

Wall For All

Department of Computer Applications, CUIET, Chitkara University, Punjab



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Dear Readers

The nostalgic feeling that one experiences while sifting through the dusty old pages of the college magazine cannot be expressed in words. However, very few of us have retained those copies, and most of those precious articles that we wrote during those golden days with enthusiasm are lost forever. With the advent of e-books and other online media, the days of paper-bound college magazines are gone, and the digital platform has paved way to allow retention of such publications without much effort.

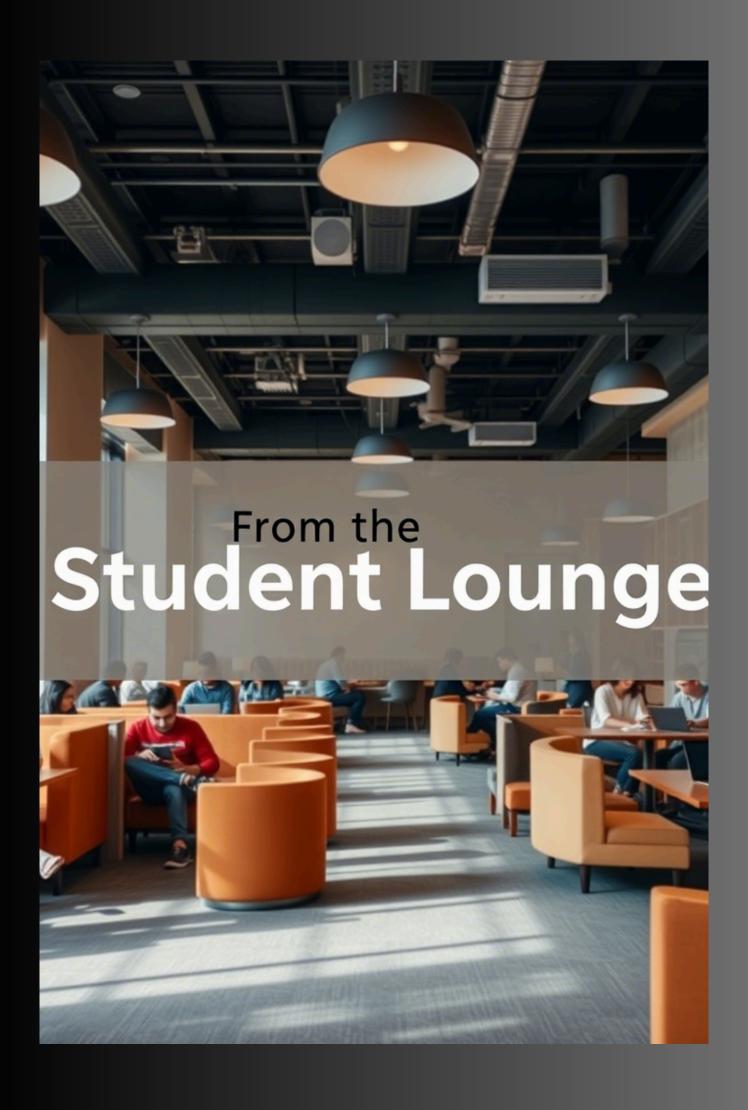
Wall-for-All, the e-Magazine published by the Department of Computer Applications, is one such effort that was started with an intent to provide a chance to all students and faculty members to share their thoughts and knowledge, and hone their skills in creative writing.

I am happy to see the enthusiasm of eminent members of the department to contribute to Wall-for-All. This shows the positive and creative energy of the contributors. However, it would be really wonderful if we can see the articles contributed by more students in the next editions, for this e- Magazine is intended to be a writing pad for each member of the department.

I proudly present the current edition of Wall-for-All.

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AI-Driven Enhancements in Chatbot Interaction and Usability

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Abstract

This paper investigates how manufactured insights (AI) upgrades the ease of use of chatbots over different segments, counting healthcare, instruction, fund, and retail. Through a audit of 15 considers conducted between 2019 and 2024, it highlights the key AI innovations, such as machine learning, common dialect handling (NLP), and personalization calculations, that progress chatbot execution, reaction exactness, and client fulfillment. The inquire about recognizes the noteworthy part of AI in changing inactive chatbots into energetic, versatile frameworks competent of conveying custom fitted, context-aware intuitive. Whereas AI-driven chatbots appear guarantee in upgrading ease of use, challenges stay in terms of domain-specific application, unwavering quality, and believe. This paper emphasizes the require for proceeded headways in AI to address these challenges and advance progress chatbot convenience.

1.Introduction

Chatbots are intelligent conversational software that mimic natural language discussions. They are becoming essential in many industries, such as e-commerce, healthcare, education, and customer support. These technologies provide efficient and effective customer relationship management (CRM) by cutting operational expenses and improving brand image through round-the-clock help. They engage users through text or voice interactions. According to forecasts, by 2020, conversational agents should handle about 85% of consumer contacts instead of human agents. By 2023, the conversational agents market is projected to grow to \$6 billion. Reliable tools to evaluate chatbots' use, user satisfaction, and interaction quality are still required deprite their popularity.



AI-powered chatbots in the education space, such as ChatGPT, provide students with writing, understanding, and personalised learning pathways through dynamic and adaptable learning experiences. But the use of AI in the classroom raises questions about creativity, critical thinking, and academic integrity, which calls for cautious thought and supervision. In order to determine how successfully users can learn and use chatbots to fulfil their goals, an evaluation of their usability must consider various aspects, including learnability, efficiency, memorability, error handling, and satisfaction. Although qualitative approaches shed light on user experiences, standardised, trustworthy tools are desperately needed to quantify chatbot usability in a range of scenarios.

The purpose of this article is to present a thorough overview of chatbot usability evaluation by outlining the status of the study, highlighting important metrics, and suggesting a model that will direct the creation and evaluation of chatbots. This effort aims to further the creation and integration of chatbots, ensuring they satisfy user expectations and contribute to improved digital interactions, by filling in the gaps in the current literature and providing useful insights. Furthermore, the relevance of these systems' usability, efficiency, and general efficacy is shown by the multifaceted role that AI plays in healthcare, education, and retail. As chatbots proliferate, it is imperative to comprehend the elements that augment their capabilities and elevate user contentment. AI chatbots, for example, can enhance patient care and diagnostic precision in the healthcare industry, while in the retail. They can improve client experiences by offering prompt, individualised assistance.

Because the effectiveness of chatbots depends on their capacity to promote meaningful and fruitful interactions, it is imperative that their usability be continuously assessed and improved. This study adds to the body of knowledge already in existence and offers developers and designers useful suggestions for building more efficient and user-friendly chatbot systems. This study attempts to close the gap between technology and user experience by combining insights from software engineering and human-computer interaction (HCI), thereby promoting more intuitive and fulfilling digital interactions.

2. Methodology

The technique for this investigate included a comprehensive writing survey of considers distributed between 2019 and 2024 that centered on AI-enhanced chatbot ease of use over different divisions. Fifteen peer-reviewed papers were chosen based on their significance to key AI strategies, such as machine learning, characteristic dialect handling (NLP), and personalization. Each think about was assessed for its strategy, AI instruments utilized, and the results related to chatbot execution and client fulfillment. Information were synthesized to distinguish common patterns, challenges, and openings within the application of AI to make strides chatbot convenience. Moreover, this investigate connected subjective and quantitative investigation of existing writing to survey the impact of AI progressions in numerous spaces, counting healthcare, instruction, client benefit, back, and retail.



Figure 1: AI-Enhanced Chatbot Usability

3. Results and Discussion

The examination of existing writing appears that AI advances altogether improve the ease of use of chatbots, with machine learning and characteristic dialect preparing (NLP) being the foremost common devices. These advances permit chatbots to superior get it and react to client inputs, progressing precision and productivity over different spaces such as healthcare, instruction, fund, and retail. Machine learning, in specific, plays a pivotal part in making chatbots more responsive and context-aware [1,2]. The integration of AI into chatbot frameworks empowers a move from inactive, rule-based reactions to more energetic, versatile intuitive, expanding client fulfilment.

Personalization is another key figure in upgrading chatbot ease of use [3,4] illustrate how AI-driven personalization methods, such as client profiling and versatile calculations, tailor chatbot reactions to person inclinations. This not as it were moves forward the pertinence of intelligent but moreover cultivates more grounded client engagement. Also, headways in profound learning [5], assist progress the capacity of chatbots to handle complex inquiries and give more nuanced reactions, making them more natural and user-friendly. In any case, challenges stay in accomplishing ideal ease of use, especially in regions like healthcare and instruction, where exactness and setting affectability are basic. Investigate by [6,7] that whereas AI upgrades chatbot execution, continuous enhancements in AI calculations are vital to overcome challenges related to believe, unwavering quality, and client flexibility. Future inquire about ought to center on refining these AI devices to address domain-specific convenience issues whereas keeping up client engagement and fulfillment.

4. Conclusion

AI has essentially upgraded the convenience of chatbots, making them more precise, personalized, and user-friendly. Machine learning, NLP, and personalization are key drivers of these enhancements, in spite of the fact that challenges stay in adjusting robotization with client engagement, especially in candidly delicate and complex intelligent. Encourage headways in AI advances, particularly in profound learning and conversational AI, guarantee to address these challenges, making chatbots an indeed more necessarily apparatus over businesses.

