Global Journal of Engineering Innovations & Interdisciplinary Research

Original Article

AI Powered Server Log Management System Using Random Forest Model

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- Received Date: 25 May 2025
- Accepted Date: 15 June 2025
- Publication Date: 27 June 2025

Keywords

AI; Error Logs; Centralized Server; Error Resolution; Google; Bing; Dataset; Operating Systems (OS); Programming; Software Bugs; Network Errors

Abstract

As technology continues to advance, system errors have become more frequent, and users often struggle to find the right solutions. Traditionally, users had to search across multiple servers for answers, which often resulted in a flood of responses, making it difficult to identify the correct one. This process can be time-consuming and frustrating. To address this issue, we've created a solution that collects error logs from all servers and utilizes Artificial Intelligence (AI) to build a smart system. By training the AI model on past error questions and their solutions, the system can now analyse a user's error and predict a suitable solution. This means users no longer have to search through various sources. Instead, they can get a quick and accurate answer from a single, centralized server. This AI-powered system simplifies error resolution by providing more direct, relevant answers. Unlike Google or Bing, which may return too many irrelevant results, our AI ensures users receive the most precise solution to their specific problem. The system is built using a carefully selected dataset containing questions and answers related to operating systems (OS), programming issues, and other technical problems. Over time, with the addition of new questions and answers from users, the AI will learn and improve, solving an even wider variety of errors. A key advantage of this system is that the dataset can be continuously updated with new information from users. This ensures that the AI model remains current and is capable of addressing a broader range of errors. Whether the issue relates to OS problems, software bugs, or network errors, the AI will keep getting better, making it a valuable tool for troubleshooting.

Introduction

Servers are the backbone of all online services in today's digital world. They process vast amounts of data and ensure seamless communication between systems and users. As organizations expand, the volume of server logs—records of activities, events, and errors—has grown exponentially. Managing and analyzing these logs has become essential to maintaining system reliability, security, and performance. However, traditional log management tools fail to cope with the complexity and scale of modern IT environments.

It is here that Artificial Intelligence (AI) steps in and revolutionizes the management, monitoring, and analysis of logs. AI-driven log management systems use machine learning and natural language processing to automatically analyze logs, identify anomalies, and give real-time insights into the matter so that organizations are proactive instead of reactive.

Traditional log management systems pose a huge problem in today's IT landscape. The sheer scale of growth of logs—driven by cloud computing, microservices, and distributed architectures—renders manual processing nearly impossible. Logs are generated by applications, operating systems, and security tools from different sources, each using different formats, which increases the complexity involved in correlating and analyzing them. They are based on predefined rules and thresholds, which are often blind to novel or unpredictable anomalies. Human analysis of logs is also expensive and resource-intensive, making scalability a major challenge.

A simple search for keywords lacks depth and thus does not offer insight into all the trends within a system, leading to an underestimation of potential risks. AI introduces new dimensions in log management because it automates, provides intelligent analysis, and responds to real-time environments. AI algorithms can parse logs from multiple sources and categorize them, eliminating the need for manual preprocessing. Machine learning techniques, such as clustering and neural networks, detect anomalies by identifying deviations from normal patterns. These anomalies could indicate potential

Citation: Yamini Ch, Ram PA, Kumar PS, Kumar TV. AI Powered Server Log Management System Using Random Forest Model. GJEIIR. 2025;5(4):078.

system failures, security breaches, or performance issues.

These processes are enhanced with the help of Natural Language Processing (NLP), which extracts valuable insights from unstructured log data, such as error messages and event descriptions—helping trace root causes and resolve them much more efficiently. Additionally, AI uses historical data to predict future events—like system bottlenecks or failures—in time, allowing teams to take preventive measures and reduce downtime.

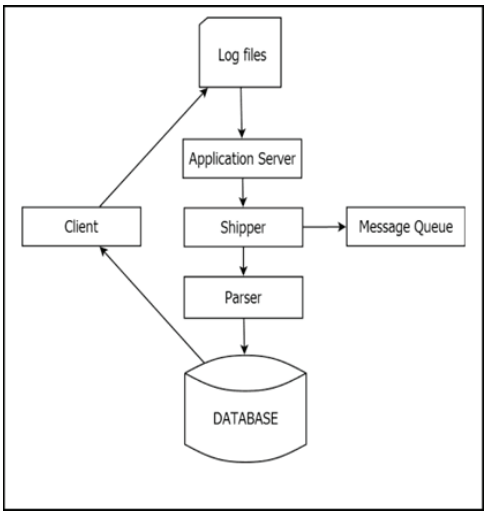
Furthermore, AI processes logs in real time and produces instant alerts with actionable recommendations that enhance response times and system reliability. The implementation of AI-based log management systems has numerous benefits for organizations. Automation reduces the time and effort needed to analyze logs, allowing IT teams to focus on strategic projects. Real-time anomaly detection enhances cybersecurity by detecting potential threats, including unauthorized access or data breaches. Predictive analytics helps organizations solve problems early, ensuring high system reliability and minimizing downtime. Moreover, these systems are scalable in nature and can handle large volumes of log data effectively.

