The Future of Cloud Computing: Cloud-Based Artificial Intelligence

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction - What is Cloud Computing and Artificial Intelligence?

The use of cloud resources and artificial intelligence have become significant factors due to the world's reliance on technology. Cloud computing has become vital in allowing businesses to optimize resources while reducing costs. Cloud computing technology has transformed the business world by using online-hosted servers to store and access data. The cloud also allows users to have access to their data and applications from anywhere. The use of cloud computing offers various benefits such as lower cost, speed, global scale, productivity, performance, and reliability (Azure, 2022). The cloud contributes to the growing need for remote work and collaboration as files and applications can easily be accessed and shared.

Artificial intelligence is another growing field of computer science as it works with machines that can perform tasks typically performed by humans. As defined by John McCarthy on the official IBM (n.d.) website, "It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but artificial intelligence does not have to confine itself to biologically observable methods." Datasets and computer science are combined to create artificial intelligence algorithms which use machine learning to solve issues. Various industries view artificial intelligence as a valuable resource that can completely technology is used.

When integrated, cloud computing and artificial intelligence can provide a platform that combines the advantages of both fields. Cloud computing can also provide an infrastructure for developing and testing, while artificial intelligence can be used to enhance the potential of cloud computing through decision-making, automation, and personalization. The combination of these

two tools can result in a more cost-effective cloud environment, enhanced data management, accelerated productivity, intelligent automation, and increased security (Mohmad, n.d.).

In this paper, I will explore the opportunities for cloud computing and artificial intelligence. This will include the advantages, challenges, and future implications of the integration. I plan to use real-world examples as evidence for both cases as advantages and risks. There also may be some challenges or risks, such as security or ethical issues, that I want to look at and possibly provide recommendations on. Finally, I will see how integration can develop and grow over time.

Literature Review

The scholarly material reviewed discussed the advantages and risks of cloud-based artificial intelligence. These will include examples of how companies have been impacted by these technological advancements. For example, James Maguire's (2023) article "Cloud and AI Combined: Revolutionizing Tech" looks at all aspects of cloud computing and artificial intelligence. It inspects the two entities separately and as an integrated product. It then progresses into looking at what the future of the integration may look like and what risks may arise from it. Maguire provides arguments for the opportunities, risks, why the technology should continue to be developed, and what restrictions should be placed. This will assist in answering the question of finding the impact of cloud computing and artificial intelligence through different perspectives. The given data will allow for an evaluation of the relationship to see how the advantages can be used to continue growth while also seeing how to mitigate risks.

Chiara Arena's (2022) article "7 Disadvantages of Artificial Intelligence Everyone Should Know About" looks at the vulnerabilities of artificial intelligence to raise caution. It is

critical to use these flaws as a way of knowing if the advantages outweigh them. These issues must be addressed to minimize them. Without the possibility to minimize these risks, there would need to be an evaluation of the technological advancement and whether it should be used. This article opens the conversation of creating guidelines and restrictions for artificial intelligence for responsible usage.

This research paper will use this information to create an argument for the use of cloud computing with artificial intelligence. While Arena's (2022) article identifies risks, this research paper will find resolutions and ways to overcome these obstacles. This paper will provide an optimistic perspective on cloud computing and artificial intelligence while also balancing it out with a comprehensive understanding of the risks. This paper will analyze the ethical implications of artificial intelligence and propose ways to mitigate inappropriate usage. This deviates from the articles as the paper will specifically identify the moral effect and propose various solutions.

Methodology Used

The purpose of this research paper is to determine the impact of cloud-based platforms working with artificial intelligence. This will include looking at the positive and negative impacts of the integration. This will then be followed by looking into what the future may hold for the integration and if any problems may need to be eventually resolved. It would be important to find research that can support both the advancements and risks while being able to look at any potential future impacts. Qualitative research is useful when looking for experiences to support or claim a theory. On the other hand, quantitative research uses data involving numbers and measurements that would not have as much of an impact on this topic. This study will take a qualitative research approach as it will rely on existing articles and research. This will

allow for a proper evaluation of the relationship in many facets, both positive and negative, especially through real-world examples.