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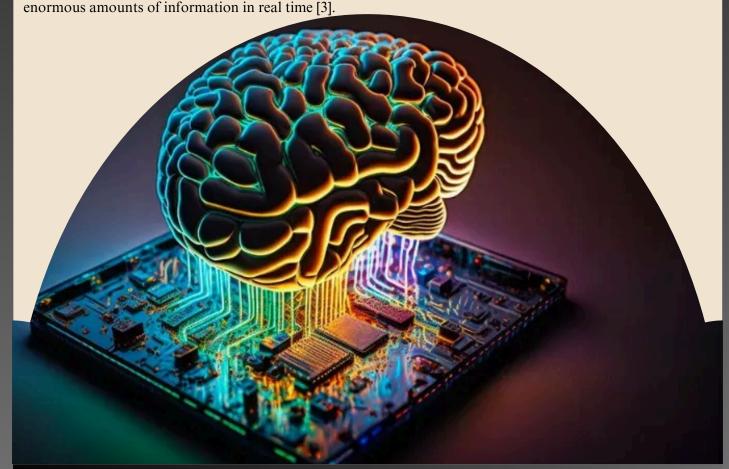
Advanced Problem Solving Using Neuromorphic Computing and Brain-Inspired AI

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A quickly developing field called "neuromorphic computing" aims to mimic the structure of the brain in order to boost computational systems' efficiency and performance. Complex, real-time AI and machine learning challenges may be resolved by neuromorphic systems, which imitate the neural networks and synaptic connections present in the human brain. This article examines the basic ideas of neuromorphic computing, its uses in domains including cognitive computing, robotics, and healthcare, as well as the main obstacles in creating systems that are inspired by the brain. It also explores the latest developments in neuromorphic hardware, such as processors like IBM's TrueNorth and Intel's Loihi, and talks about the potential of neuromorphic computing in the future, especially how it might be integrated with other cutting-edge technologies like quantum computing. The future generation of AI technologies is expected to heavily rely on neuromorphic computing because of its energy economy, versatility, and capacity for sophisticated problem-solving.

1. Introduction

Computational systems that mimic the structure and operation of the human brain are referred to as neuromorphic computing. Particularly in domains like pattern recognition, adaptive learning, and sophisticated decision-making where conventional designs falter, this paradigm change in computing has the potential to be revolutionary. To attain comparable levels of speed and energy optimization, neuromorphic devices are being created, drawing inspiration from the brain's unmatched efficiency and capacity to process



By combining artificial intelligence (AI) and neuromorphic computing, scientists are opening up new avenues for intelligent, real-time systems that can react, learn, and adapt on their own. In domains like robotics, autonomous cars, cognitive computing, and healthcare, where sophisticated, effective, and context-aware problem-solving skills are essential, this convergence holds great promise.

2. Neuromorphic Computing

A branch of computer engineering called "neuromorphic computing" creates software and hardware systems that are designed to resemble the composition and operations of the human brain. Instead of employing conventional logic gates, it uses spiking neural networks (SNNs) to mimic the functioning of biological neurons and synapses. Similar to the neural network in the brain, neuromorphic systems operate in parallel, in contrast to traditional computers that use the von Neumann architecture to process information sequentially. Because of this, they are extremely effective at using very little power for tasks like pattern recognition, making decisions in real time, and learning from data [1]. Specialized parts that mimic synapses (connections) and neurons (processing units) are used in neuromorphic electronics. In robotics, autonomous systems, and cognitive computing, where efficiency and adaptability are crucial, these systems are especially well-suited for AI applications [2].

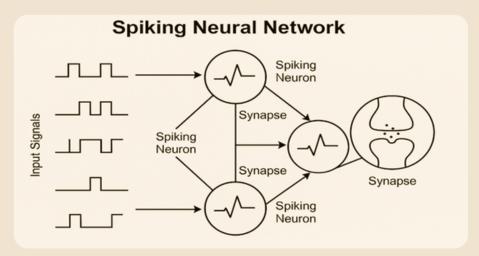


Fig-1 Neuromorphic Computing Architecture

3. Brain-Inspired AI and Its Benefits

Through the development of artificial neural networks that duplicate biological processes, brain-inspired AI models seek to emulate the cognitive capacities of the human brain. In the same manner that the human brain processes sensory inputs through sensory pathways before reaching higher cognitive functions, these networks process information in layers, with each layer recognizing certain aspects of the data [5].

- 3.1 Benefits of Brain-Inspired AI: The benefits of brain inspired AI are as follow:
- 3.1.1. Efficiency: The parallel processing design of neuromorphic systems results in extremely high energy efficiency. Compared to conventional computers, they can execute intricate calculations with significantly reduced power consumption [6].
- 3.1.2. Real-Time Processing: Information can be processed literally instantly by the brain thanks to parallel processing. Real-time feedback loops and decision-making are made possible by neuromorphic computer systems, which also duplicate this capability.
- 3.1.3. Adaptability: Similar to the human brain, neuromorphic systems are more adaptable in dynamic contexts because they can adjust to new information and experiences without needing to be fully retrained[7].

4. Applications of Neuromorphic Computing

Applications for neuromorphic computing are extensive and span many different industries. These systems have the potential to significantly advance fields that demand processing that is quick, flexible, and effective.

- 1. Autonomous Systems: Real-time decision-making in dynamic and complicated contexts is necessary for robotics, autonomous cars, and aerial drones. The energy requirements and delay of such operations are frequently too much for conventional computing systems to handle. By interpreting sensor inputs (such as vision, radar, and LiDAR) and responding quickly to changing conditions, neuromorphic systems—which have an event-driven architecture and brain-like parallel processing—improve safety and efficiency in autonomous operations [8].
- 2. Medicine: Neuromorphic technologies are very good at taking in and reacting to environmental information. The human body can use these technologies when they are combined with organic components. Neuromorphic devices may be employed in the future to enhance medicine delivery methods. Because of their high sensitivity, they could release a medication when they detect a change in bodily conditions, such as fluctuating insulin and glucose levels. Neuromorphic computing also holds promise for transforming medical equipment. Real-time brain signal analysis by neural implants employing these processors may enable more natural reactions from prosthesis and let paralyzed limbs function again.
- 3. Artificial Sensory Systems: In order to create artificial sensory processes that mimic human senses, neuromorphic computing is helpful. Neuromorphic vision sensors, for instance, analyze visual information similarly to the retina, allowing for quick and effective motion tracking and object detection. Neuromorphic tactile devices, which are essential for robotic grasping and prostheses, also mimic the sense of touch. These features make machines more responsive and realistic in human-centered settings [10].

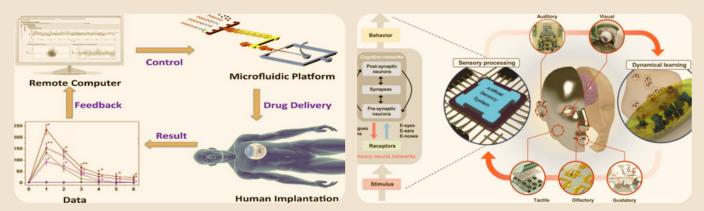


Fig-2 Schematic flow of a drug delivery system

Fig- 3: Hardware artificial sensory neural network

- 4. Cognitive Computing: Cognitive computing, or systems that imitate the human brain's capacity for learning, thinking, and problem-solving, is a good fit for neuromorphic processors. These systems can be used for personalized learning platforms, virtual assistants, and healthcare or financial decision-making systems. They are perfect for sophisticated, context-aware AI applications because of their capacity to learn from experience and adjust to new inputs without requiring extensive retraining [5].
- 5. Key Challenges in Neuromorphic Computing
 - I. Hardware Complexity: The scale of neurons and synapses in the brain is now beyond the capabilities of such chips as IBM's TrueNorth [1] and Intel's Loihi [2].
- II. Algorithm Incompatibility: Neuromorphic systems employ spiking neural networks (SNNs), which are incompatible with traditional AI paradigms [5].
- III. Problems with Data Encoding: One of the biggest obstacles is still converting real-world data into spike-based input [6].
- IV. Scalability Issues: Neuromorphic systems are hard to scale without causing latency and power consumption to rise [7].

6. Neuromorphic Hardware: The Race to Brain-Like Chips

Several companies and institutions are currently developing neuromorphic chips designed to replicate brain-like processing. One of the leaders in neuromorphic hardware is IBM, which introduced its TrueNorth chip [1]. TrueNorth is a neuromorphic chip designed to emulate 1 million neurons and 256 million synapses. Another major player is Intel, with its Loihi chip [2], which is designed to replicate the functionality of the brain's spiking neurons. These chips are specifically designed to execute computations based on how the brain works, focusing on energy efficiency and speed.

7. The Future of Neuromorphic Computing

Working together, AI researchers, hardware engineers, and neuroscientists will be essential to the advancement of neuromorphic computing as the field grows. Enhancing the size and effectiveness of neuromorphic hardware, creating specific algorithms to take advantage of it, and broadening the range of applications are the next steps. Furthermore, combining neuromorphic computing with other cutting-edge technologies like quantum computing could result in even bigger advancements. By providing exponentially scalable processing capability, quantum computing may be able to be used in conjunction with neuromorphic systems to solve challenging issues in domains such as materials science, drug development, and climate modeling [9].