Methodology

Servers are the heartbeat of all online services, making sure systems and users can connect and work together in a smooth and efficient manner. These servers create logs—records of everything that happens, like actions taken, errors, or important events. Logs help businesses monitor how things are working, fix issues, and stay secure.

However, with companies growing and using advanced technologies like cloud computing, the exploding number of logs makes it much harder to handle and analyze them manually. Older log management methods rely on people to look through them manually or on the use of basic tools. They cannot cope with the enormous volumes of logs nor the complexity of modern systems. Logs come from different places and look different, making them difficult to organize and understand. It is a very time-consuming, error-prone, and expensive process.

AI-powered log management systems are smarter solutions. They use advanced technology like machine learning and natural language processing to analyze logs automatically, find unusual problems, and even predict future issues. This makes life easier for IT teams, keeps systems running smoothly, and ensures they're secure and reliable.



Log Collection and Preprocessing

The system collects logs from many sources, like apps, operating systems, and security tools. Since these logs often look different depending on where they come from, AI steps in to clean, organize, and group them in an easy-to-understand way. This makes sure the logs are ready for analysis without any extra manual work.

Anomaly Detection

AI learns what normal system behavior looks like by studying the patterns in log data. Once it knows what's normal, it can quickly spot anything unusual, like errors, security threats, or signs of system failure. These issues are flagged early so they can be fixed before they cause bigger problems.

Natural Language Processing (NLP)

Logs often have messy text, like error messages or event descriptions, that can be hard to understand. AI uses NLP to break down this text, pick out the important parts, and figure out what's causing the problem. This helps prioritize what needs to be fixed first.

Predictive Analytics

By analyzing past log data, AI can predict future issues, like warning if a server is running out of storage or if a component might fail soon. This allows IT teams to address problems early and prevent disruptions.

Real-Time Monitoring and Alerts

The system checks logs as they are created and processes them instantly. If it finds a critical issue, it sends an alert right away, often with tips on how to fix it. This helps IT teams respond quickly and avoid downtime.

Pattern Recognition and Optimization

Over time, AI spots patterns in the logs, like errors that keep happening or performance getting slower. It uses these patterns to suggest ways to improve how systems work and avoid repeated problems.

Automation of Routine Tasks

The system handles boring, repetitive jobs like sorting, filtering, and organizing logs. This lets IT teams spend more time on important tasks instead of wasting time on manual work.

Continuous Learning

AI keeps getting smarter as it processes more logs and faces new situations. It learns from these experiences, which makes it better at finding issues, predicting problems, and offering helpful solutions over time.

Steps Involved:

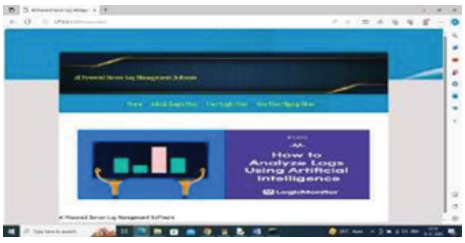


***Figure 1**: In above screen click on 'Admin Login Here' link to get below login page*

Figure 2. In above screen admin is log in and after login will get below page

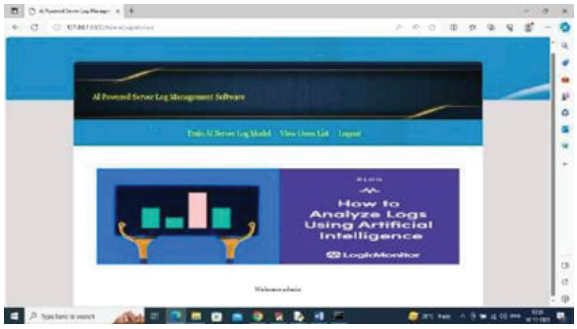


Figure 3. In above screen admin can click on 'Train Server Log Model' link to train AI model on dataset and then will get below output

