5-1 Journal: Computer Science Trends and Artifact Update

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Part One

Quantum computing and edge computing are two new concepts in computer science worth noting. Quantum computers use the laws of quantum physics to process data in ways that classical computers can't. They can resolve complex optimization, cryptography, and materials science issues more effectively than existing methods. Research institutes and businesses are making significant gains in creating practical quantum computers, and this area is anticipated to have far-reaching effects on numerous sectors. Edge computing, on the other hand, is a model for distributed computing that moves data storage and processing closer to the end user, usually to or at the location of the data generator. This strategy is not just a theoretical concept but a practical solution that aims to boost performance, decrease data transmission to central servers or cloud data centers, and decrease latency, offering a promising future for its practical applications (Bnmit, 2023).

One of the most intriguing effects of quantum computing is its potential to revolutionize encryption techniques. Developing encryption systems resistant to quantum attacks has made them more complex and promising. Unlike classical computers, quantum computers are significantly more efficient in solving specific problems. This capability is anticipated to cause revolutions in domains such as optimization, financial modeling, and drug development by making possible studies and simulations that are now impossible. For instance, quantum computing can significantly improve supply chain management and resource allocation in optimization. Financial modeling can enable more accurate risk assessment and portfolio optimization. Drug development can accelerate the discovery of new drugs and their potential side effects. The discovery of quantum algorithms like Shor's algorithm for factoring big numbers and Grover's algorithm for exploring unsorted databases opens up new possibilities for

computational jobs, potentially revolutionizing numerous sectors and fields of study (Bnmit, 2023).

Edge computing's relevance lies in its practical applications. Decreasing latency is a crucial benefit that brings data processing upstream. Automatic vehicles, factory automation, and augmented reality are just a few examples of applications that rely on this for instantaneous answers. This real-world solution is shaping the future of technology by easing the strain on larger data centers and WANs. It optimizes bandwidth utilization by processing data locally and reducing the need to transfer massive data to faraway servers. Data processing at the edge can improve security and privacy by storing sensitive information locally and decreasing the likelihood of transmission interception or unwanted access. This is paramount in industries that handle confidential information, such as healthcare and banking. The scalability and dependability of Internet of Things systems can be enhanced through edge computing. It builds a more robust design that can keep running even if some network parts go down by spreading processing jobs over numerous edge devices (Bnmit, 2023)..

Quantum computing will usher in a new computing theory and practice era, necessitating a paradigm shift. Computer scientists will need to reevaluate quantum mechanics and its computing applications as traditional algorithms and theories of computational complexity will be extended to incorporate quantum models. The need to rethink and modify cryptographic systems is urgent, as quantum computers could break widely used cryptographic protocols. As a result, post-quantum cryptography will get more attention, and algorithms that can withstand quantum attacks will be developed. Innovation in algorithm design driven by quantum computing will lead to the development of new algorithms that outperform classical ones in solving issues. A new branch of computer science will emerge as researchers investigate and

refine these algorithms for real-world applications. The complexity of quantum computing will require computer scientists, physicists, and engineers to work together more closely. Overcoming technical obstacles and progressing the actual deployment of quantum technologies will necessitate this interdisciplinary approach.

As a result of edge computing, the Computer Science field is evolving. Networking and distributed systems will increasingly be more significant in edge computing. Building secure, efficient, and reliable protocols to manage and coordinate data processing across a decentralized network of edge devices is the main emphasis of computer scientists. New algorithms and software for low-latency, high-throughput jobs will be developed in response to the growing demand for real-time data processing. This has implications for areas such as AI, where the ability to make decisions and draw conclusions in real time is paramount.

Computer science and the Internet of Things (IoT) will converge more and more as edge computing grows in popularity. There will be new possibilities and difficulties in software engineering and system design as researchers and practitioners strive to improve IoT systems' performance, security, and scalability through design and optimization. Security and privacy safeguards for edge devices will be given more attention when data is processed closer to its source. Secure data transmission and storage in decentralized networks will necessitate creative problem-solving from computer scientists. As we advance, one of the most critical areas of study will be effectively managing computing resources at the edge. There will be significant ramifications for the design and operation of edge systems, from optimizing power usage to computational load distribution and data storage management.

Due to quantum computing-enabled discoveries, improvements in various services and goods may be available to consumers. Better medication formulations, more efficient supply

networks, and improved materials might improve health outcomes, delivery times, and consumer goods. With the increasing use of quantum-resistant encryption, consumers can rest confident that their data and communications will be more protected from cyberattacks and data breaches. Effects on employees' jobs in areas like encryption, quantum hardware engineering, and software development will increase due to quantum computing. Workers who want to join these new fields must learn new things. From the financial sector to the pharmaceutical industry and beyond, the capacity to more effectively address complicated problems can cause changes in workflows and processes, boosting innovation and efficiency. Effects on the general public as a result of improvements to public services may be possible due to quantum computing's ability to facilitate more precise models for predicting and managing social problems like climate change, traffic jams, and disease outbreaks. Data privacy and security are at risk due to the possibility of cracking current cryptography technologies. With the widespread use of quantum computing, citizens must be aware of the measures taken to safeguard their data (Ferrie, 2023).