8. Conclusion

Neuromorphic computing implies a paradigm shift in the way we perceive AI problem-solving. These systems can solve a variety of problems more quickly, effectively, and flexibly by taking inspiration from the human brain. Despite ongoing difficulties in the development of hardware and software, recent advancements indicate that neuromorphic computing will be essential to the development of AI in the future, especially in the areas of autonomous systems, real-time decision-making, and sophisticated problem-solving.

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Student Guide: Getting Free Access to Microsoft Azure

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1.Introduction

In the age of digital transformation, cloud computing has become the backbone of modern innovation. Whether it's hosting a website, analysing large datasets, training AI models, or deploying scalable applications, cloud platforms like Microsoft Azure offer a playground of possibilities. For students, gaining hands-on experience with such platforms can significantly boost employability, enhance project quality, and inspire creativity.

Thankfully, Microsoft recognizes this need and offers a fantastic program called Azure for Students, which allows learners to explore Azure services for free, without needing a credit card. With this subscription, students can build and deploy cloud-based applications, access premium services, and prepare for certifications all while learning at their own pace.

In this guide, we'll walk through how to create a free Azure for Students account, explore the benefits of the program, and offer an alternative method for students without a school-issued email address.

1.1 Why Use Azure as a Student?

Before diving into the setup process, let's understand why you should consider using Azure as a student:

- 1. Free \$100 credit to explore and use paid services.
- 2. Access to over 25+ services for free, such as:
 - a. Azure Virtual Machines
 - b. Azure AI and Machine Learning tools



- 3. Learning resources, including modules, labs, certifications, and projects.
- 4. No credit card required, making it safe and student friendly.
- 5. Preparation for industry-relevant certifications like Microsoft Certified: Azure Fundamentals.[1]

2. Step-by-Step Process to Creating an Azure Student Account

Step 1: Visit the Azure for Students Page

Open a web browser and search for "Azure for Students." Alternatively, go directly to the URL: https://azure.microsoft.com/en-us/free/students

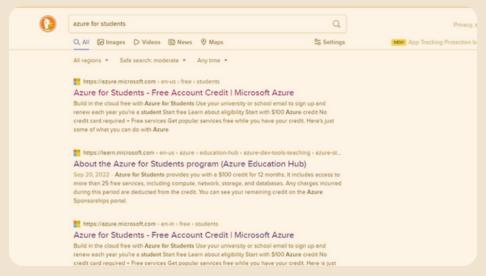


Figure 1 Azure Portal

- a) Click on the "Start Free" or "Activate" button.
- b) You'll be taken to the sign-in page for your Microsoft account.[2]

Step 2: Sign in with Your School Email

To be eligible, Microsoft verifies your student status using a valid school or university-issued email address.

- a) Enter your .edu, .ac, or official university domain email.
- b) If it's your first time logging in, a verification code will be sent to that email.
- c) Enter the code to confirm your identity.



Figure 2 Azure Home Page

Step 3: Identity Verification

Microsoft may ask for a second layer of verification using your phone number.

- a) Select your country and enter a mobile number.
- b) You will receive a text message with a verification code.
- c) Input the code and continue.

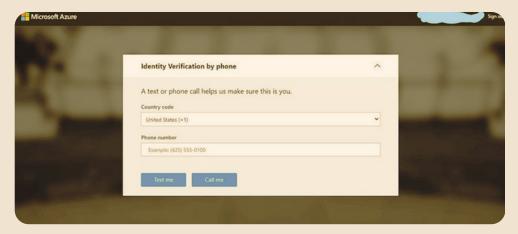


Figure 3. Identification by Phone Number

Once verified, you'll be taken to the Azure Portal.

3. Exploring the Azure Portal

Welcome to your student dashboard! Here's what you'll typically see:

1. Azure Credit

You'll see your free \$100 credit clearly mentioned on the dashboard. This credit can be used over 12 months.

2. Education Hub

The Education Hub offers guided learning paths, sandbox environments, and student-specific tools like:

- GitHub Code spaces integration
- Azure AI Notebooks
- Web App Hosting
- VS Code for Web

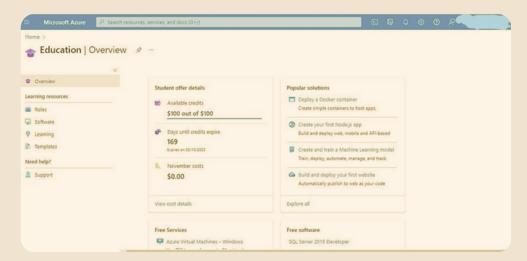


Figure 4. Azure Education Overview



Figure 5 Azure Education Hub

3. Start Learning

Click on Learning Resources, or head over to Microsoft Learn to take structured courses [3] such as:

- Azure Fundamentals
- · Azure AI Fundamentals
- DevOps with Azure

4. What If You Don't Have a School Email? (Alternative via GitHub)

Not every student has a university-issued email. Don't worry Microsoft allows verification through the GitHub Student Developer Pack.[4]

Step 1: Go to GitHub Education

Visit: https://education.github.com

Click on "Get Student Benefits" or "Sign up for Student Developer Pack."

Step 2: Sign In and Apply

- Log in with your GitHub credentials.
- You'll be asked to provide academic proof. You can upload:
- · Your student ID card
- · Admission letter
- · Any document with your name and university name



Figure 6. Github Home Page

GitHub's team will review your application, and the verification usually takes a few days.

Step 3: Link GitHub with Azure

Once you've been approved by GitHub, you can now go back to the Azure for Students page.

- During the sign-up, select the GitHub login option.[5]
- Use your verified GitHub account to proceed.
- You'll get the same benefits even without a school email.

How to Use Azure as a Student?

Now that your account is active, here are a few ways you can start using Azure for learning and building:

- 1. Host Your Portfolio Website: Use Azure App Service to host your HTML, React, or Node.js website live on the internet. You can even link a custom domain!
- 2. Experiment with AI & Machine Learning: Try out Azure Cognitive Services and Azure Machine Learning Studio to build models, perform sentiment analysis, or create bots.
- 3. Build a Cloud Database: Use Azure SQL Database or Cosmos DB to learn about relational and NoSQL databases. You can build CRUD apps and connect them to front-end interfaces.[6]
- 4. Practice DevOps Skills: Explore Azure DevOps, CI/CD pipelines, and infrastructure-as-code tools to prepare for enterprise workflows.
- 5. Certification & Resume Building

Microsoft offers student discounts on certification exams [7] like:

AZ-900: Azure Fundamentals

AI-900: Azure AI Fundamentals

DP-900: Azure Data Fundamentals

5. Security and Best Practices

As you explore Azure, make sure to:

- 1. Monitor your usage through the Azure Cost Management dashboard.
- 2. Turn off unused resources to avoid draining credits.
- 3. Use resource groups to organize and manage your services.
- 4. Secure your projects with role-based access control (RBAC) and Azure Identity tools.[8]



Figure 7. GitHub credentials

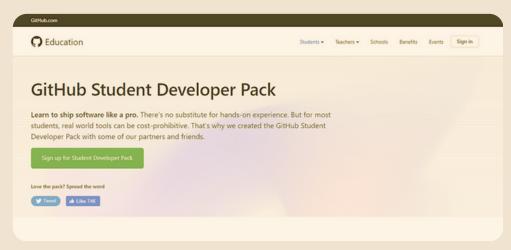


Figure 8. GitHub Student Developer Pack

6. Conclusion

Azure for Students is an excellent opportunity for learners to explore cloud computing, AI, and software development without worrying about initial costs. With free access to powerful tools, services, and learning resources, students can build real-world skills, innovate on projects, and prepare for future careers in tech. Whether you're experimenting with AI, deploying web apps, or managing databases, Azure equips you with everything needed to grow as a developer. Make the most of this offer and start building your future in the cloud today!

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5G Technology: A Gateway to Next-Generation Connectivity

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1. Introduction

Fifth-generation (5G) wireless communication represents a transformative advancement in connectivity. As the successor to 4G LTE, 5G introduces ultra-high-speed data transmission, reduced latency, and expanded network capacity—critical enablers of innovations such as autonomous vehicles, smart infrastructure, and immersive virtual experiences. While global adoption is still progressing, 5G is emerging as a foundational layer in the digital transformation of diverse industries.

2. Key Benefits of 5G Technology

2.1 Ultra-High Speed and Low Latency

5G delivers peak data rates of up to 10 Gbps—nearly 100 times faster than its predecessor. Latency is reduced to as low as 1 millisecond, supporting real-time operations essential for sectors such as healthcare and manufacturing.

2.2 Enhanced Network Capacity

With the ability to connect up to one million devices per square kilometer, 5G is tailored to accommodate the dense interconnectivity required by smart cities and the Internet of Things (IoT).

2.3 Reliability and Energy Efficiency

5G employs advanced infrastructure technologies such as network slicing and beamforming to enhance reliability and optimize energy usage, resulting in longer battery life for connected devices.



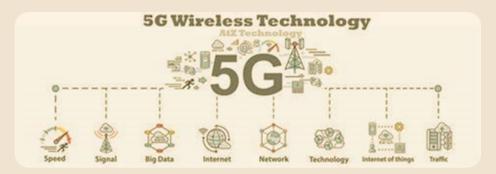


Figure 1: Overview of 5G wireless technology and its core components, [1]

2.4 Support for Emerging Technologies

Innovations in artificial intelligence, augmented/virtual reality, machine learning, and edge computing thrive under 5G due to its bandwidth and responsiveness.