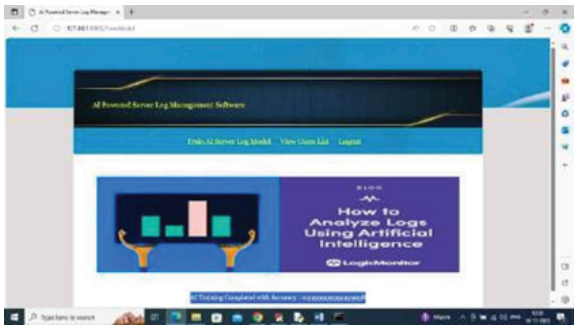


Figure 4. In above screen AI model training completed and its prediction accuracy is 0.99% and now click on 'View Users List' to get below page

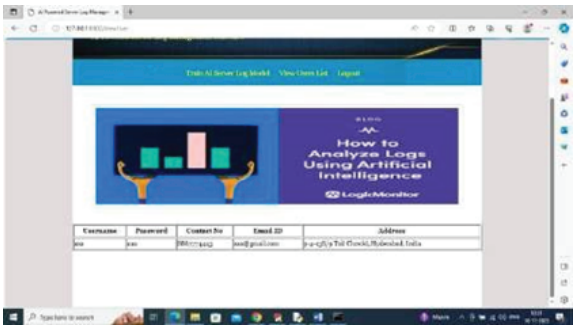


Figure 5. In above screen admin can view list of registered users and now logout and register one user to ask error from AI model is 0.99% and now click on 'View Users List' to get below page

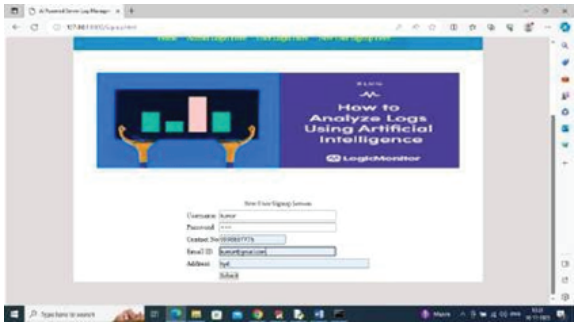


Figure 6. In above screen user is getting signup and then press button to get below page

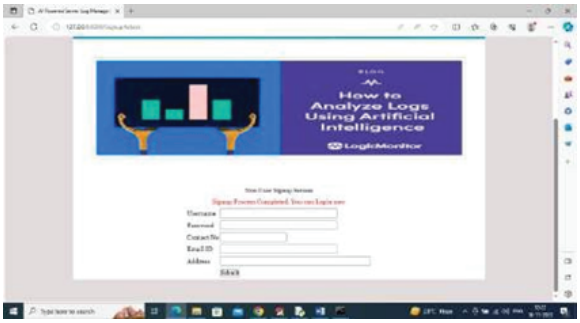


Figure 7.In above screen user signup completed and now click on 'User LoginHere' link to get below page is0.99%andnowclickon 'View UsersList'togetbelowpage

Figure 8. In above screen user is login and after log in will get below page

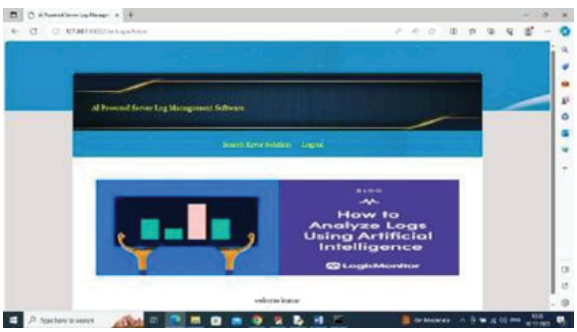


Figure 9. In above screen user can click on 'Search Error Solution' link to get below page

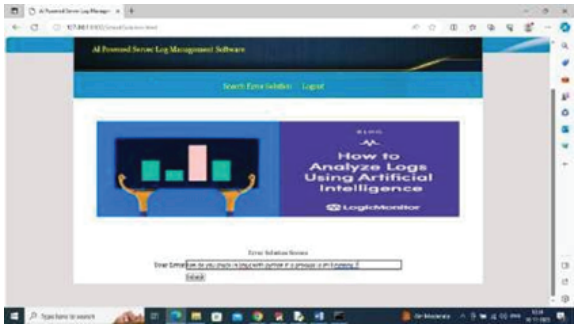


Figure 10. In above screen I entered some error query and then press button toget below output

Result and discussion

The use of AI-powered server log management systems has made systems more efficient, reliable, and secure. It quickly detects problems in real time, so IT teams can fix issues right away. This has reduced downtime and kept systems running smoothly.

