



**Analysis of artificial intelligence applications in improving
the efficiency of computer systems**

Student preparation :

Maram Fakhri Ayada raeq Al-Masri

Supervision of :

Dr. Muhammad Anbar

Table of contents

Research summary.....	3
Chapter one.....	4
Introduction.....	4
Background.....	5
Problem statement.....	6
Research objective.....	7
Scope research.....	8
Chapter two	9
Literature review	9
Chapter three	13
Research mythology	13
Expected results.....	14
Gantt chart	15
The reviewer	16

Research summary:

This research analyzes artificial intelligence (AI) applications and their role in improving the efficiency of computer systems, it examines modern methods and techniques that rely on intelligent algorithms to enhance system performance, the research aims to demonstrate how AI contributes to increased data processing speed , improved computing resource management, reduced operational errors, and enhanced decision – making within digital systems.

The research also discusses key AI applications in areas such as machine learning, big data processing, fault prediction , and improved information security. These technologies have become essential for boosting the efficiency of computer systems and making them more adaptable to rapid technological changes.

The research concludes that integrating AI Technologies contributes to more accurate, flexible and efficient performance , while acknowledging challenges related to cost , data for a sophisticated technological infrastructure.

Chapter one

Introduction

The modern world is witnessing rapid advancements in digital technology, with Artificial intelligence (AI) becoming a leading field that has fundamentally transformed various scientific and practical sectors, smith et al (2021), this transformation stems from AI's advanced capabilities in data analysis, decision – making, and the simulation of human behavior within technological systems, this development has led to the expansion of AI applications in computer systems, aiming to enhance their efficiency and continuously improve their performance (smith,et,al,2021).

Modern computer systems rely on a range of intelligent applications that contribute to improved processing speed, reduced resource consumption, and early fault detection, in addition to enhancing information security and operational reliability. Garica et al (2023), Furthermore, the use of technologies such as machine learning and big data analytics has become crucial in developing computer systems and making them more adaptable to rapid technological changes. This research examines and analyzes AI applications within computer systems, focusing on their impact on improving operational efficiency, highlighting the key benefits these applications offer, and addressing the challenges that may arise in their implementation across diverse technological environments, the research also aims to highlight the growing role of artificial intelligence in building smarter , lee & chen, (2023), more flexible computer systems capable of meeting the demands of the future technology (zhang et al, 2022).

Background

Computer systems have witnessed significant development in recent years as a result of rapid advancements in digital technology and computer science. Electronic systems have become an essential component in managing businesses, nyaga & Temkin (2024) services, and various operations, this development has led to an increased need for systems capable of processing data quickly and efficiently , especially given that vast expansion in information volume and the increasing complexity of technical processes (nyga & Temkin, 2024).

In light of this development artificial intelligence (AI) has emerged as one of the most important modern technologies, bringing about a clear transformation in the field of computer systems. AI relies on developing intelligent programs and algorithms that can mimic human thinking analyze data, and make decisions automatically.

This has contributed to improving the performance of computer systems and raising their operational efficiency across multiple areas.

Furthermore, AI applications within computer systems include the use of technologies such as machine learning, these technologies help analyze large amounts of data, discover different patterns , and predict problems before they occur (Zahoor, et al ,2024).

This contributes to reducing technical malfunctions and improving the management of software and hardware resources within systems.

On the other hand.

AI has become an effective tool for enhancing information security and improving responsiveness to technological changes, leading organizations to

increasingly rely on it to develop their technological infrastructure. Lee and chen (2023) , Therefore, it is important to study artificial intelligence applications and analyze their role in improving the efficiency of computer systems, while explaining the benefits and challenges associated with employing these technologies in modern computer environments.

problem statement with the rapid advancement of digital technology and the increasing reliance on computer systems across various sectors, the efficiency of these systems has become a fundamental element in ensuring processing speed and execution accuracy (ahmed et al, 2020).

As data volumes and operational processes grow in complexity, computer systems face numerous challenges related to resource management, reducing response times. And improving adaptability to continuous technological changes. Despite the advancements in traditional computer systems, many still rely on conventional operating and management methods that may not achieve the required level of efficiency, especially in environments demanding rapid data processing and immediate decision – making.

The sometimes leads to increased computing resource. Consumption, a higher probability of failures and a reduced ability to predict technical problems before they occur (smith et al, 2021).