3. Applications of 5G

3.1 Healthcare

5G facilitates high-resolution imaging, remote diagnostics, and telesurgery with minimal lag, enabling real-time control of medical instruments from distant locations.

3.2 Autonomous Mobility

Connected vehicles rely on instantaneous data exchange for navigation and safety. 5G ensures low-latency communication between sensors, traffic systems, and vehicles.

3.3 Smart Cities

Urban management systems use 5G to integrate traffic flow optimization, waste management, energy grids and surveillance in real-time.

3.4 Industry 4.0 and Manufacturing

5G empowers predictive maintenance, automation, and remote control of industrial equipment, contributing to operational efficiency and worker safety.

3.5 Education and Entertainment

Immersive virtual learning and ultra-HD media streaming become accessible with 5G, enhancing user experiences across platforms.

4. Challenges and Considerations

4.1 Infrastructure Demands

5G deployment necessitates widespread installation of small cells and fiber networks, posing logistical and financial challenges, particularly in remote regions.

4.2 Spectrum Allocation

Efficient low, mid, and high-frequency bands requires international coordination and regulatory reforms.

4.3 Cybersecurity and Privacy

As more devices connect to 5G, the risk of cyber threats escalates, necessitating advanced encryption, authentication, and real-time threat monitoring.

4.4 Health and Environmental Concerns

Although inconclusive, public discourse persists on the biological impacts of high-frequency radiation. Moreover, the environmental footprint of data centers supporting 5G remains a concern.



Direction 4 Direction 2 Direction 3

Operator 1 Core Network

(Traditional Operator)

Figure 2: Key challenges of 5G implementation [4]

Figure 3: Key challenges of 5G implementation [4]

Direction 1

Operator 2 Core Network

(Road Operator)

5. Future Outlook

5G serves as a precursor to upcoming innovations such as 6G, holographic communication, AI-integrated services, and drone logistics. With strategic collaboration among academia, industry, and policy-makers, 5G can drive sustainable digital ecosystems and greener technology infrastructures.

6. Conclusion

Beyond being a mere upgrade, 5G is a transformative force poised to redefine connectivity. Its promise extends across sectors, enhancing efficiency, innovation, and quality of life. However, realizing its full potential necessitates deliberate planning, robust infrastructure, and responsible governance.

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The Rise of Internet of Things (IoT) and Smart Home Technology

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1.Introduction

The Internet of Things (IoT) has revolutionized how we interact with our living spaces, transforming ordinary homes into smart homes. This article explores the rise of IoT in smart home technology, examining current trends, statistical data, benefits, challenges, and the future of this rapidly evolving field.

2. What is the Internet of Things (IoT)?

The Internet of Things (IoT) is a system of interconnected devices, vehicles, appliances, and other objects equipped with sensors, software, and network capabilities that allow them to gather and share data [4]. These intelligent devices can include everything from household items like smart thermostats to advanced industrial equipment and transportation systems. By enabling communication between devices and with the internet, IoT facilitates autonomous data exchange and task execution across a broad network [4].

3. Smart Home Technology: An Overview

Smart home technology involves utilizing internet-enabled devices that allow homeowners to oversee, manage, and automate different household functions like lighting, climate control, security, and entertainment. These devices, operating through the Internet of Things (IoT), interact with one another and can be controlled remotely using smartphones or voice-controlled assistants, offering increased comfort, improved energy efficiency, and enhanced home security in today's digital age [1].



4. Applications of IoT in Smart Homes

- Home Automation: IoT devices automate tasks such as lighting, temperature control, and appliance operation. Smart lighting systems automatically modify brightness and color temperature depending on room occupancy and the time of day. Home automation hubs integrate various devices, enabling centralized control and coordination [1].
- Energy Management: Smart thermostats, smart plugs, and energy monitoring systems help optimize energy consumption, reducing waste and lowering utility costs.
- Security and Safety: Devices like smart locks, surveillance cameras, and alarm systems improve home protection by offering remote monitoring and instant alerts in real time [5].
- Entertainment: Smart TVs, audio systems, and media streaming devices offer seamless entertainment experiences [2].
- Healthcare and Elder Care: IoT devices play a crucial role in remote patient monitoring, medication management, and fall detection for the elderly, enabling independent living and improving quality of life [2].

5. The Rise of IoT in Smart Homes

The Internet of Things (IoT) refers to a network of physical devices, vehicles, appliances, and other physical objects embedded with sensors, software, ¹ and network connectivity, allowing them to collect and share data. IoT devices, also known as "smart objects," range from simple smart home devices like thermostats to complex industrial machinery. This interconnected ecosystem enables smart devices to communicate with each other and other internet-enabled devices, creating a vast network that can exchange data and perform various tasks autonomously. The rise of IoT in smart homes has led to significant advancements in home automation, security, energy efficiency, and overall convenience. Smart homes are now equipped with devices and systems that enhance comfort, security, and energy efficiency.



Services 1

Figure 1. Internet of Things

Figure 2. Smart Home Technology

6. Current Trends in IoT Smart Homes

Several emerging trends are shaping the future of IoT in smart homes:

- Emotion-Aware Devices: Devices that use sensors and AI to detect human emotions, creating personalized experiences [2].
- AI-Driven Analytics: Integration of AI for real-time data analysis and action, enabling devices to learn and adapt to user preferences [2].
- Personalized Interactions: IoT systems learning user preferences to optimize home automation and healthcare [2].
- Smart Home AI: AI-driven smart homes adapting systems like thermostats by observing and repeating inhabitants' habits [2].
- Smart Furniture: Voice-enabled smart couches and intelligent wardrobes organizing accessories and clothes [2].
- Blockchain Technology: Increased adoption of blockchain for ensuring data security in IoT devices [2].

7. Statistics on IoT and Smart Home Technology

The smart home market is experiencing substantial growth:

- The global smart home market size was valued at USD 121.59 billion in 2024 and is projected to reach USD 633.20 billion by 2032 [3].
- Global consumer spending on smart home systems is expected to exceed \$170 billion by 2025 [6].
- North America accounts for 40% of all smart home consumer spending [6].
- The number of connected IoT devices is estimated to grow to 40 billion by 2030 [6].

8. Benefits of IoT in Smart Homes

IoT technology offers numerous benefits for smart homes:

- Improved Efficiency: Automating and optimizing processes to improve productivity.
- Data-Driven Decision-Making: Generating data for better-informed business decisions and understanding customer behaviour.
- Cost Savings: Minimizes manual effort by automating routine tasks.
- Enhanced Security: Provides instant notifications and live monitoring for enhanced home security.
- Energy Conservation: Lowers energy usage with the help of intelligent lighting and thermostat controls.

9. Challenges of IoT in Smart Homes

Despite the numerous benefits, IoT in smart homes also presents several challenges:

- Security and Privacy Concerns: Vulnerability to hackers and cyber threats.
- Interoperability Issues: Difficulty in integrating devices from different manufacturers.
- Complexity and Usability: Complicated setup and management of multiple devices.
- Cost: Significant upfront expenses and continuous maintenance requirements.
- Dependence on Internet Connectivity: Reliance on a stable internet connection for proper functioning.

10. The Future of IoT in Smart Homes

The outlook for IoT in smart homes is bright, driven by progress in:

- Artificial Intelligence (AI): AI will work with IoT to provide more intelligent and adaptive automation.
- Machine Learning: Integration of machine learning algorithms to enable smart homes to learn and adapt to user preferences.
- Enhanced Security: More sophisticated security systems using machine learning and AI to detect and respond to threats.
- Interconnectivity: Seamless communication between devices for a unified experience.
- Sustainability: Devices designed to minimize resource consumption and waste.

11. Conclusion

IoT and smart home technology are changing the way we live by making our homes more convenient, efficient, and secure. As innovations advance, smart homes are expected to become increasingly intelligent, tailored to individual needs, and seamlessly integrated into everyday routines. Although some challenges persist, the advantages of IoT in home environments are clear, pointing toward a future with smarter, safer, and more eco-friendly living spaces.

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A Comparative Analysis of iOS and Android: A Case for iOS Superiority

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Abstract

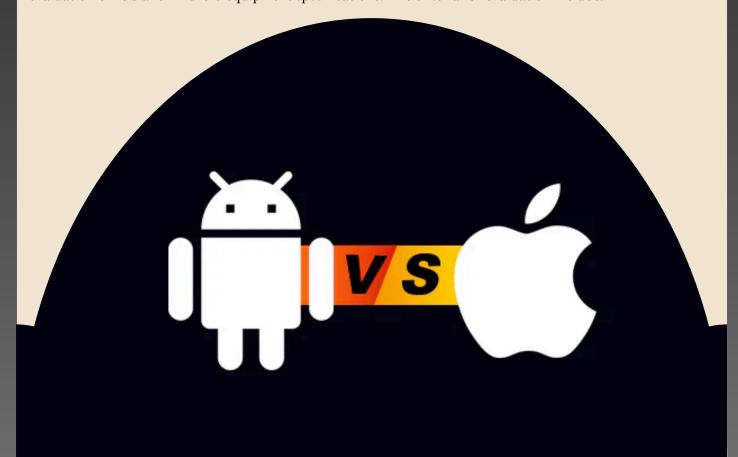
Millions of people worldwide continue their protracted argument over these two mobile operating systems since their introduction in 2007. The research investigates Apple's iOS and Android features to establish clear distinctions which make iOS users prefer its experience. This paper presents the advantages of iOS through an examination of factors such as user interface design, software updates, privacy and security, app quality, customer support, device longevity, ecosystem integration and resale value. Users select iOS devices as their main option because they prioritize security as well as simplicity and consistent usage alongside long maintenance.