This study will take a secondary data approach as others collected the data. This is because it will include articles that provide existing research and studies on the collaboration of cloud computing and artificial intelligence. Secondary data will remove any bias on the cloud-based artificial intelligence relationship as the information can be used purely for analysis. Secondary data allows for both positive and negative impacts of the integration to be examined. Another advantage is the endless number of different articles and studies that can be found online to conduct the research. This will provide various data that can be collected to analyze the advantages and challenges of the research topic.

An equally important initiative is taking a descriptive and experimental approach that is necessary to perform an analysis of existing articles and a previously performed experiment on the relationship between cloud computing and artificial intelligence. This descriptive approach will create a better understanding of the integration of cloud computing and artificial intelligence through collected research. This undertaking requires analyzing the relevant data discovered and finding overlapping relationships that can provide additional insight into the integration. The experimental approach will use an internship experience as it was a project closely related to the topic. The experience gave a first-hand example that can be used to provide another perspective on the impact of artificial intelligence and cloud computing.

The Integration of Cloud Computing and Artificial Intelligence

The integration of cloud computing and artificial intelligence provides countless opportunities, including reduced costs, analytical advantages, data management, accelerated

productivity, and autonomy. The relationship between cloud computing and artificial intelligence is relatively new and continues to grow as the capabilities are endless. This symbiotic relationship has been used within the business world in many businesses and organizations to achieve success. AWS AI Services, Microsoft Azure AI, and Google Cloud AI are among a list of many known artificially intelligent cloud platforms (Adebayo, 2022). These are well-known brand names within the information technology industry that underscore the importance of cloud-based artificial intelligence. However, with these opportunities come possible risks such as connection concerns, cloud downtime, and overreliance on the internet. Ethical concerns that include data privacy, biased algorithms, and the spread of misinformation are also risks that come with artificial intelligence.

Advantages of Cloud Computing and Artificial Intelligence

Cloud computing as a standalone product is used to deliver computing services, including servers, storage, databases, networking, software, analytics, and intelligence (Azure, n.d.). Amazon's (n.d.) website defines cloud computing as “Cloud computing is the on-demand delivery of IT resources over the Internet with pay-as-you-go pricing. Instead of buying and maintaining physical data centers and servers, you can access technology services, such as applications, storage, and databases, on the internet from a cloud provider such as Amazon Web Services (AWS).” There is no longer the need to set up hardware as the cloud systems are all within the internet. This then allows for more resources to be allocated to other areas. A key feature includes easy access to the data as all the data is centralized in one location. Furthermore, cloud computing can efficiently scale so that the proper amount of computing power, storage, and bandwidth is used when required.

Another important benefit resulting from integrating artificial intelligence with cloud computing is the reduction of the overall cost of the cloud (DevOps, n.d.). This is made possible by providing the ability for enterprises the option to "pay-as-use" meaning that the cost is based on the usage of the cloud. This can result in realizing considerable cost savings compared to a set cost and having large data centers that would need to be managed. The savings can then be used to further develop artificial intelligence tools and accelerate progress. Eventually, this will produce more revenue and reduce overall costs.

As for the analytical advantage, implementing artificial intelligence can provide meaningful insight from a dataset thereby reducing the need for humans to find them (TechBlogger, n.d.). An example of artificial intelligence saving the cost on cloud costs through an analytical advantage came as a result of my 2023 Summer internship. This internship required me to extract all the cloud data from a user's account as an Excel and import it into a Jupyter Notebook. This notebook then allowed me to use the programming language Python to create plots to display the data I acquired. I created plots that revealed cloud spending by the user over a given period. This documented trends such as spending on weekdays against weekends, spending on various apps, and even throughout holidays. This enabled me to use a Python library called Facebook Prophet to forecast future spending which allowed users to see what their spending could look like in the future based on previous patterns. This forecast used machine learning and artificial intelligence to give recommendations to customers on how to efficiently use the cloud. For example, most customers shut their servers down overnight and during holidays as they noticed that the cost was not worth the minimal usage. They could also set their servers to run during the day when they were more likely to have a higher demand. Overall, the system gave the customer control over their server usage, allowing them to optimize their usage

while reducing the cost. This resulted in a more efficient system as customers could save money while still getting the server capacity required.