In the context, artificial intelligence (AI) has emerged as a modern technological solution capable of improving the performance of computer systems to analyze data, learn from past patterns, and make more efficient decisions (ahmed et al , 2020).

Applications such as machine learning have contributed to developing computing resource management and enhancing operational performance.

Despite this, a deeper analysis of artificial intelligence applications within computer systems is still needed to determine their effectiveness in improving operational efficiency across different environments, as well as to identify the most significant challenges facing the practical application of these technologies. zhang, et al (2022) Therefore , the research problem lies in the need for an analytical study that clarifies the role of artificial intelligence applications in improving the efficiency of computer systems and their contemporary technological challenges.

Research objective

- To analyze artificial intelligence (AI) applications used to improve the efficiency of computer systems and identify their modern applications.
- To identify the impact of machine learning and deep learning techniques on enhancing the operational performance of computer systems.
- To examine the role of AI applications in improving data processing speed and reducing computing resource consumption and response time.
- To evaluate the effectiveness of AI-based systems in predicting technical malfunctions and improving operational decision – making.
- To determine the most significant technical challenges facing the implementation of AI within computer systems and ways to overcome them (garica, et al 2023).

Scope of research

The research focuses on studying and analyzing artificial intelligence (AI) applications used to improve the efficiency of computer systems, with an emphasis on applications related to managing computing resources, accelerating data processing, reducing operational malfunctions, and enhancing the ability to predict technical problems (nyaga & temkin, 2024).

The research also addresses some key AI technologies, such as machine learning and deep learning, as they are among the most widely used methods in developing modern computer systems, bala et al (2024), the research focuses on the theoretical and analytical aspects to clarify the impact of these applications on improving the operational efficiency of computer systems, without delving into detailed application software aspects or studying specific specialized technical systems.

Furthermore, the research is limited to presenting the most prominent technical challenges associated with implementing AI within contemporary computing environments, while demonstrating the role of these technologies in addressing operational problems and improving the overall performance of systems (bala, et al , 2024).

Chapter two

Literature review

Artificial intelligence (AI) applications have witnessed remarkable development in recent years, becoming essential tools for improving the efficiency of computer and industrial systems.

This is due to their ability to analyze data and make decisions more accurately and quickly.

Many recent studies have focused on employing AI techniques such as machine learning, deep learning, and reinforcement learning to enhance the performance of various systems and reduce resource waste.

The study by smith et al (2021) explored the use of AI improve the permeance of operating systems by developing intelligent mechanisms for process scheduling and resource management, the study aimed to improve CPU utilization and reduce system response times.

It relied on reinforcement learning algorithms and neural network to analyze system loads and dynamically allocate resources.

The results showed that these algorithms helped increase traditional scheduling methods.

In the industrial sector, the study by kumar and patel (2022) investigated the role of AI in industrial automation, it aimed to analyze the impact of using AI algorithms on improving production processes and reducing operational errors. The study relied on an analytical review of case studies in various industrial environments.

The results showed that intelligence (AI) into industrial systems contributes to increased productivity and improved operational accuracy.

The study by Zhang et al (2022) focused on using AI improve electrical control systems by designing an intelligent control model capable of adapting to operational changes and minimizing the impact of interference.

The study employed an experimental approach based on testing a control model using machine learning algorithms.

The results demonstrated the proposed system's ability to improve response speed and enhance performance efficiency, In the area of anergy management, the study by Garcia et al (2023) addressed the use of AI to improve energy efficiency within smart buildings. It aimed to evaluate the effectiveness of intelligent algorithms in reducing energy consumption and improving resource management.

The study relied on a systematic review of numerous previous studies.

The results showed that AI techniques, particularly reinforcement learning, art capable of achieving significant reductions in energy consumption.

The study by lee and chen (2023) also discussed the use of artificial intelligence (AI) models in improving critical industrial processes, focusing on predictive maintenance and fault prediction.

The study analyzed several industrial applications, and the results showed that AI contributes to reducing system downtime and improving business continuity.

Meanwhile, the study by Ahmed et al (2020) compared different machine learning algorithms used to improve system efficiency, aiming to identify the most efficient algorithms for data processing and decision – making.

The study employed an experimental approach, comparing the performance of several algorithms using training and testing data.

The results showed that the more advanced algorithms provided higher predication accuracy and improved overall system performance.