1.Introduction

Smartphones are essential modern devices that function with either iOS developed by Apple Inc. for iPhones or Android developed by Google for phones made by Samsung Google and OnePlus. While both systems provide different advantages each system holds users tend to consistently choose iOS which leads to a comparison between their respective features. The study investigates iOS features which attract users by using examples of how iOS beats Android in different operational areas [1].

2. Methodology

Research methodology uses literature review results combined with consumer observations and detailed evaluation of iOS and Android equipment specifications. The criteria for evaluation include:



2.1. User Interface and Experience

The user interface (UI) stands as an essential part of smartphone functionality because iOS developers created it for ease of use and simplicity. The system functions as an integrated unit with hardware components to enable fluid device experiences. Distinct features differentiate Android mobile phones from one another because manufacturers integrate original skins and additional apps into their operating systems. The wide range of customization among Android devices makes the user experience unstable for users who lack technical expertise[2].

2.2. Software Updates and Longevity

The main strength of iOS involves delivering equal software updates for every device that supports its system. Every new version of iOS that Apple launches arrives on all iPhones which meet the compatibility requirements during a single release period no matter what carrier or manufacturer the phone came from. Through this method manufacturers provide security fixes and feature improvements to all devices which remain supported by the operating system. The process of Android software update distribution moves at a slower pace because manufacturers need to modify the software for each distinct smartphone model. Users who possess some devices might end up without software updates because these devices get excluded from receiving new updates. The inconsistent update frequency and different levels of consistency result in shorter life spans for numerous Android mobile devices[3].

2.3. Privacy and Security Features

Digital users need privacy protections and security safeguards above all else in the contemporary digital world. Customer privacy stands at the core of Apple's policies because iOS requires apps to ask users explicitly for permission to use sensitive information including location data and personal details. Customer trust in the platform increases because Apple maintains it does not sell user data to advertisers. The design of Android features extensive privacy controls yet it remains open to broader app operations making it accessible to numerous applications. The application review process in iOS results in fewer malicious software risks following its stringent approval methods leading to lower chances of harmful program encounters[4].

2.4. App Quality and Availability

Application quality serves as the main separating element between iOS and Android platforms. Users gain access to high-quality tested apps exclusively through the Apple App Store since it operates a stringent evaluation process. Turned-by-developers favor iOS for app deployment because its enhanced monetary possibilities generate an app environment that features polished and trustworthy applications. The Google Play Store on Android features more available applications but its limited quality assessment leads to an abundance of unsatisfactory and dangerous programs. Apps that serve users in need of secure seamless operation show a special significance to this distinction[5].

2.5. Customer Support and After-Sales Service

Apple maintains an outstanding customer support system that receives universal acclaim from its clients. Users have three support channels to contact trained Apple representatives through physical stores and digital conversation and telephone service. Customer service at this level enables quick and proper solutions for all issues that customers experience. Android device support represents a wide range of capabilities since different manufacturers have differing policies that lead to quicker responses from some while others provide restricted contact options[6].

2.6. Device Durability and Performance

The dedication Apple shows to product quality allows iPhones to achieve extended periods of use. Updated software and appropriate optimization practices enable iPhones to deliver continuous strong performance till the end of their lifespan. Users often state their iPhones retain normal functioning for a span of four to five years without encountering significant problems. Android devices experience performance loss that becomes worse when their software support period ends.

The better quality construction from Android manufacturers does not outweigh their inconsistent software update policies which lead iPhones to provide users with uniform and enduring experiences.

2.7. Ecosystem Integration

The seamless connection between Apple's hardware products and operating systems within a unified system stands as a cornerstone of the iOS benefits. Apple provides users with a unified experience by making its iPhone pair harmoniously with iPad and MacBook as well as Apple Watch and AirPods. The iPhone system enables simple transitions between devices with Handoff, AirDrop and iCloud features that enhance the process of sharing files and device synchronization. Android features exist but most Android brands subject these capabilities to conditions or demand users to perform advanced configurations[7].

2.8. Resale Value

The reselling value of iPhones constantly exceeds that of Android smartphone models. The combination of strong construction quality and extended software maintenance and sustained consumer demand permits iPhones to preserve a major portion of their initial value through time. Phones running on the Android operating system lose their value quickly while most models that operate on a budget or middle segment see significant depreciation. The resale value advantage of iOS devices demonstrates how Apple products are viewed as durable products which makes iPhones an appealing choice for long-term economic investments.

3. Conclusion

The evaluation between operating systems reveals that iOS provides superior features than Android through its consistent user interface and updated software alongside excellent privacy protection and app quality, extended support and lifetime span and integrated ecosystem and excellent resale market value. Despite its open platform and extensive device selection Android trails against iOS because the iOS system offers an exceptional unified experience while guaranteeing security and easy usage together with long-term product worth. The mobile ecosystem keeps evolving but users primarily select iOS as their system choice because it delivers reliability together with performance alongside seamless integration within a secure digital environment.

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AI Agents and Autonomous Task Execution

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1.Introduction to AI agents

An Artificial Intelligence (AI) agent refers to a system or program that is capable of autonomously performing tasks on behalf of a user or another system by designing its workflow and utilizing available tools.AI agents operate by processing large amounts of data, learning from this data, and making informed decisions based on their learning.

2. Need for AI agents:

Today, with increasing industrialization and workload, we need to be competitive and perfect among our competitors. Moreover, the demand of skill is increasing incredibly. Thus, to come up with it we need to focus on "Smart Work, Not Hard Work". Thus, using AI based software which can humanize the tasks is required. Undoubtedly, they represent a significant leap in the capabilities of software to perform tasks that would typically require human intelligence. These agents are designed to automate a variety of complex tasks, ranging from simple data entry to more complex decision-making processes [1].

3. Evolution/ Invent of AI agents:

Earlier technology advancements came up with chatbots like OpenAI's ChatGPT which have been pivotal in understanding and generating human-like text based on the input they receive. However, AI agents take this a step further by not only understanding and generating text but also by interacting with the environment in a more dynamic and purposeful way.



4. Difference Between Traditional AI and AI Agents:

Autonomous AI agents have broader capabilities compared to chatbots. The main difference is that chatbots work based on natural language prompts, and their job is to fulfill one task using the input instructions. And this is when their job ends. Autonomous AI agents perform a more complex mission. They're focused on completing an objective that includes multiple tasks that need to be ordered and evaluated before the objective completion.

Another difference is that a chatbot doesn't learn from its responses. It neither stores what it produces nor knows if it is good or bad. Autonomous AI agents can learn and store the feedbacked information in the memory to refer to it and find the best solution. With feedback, they can improve and complete their objectives well.

'Chatbots generate text responses based on the user input. Autonomous AI agents go a few steps further and can execute complex actions and operations using tools and memory. They can make a task list, prioritize, and order them to finally complete the objective.'

Let's Dive Straight Into How This Amazing Technology Works:

- Persona: A well-defined persona allows an agent to maintain a consistent character and behave in a manner appropriate to its assigned role, evolving as the agent gains experience and interacts with its environment.
- Memory: The agent is equipped in general with short term, long term, consensus, and episodic memory. Short term memory for immediate interactions, long-term memory for historical data and conversations, episodic memory for past interactions, and consensus memory for shared information among agents. The agent can maintain context, learn from experiences, and improve performance by recalling past interactions and adapting to new situations[2].
- Tools: Tools are functions or external resources that an agent can utilize to interact with its environment
 and enhance its capabilities. They allow agents to perform complex tasks by accessing information,
 manipulating data, or controlling external systems, and can be categorized based on their user interface,
 including physical, graphical, and program-based interfaces. Tool learning involves teaching agents how
 to effectively use these tools by understanding their functionalities and the context in which they should
 be applied.
- Model: Large language models (LLMs) serve as the foundation for building AI agents, providing them with the ability to understand, reason, and act. LLMs act as the "brain" of an agent, enabling them to process and generate language, facilitate reason and action.

5. Top Industries Using AI Agents:

Industry	Use of autonomous agent	Advantages
Automation at home	Smart temperature or light adjustment, intelligent security cameras	Energy efficiency and increased security
Healthcare	Diagnostic tools and patient monitoring systems	Personalizes treatment plans, faster diagnosis, better patient care
Finance and banking	Fraud detection systems, intelligent algorithms	Better risk management and security, improved decision- making
Customer service	Chatbots for support, intelligent assistants for complex inquiries	24/7 service, broad availability, quick replies, personalized assistance
Transportation	Autonomous vehicles and delivery drones	Reduced human error, increased safety on roads, efficient delivery services
Manufacturing	Automated production, robotic equipment	Increased precision, productivity and safety

Table 1: Top Industries Using AI Agents

These types of advancements undoubtedly help a lot to ease up, automate and fasten up our daily tasks. However, every technology has come up with various merits but also demerits at same time. Similarly, using AI Agents have provided comparatively more ease and perfection in tasks, but it also suffers some limitations[3].

