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Cloud Computing : Today and Tomorrow

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Abstract: ***Cloud computing has grown into more than just a way to store data. It now has an impact on many parts of our lives, like healthcare, finance military plans, and world trade. This essay reveals the hidden effects of cloud computing. It shows how people use it in AI-powered gene editing, stock market tricks, drone wars, and widespread spying. As cloud AI becomes a bigger part of how we make choices, we face big ethical and security issues. These include problems with control, privacy, and risks that can hurt systems on a large scale. By finding and looking at these new trends, this paper stresses the need to act fast for openness, rules, and moral guidance in the changing world of cloud computing.***

Keywords: Cloud Computing, Artificial Intelligence (AI), AI in Healthcare, Gene Editing, Financial AI, Stock Market Manipulation, AI in Cybersecurity, Autonomous Weapons, AI in Warfare, Cyberwarfare, AI-Driven Surveillance, Social Credit Systems, AI and Bioweapons, Predictive Analytics, Data Privacy, AI-Controlled Economy, Cloud-Based Decision Making, AI-Driven E-Commerce, Algorithmic Manipulation, Ethical AI Concerns.

I. INTRODUCTION (SIZE 12 BOLD)

Cloud computing has developed well beyond its original function as storage and access to data. It is now an intangible force behind advancements in the healthcare industry, finance, cybersecurity, and even world governance. While mainstream discourse touts its advantages, a closer look at the reality is more multifaceted and sometimes eerie in nature. The convergence of artificial intelligence (AI) in the cloud is redefining industries, shaping human biology, and even deciding financial and political results. This essay examines the less-discussed, but vital implications of cloud computing, where its potential for both advancement and governance is revealed. By revealing the secret dynamics of AI powered by the cloud, we seek to reveal the real power behind the technology—and who really wields it.

II. HEALTHCARE & HUMAN BIOLOGY – CLOUD AI IS STUDYING LIFE ITSELF

The use of AI-based cloud computing is transforming the healthcare and human biology landscape in ways we cannot conceive of. AI-enabled cloud settings are being leveraged by people to analyze large quantities of genetic datasets, forecast the timeline for disease, and model DNA changes via CRISPR technology. Deep Mind and DARPA are developing AI systems capable of diagnosing disease years prior to a clinical diagnosis. Drug companies are incorporating cloud computing into the drug discovery process and designing personalized medicine. However, these advances raise multiple ethical and security concerns. AI-based genetic engineering would maximize human potential; however, it would open the doors to biohacking and engineer new diseases. As AI analyzes and alters life itself, we must ask the lower-level question: will this knowledge improve the human condition, or will someone use it for profit and control over human life?

III. CLOUD AI PREDICTING LIFESPAN & CONTROLLING HEALTHCARE DECISIONS

Advancements in artificial intelligence (AI) that are cloud-based are having an impact on the realm of healthcare. AI models can not only predict how long one may live, but also affect some aspects of healthcare. AI can call upon multiple large datasets, including but not limited to, medical history, genomic markers, and health-related behaviors to predict not only the onset of illness, but also how likely an individual might die or how long someone might live, even if they have a chronic illness. While these predictions can assist in making recommendations for preventative screening, or help individualize health management, the implications of its use can be alarming. A government-affiliated organization, or a healthcare insurance company, may reference informative predictions in determining if an individual is eligible for care, or whether they qualify for coverage, or even if they will be prioritized for receiving care in an emergency situation. Additionally, as AI begins to take on a larger role in decision-making about healthcare, the acknowledgement of what is relevant to the healthcare decision-making process becomes less clear. The inquiry we have yet to answer is whether AI in cloud computing leads to potential enhancements in equitability and accessibility to healthcare, or conversely, if an algorithm will determine who might live longer or differently.

