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5-1 Journal: Computer Science Trends and Artifact Update

**Part One:**

In this journal post, I will examine two new developments that are significantly influencing the direction of computer science: artificial intelligence (AI) and quantum computing. Although still in its infancy, quantum computing holds the potential to completely transform how we approach difficult computation and problem-solving, leading to advances in domains like drug discovery and cryptography. However, AI, which is already extensively incorporated into many different businesses, keeps pushing the boundaries of automation, data processing, and decision-making. Both of these developments have the potential to reshape technology and impact how we create, use, and depend on computational systems, even if they are at varying stages of maturity. I want to draw attention to these two developments' importance, possible effects, and connection to my intended computer science career by examining them.

1. **What is the significance of each trend?**

**Quantum Computing**

The capability of computers has significantly increased with quantum computing. It is important because it can solve problems like complex simulations and optimization tasks that traditional computers can no longer do due to resource constraints. For instance, the well-known quantum algorithm Shor's algorithm may factor large numbers ten times quicker than traditional methods, which challenges the effectiveness of current encryption methods. McKinsey claims that improvements in areas like encryption, material science, and medicine discovery might be significantly accelerated by quantum computing (The emergence of quantum computing, n.d.). Its applicability to fields that depend on resolving intricate issues implies that as technology advances, it will allow for innovations in fields that were previously restricted by the constraints of traditional computing.

**Artificial Intelligence (AI)**

AI is relevant because it can mimic human intellect using machine learning and neural networks, which enables automation and boosts productivity in a variety of sectors. Deep learning algorithms and other AI technologies are specifically transforming fields including speech and picture recognition, decision-making, and tailored recommendations. AI has become essential in the fields of healthcare (for diagnostic tools) and finance (for improved risk assessment and fraud detection). AI is also propelling automation advancements, increasing the efficiency of repetitive operations, and extending capabilities into sophisticated decision-making through natural language processing and predictive analytics, claims Salminen (2024).

1. **How will each trend change the field of computer science?**

**Quantum Computing .**

The area of computer science will undergo a major transformation due to quantum computing. It will necessitate the creation of completely new frameworks, algorithms, and perhaps even programming languages tailored to quantum machines. For unstructured search problems, quantum techniques like the Grovers search algorithm already show this, providing a quadratic speedup over traditional algorithms. The ability of quantum systems will require changes in several standard computer science fields, including cryptography. Specifically, if encryption methods like RSA become obsolete, it would be necessary to develop quantum-safe cryptographic algorithms (The evolution of quantum computing, n.d.). Moreover, the incorporation of quantum computing is anticipated to result in hybrid systems that blend classical and quantum computational models, thereby transforming the field of computational problem-solving.

**Artificial Intelligence (AI)**

By focusing on data-driven methodologies and machine learning, artificial intelligence is further transforming the fundamentals of computer science. One of the biggest shifts brought about by AI is the substitution of systems that learn and adapt from data for conventional rule-based programming. Software development is shifting its focus from static codebases to models that demand enormous volumes of data and processing capacity due to developments in neural networks and deep learning. AI is promoting cooperation in a variety of disciplines, including economics, psychology, and neuroscience, and it is expanding the possibilities for human-computer connection. As AI has advanced, new frameworks, tools, and algorithms have also been required, such as TensorFlow and PyTorch, which are now crucial for machine learning development (Salminen, 2024).

1. **How will each trend change the experience of consumers, workers, or citizens?**

**Quantum Computing.**

While consumers may not immediately experience the effects of quantum computing, its long-term impact will be transformative. In the healthcare sector, for example, quantum computing could enable personalized medicine by simulating drug interactions at the molecular level, leading to more effective treatments. Workers in technology fields will need to adapt to new quantum programming languages, such as Qiskit and Cirq, and develop an understanding of quantum mechanics and algorithms. Additionally, as quantum computers evolve, businesses must prepare for quantum-safe cybersecurity practices to protect sensitive information, given that current encryption techniques could become vulnerable to quantum attacks (The rise of quantum computing, n.d.).

**Artificial Intelligence (AI)**

AI-powered customer service and tailored online experiences are already having a big influence on customers. Artificial Intelligence is anticipated to continue automating monotonous jobs in the workplace, freeing up employees to concentrate on higher-value duties like creativity and decision-making. In sectors like manufacturing and logistics, where machines can completely replace human work, the growing automation of AI also raises concerns about job displacement. AI's predictive analytics and diagnostic powers are already enhancing patient outcomes in industries like healthcare by increasing the precision and personalization of treatment regimens (Salminen, 2024). AI is also spurring innovation in smart cities and transportation, among other public services, increasing sustainability and efficiency.