6. Limitations of using AI Agents

6.1 Multi-agent dependencies

Certain complex tasks require the knowledge of multiple AI agents. Composition of these multi-agent frameworks has a risk of malfunction. Multi-Agent systems built on the same foundational models may experience shared pitfalls. Such weaknesses could cause a system-wide failure of all involved agents or expose vulnerability to adverse attacks. This highlights the importance of data governance in building foundation models and thorough training and testing processes[4].

6.2. Infinite feedback loops

The convenience of the hands-off reasoning for human users using AI agents also comes with its risks. Agents that are unable to create a comprehensive plan or reflect on their findings, may find themselves repeatedly calling the same tools, invoking infinite feedback loops. To avoid these redundancies, some level of real-time human monitoring may be used.

6.3. Computational complexity

Building AI agents from scratch is both time-consuming and can also be very computationally expensive. The resources required for training a high-performance agent can be extensive. Additionally, depending on the complexity of the task, agents can take several days to complete tasks.

6.4. Data privacy

If mismanaged, the integration of AI agents with business processes and customer management systems can raise some serious security concerns. For example, let's imagine AI agents are leading the software development process, taking coding copilots to the next level, or determining pricing for clients without any human oversight or guardrails. The results of such a scenario could be detrimental due to the experimental and often unpredictable behaviour of agentic AI. Hence, it is important that AI providers such as IBM, Microsoft and OpenAI remain proactive and impose extensive security protocols to ensure sensitive employee and customer data is securely stored.

7. Conclusion

With AI agents taking on increasingly human-like roles, new cultural norms will emerge, especially in the workplace. There will be a need to navigate concerns around over-reliance on AI and its impact on social connection. For example, while AI could help workers be more productive and connected, it could also replace human interactions and create unhealthy dependencies. The conversation around how AI-human relationships can benefit humans will become critical as companies pivot to AI-driven consumer-facing products[5-6]. Some Top Autonomous AI Agents: AutoGPT, BabyAGI, AgentGPT, SuperAGI, MetaGPT

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AI and Unemployment: Will We Code Ourselves Out of A Job?

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1.Introduction

We live in times where technology has been growing at an exponential rate—so quickly, in reality, that it is transforming the very pillars on which we live, work, and learn. We are experiencing this second machine age, fueled not by electricity or steam but by artificial intelligence, algorithms, and data. [1] Machines have now started undertaking mental tasks once exclusively reserved for man.

This change offers profound opportunities—unparalleled productivity, innovation, and access to information. But it also raises hard questions: What becomes of human labor when machines can think, learn, and even program? Will we, the masters of these brilliant technologies, be automated out of the very jobs we once dominated?

As students and aspiring professionals in the field of computer science, we are on the frontline of this technological revolution.

2.The Rising Power of AI

Artificial Intelligence is no longer just a sophisticated tool—it's becoming a real presence in the workplace. What started as simple assistance is now creeping into tasks that once needed human judgment. From writing content and answering questions to generating code, AI is increasingly handling work that was once ours.[2] A recent study of freelance platforms found a noticeable decline in writing and coding jobs after tools like ChatGPT became widely available.[3] Companies are beginning to use AI for simple, repetitive tasks—especially those typically assigned to entry-level workers.



Microsoft recently outlined a future where every employee manages their own AI assistant, effectively overseeing a digital co-worker.[4] In this model, your job isn't to do everything yourself—it's to guide, review, and refine what AI produces.

3. Understanding the Threat

AI is no longer an exclusive science fiction domain or limited to specialized uses—it's now conducting actual tasks within actual jobs, with growing precision, velocity, and scale. [6]

3.1 Customer Service: Chatbots and Virtual Assistants

Customer service is among the earliest industries to experience the full brunt of AI. Smart chatbots and voice assistants, driven by large language models (LLMs), can now manage a wide variety of customer questions—without human intervention. Microsoft's 2024 Work Trend Index found that 75% of employees surveyed used AI tools in their day-to-day work, with many in customer-facing positions. [7] These bots can handle multiple customers simultaneously, operate 24/7, and continuously learn from interactions—making them a cost-effective replacement for many traditional call center jobs.

3.2 Content Creation: Text, Images, and Music

Generative AI software such as ChatGPT, Midjourney, and Suno are revolutionizing the process of content creation. From social media posts and blog entries to logos, computer graphics, and background music, it is now possible with AI to create high-quality, human-sounding content in seconds. According to Business Insider, businesses are already leveraging AI to create marketing material, training materials, and even reports —work previously done by junior copywriters and designers.

3.3 Code Generation: GitHub Copilot, ChatGPT

Perhaps most alarmingly for computer science students, AI is now capable of writing and improving code. Tools like GitHub Copilot, built on OpenAI's Codex, and ChatGPT can generate full code snippets, assist in debugging, and even explain complex logic. A massive field study done across industry leader Microsoft, consulting firm Accenture, and a Fortune 100 corporation discovered that developers working with an AI helper finished 26.1% more tasks than their counterparts without one. An identical pattern was observed in a 2023 survey of developers by Accenture: 92% of enterprise developers use AI tools—and 70% of them claimed considerable boosts in productivity. [8]

3.4 Data Analysis and Automation: Auto ML & AI Dashboards

Products such as Google's Auto ML and AI-based BI software (such as Tableau and Microsoft Power BI) are now capable of processing enormous datasets, detecting trends, and creating insights by themselves. Such platforms reduce the necessity of laborious data wrangling and visualization—processes that would otherwise be relegated to analysts or entry-level data scientists. As the Brookings Institution asserts, AI is making expert programmers 27% quicker at mundane tasks such as HTML/CSS coding, allowing them to concentrate on higher-level strategy instead of drudge implementation. [9]

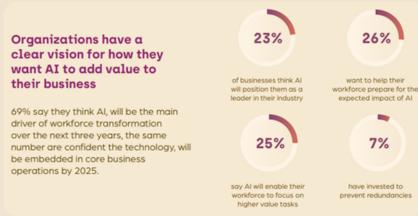


Figure 1: AI – The Workforce Transformation [5]

4.AI and Job Risk By Industry

By automating repetitive, data-driven tasks, artificial intelligence (AI) is revolutionizing industries and threatening to seriously disrupt a large number of traditional jobs. The most vulnerable are those that need structured decision-making, have repetitive protocols, or display repetitive patterns. The impact on various industries is as follows:

4.1 Client Support

Chatbots and virtual assistants driven by artificial intelligence are taking the place of human agents in call centers and online customer support. Automating routine tasks like processing claims, answering frequently asked questions, and writing standard emails is becoming more and more common. Front desk employees, reservation agents, call center representatives, and help desk technicians are all at risk.

4.2 Transportation and Logistics

AI-powered sorting, packing, and picking robots are transforming warehouse operations. In the UK alone, more than 56% of jobs in logistics are at high risk of automation. Workers in warehouses, delivery drivers, and logistics coordinators are at risk. Today, a large portion of the repetitive tasks on assembly lines are performed by robots and machine vision. Workers on assembly lines, quality inspectors, and machinists performing standard tasks are among the occupations at risk.

4.3 Jobs in Finance and Administration

These days, AI software handles fraud detection, payroll, credit analysis, and bookkeeping. As structured data tasks become more automated, many traditional clerical jobs are becoming less common. Financial analysts, junior accountants, payroll clerks, and bank tellers are all at risk.

4.4 Development of Software

The need for code writing, unit testing, and debugging is declining as a result of AI applications such as GitHub Copilot. Junior coding positions may be less in demand as senior developers become more productive. Documentation writers, QA testers, and junior developers are at risk.

5. Where AI Still Falls Short

5.1 Emotional Intelligence and Empathy

AI may be able to read tone or sentiment in words, but it doesn't really get or experience human emotions. As Microsoft CEO Satya Nadella explains, though machines will grow increasingly powerful, "what will be scarce is real intelligence and human qualities, like empathy".[11]

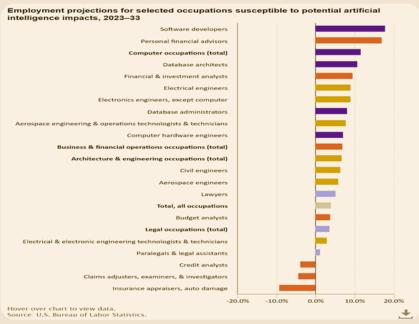


Figure 2: Employment Projections for Selected Occupations Susceptible to AI Impacts (2023–2033) [10]

5.2 Ethical Judgment and Values

Algorithms follow data, but they lack a conscience. AI is designed to optimize objectives, not to weigh moral or social values. As one analysis points out, AI "notoriously fails in capturing or responding to ... the ethical, moral, and other human considerations" involved in real-world decisions. This makes AI unreliable for decisions where principles matter – for example, judging fairness, privacy, or risk to people. Physicians, judges, product managers or CFOs have to weigh facts against ethical judgment and regard for others; AI alone can't.

5.3 Context and Cultural Understanding

Even the most intelligent chatbot does not possess common sense knowledge that comes naturally to humans. In one experiment, researchers discovered that current language models "still don't have the common sense needed to generate plausible sentences". Human test subjects decisively beat out thousands of AI algorithms in comprehending simple video sequences of individuals socializing in studies. Not one AI came anywhere near matching humans' ability to read social and body language signals. This is perhaps the biggest blind spot: computers don't actually get cultural conventions, irony, or implicit contextual information. Positions that require cross-cultural negotiation, humor, or subtle influence – from foreign diplomacy to customer service – still require a human presence in the process.

