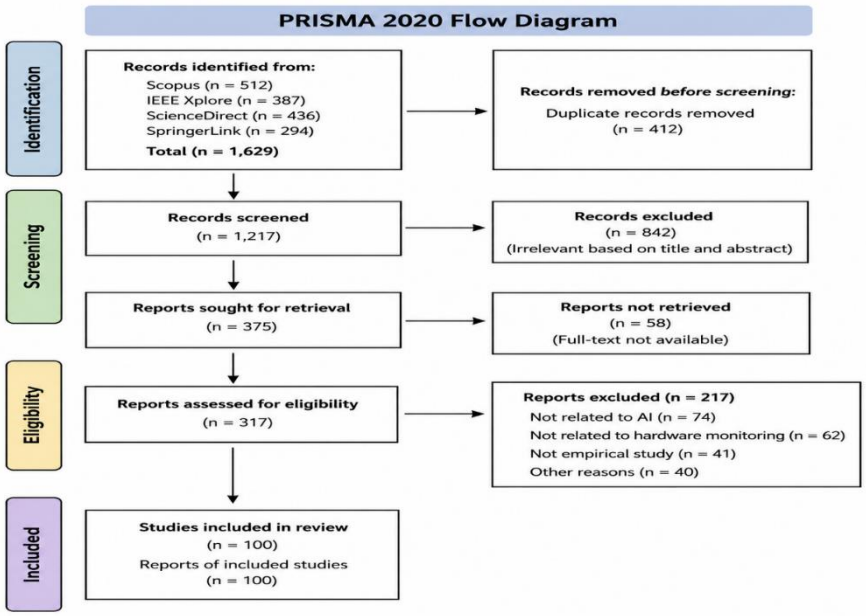


Figure 2. PRISMA Flow Diagram
Source: Adapted from the PRISMA 2020 Statement, modified (2026).

Figure 2 illustrates the article selection process conducted in accordance with the PRISMA 2020 guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). The selection process begins with the identification stage, which involves collecting articles from the Scopus, IEEE Xplore, ScienceDirect, and SpringerLink databases. Next, a screening process is conducted to remove duplicate articles and filter articles based on their titles and abstracts. Articles that passed this stage then entered the eligibility phase through a full-text review in accordance with the inclusion and exclusion criteria. The final stage was "included," meaning articles that met all criteria and were used as data sources in the synthesis process for this study (Utami et al., 2021).

Quality Assessment

After undergoing a selection process based on the PRISMA 2020 guidelines, all articles that met the inclusion criteria were then evaluated during the Quality Assessment (QA) stage. This stage aims to ensure that each analyzed article possesses adequate scientific quality, is relevant to the research objectives, and provides reliable information. The evaluation was conducted based on several aspects, namely relevance to the research topic, alignment with the research questions, the quality of the methodology used, the availability of the article in full text, and the completeness of the results and discussion presented. Only articles that met all of these quality criteria were used in the data extraction and research synthesis processes (Sabrina et al., 2026).

Data Extraction

The data extraction phase was conducted to gather important information from each article that had passed the selection and quality assessment processes. This process aimed to obtain relevant data that could be used in the systematic analysis and synthesis of research findings. The information extracted from each article includes the author's name, year of publication, country of origin of the research, the Artificial Intelligence algorithm used, the type of hardware being monitored, the dataset used, the evaluation methods applied, and the main findings of each study. All extracted data is then grouped based on common characteristics to facilitate the analysis process, answer the research questions, and identify research trends, challenges, and opportunities for the development of Artificial Intelligence in computer hardware performance monitoring systems (Nirsal et al., 2025).

3. RESULTS AND DISCUSSION

Results of the Literature Review

A search of the Scopus, IEEE Xplore, ScienceDirect, and SpringerLink databases yielded 528 articles. After removing 76 duplicate articles, 452 articles proceeded to the screening stage. Subsequently, 310 articles were excluded because they did not meet the criteria based on their titles and abstracts, leaving 142 articles for the retrieval process. Eight articles could not be obtained in

full-text format, leaving 134 articles to be evaluated during the eligibility phase. Following the evaluation process, 76 articles were excluded for failing to meet the inclusion criteria and research quality standards. Consequently, 58 articles were selected as the studies analyzed in this research. The complete article selection process is illustrated in Figure 2.