The AI is also very accurate, removing the risk of human error and ensuring no critical problem gets missed. The most important advantage is that the system can predict problems before they occur. It can warn teams that things such as running out of storage or possible failures are likely to occur and give time to correct issues early. The result has made systems more stable and reliable.

Figure 11. In above screen in red color text can see Error question and its possible solution and similarly you can enter any question and get output. If you want you can use some questions from 'test Questions.txt' file which is available inside code folder and in below screen displaying another error output

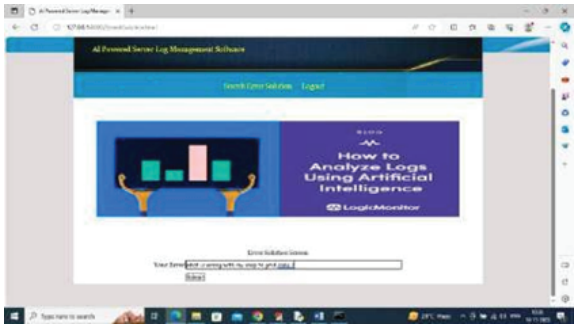


Figure 12. In above screen entering some other error and below is the output

Figure 13. Similarly by following above screens you can ask any question from AI model to get solution

Moreover, it enhances security by speedy identification of unusual activities and possible threats, and thus teams have ample time to arrest problems such as a breach of data. It has freed up IT teams to do more important work by automating boring and repetitive tasks. It has not only made things run more efficiently but also saved money by reducing costs and minimizing downtime. Businesses are better prepared for the future with better performance and fewer disruptions. AI-powered log management has been a big step forward in managing complex IT systems.

Conclusion

This is the game-changer in the way we deal with server issues—an AI-powered Server Log Management System. Artificial Intelligence makes the process of server log management simpler and offers a smarter, faster, and more centralized solution for error correction. It is intuitive, efficient, and responsive in improving user experience, thereby making it easier for businesses to deal with server-related problems.

It will continue to grow and learn from new data, so it is going to be more accurate and useful when applied across various industries. This system makes the management of IT infrastructure much easier and more reliable. With technologies such as machine learning, natural language processing, and anomaly detection, it can monitor and analyze logs very effectively, proactively respond to issues, and even predict potential problems before they happen.

Through automation of log collection, analysis, and alerting, it saves IT teams a lot of time and effort while ensuring that systems stay secure and perform well. Its ability to handle large amounts of log data makes it a great fit for both small businesses and large enterprises, especially in complex cloud and distributed environments.

One of the standout features of this system is its ability to spot patterns and unusual activities that might otherwise be missed. This is crucial for modern IT setups, where things are always changing and spread across multiple systems. It can sense early signs of security threats, system overloads, or performance issues, thereby preventing problems before they get worse.

AI can predict hardware failures, software bugs, or other critical events based on past data, allowing businesses to fix potential issues in advance. The system doesn't just detect problems—it takes action. It can send automatic alerts, run services, or adjust configurations to help mitigate the problem before anyone intervenes. It, therefore, accelerates the remediation process while the IT staff concentrates on core and strategic roles, rather than having to repeatedly address the same errors.

In essence, an AI-powered log management system simplifies server management, saves time, and ensures operations go smoothly while becoming an absolute requirement for a modern IT infrastructure.

Future scope

As AI evolves, future log management systems will become smarter and more advanced. They will be able to use machine learning and other AI techniques to improve accuracy and insights. Such systems will not only identify problems but also provide creative solutions to them, thus making IT management more efficient.

They may even handle issues automatically without the need for IT teams to intervene. For example, AI can independently run repair scripts, adjust settings, or allocate resources, thereby causing fewer delays, minimal downtime, and smoother operations in general.

Security will also undergo significant developments, as AI will be able to detect even the slightest signs of suspicious activity—thus keeping systems safe from cyberattacks and ensuring data security while adhering to the strictest industry standards.

Acknowledgement

We would like to extend our heartfelt gratitude to our mentors for their guidance, valuable insights, and encouragement throughout this project. Our team members and collaborators deserve heartfelt appreciation for their dedication and innovative contributions. We also acknowledge the support of organizations and individuals who provided essential resources. Lastly, we're grateful to our families and friends for their unwavering support and motivation.

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