IV. AI CREATING SYNTHETIC VIRUSES & DIGITAL BIOWEAPONS

The overlap of artificial intelligence (AI) and cloud computing has brought about unprecedented technological developments in biotechnology, but it has also unleashed unprecedented danger - particularly in the dimension of synthetic biology and bio-warfare. Cloud-based AI platforms can recreate viral mutations, design synthetic pathogens, and simulate how diseases will spread before they occur in nature. While the prospect of vaccine development and pandemic readiness is invigorating, it also raises the threat of using AI to create new bioweapons. Governments, biotechnology companies, or even hackers could use biologic engineering, augmented by AI, to engineer bioweapons designed against targeted populations or to create pandemics. As we accelerate our ability to alter the molecular biological architecture of life with AI, trust, ethical and security questions around digital biological weapons grow more serious. Will AI in the cloud be used to protect the health of our planet, or is it simply the next act of bio-warfare?

V. FINANCE & ECONOMICS – AI CLOUD IS CONTROLLING GLOBAL MONEY FLOW

The financial landscape has shifted away from being merely a function of choice—economic activity is running by AI-enabled cloud systems, now the dominant forces shaping finance—a recently debated topic from stock trading to economic policy. Today, over 90% of stock market trading takes place via AI algorithms that cannot be matched by human speeds. In practical terms, this means that hedge funds and financial institutions can use predictive analytics and automatic trades to manipulate the market without regard for potential harm. Cloud AI programs also evaluate creditworthiness, loans and credit risk—often making life-impacting decisions without human actors or oversight to act as a fiduciary. The potential for efficiency and profit is tremendous but the same AI can accelerate economic inequality and potentially creates serious risks in the financial ecosystem (for example AI induced market crashes (and political) or algorithmic bias in financial products). While all this is taking place, did we create an efficient economy or just concentrated financial power in too few actors that feel no public accountability?

VI. MILITARY & CYBERWARFARE – CLOUD AI IS THE ULTIMATE WEAPON

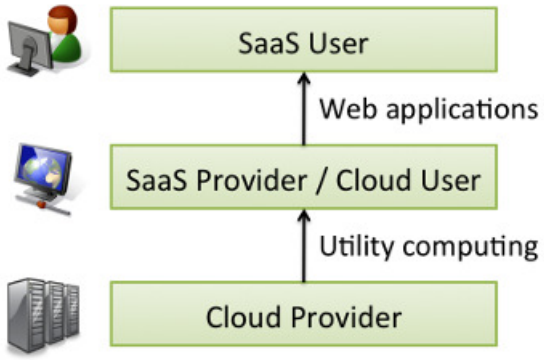
The advent of cloud-based artificial intelligence (AI) has transformed the nature of modern warfare, converting AI from a tool of defense to a weapon of last resort. Governments and military organizations worldwide are now commanding autonomous drones, cyber warfare units, and predictive simulations of combat using AI cloud-powered systems. AI-enabled weapons can identify, track, and destroy targeting systems without human interaction. This is ethically and security complicated. AI cyber attacks are also producing new complex attacks that non-state actors can leverage to incapacitate entire infrastructures, disrupt economies, and alter political geopolitics. As nations rush to be first to dominate AI warfare, the line between defense and aggression is fading. Is the cloud AI going to be used for global security, or have we entered an era of warfare where wars are conducted by self-learning, Internet-controlled machines instead of soldiers?

VII. E-COMMERCE & DATA CONTROL – CLOUD AI KNOWS YOU BETTER THAN YOU KNOW YOURSELF

Cloud-based Artificial Intelligence (AI) has transformed consumer engagement with online retail, introducing a domain where AI-guided algorithms pre-empt purchasing behaviors before the consumer is even aware of these desires. E-commerce giants such as Amazon, Google, and Alibaba, pull from large pools of personal data: an individual's browsing history, search history, inquiries via devices that enable voice, even emotion expressed in communication, etc. With the use of data, they create tailored advertising, product recommendations, and crafted pricing systems. AI-enhanced predictive analytics has served automated "anticipatory shipping" which allows organizations to pre-ship products before even purchased, narrowing consumer choice merely down to an expression of choice towards AI-recommended items. While there are advantages to greater convenience and efficiency, it also creates an ethical dilemma tied to privacy, consumer autonomy, and organizational programming. With systems of AI becoming increasingly more capable, shopping decisions that are made are informal suggestions, suggestions driven by the cloud systems rather than independent consumer decisions.