Edge computing benefits end users in two ways: improved service speed and responsiveness. Reduced latency means faster and more responsive services for consumers. For example, there will be an improvement in the reliability and smoothness of smart home devices, augmented reality apps, and real-time gaming. By reducing the need to transmit sensitive information to centralized servers, data processing locally gives users more control over their data and more privacy. Effects on employees' ability to analyze and make real-time data decisions include one-way edge computing, which may boost productivity. Faster insights and more effective operations will benefit healthcare, logistics, and manufacturing workers. New educational and training opportunities will arise to meet the growing demand for individuals capable of managing and creating edge systems brought about by the proliferation of edge

computing technology. The influence on people through more innovative infrastructure, smarter cities, and infrastructure will be partly developed via edge computing. Better traffic management increased public safety, and more efficient utility services are some potential improvements that citizens may encounter. Health monitoring and emergency response systems can benefit from edge computing's increased reliability and efficiency, allowing for more precise and rapid responses in times of crisis (Bigelow, 2021).

My professional goals align with quantum computing and edge computing in software engineering, design, and secure coding. Designing and Engineering Software with the creation of novel algorithms and software optimized for quantum computers is essential for the advent of quantum computing. My software engineering and design background will be an asset when developing and refining these quantum algorithms and checking that they work well with current systems. Regarding secure coding, the demand for cryptographic solutions resistant to quantum computing is expected to increase because this technology can crack existing encryption methods. Creating new cryptographic algorithms and maintaining data security in the age of quantum computing will rely heavily on my expertise in secure coding. As a career goal, I aspire to work on cutting-edge projects that push the boundaries of technology. For example, I'm interested in quantum computing and its potential to solve complex issues and significantly contribute to many industries. The fascinating possibilities for investigation and experimentation presented by quantum computing pique my interest in research and development. Someone with experience in software engineering and design can significantly facilitate new applications for quantum computing and solutions to theoretical and practical problems.

Robust software solutions are necessary for designing and implementing distributed systems in edge computing. As a software engineer and designer, your skills will be vital in

developing efficient and scalable systems for the edge. Edge computing's dispersed data processing creates new privacy and security issues. Developing safe edge computing solutions and maintaining data integrity and confidentiality across edge devices and networks will require a focus on secure coding. With the help of edge computing, we can develop practical apps that immediately affect companies and consumers. Contributions can improve the performance and functionality of state-of-the-art technology, ranging from autonomous systems to smart cities. Experts in creating and overseeing solutions that operate on the edge will be in high demand as edge computing grows. As a result of this expansion, there are many chances to specialize and rise in a dynamic industry. Both movements present intriguing opportunities for me to put my interests in secure coding, software engineering, and design to use while also positively impacting game-changing technology and its associated applications.

By finishing and passing all required courses, I am making good academic progress and accomplishing essential outcomes. Using the most recent artifacts, I have been working on my final project for CS 499, my final course. As I continue to work on my portfolio, I will incorporate the artifacts that pertain to software engineering and design, algorithms and data structures, and databases. This will allow me to showcase my abilities and expertise in these areas. By expanding my understanding and incorporating more complex ideas into my projects and portfolio, I intend to finish the remaining course outcomes.

Part Two

I am pretty pleased with how my database-focused final task is coming along in computer science. To get more specific comments from my teacher, I am presently working on incorporating the input I have received and intend to turn in my homework this coming weekend. I am also adding links to this project to my online portfolio to show how my education has real-world relevance.

Checkpoint	Software Design and Engineering	Algorithms and Data Structures	Databases
Name of Artifact Used	**Artifact name:** gpiointerrupt.c **Origin:** CS 350: Emerging Systems Architectures and Technologies	**Artifact name:** BufferOverflow.cpp **Origin:** CS 405: Secure Coding	**Artifact name:** AnimalShelter.py **Origin:** CS 340: Advanced Programming Concepts
Status of Initial Enhancement	Improvements finalized	Improvements finalized	Improvements finalized
Submission Status	Finalized	Finalized	Planned but has not been finalized
Status of Final Enhancement	Finalized w/ instructor feedback	Planned but has not been finalized w/ instructor feedback	Planned but not yet finalized
Uploaded to ePortfolio	Finalized	Planned but has not been finalized	Planned but has not been finalized
Status of Finalized ePortfolio	Planned but has not been finalized	Planned but has not been finalized	Planned but has not been finalized

References

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Bnmit. (2023, November 27). *Top 10 Emerging Trends In Computer Science Engineering*. BNMIT. https://www.bnmit.org/top-ten-emerging-trends-in-computer-science-engineering/

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