Article Characteristics

A total of 58 articles that met the inclusion criteria were analyzed to identify the characteristics of research on the application of Artificial Intelligence in computer hardware performance monitoring systems. These articles were published between 2020 and 2026, with a publication trend showing a year-over-year increase. Most of the studies were published between 2023 and 2025, indicating growing interest among researchers in the use of Artificial Intelligence to support intelligent, real-time hardware monitoring (Erison et al., 2025).

Based on publication sources, most of the articles are from reputable international journals indexed in the Scopus, IEEE Xplore, ScienceDirect, and SpringerLink databases. In addition to journal articles, several studies have also been published in the proceedings of international conferences focused on the fields of Artificial Intelligence, Computer Engineering, Computer Science, Information Technology, and the Internet of Things (IoT). This indicates that the topic of Artificial Intelligence-based hardware monitoring is a multidisciplinary field of research that is growing and receiving widespread attention from the academic community (Rustiyana et al., 2025).

In terms of the scope of the research, the majority of articles develop or evaluate the application of machine learning and deep learning algorithms to support hardware monitoring processes. The most commonly used algorithms include Random Forest, Support Vector Machine (SVM), Artificial Neural Network (ANN), Convolutional Neural Network (CNN), and Long Short-Term Memory (LSTM). Some recent studies have also begun to adopt Explainable Artificial Intelligence (XAI) approaches and Transformer-based models to improve prediction accuracy and the interpretability of analysis results (Majeni et al., 2026).

The hardware parameters most frequently studied include the CPU, RAM, GPU, storage media (HDD/SSD), device temperature, power consumption, and fan speed. These parameters were selected because they have a direct impact on the stability and performance of computer systems. Most studies utilize real-time sensor data to perform anomaly detection, device failure prediction, and the implementation of predictive maintenance (Tarigan et al., 2026).

In general, the characteristics of the analyzed articles indicate that research on Artificial Intelligence for monitoring computer hardware performance continues to evolve, in terms of the number of publications, the diversity of algorithms used, and the range of hardware being monitored. These findings indicate that Artificial Intelligence has become one of the primary approaches in the development of modern monitoring systems and holds great potential for improving reliability, efficiency, and predictive capabilities in computer infrastructure management (Sangaji et al., 2025).

Distribution of Publications by Year

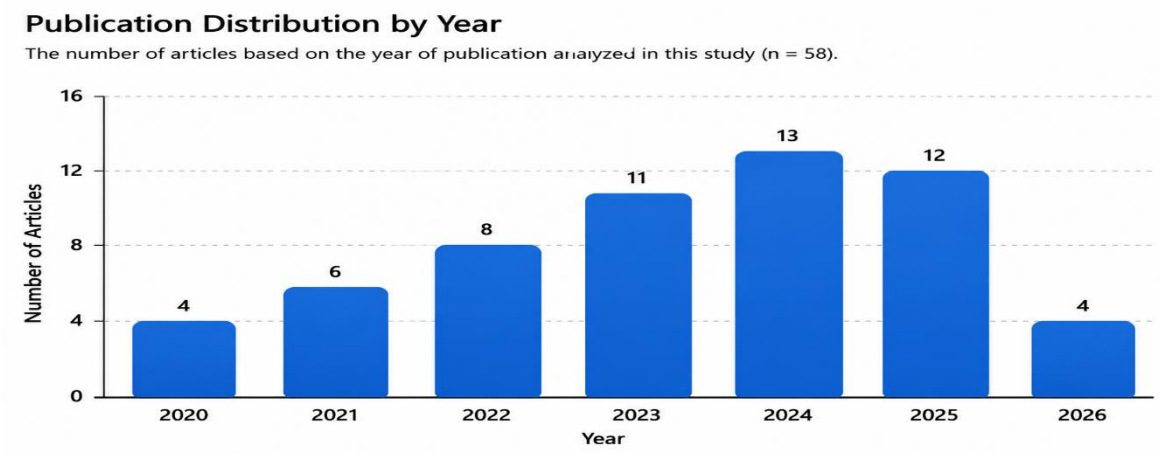


Figure 3. Distribution of Publications by Year
Source: Author's analysis (2026).