VIII. FROM A HARDWARE POINT OF VIEW, THREE ASPECTS ARE NEW IN CLOUD COMPUTING

1. The illusion of infinite computing resources available on demand, thereby eliminating the need for Cloud Com putting users to plan far ahead for provisioning; 2. The elimination of an up-front commitment by Cloud users, thereby allowing companies to start small and increase hardware resources only when there is an increase in their needs; and 3. The ability to pay for use of computing resources on a short-term basis as needed (e.g., processors by the hour and storage by the day) and release them as needed, thereby rewarding conservation by letting machines and storage go when they are no longer useful.



Users and Providers of Cloud Computing. The benefits of SaaS to both SaaS users and SaaS providers are well documented, so we focus on Cloud Computing's effects on Cloud Providers and SaaS Providers/Cloud users. The top level can be recursive, in that SaaS providers can also be a SaaS users. For example, a mashup provider of rental maps might be a user of the Craigslist and Google maps services.

IX. PAST EFFORTS, CHARACTERISTICS AND EXAMPLES

We will argue that all three are important to the technical and economic changes made possible by Cloud Com puting. Indeed, past efforts at utility computing failed, and we note that in each case one or two of these three critical characteristics were missing. For example, Intel Computing Services in 2000-2001 required negotiating a contract and longer-term use than per hour. As a successful example, Elastic Compute Cloud (EC2) from Amazon Web Services (AWS) sells 1.0-GHz x86 ISA "slices" for 10 cents per hour, and a new "slice", or instance, can be added in 2 to 5 minutes. Amazon's Scalable Storage Service (S3) charges $0.12 to $0.15 per gigabyte-month, with additional bandwidth charges of $0.10 to $0.15 per gigabyte to move data in to and out of AWS over the Internet. Amazon's bet is that by statistically multiplexing multiple instances onto a single physical box, that box can be simultaneously rented to many customers who will not in general interfere with each others' usage (see Section 7). While the attraction to Cloud Computing users (SaaS providers) is clear, who would become a Cloud Computing provider, and why? To begin with, realizing the economies of scale afforded by statistical multiplexing and bulk purchasing requires the construction of extremely large datacenters. Building, provisioning, and launching such a facility is a hundred-million-dollar undertaking. However, because of the phenomenal growth of Web services through the early 2000's, many large Internet companies, including Amazon, eBay, Google, Microsoft and others, were already doing so. Equally important, these companies also had to develop scalable software infrastructure (such as MapReduce, the Google File System, BigTable, and Dynamo [16, 20, 14, 17]) and the operational expertise to armor their datacenters against potential physical and electronic attacks. Therefore, a necessary but not sufficient condition for a company to become a Cloud Computing provider is that it must have existing investments not only in very large datacenters, but also in large-scale software infrastructure and operational expertise required to run them. Given these conditions, a variety of factors might influence these companies to become Cloud Computing providers:

1) Make a lot of money. Although 10 cents per server-hour seems low, Table 2 summarizes James Hamilton's estimates [23] that very large datacenters (tens of thousands of computers) can purchase hardware, network bandwidth, and power for 1 5 to 17theprices offered to a medium-sized (hundreds or thousands of computers) datacenter. Further, the fixed costs of software development and deployment can be amortized over many more machines. Others estimate the price advantage as a factor of 3 to 5 [37, 10]. Thus, a sufficiently large company could leverage these economies of scale to offer a service well below the costs of a medium-sized company and still make a tidy profit.

2) Leverage existing investment. Adding Cloud Computing services on top of existing infrastructure provides a new revenue stream at (ideally) low incremental cost, helping to amortize the large investments of datacenters. Indeed, according to Werner Vogels, Amazon's CTO, many Amazon Web Services technologies were initially developed for Amazon's internal operations [42].

