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Article

The Importance of Artificial Intelligence Systems in Creating Databases

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Abstract: In the current digital age, the importance of database (DB) technologies is increasing. Artificial intelligence (AI) systems are playing a crucial role in this process. This article highlights the significance of AI technologies in creating, managing, and optimizing databases. The possibilities of improving DB efficiency through AI tools, including machine learning and automated data analysis, are analyzed. The article examines opportunities for automated indexing, optimized search, and efficient processing of large volumes of data based on AI. Research results demonstrate that AI can reduce human intervention, enable more efficient use of resources, and enhance security in the creation and management of databases. Additionally, the article discusses future prospects for database development.

Keywords: Artificial Intelligence, Database, Automation, Optimization, Big Data, Data Management System, Security, Indexing, Search System, Automatic Coding, Cloud Technologies, AI Algorithms, and Others

1. Introduction

Databases are considered a fundamental element of modern information systems. They play a crucial role in business, science, social sectors, and public administration [1]. However, creating and efficiently managing databases is a complex process that requires integrating new technologies to meet evolving demands. Artificial intelligence (AI) systems are revolutionizing this field. AI technologies serve as essential tools for creating, optimizing, and ensuring the security of databases [2]. For instance, during the data cleaning process, AI can automatically identify incorrect or redundant data. Additionally, AI algorithms are highly effective in managing the dynamic structure of databases. When working with dynamic databases (NoSQL), AI systems help process data more quickly and derive maximum value from it [3].

Today, the volume of data is growing exponentially, necessitating the use of Big Data solutions. Artificial intelligence serves as the primary tool for analyzing Big Data and extracting valuable insights [4]. Moreover, AI models (machine learning algorithms) are widely used to detect and prevent errors in databases. The relevance of this research lies in the increasing role of artificial intelligence in database creation. The purpose of our article is to demonstrate how artificial intelligence can be applied in database creation and to analyze its advantages [5].

2. Materials and Methods

The research methodology was designed by combining quantitative and qualitative methods. First, experimental measurements were conducted to evaluate the efficiency of

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artificial intelligence in creating databases [6]. For this purpose, the PostgreSQL (relational DB), MongoDB (NoSQL), and Apache Cassandra (dynamic DB) platforms were selected, and the performance metrics of AI systems (speed, accuracy, resource requirements) were measured on these platforms.

For security analysis, anomaly detection algorithms (such as Isolation Forest) were applied. Machine learning models were developed using the TensorFlow and PyTorch libraries to identify and prevent errors in the database [7]. Additionally, the efficiency of AI systems in the data cleaning process was studied. In the qualitative analysis, expert interviews and surveys conducted with companies were utilized [8]. Data collected from nearly 50 IT specialists were used to determine the advantages and limitations of AI systems in creating databases.

The results underwent statistical analysis. Each experiment was repeated three times, and average indicators were calculated. Cloud environments (AWS, Google Cloud) were also utilized in the experiments. The results were analyzed using scripts written in Python [9].

3. Results and Discussion

The research findings demonstrated that artificial intelligence (AI) algorithms play a crucial role in enhancing the efficiency of database management [10]. The following table highlights the key differences between traditional methods and AI-based approaches, see Table 1:

Table 1. Efficiency Indicators of Artificial Intelligence in Database Management.

Indicators	Traditional Methods	AI-Based Approaches
Speed of indexing and searching	2.5 seconds for 1 million records	0.8 seconds for 1 million records
Analysis and processing of large volumes of data	Slow (requires significant resources)	Fast (automated and adaptive)
Data security and anomaly detection	Manual inspection required	AI automatically detects anomalies
Predictive analytics and providing recommendations	Requires manual creation of algorithms	Automated forecasting based on machine learning
Resource consumption and optimization	Requires extensive manual adjustments	AI automatically optimizes resource usage
Capability for real-time analysis	Limited	High
Adaptability	Limited	High adaptability through self-learning systems
Error rate in data processing	Average error rate of 5–10%	Reduced to 1–3%

These results indicate that, with the help of artificial intelligence systems, data processing speed increases, security levels are higher, and it becomes possible to use resources more efficiently. Additionally, AI algorithms provide the ability to operate in real-time, which is of great importance for business and scientific research. For example, automated search systems based on artificial intelligence can help increase data processing speed by up to three times.

The analysis shows that the application of AI algorithms not only accelerates databases but also enhances their security and enables more accurate forecasting [11]. These technologies are expected to further evolve in the future[12], [13], [14], [15].

4. Conclusion

In today's digital world, the efficient management of databases is of critical importance. Artificial intelligence (AI) technologies are driving revolutionary changes in this field, fundamentally improving methods for storing, processing, and managing data. The research findings demonstrate that the application of artificial intelligence algorithms significantly enhances the speed, security, and adaptability of databases.

With the help of AI, automated indexing, real-time data analysis, and anomaly detection are demonstrating higher efficiency compared to traditional methods. Additionally, AI-driven databases are introducing new opportunities in business and scientific fields by reducing human intervention, lowering the likelihood of errors, and optimizing analytical processes.

In the future, as AI technologies continue to advance, database management processes are expected to become even smarter, faster, and more reliable. This will enable companies, research institutions, and government organizations to make more precise and efficient data-driven decisions. Thus, artificial intelligence is contributing not only to technological advancements in the field of databases but also to economic and scientific progress.

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