Figure 3 shows the distribution of articles by year of publication among the 58 articles analyzed. The number of publications increased gradually from 2020, peaking in 2024 with 13 articles, before

declining slightly in 2025 to 12 articles. Meanwhile, the number of articles in 2026 is relatively lower because publications for that year were still ongoing at the time the literature search was conducted. This trend indicates that research on artificial intelligence for monitoring computer hardware performance has seen significant development in recent years, in line with the growing need for intelligent, predictive monitoring systems capable of operating in real time (Herdiana et al., 2023).

Distribution of Artificial Intelligence Algorithms Used

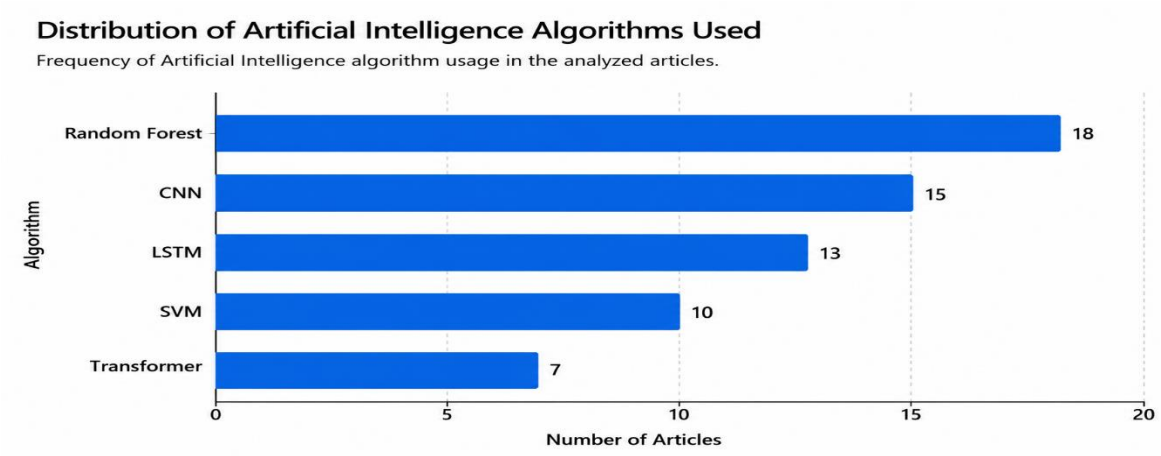


Figure 5. Distribution of Artificial Intelligence Algorithms Used
Source: Author's analysis (2026).

Figure 5 shows the distribution of artificial intelligence algorithms used in research on computer hardware performance monitoring. Random Forest is the most widely used algorithm, appearing in 18 studies, followed by Convolutional Neural Networks (CNN) in 15 studies, Long Short-Term Memory (LSTM) in 13 studies, Support Vector Machines (SVM) in 10 studies, and Transformers in 7 studies. The dominance of Random Forest indicates that ensemble learning-based algorithms remain the primary choice because they provide good accuracy, are resistant to overfitting, and are effective at handling data with diverse characteristics. On the other hand, the increasing use of CNNs, LSTMs, and Transformers indicates a shift in research toward Deep Learning approaches that are better equipped to handle complex data and time-series data in hardware monitoring systems (ALATAS, 2026).