Businesses are always looking to increase their efficiency at the fastest pace possible. As stated by Mohamad (n.d.) “AI, for example, can automatically schedule and manage cloud resources, optimize workloads, and make recommendations to improve cloud performance.” Artificial intelligence paired with machine learning will identify patterns within its given data set to assist in making swift and accurate decisions. This is particularly helpful when working with large data sets. Cloud-based artificial intelligence will be able to automate the analysis significantly quicker than any person would traditionally.

Cloud-based artificial intelligence has seen a shift in automating customer service. There has been a focus on using chatbots for customers to use to solve their issues. This allows customers to receive quick service 24/7. This will also meet customers' needs while not relying on human labor. Human resources that free up will allow the company to allocate resources to other tasks to increase productivity. Artificial intelligence may increase the speed of a specific task, but it will also allow humans to improve productivity in other departments. Kriech (2022) speaks on the role of artificial intelligence in increasing productivity, “IT teams can also utilize artificial intelligence to control and monitor critical workflows. While AI handles tedious tasks, IT teams can concentrate on strategic operations that drive genuine business value.” Businesses now have a reliable tool to take over a department of the company.

The Future of Cloud Computing and Artificial Intelligence

Cloud computing and artificial intelligence have a mutually beneficial relationship as the future of one has a direct impact on the other. Maguire (2023) explains their relationship, “Cloud

and AI are locked in a ‘virtuous circle’ in which the growth of one necessarily drives the arc of the other. This mutually supporting spiral upward happens in multiple ways.” Cloud-based platforms such as AWS, Azure, and Google Cloud, allow artificial intelligence to develop. Artificial intelligence gives cloud vendors various tools to provide enhanced and personalized solutions. According to Maguire (2023), there is a rise of a supercloud, “On the horizon is the rise of supercloud, which is a management abstraction layer over a multicloud. Some experts predict that this management layer will eventually encompass all of enterprise IT.” Maguire believes that artificial intelligence will be the engine of the supercloud as there will be countless automation and management tasks. However, Maguire also states that it is likely that artificial intelligence will shape the cloud more than the cloud will shape artificial intelligence. This is because artificial intelligence can function without human input as it grows at a remarkably high rate. Ultimately, artificial intelligence will reshape the world as it uses the cloud to grow stronger.

Risks of Cloud Computing and Artificial Intelligence

Cloud-based platforms' strong dependence on the internet is seen as a risk as there are possible issues such as connectivity concerns and cloud downtime. Kanjilal (2021) states that cloud-based machine learning systems need a stable internet connection, “IT teams use the internet to send raw data to the cloud service and recover processed data. Poor internet access can hinder the advantages of cloud-based machine learning algorithms.” While being able to access the cloud from anywhere given that it is accessed through the internet may be seen as a reward, but also a risk due to the potential issues that come with the internet. The connectivity concerns can lead to decreased performance and an increase in data loss. A stable internet connection is required when working with artificial intelligence and machine learning to process

the data in the cloud. Cloud downtime is the result of a network outage where the server is temporarily unavailable. For example, on July 17th, 2020, the company "Cloudflare" was responsible for the shutdown of nearly half of the internet (Abdullah, 2020). This was due to their server having an issue and not being operational. Fortunately, the Cloudflare team could act quickly and use their backup server as a host as they solved the issue. However, this documented the issue that there is an abundance of dependency on the cloud being operational.