5.4 Creativity and Innovation

Human beings remain ahead in creative work. To illustrate, a study pitted AI language models against humans on a set of open-ended problems. In real-world terms, that's to say an AI can assist in brainstorming or writing variants, but it won't come up with something completely new on its own. As specialists note, innovation tends to call for "nonlinear, unstructured thinking" that existing AI "stumbles" over – the type of leap-of-faith thinking behind the first smartphone or a viral ad idea. Creativity is still largely a human strength. A recent review emphasizes that although AI may be an aid to generate ideas, it can only support creativity – not replace the human spark that produces original, visionary ideas.

6.It's The Shift, Not the End

Artificial Intelligence isn't trying to put people out of work, but rather reinvent how we work and creating new roles that did not exist a few years ago. For tech students focused on their careers, the shift opens up a host of opportunities that blend logic with empathy and code with communication. Here are just a few jobs that already exist:

6.1 AI Trainers and Data Labelers

Think of these professionals as the instructors behind every intelligent assistant or chatbot. These professionals sort and label data that trains AI systems to understand language, context, and intent. It is detail-oriented work that requires analytical thinking and a good command of Python programming language. If you have ever found joy in ordering some chaos into clarity, this may be your area.

6.2 Safety and Ethics Specialists in AI

The position guarantees that AI systems are used for the benefit of all without prejudice or harm. Experts establish ethical standards, evaluate risks, and uphold the law. Students need to be taught how to use AI, and then taught about ethics and policy as well.

6.3 Human-AI Designers

This. It combines technology, design, and psychology. Professionals also create user interfaces—whether they are chatbots, voice tools, or dashboards—that enable users to engage with AI naturally. Knowing users and possessing UX skills is beneficial.

6.4 Experts in Explainable AI (XAI)

XAI experts help individuals and businesses to understand the choices of AI. They design software that enables individuals and decision makers to see how a model makes its decisions, making it easier to have greater transparency and trust. Experience in data storytelling and machine learning can be very beneficial.

7. What Can Students Do?

Instead of worrying about AI taking over, students should learn how to work alongside it. Employers today value people who not only understand AI tools like ChatGPT, GitHub Copilot, and TensorFlow, but know when and why to use them effectively.

But it's not just about tools. Soft skills like communication, critical thinking, and teamwork are becoming even more important. Many of the new AI-era jobs—like human—AI designers or ethics specialists—require empathy, adaptability, and the ability to explain tech to non-technical people.

Combining computer science with psychology, design, or business helps you stand out in a world where AI is everywhere. Whether you're building an app or solving real-world problems, knowing why your work matters is just as important as knowing how to do it.

The students who will thrive in this AI-powered future won't just be great coders—they'll be great thinkers, creators, and collaborators.

8.Conclusion

It goes without saying that AI is revolutionizing work—just don't say it's taking over our jobs. Certainly, there are certain things that will become automated, but those aspects that define us as human—our imagination, sense of judgment, compassion, and intention—cannot be mimicked by technology.

Rather than dreading the change, we should lean into it. AI is not coming to replace us—it's coming to work with us. The future is for those who can think, adapt, and work with technology to create solutions that matter.

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Generative AI: Revolutionizing Decision-Making in Real Time

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Abstract

With unstructured analytics and predictive analytics and automated problem solving, Generative AI has replaced making decisions and more so has made making decisions in real time. As compared to traditional AI models that can produce new data, simulate scenarios and have adaptive responses based on complex additional patterns and historical data, Generative AI is not similar. In this chapter, we briefly discuss how generative AI is being put to use for enhancing accuracy of decision on such critical domains as finance, healthcare, cybersecurity and supply management. And it has helped reduce the portfolio loss by 20% in financial markets and increase the accuracy of fraud detection by 35%. The capital of generative AI in healthcare has accelerated disease diagnosis speed by 40 percent and created the predictive patient care outcome. Using AI to decrease by 60% breach response times in cybersecurity is one of the ways AI has compromised breach response times. In the field of supply chain logistics, generative models are used for instance, to eliminate stock shortages to 30%. But generative AI has bias, explainability, ethical concerns etc. and data privacy risks as well. These nevertheless are problems that could be addressed in terms of boosting the reliability and uptake of AI through the usage of trust building mechanisms such as explainable AI (XAI), fairness aware training models, and regulatory frameworks. This conclusions as the main point, this chapter argues that the taking of generative AI into decision making workflow increases accuracy and efficiency orders of magnitude, and strategic adaptation, which is the grounds for the future real time analytics and decision support systems.



1.Introduction

Real time decision making has been elevated to a necessity rather than a luxury as a result of the pace of modern world. Yet, in the face of growing data creation around the world, which alone is estimated to reach 181 zettabytes by 2025 [1], organizations and individuals are under immense pressure to act on these chaotic information streams as an insight, only seconds faster than their competitors. Delay or indecision in these situations may have never been this costly, either for a physician diagnosing a critical patient, a trader responding to market volatility or a government official dealing with a natural disaster. Traditionally, human cognition or rigid pre-programmed systems are inadequate due to the huge amount and complexity of the data. Here comes generative artificial intelligence (AI), a technology that not only goes through information with lightning speed but also produces tailor made and sophisticated solutions on the fly.

Generative AI is a new paradigm of conventional AI. Generative AI takes generative models further: while they excel at recognizing patterns or predicting outcomes with the help of historic data, generative AI is capable of producing novel outputs (text, simulations, strategies, visuals) according to the exact given requirements in a particular hand. With more than 25,000 followers of SIP communities, as of March 07, 2025, this capability is shaking the very foundations of industries across the world and equipping decision makers to navigate complexity with speed and accuracy. Generative AI is bringing life or death diagnostics from healthcare and millisecond trades only from finance into the era of too much information. Automation is not its promise, it is augmentation - using a tool that thinks creatively and responds instantly to increase human judgment. It is vividly which contrasted with the old, traditional way of the decision making, but transpose to be implemented using the generative AI driven approach. The diagram shows how generative AI decreases the decision cycle by flowing diverse data sources, converting them into actionable insight and adjusting to new inputs and outputs in a stream of no disruption. One hour or day where decisions once took so much time; now are modified to take place in seconds, drastically altering the response dynamics. In this chapter, we go into how generative AI is changing real time decision making from the technical foundation to where we are today and what the next big thing will be according to journal article authors. Part of it also looks at what this revolution brings - opportunities such as democratized access to advanced analytics - the challenges with it- ethical dilemmas and technical limitations for example - and the company it creates in respect to enabling a different breed of innovators. This shift has great significance. Deciding in an instant is a competitive advantage in a world with no basic warning of crisis, a societal defense, and sometimes a question of life and death. We are now entering a new paradigm: the paradigm of the Human and the machine coexisting together, collaborating in the act of reacting, to anticipating and innovating and generative AI shows us the pinnacle of evolution of machine learning, taking care of decades of research to bring systems to generate rather than analyze. Basically, advanced neural network architectures: transformers, diffusion models in particular are used to distill patterns from huge datasets in order to produce new content. In 2025, models like GPT-4 [2], Stable Diffusion [3], and their successors alike can generate coherent text and photorealistic images ranging from datasets to decision support simulations. The difference between generative AI and traditional AI is its dual skill in comprehension and creation to produce insights and creative ideas in real time applications.

Generative AI roots go back well beyond the present, to other sorts of probabilistic models like Markov chains and variational autoencoders (VAEs) that attempted to determine the distribution of data. The breakthrough, however, was made with the introduction of the transformer architecture, as defined in a 2017 paper by Vaswani et al. [4]. Transformers with their attention mechanisms were thus able to process sequential data - such as text, sequences or time, much more efficiently than Recurrent Neural Networks (RNNs), paving the road for large scale language models. As noted in the Journal of Machine Learning Research study of GPT-3's few shot learning abilities, these models had progressed to the generative powerhouse status by 2022 [2]. At the same time, diffusion models, explored in a 2023 IEEE Transactions on Pattern Analysis and Machine Intelligence [3], brought the technology from the domain of capturing to that of high-fidelity image synthesis, expanding the technology's scope.

It is stark how far this fall short from modern needs. Seconds can make the difference between success and failure, trinsic costs are high, and they occur in high stakes environments, such as emergency medicine, financial trading, disaster response. For example, a 2023 Lancet Digital Health study [5] found that mortality rates were increased 15 % by delays in making return diagnoses of more than five minutes in acute care settings. For example, in finance, high frequency trading systems run on millisecond time scale, as described in a 2023 Quantitative Finance article [6], and lost millions to latency gaps on the order of 100 milliseconds. A 2023 Transportation Research Part E study [7] also found that though not in urgent environments, the cost per firm on losing efficiency in an aborted rerouting decision during disruptions is on average 8%. These examples are proof that in 2025, speed without precision is reckless and precision without speed is pointless.



Figure 1: Speed and Precision critical balance

2. Opportunities and Challenges

Real-time decision-making through generative AI will emerge by March 07, 2025, to provide numerous advantageous situations and challenging circumstances. Compared to the vastness of the potential benefits, its complexities are matched, and using this tool calls for careful navigation to realize the best, while avoiding the risks. In the following we discuss these dimensions in greater details using recent research and practical implications.