3) Defend a franchise. As conventional server and enterprise applications embrace Cloud Computing, vendors with an established franchise in those applications would be motivated to provide a cloud option of their own. For example, Microsoft Azure provides an immediate path for migrating existing customers of Microsoft enter prise applications to a cloud environment.

Economies of scale in 2006 for medium-sized datacenter (1000 servers) vs. very large datacenter (50,000 servers).

Technology	CostinMedium-sized DC	Cost in Very Large DC	Ratio
Network	$95 per Mbit/sec/month	$13 per Mbit/sec/month	7.1
Storage	$2.20 per GByte / month	$0.40 per GByte / month	5.7
Administration	140 Servers / Administrator	>1000 Servers / Administrator	7.1

Price of kilowatt-hours of electricity by region

Price per KWH	Where	Possible Reasons Why
3.6¢	Idaho	Hydroelectric power; not sent long distance
10.0¢	California	Electricity transmitted long distance over the grid; limited transmission lines in Bay Area; no coal f ired electricity allowed in California.
18.0¢	Hawaii	Must ship fuel to generate electricity

4) Attackanincumbent.Acompanywiththerequisitedatacenterandsoftwareresourcesmightwanttoestablisha beachhead in this space before a single "800 pound gorilla" emerges. Google AppEngine provides an alternative path to cloud deployment whose appeal lies in its automation of many of the scalability and load balancing features that developers might otherwise have to build for themselves.

5) Leverage customer relationships. IT service organizations such as IBM Global Services have extensive cus tomer relationships through their service offerings. Providing a branded Cloud Computing offering gives those customers an anxiety-free migration path that preserves both parties' investments in the customer relationship.

6) Become a platform. Facebook's initiative to enable plug-in applications is a great fit for cloud computing, as wewill see, and indeed one infrastructure provider for Facebook plug-in applications is Joyent, a cloud provider. Yet Facebook's motivation was to make their social-networking application a new development platform.

Several Cloud Computing (and conventional computing) datacenters are being built in seemingly surprising loca tions, such as Quincy, Washington (Google, Microsoft, Yahoo!, and others) and San Antonio, Texas (Microsoft, US National Security Agency, others). The motivation behind choosing these locales is that the costs for electricity, cool ing, labor, property purchase costs, and taxes are geographically variable, and of these costs, electricity and cooling alone can account for a third of the costs of the datacenter. Table 3 shows the cost of electricity in different locales [10]. Physics tells us it's easier to ship photons than electrons; that is, it's cheaper to ship data over fiber optic cables than to ship electricity over high-voltage transmission lines.

X. CLOUD COMPUTING VENDORS: A SIMPLE COMPARISON OF AWS, AZURE, AND GOOGLE APPENGINE

Here's a quick and easy breakdown of how Amazon Web Services (AWS), Microsoft Azure, and Google AppEngine handle computing, storage, and networking in the cloud:

1) Computing (Virtual Machines):

- AWS: Runs on x86-based Xen VMs. It's highly scalable, but you'll need to set up the scaling yourself or use third-party tools like RightScale.
- Azure: Uses Microsoft's Common Language Runtime (CLR) VM. It's managed automatically, so machines are created based on predefined roles, making scaling easier.
- Google AppEngine: Comes with a prebuilt framework where developers write "handlers" in Python. Everything—computation, storage, and networking—scales automatically.

2) Storage:

- AWS: Offers flexible options, from basic block storage (EBS) to scalable database services like SimpleDB and S3. Different models offer different levels of consistency and API compatibility.
- Azure: Provides SQL-based data services and Azure storage.
- Google AppEngine: Uses MegaStore and BigTable for storage, ensuring scalability and consistency.

3) Networking:

- AWS: Offers detailed control over networking with security groups, availability zones, and elastic IPs for reliability.
- Azure: Automatically manages networking based on how app components are defined.
- Google AppEngine: Uses a fixed network design that works seamlessly with its 3-tier web app structure, handling scaling behind the scenes.