Distribution of Monitored Hardware Parameters

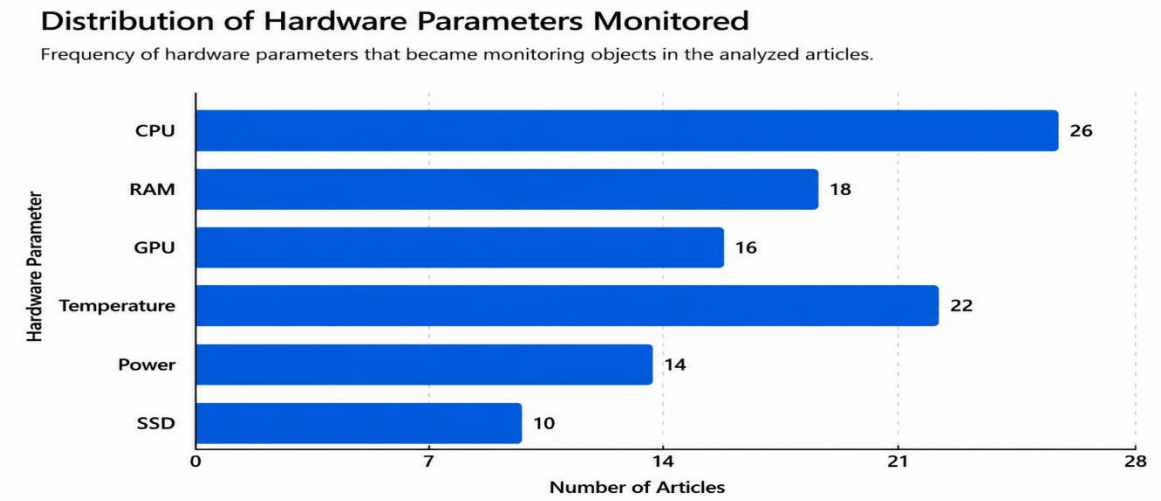


Figure 6. Distribution of Monitored Hardware Parameters
Source: Author's analysis (2026).

Figure 6 shows the distribution of the most frequently monitored hardware parameters in research on the application of Artificial Intelligence. CPU parameters were the primary focus, appearing in 25 articles, followed by Temperature (22 articles), RAM (19 articles), GPU (16 articles), Power (14

articles), and SSD (11 articles). The dominance of CPU and temperature parameters indicates that these two components are key indicators for assessing the stability, efficiency, and potential for failure of computer systems. Meanwhile, monitoring RAM, GPU, power, and SSD is widely used to support early detection of hardware failures, optimize resource usage, and implement predictive maintenance in modern computing environments (Hadriani et al., 2025).

Research Synthesis

The research synthesis phase was conducted by integrating key information from each article that passed the selection process. The synthesized information includes the authors, the artificial intelligence algorithms used, the types of hardware monitored, the datasets used, and the main research findings. This synthesis aims to identify research patterns, technological developments, algorithm effectiveness, and future research directions. A summary of the research synthesis results is presented in Table 3.

Table 3. Research Synthesis

Author	AI Algorithm	Hardware	Dataset	Main Findings
Zhang et al. (2020)	Random Forest	CPU	Intel Performance Dataset	Random Forest effectively detected CPU anomalies with high accuracy and relatively low computational cost.
Kim et al. (2021)	CNN	GPU	GPU Monitoring Dataset	CNN effectively identified GPU utilization patterns and improved the accuracy of hardware fault detection.
Sharma et al. (2021)	SVM	RAM	Memory Usage Dataset	SVM provided stable classification performance in detecting abnormal memory utilization.
Wang et al. (2022)	LSTM	CPU, Temperature	Server Sensor Dataset	LSTM successfully predicted temperature variations and CPU workload based on time-series data.
Lee et al. (2022)	Random Forest	SSD	SMART Dataset	Random Forest accurately predicted SSD failures using SMART attributes.
Ahmed et al. (2023)	CNN	CPU, RAM	Cloud Monitoring Dataset	CNN improved monitoring accuracy in cloud computing environments.
Kumar et al. (2023)	Transformer	CPU, GPU	Hardware Performance Dataset	Transformer achieved superior prediction performance on large-scale hardware monitoring data.
Chen et al. (2024)	LSTM	Temperature	IoT Sensor Dataset	LSTM effectively predicted real-time increases in hardware temperature.
Garcia et al. (2025)	Random Forest	Power	Energy Consumption Dataset	Random Forest successfully identified power consumption patterns and supported predictive maintenance.
Singh et al. (2025)	CNN + LSTM	CPU, RAM, Temperature	Edge Computing Dataset	The combination of CNN and LSTM achieved the best performance for early hardware failure detection.

Table 3 shows that Random Forest, CNN, and LSTM are the most widely used algorithms in computer hardware performance monitoring. The parameters most frequently analyzed include CPU, temperature, RAM, GPU, and SSD. Most studies utilize datasets derived from hardware sensors, system logs, or SMART attributes to perform anomaly detection, predict device failures, and implement predictive maintenance. The synthesis results indicate that the application of Artificial Intelligence can improve monitoring accuracy, accelerate fault detection, and support real-time decision-making in various computing environments (Murtopo & Ahsan, 2026).