As artificial intelligence has grown, there have been doubts associated with the ethical issues involving data privacy, biased algorithms, and the spread of misinformation. Artificial intelligence requires a large amount of data that may include using sensitive information from customers and businesses. This can be seen as a breach of privacy, Kanjilal (2021) recommends, "Enterprises need to create privacy policies and secure all data when using AI in cloud computing." This includes how artificial intelligence picks up sensitive information through data sets, it can also learn from biased and discriminatory information. Arena (2022) introduced a study that was performed on a facial recognition program that incorrectly identified less than 1 percent of light-skinned men but more than 33 percent of dark-skinned women. The problem also found that the data set used to create the program was 77 percent male and more than 83 percent white. Artificial intelligence will reproduce bias that exists within society creating a divide within our technological advancements.

With the power of artificial intelligence comes the risk of spreading false information. Arena (2022) shares a story about how an activity group created a deepfake speech by the Belgian prime minister, "In the fake video Wilmès can be seen talking about Covid-19, claiming that the pandemic is directly linked to the exploitation and destruction by humans of our natural environment". This is only one of many cases where people are creating fake videos and images

to damage someone's reputation. These are becoming a serious threat as they have been able to evolve and look more realistic. Despite the technological advancement of artificial intelligence, ethical concerns have prompted the debate on appropriate and necessary regulations to ensure responsible usage.

Conclusion

In conclusion, cloud-based platforms integrated with artificial intelligence offer a plethora of opportunities for technological advancements, but they also come with technological and ethical risks. Artificial intelligence gives cloud computing opportunities such as reducing costs, analytical advantages, data management, accelerated productivity, and autonomy. The reduced costs come from the ability to rely on the internet rather than physical hardware. They can use a structure to pay by the amount of usage rather than a set amount over time to avoid paying for unused data. By storing data in the cloud, users can easily access their data on the internet from anywhere. Increased analytical capabilities create an advantage to analyze data quickly and efficiently. Artificial intelligence supports businesses in making better decisions through data analysis. It can assist humans by completing tasks that may be too complex or time-consuming. Statistically, they minimize human error and are more accurate and efficient than humans. These advantages have created a focal point for businesses to transition to a cloud-based business model. The number of opportunities gives a competitive edge to proactive companies willing to trust technology. They are also given a selling point to customers as they can use the advancement to advertise their products and system. The integration of cloud-based artificial intelligence is continuing to grow as it is a focal point of the future.

In contrast, these opportunities come with technological and ethical risks that should be managed by the government and businesses. Companies could use a code of ethics that their

artificially intelligent systems follow. It would be a guideline with clear restrictions on cloud-based platforms with artificial intelligence. With this guideline, there would be consequences listed in the case of a breach of ethics. This would be important to keep all parties responsible and in check throughout the process. Regulation over ethical issues would be incorporated to make sure technology is being used responsibly. It would be essential for the government and businesses to work together throughout the process to create an effective system against data privacy, bias, the spread of misinformation, and overall regulation of the use of artificial intelligence.

There should also be priority put on creating an action plan to implement security measures to create a reliable system that is used responsibly. There needs to be transparency throughout the process as businesses must be accountable for the actions of the artificially intelligent system. For example, there is a data privacy risk with artificial intelligence. All parties should agree upon the available data that may be accessed. If a party wants to restrict specific data from being used, then that should be respected and excluded from the data set. Another issue is putting the malicious use of artificial intelligence. For example, it has become so powerful that people are using it to create deepfakes and fake information to taint someone's public image. Artificially intelligent systems should have a filter to avoid these issues. For example, some artificially intelligent chatbots will not fulfill a malicious request. As for security issues, encrypting the information should be a priority so that data can be used and secure. Encryption is when information is converted into a secret key using an algorithm so that it is unreadable to unauthorized users. To avoid security breaches, the system should be regularly monitored while auditing for any possible vulnerabilities. Although these measures would help

create a reliable and secure system, it is important to create an ongoing discussion. This is essential to establish an open dialogue on the risks associated with the technology.

With consideration, proper guidelines, and responsible use, cloud-based platforms incorporated with artificial intelligence can contribute to technological advancements while still being within ethical expectations. This will promote transparency and accountability, which are necessary to mitigate risks while maximizing potential. It is important to tackle these risks and issues as these advancements can revolutionize industries and the way we live.

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