1. **How will each trend fit in with your career interests or aspirations?**

**Quantum Computing .**

Even though quantum computing is still in its infancy, I'm excited about its possibilities in the long run. My fascination with algorithmic problem-solving is in line with quantum computing's exceptional capacity to manage intricate, high-dimensional issues. Quantum algorithms, like the quantum Fourier transform, intrigue me since they can solve some problems 10 times faster than classical ones. As access to quantum computers increases, I envision myself working in the field of developing quantum software, specializing in employing quantum systems for data processing and optimization. This tendency is exactly in line with my objective of improving problem-solving skills and helping shape the future of computing.

**Artificial Intelligence (AI)**

AI directly relates to my present professional goals. Machine learning and AI-driven technologies really intrigue me, because the subject provides many chances to advance in automation, data science, and natural language processing. I'm excited about the growing use of AI across industries, and I envision myself working on initiatives that use AI to generate better, more individualized customer experiences or enhance corporate operations. My interest in dynamic and significant technology is well suited to artificial intelligence (AI) due to its adaptability and ongoing development.

1. **Which course outcomes have you achieved so far, and which ones remain?**

In terms of certain course goals, I have so far made significant strides. Through the application of algorithmic principles to a variety of situations, I have effectively built and evaluated computing solutions that meet computer science standards. In addition, I have developed expertise in producing high-caliber communications that are suited to various audiences and situations, including technical reports and presentations.

However, I still have a few things to improve. Even though I've employed a few cooperative strategies, I still need to improve my ability to create spaces that respect different viewpoints, particularly when working on collaborative projects. In addition, I'm still trying to sharpen my security thinking, particularly in terms of anticipating and fixing any software architecture flaws. AI and quantum computing both present serious security issues, therefore this is still a crucial field for development. Finally, even though I've started to investigate cutting-edge tools and methods in AI and machine learning, I intend to learn more about cutting-edge technologies like quantum computing to better match industry-specific objectives and upcoming advancements in the field.

**Conclusion:**

In conclusion, two major trends that will influence computer science in different ways are quantum computing and artificial intelligence. AI is already changing how we use technology and do business, while quantum computing has the potential to completely revolutionize sectors by resolving issues that were previously unsolvable. My interest in cutting-edge, influential technologies is in line with both trends, and I hope to make a significant contribution to these fascinating advancements in the sector by remaining educated and acquiring pertinent skills.

Part Two:

Provide an update to your instructor on your progress with each category of artifacts for the ePortfolio:

* Software design and engineering
* Algorithms and data structures
* Databases

Maintaining a record of our progress and providing instructors with updates on our work on the ePortfolio's development and enhancement implementations for each of the artifact's primary categories.

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| --- | --- | --- | --- |
| **Checkpoint** | **Software Design and Engineering** | **Algorithms and Data Structures** | **Databases** |
| **Name of Artifact Used** | “3D Modeling and Scene Design from CS 330 (Computational Graphics and Visualization)” | IT-145 – Zoo Monitor System | “Database Project from CS 340: Using MongoDB for Animal Rescue” |
| **Status of Initial Enhancement** | Sumbitted but my video recording has no sound | Complete creation of pseudocode. Complete coding  The code has been thoroughly tested.  General cleanup of the code. | Playing with methods for indexing and aggregating in order to manage bigger datasets. |
| **Submission Status** | Work has begun, but because I was not able to comprehend the assignment, no submission has yet been made. | Not started | No submission yet, still conducting research and making adjustments. |
| **Status of Final Enhancement** | I'm now working on adding more realistic models, texturing, and simple motions with lighting effects. Not yet a final version. | Not started | enhancing query speed and employing aggregation pipelines more effectively. |
| **Uploaded to ePortfolio** | Not yet uploaded. | Not yet uploaded. | Not yet uploaded. |
| **Status of Finalized ePortfolio.** | Since improvements are still being made, the ePortfolio is not yet finished. | Not yet uploaded. | Not yet uploaded. |

**References:**

“The rise of quantum computing. McKinsey & Company. (n.d.). <https://www.mckinsey.com/featured-insights/the-rise-of-quantum-computing>.”

“Salminen, M. (2024, May 21). 41 AI statistics and trends in 2024. Hostinger Tutorials. <https://www.hostinger.com/tutorials/ai-statistics?gad_source=1&gclid=CjwKCAjwx4O4BhAnEiwA42SbVNHuzZSj5S569se9j5P42L2Y_ohz591FLuRAifxHuyefRY8j3tpVlxoC0jkQAvD_BwE>.”