These studies collectively indicate a clear consensus that AI is an effective tool for improving system efficiency. However, some studies relied on simulation environments or limited data, highlighting the need for more applied studies based on real – world data to evaluate the effectiveness of these technologies in actual operating environments.

Nyaga & Temkin's (2024) study on the use of machine learning in software engineering aimed to review machine learning application within various software processes.

The results showed that intelligent models contributed to improving software quality, early error detection, and more efficient software maintenance, thus reinforcing the role of artificial intelligence in enhancing the efficiency of computer systems.

Performance enhancement of artificial intelligence: A survey (2024) analyzed methods for improving the performance of artificial intelligence applications in terms of algorithms and computer architecture.

The results confirmed that developing computing resource management and selecting appropriate algorithms contribute increasing processing efficiency and reducing the consumption of technical resources.

Bala et al 's 9(2024) study on artificial intelligence and edge computing in system maintenance aimed to demonstrate the role of intelligent systems in predicting failures before they occur.

The results showed that using intelligent algorithms contributes to reducing operational failures and improving performance continuity within computer systems.

A study by Zahoor et al (2024) examined the applications of artificial intelligent in improving the efficiency of operating systems, the results showed that integrating intelligent systems increases performance efficiency and enhances decision – making speed within various technological environments.

Chapter three

Research methodology

This research employs descriptive analytical approach, deemed most suitable for the study's focus on analyzing the applications of artificial intelligence (AI) in enhancing the efficiency of computer system.

This is achieved by describing the fundamental concepts related to the topic and analyzing the technical application used in the field.

The research objectives will be achieved through a review of scientific literature and previous studies related to AI application, with a focus on machine learning and deep learning techniques.

The study will analyze their role in improving data processing speed, managing computing resources, and reducing operational malfunctions.

Furthermore, the research relies on an analysis of the findings of recent studies to demonstrate the effectiveness of these applications in improving the operational efficiency of computer systems and to identify the most significant technical challenges associated with their implementation in various environments.

Expected results

The research is expected to demonstrate that artificial intelligence (AI) applications significantly contribute to improving the efficiency of computer systems by increasing data processing speed, enhancing computing resource management, and reducing traditional methods.

The results are also expected to show that machine learning technologies play a crucial role in predicating technical failures before they occur and improving the ability of computer systems to adapt to operational changes, thereby increasing reliability and operational efficiency.

The research is also expected to reveal challenges associates with implementing AI within computer systems, such as the need for advanced technological infrastructure, accurate data availability, and information security requirements, however these challenges do not diminish the growing importance of these applications in the development of modern computer systems.

Gantt chart

activity	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Choosing a research topic and defining the problem	✓			✓			
Collection of references and pervious studies				✓	✓		
Writing the introduction and scientific background						✓	✓
Setting the research problem, objective, and methodology		✓	✓		✓		
Writing a literature review previous studies						✓	✓
Analyzing the results and formulating the expected outcomes						✓	✓
Final review and formatting							✓

The research process is divided into several stages, beginning with identifying the topic of the study and collecting scientific sources, then preparing the introduction and background and formulating the basic research elements, followed by analyzing the literature and previous studies, then reaching the expected results and conducting the final review within a specific time period according to a gradual plan that ensures the research is completed in an organized manner.

The reviewer

- Nyaga & Temkin (2024) machine learning applications in software engineering: A systematic review . (3) p.35-21.
- Elsevier, journal of (2024), Performance enhancement of artificial intelligence: network and computer applications.
- Bala et al (2024), artificial intelligence and edge computing for predictive maintenance in computer system.
- Zahoor et al (2024), artificial intelligence techniques for optimizing operational system efficiency.
- Ahmed, s, khan , m & ali R (2020) machine learning algorithms: A comparative study on efficiency and effectiveness , journal of artificial intelligence and machine learning.
- Smith j brown , t , & William , r (2021) enhancing operating system performance with artificial intelligence: optimized scheduling and resource management, international journal of artificial intelligence for optimum performance in industrial automation , journal of industrial engineering and automation.
- Zhang , y , liu H , & CHEN X (2022) , optimization of electric automation control using artificial intelligence , optic - intentional journal for light and electron optics.
- Garica , l rodriguez, m & torres p (2023) artificial intelligence for energy optimization in smart buildings: a systemic review , energy informatics.
- Lee , j & chen k (2023) enhancing clitoral industrial processes with artificial intelligence models, proceedings of engineering and industrial technology research.