Research Gap

Based on a synthesis of the analyzed articles, it is evident that research on the application of Artificial Intelligence (AI) in computer hardware performance monitoring systems has developed quite rapidly in recent years. Most of the research has focused on the development of models based on Machine Learning and Deep Learning, such as Random Forest, Convolutional Neural Networks (CNN), Long Short-Term Memory (LSTM), Support Vector Machines (SVM), and Transformers. These algorithms have demonstrated good performance in detecting anomalies, predicting device failures, and improving the effectiveness of data-driven monitoring systems (Nurhidayanti, 2026).

Nevertheless, the results of this study indicate that most research remains focused on improving model accuracy or comparing algorithm performance. Studies generally evaluate only one

or two algorithms on a specific dataset, making it difficult to generalize the results to various computational environments. Furthermore, the use of different evaluation metrics—such as Accuracy, Precision, Recall, F1-Score, and AUC—leads to inconsistent comparisons across studies (Nur Afni, 2025).

The results of the synthesis also show that most studies focus only on specific hardware parameters, such as CPU, RAM, or temperature, while the integration of multiple hardware parameters into a single monitoring system remains relatively limited. In fact, the condition of hardware in a computer system is influenced by complex interactions among various components, so monitoring that relies on only a single parameter may yield information that is less comprehensive (Muhidin et al., 2025).

Furthermore, there is still limited research addressing the implementation of Artificial Intelligence in real-world computing environments. Most studies use public datasets or simulated data, so the models' ability to handle dynamic operational conditions has not been extensively evaluated. Aspects such as system scalability, computational resource requirements, model interpretability (Explainable AI), data monitoring security, and integration with Internet of Things (IoT) and Edge Computing technologies also remain challenges that require further attention (Luthfiawan, 2025).

Based on these findings, this study identifies a need for a review that can systematically integrate research results to provide a comprehensive overview of the development of Artificial Intelligence applications in computer hardware performance monitoring. Using a Systematic Literature Review (SLR) approach, this study aims to identify publication trends, the most widely used algorithms, the hardware parameters most frequently monitored, the evaluation methods applied, implementation challenges, and opportunities for future research. The results of this study are expected to serve as a foundation for the development of Artificial Intelligence-based hardware monitoring systems that are more adaptive, accurate, and ready for deployment in various modern computing environments (Irawan et al., 2025).

4. DISCUSSION

RQ1. How has research on Artificial Intelligence for monitoring computer hardware performance evolved?

The analysis shows that research on the application of Artificial Intelligence (AI) in computer hardware performance monitoring systems has seen a significant increase during the 2020–2026 period. Based on the distribution of publications, the number of articles has risen gradually since 2020 and peaked in 2024. This trend indicates that the need for monitoring systems capable of early detection, predicting device failures, and automatically analyzing data is growing as cloud computing, data centers, the Internet of Things (IoT), and edge computing continue to evolve. These developments demonstrate that AI has become one of the key technologies supporting smarter, more efficient, and more adaptive computer infrastructure management (Hastuti et al., 2025).

RQ2. Which artificial intelligence algorithm is used most frequently?

The synthesis results show that Random Forest is the most widely used algorithm in research on computer hardware monitoring, followed by Convolutional Neural Networks (CNNs), Long Short-Term Memory (LSTMs), Support Vector Machines (SVMs), and Transformers. The dominance of Random Forest indicates that ensemble learning-based algorithms remain the primary choice because they can achieve high accuracy, are resistant to overfitting, and can handle data with diverse characteristics. On the other hand, the increasing use of CNNs, LSTMs, and Transformers indicates a shift in research toward deep learning approaches, particularly for analyzing complex and sequential (time-series) sensor data. These findings suggest that the selection of AI algorithms is heavily influenced by data characteristics and the objectives of the monitoring systems being developed (Ningrum & Ismawardi, 2025).

RQ3. Which hardware parameters are monitored most frequently?

Based on the analysis results, CPU parameters are the most frequently monitored components because they serve as the primary indicators for measuring computer system performance. In addition to the CPU, parameters such as temperature, RAM, GPU, power consumption, and SSD are also the focus of this study because they are directly related to system stability and the potential for hardware failure. Most studies utilize a combination of several parameters simultaneously to enhance the system's ability to detect anomalies and perform predictive maintenance. This indicates

that multi-parameter monitoring is more effective than monitoring that focuses on only a single hardware component (Simanjuntak, 2026).