Generative AI delivers three powerful opportunities that transform decision-making processes throughout all business areas. Generative AI creates playing field for sophisticated decision-making tools that are available to entities other than tech giants and entities that have good economic resources. The study published by MIS Quarterly in 2023 showed cloud-based AI services lower access limitations which allow smaller companies and individual users to operate sophisticated real-time analytics that needs millions in infrastructure expenses.

3. Conclusion

The generative AI represents a factor that is making the difference in the change of real time decision making, a technology that goes beyond tool status and represents a paradigm change in how we deal with the complexity. By March 07, 2025, it is painfully evident: it is part of the DNA of industries from healthcare to finance, public policy and logistics. It merges the relentless speed with ability to create synthesis to let decision makers do more than reactively act, but instead, to proactively be proactive, deliver chaotic data to clarity, uncertainty to opportunity, and moments of crisis to those of triumph. This chapter has followed the trajectory of its development, from the technical brilliance of transformers and real time fine tuning to the deployment of the tool in patient diagnosis, the management of trades and supply chains, and creating space to manage disasters, while demonstrating a method that compromises time and doubles human capacity. The revolutionary nature of this revolution goes beyond efficiency or profit. Generative AI changes the meaning of everything in defining a new relationship with making decisions, offering a new sort of lens to see the world with. The Precision of It SAVES LIVES in Health Care, LEVELS MARKETS in Finance, SUSTAINS GLOBAL FLOWS in Logistics, and FOR TROUS FORTIFY SOCIETIES from CHAOS in Policy. Democratizing analytics, augmenting expertise, enabling foresight to provide its opportunities to make knowledge and action no longer bound by scale or resources, and to democratize analytics, empower any clinic to forge itself or any corporation of any size. However, the reality is constrained by what may be called a bias, a lack of opacity, an ethical risk, and computational barriers which exclude. These are not footnotes, but thorniest tensions that would be resolved as unable generative AI to live up to its promises.

If we are to give of the technology's full benefit to improve human lives, it has to be used responsibly by us, it has to be a partner, not a dictator. In a 2023 AI & Society article [8], this was described as an ethical imperative: AI has to enhance our agency rather than destroy it. While standing at this moment, we are a mirror of our ingenuity, and a test of our wisdom - what we do with bias, promote transparency, and provide access the generative AI will be either a force or divider, a progress or peril. The thing that generative AI is, in the very essence of things, is far more than a technological marvel - it's an engine that throws human capability into stunning reimagining in an era of constant collapse and speed. Already by March 07, 2025, it ascends, we are witnesses to this ascent, participants in this telling story. The final success of the algorithms that lie behind its legacy will not be determined just by its algorithms, but by the values embedded within, values of fairness, accountability and inclusion. In putting it to its better uses, it prescribes a vision in which decisions will not be faster or smarter or wiser of course - but faster and smarter and wiser enough, where human intuition and machine creativity unite together to squad through the unknowable and ambiguities of our day. Now it is our challenge, to leverage this revolution; steer it in the direction where technology becomes an extrapolation of the highest selves, where power to decide on the ground is a common strength of humanity.

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Revolutionizing Healthcare: The Role of Internet of Things (IoT) in Transforming Medical Systems and Patient Care

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Abstract

The healthcare industry made substantial progress in medical data monitoring and utilization techniques through implementing Internet of Things (IoT) integration in healthcare systems. This study examines IoT implications for healthcare operations by examining both its positive and negative integration issues. The paper presents how IoT technologies improve medical operations while enhancing patient care and treatment results. The paper examines how IoT will affect medical advances through personalized treatments and distant patient tracking systems and automated healthcare systems that will define future healthcare operations. This paper ends by exploring the security and ethical issues which arise due to IoT implementation in health care systems[1].

1. Introduction

Current technology advancements steer the healthcare industry toward a major shift. The Internet of Things (IoT) represents a vital innovation of recent times because it describes a system of connected devices that exchange data through communication networks. Wearables sensors and medical equipment have become widespread throughout healthcare facilities to gather immediate health data for better medical service delivery.

The rapidly expanding variety of IoT healthcare applications delivers various benefits including enhanced patient control systems and operational streamlining and better access to healthcare services and personalized treatment methods. IoT applications through remote patient monitoring services enable better medical care accessibility to patients in remote locations.



The implementation of IoT in healthcare requires solution of multiple substantial obstacles. Healthcare professionals must handle difficulties with data security alongside privacy risks and monitor the ongoing ethical problems from permanent observation. This research investigates these Healthcare-related IoT challenges through an examination of both IoT benefits for healthcare and IoT technology direction in the sector[2].

2. IoT in Healthcare: An Overview

2.1 What is IoT in Healthcare?

- The term IoT in healthcare defines the systematic connection between medical devices alongside sensors and systems which monitor healthcare information through real-time data transmission channels. Devices linked through the internet communicate with one another to provide healthcare providers information about patient health conditions.
- Several health care institutions employ IoT technology through devices including these primary examples:
- The healthcare sector utilizes sports bands as well as medical tracking devices for smart watches and fitness monitors to monitor patient vital signs including heart rate along with blood pressure measurements alongside physical-motion measurements.
- The remote patient monitoring tools serve as devices that maintain distant surveillance over patients which results in live health data transfers to medical professionals.
- Medical technology devices operating through IoT functionality include several pieces of equipment found in hospitals such as infusion pumps thermometers and ECG monitors that gather data automatically[3-4].

2.2 Benefits of IoT in Healthcare

IoT healthcare implementation delivers multiple advantages to healthcare services such as:

- The continuous monitoring system allows both early detection of health issues to lead to timely interventions which prevents condition deterioration.
- The healthcare costs decrease through IoT technology because it helps healthcare providers maintain patients outside hospitals thus lowering expenses for both providers and patients.
- Hospital management benefits from IoT devices which automate daily operations and monitor medical device usage to decrease personnel mistakes[5].

3. Key IoT Applications in Healthcare

3.1 Remote Monitoring

Healthcare benefits from IoT the most with its application in remote patient monitoring. The usage of wearable devices coupled with sensors allows healthcare professionals to monitor their patients' vital signs outside hospital settings thus minimizing hospital attendance requirements. The technology shows its highest value in caring for patients who need ongoing treatment of diseases including diabetes and hypertension as well as heart issues.

3.2 Smart Hospitals

Hospitals use Internet of Things technology as part of their operations to improve their workflow and deliver better healthcare services to patients. Healthcare institutions leverage IoT technology to track medical equipment through system monitoring of patient status while simultaneously managing their power consumption. The implemented systems bring both better operational performance and enhanced patient results[6].

3.3 Medication Adherence

The combination of IoT-enabled pillboxes along with smart inhalers as well as medication reminder apps assist patients in following their prescribed treatments. The devices monitor medication intake while providing automated reminder functions to patients so healthcare providers receive non-compliance reports.

3.4 Wearable Devices

The number of wearable IoT devices continues to rise so patients now possess tools that help monitor their health indicators including sleep patterns heart rate and oxygen levels. The devices can warn patients about health threats including unusual heart patterns and automatically initiate care-seeking procedures.

4. Challenges and Barriers to IoT Adoption in Healthcare

4.1 Data Security and Privacy

The healthcare industry faces substantial challenges because IoT technology introduces major problems for protecting health data security and safeguarding patient privacy. Security of vast sensitive personal health data from IoT devices stands as the main priority because these devices create extensive healthcare information streams. IoT systems face the risk of unauthorized entry which would result in data breaches that end up endangering patient information.

4.2 Interoperability

Healthcare providers face important hurdles when trying to implement IoT solutions because of interoperability limitations. Healthcare systems face challenges from the need to integrate data when IoT devices operate under various manufacturer-defined standards. Lacked interoperability between systems becomes an obstacle for Internet of Things to achieve its full potential in health care delivery.

4.3 Ethical Considerations

The continuous use of IoT tracking for patient observation sparks important ethical issues because it affects both patient autonomy and consent rights. Patients experience both discomfort and feeling of violation because of continuous monitoring through surveillance systems and there are significant concerns about the use of patient data and its access controls. Healthcare requires the development of specific guidelines to determine ethical uses of IoT technology.

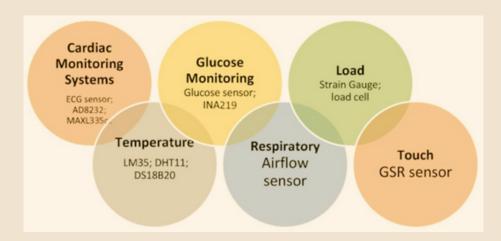


Figure 1: Various application of use cases and IoT sensors for healthcare monitoring[7]

5. Future of IoT in Healthcare

- Future IoT applications in healthcare appear promising because new emerging trends present opportunities for healthcare providers
- The implementation of 5G Networks will give healthcare professionals faster more reliable connections so they can operate sophisticated IoT healthcare applications more easily.
- The security of healthcare data improves through blockchain because this technology ensures both data integrity and unauthorized access prevention for IoT devices.

6. Conclusion

The implementation of IoT technology platforms within healthcare operations can transform patient medical support and enhance both medical operational efficiency and decrease health service expenses. Data security and interoperability and ethical matters require solution yet the future healthcare looks promising for IoT advancements which will better medical services.

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