XI. ACKNOWLEDGEMENTS

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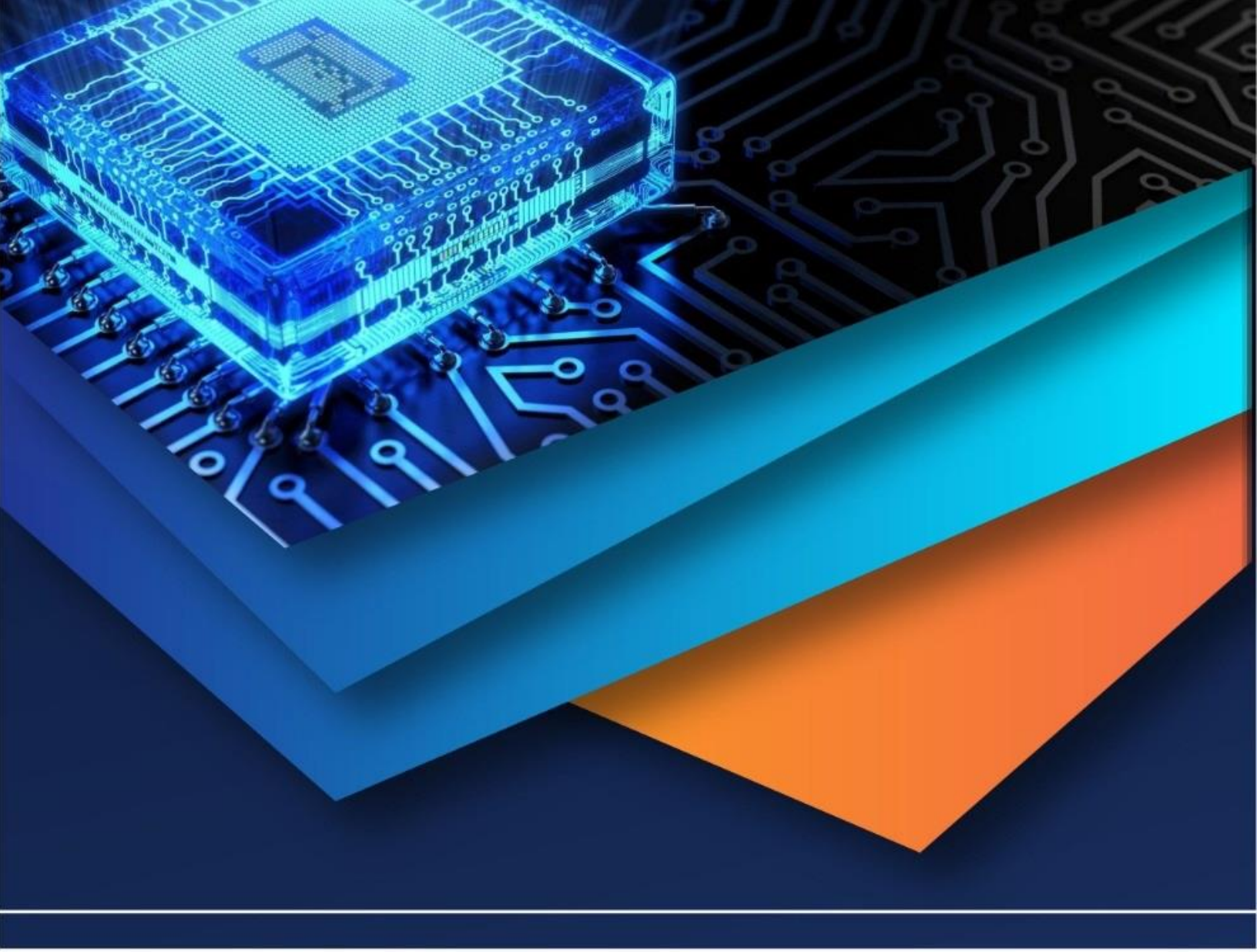

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