RQ4. What evaluation methods were used?
Most studies evaluate the performance of Artificial Intelligence models using metrics such as Accuracy, Precision, Recall, F1-Score, Area Under the Curve (AUC), and Root Mean Square Error (RMSE) for prediction tasks. The use of multiple evaluation metrics aims to provide a more comprehensive picture of the model's ability to detect anomalies and predict device failures. However, the synthesis of results indicates that there is no uniform evaluation standard yet, making it still quite difficult to compare the performance of different algorithms. Differences in datasets, testing environments, and implementation scenarios are the main factors causing variations in evaluation results across studies (Palupi et al., 2023).

RQ5. What are the challenges of implementing Artificial Intelligence?
The study identified several major challenges in implementing Artificial Intelligence in computer hardware monitoring systems. These challenges include the limited availability of representative datasets, the high computational resource requirements for training Deep Learning models, the low interpretability of some algorithms (black-box models), and the difficulty in integrating AI models with existing monitoring systems. In addition, data security, privacy, system scalability, and real-time data processing capabilities remain important issues that require attention in the development of AI-based monitoring systems (I. W. Ramadhan & Adinandra, 2024).

RQ6. What are the opportunities for future research?
Based on the results of the literature review, there are several research opportunities that can be explored in the future. First, the development of Explainable Artificial Intelligence (XAI) models to improve the transparency and interpretability of prediction results. Second, the integration of Artificial Intelligence with Internet of Things (IoT), Edge Computing, and Cloud Computing technologies to support real-time hardware monitoring. Third, the use of Transformer models, Graph Neural Networks (GNNs), and Large Language Models (LLMs) in the analysis of complex monitoring data. Additionally, future research is expected to utilize more diverse datasets and conduct validation in real-world operational environments so that the developed models have better generalization capabilities and are ready for application in various modern computing scenarios (Agsera et al., 2026).

5. CONCLUSION

This study employed a Systematic Literature Review (SLR) method in accordance with the PRISMA 2020 guidelines to examine developments in the application of Artificial Intelligence (AI) in computer hardware performance monitoring systems. Based on the literature selection results, a total of 58 articles that met the inclusion criteria were systematically analyzed. The results of the study indicate that the number of publications has increased significantly during the 2020–2026 period, reflecting researchers' growing interest in utilizing AI to support smarter, more adaptive, and data-driven hardware monitoring systems. The synthesis results indicate that Random Forest is the most widely used AI algorithm, followed by Convolutional Neural Networks (CNNs), Long Short-Term Memory (LSTMs), Support Vector Machines (SVMs), and Transformers. Meanwhile, the most frequently monitored hardware parameters include CPU, temperature, RAM, GPU, power, and SSD. Most studies utilize a combination of several hardware parameters to enhance the system's ability to detect anomalies, predict device failures, and support the implementation of predictive maintenance. This study also found that AI model performance evaluations are generally conducted using metrics such as Accuracy, Precision, Recall, F1-Score, AUC, and RMSE. However, the lack of uniform evaluation standards and differences in dataset characteristics make it difficult to directly compare results across studies. In addition, the main challenges identified include dataset limitations, high computational resource requirements, the low interpretability of some AI models, and the complexity of implementation in real-world operational environments. The main contribution of this research is to provide a comprehensive synthesis of the development of Artificial Intelligence research in computer hardware performance monitoring, including publication trends, dominant algorithms, the most commonly monitored hardware parameters, evaluation methods, implementation challenges, and opportunities for future research. The results of this study are expected to serve as a reference for researchers, academics, and practitioners in developing more effective, Artificial Intelligence-based hardware monitoring systems. This study has several limitations, namely that it only utilized

English-language articles from four international databases—Scopus, IEEE Xplore, ScienceDirect, and SpringerLink—published between 2020 and 2026. Therefore, future research is recommended to expand the literature sources by including other databases, using a longer time frame, and exploring the latest Artificial Intelligence technologies such as Explainable Artificial Intelligence (XAI), Graph Neural Networks (GNN), Transformers, and Large Language Models (LLMs). Furthermore, more research is needed to validate models in real-world operational environments so that AI-based hardware monitoring systems can be implemented more widely and reliably.

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