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Journal: Disruptive Technologies and Artifact Update

Part One: Game-Changing Technologies in Computer Science

1. Quantum Computing

Identification and Description:  
 Quantum computing is an emerging technology that leverages the principles of quantum mechanics to perform calculations at speeds unattainable by classical computers. Unlike traditional computers that use binary bits (0s and 1s), quantum computers use qubits, which can exist in multiple states simultaneously due to superposition and entanglement. Companies like Google, IBM, and D-Wave are developing quantum processors capable of solving problems exponentially faster than today’s supercomputers.

Impacts on Computer Science and My Career:  
 Quantum computing is set to revolutionize fields that require high-performance computation, such as cryptography, materials science, and artificial intelligence. Traditional encryption methods like RSA and ECC could become obsolete, leading to a shift toward quantum-resistant encryption. In my career as a software developer, understanding quantum algorithms and post-quantum cryptography will be essential, especially as industries begin adopting quantum-safe security measures.

Impacts on Humans, Communities, and the World:  
 Quantum computing has the potential to accelerate medical research, optimize logistics and supply chains, and enhance AI capabilities. It could help scientists simulate complex molecular interactions, leading to faster drug discoveries. However, it also poses cybersecurity risks, as many encryption standards used today may become vulnerable to quantum-based decryption attacks.

2. Artificial Intelligence in Cybersecurity

Identification and Description:  
 Artificial Intelligence (AI) is transforming cybersecurity by enabling real-time threat detection, anomaly detection, and automated responses to security incidents. AI-driven intrusion detection systems (IDS), automated vulnerability assessments, and deep learning-based malware analysis are making networks and systems more secure. Companies like Darktrace, Microsoft, and Palo Alto Networks are integrating AI into security frameworks to detect threats before they cause damage.

Impacts on Computer Science and My Career:  
 AI-driven cybersecurity is increasing demand for professionals skilled in machine learning, threat modeling, and security analytics. As cyber threats become more sophisticated, AI will be essential in automating security responses and reducing human intervention. I am particularly interested in learning how AI-driven SIEM (Security Information and Event Management) systems can proactively monitor and neutralize security risks in real-time.

Impacts on Humans, Communities, and the World:  
 AI-powered cybersecurity will benefit individuals and organizations by reducing cyberattacks, preventing data breaches, and ensuring privacy. Governments and financial institutions are already deploying AI-driven fraud detection systems to combat identity theft and cyber fraud. However, AI in cybersecurity also raises ethical concerns, such as AI-powered surveillance and potential bias in threat detection models.

Course Outcomes Achieved and Remaining Goals

So far, I have demonstrated progress in the following course outcomes:

* Software Design and Engineering: I have successfully enhanced the To-Do List application by refactoring the code, improving error handling, and integrating a GUI.
* Algorithms and Data Structures: My Sorting Algorithms Comparison project now includes Radix Sort and Heap Sort with a visualization component.
* Database Management: I have completed the migration of the Library Management System from MySQL to MongoDB and improved database security and query performance.

The remaining areas of focus include:

* Refining security measures across all artifacts.
* Ensuring best practices in data encryption and user authentication.

Part Two: Artifact Update

Software Design and Engineering:  
 The To-Do List application now features task persistence with SQLite, a user-friendly GUI, and file-based backup functionality. The final step is implementing user authentication to improve security.

Algorithms and Data Structures:  
 The Sorting Algorithms Comparison project is nearing completion, with sorting visualization enhancements in progress. I am currently optimizing sorting algorithms for better performance on large datasets.

Databases:  
 The Library Management System has been successfully migrated to MongoDB, and the new web-based interface is under development. The next step involves refining the API for better database interactions and enhancing access control security.

Conclusion

This journal entry explores the transformative impact of Quantum Computing and AI in Cybersecurity, both of which will shape the future of data security, computation, and software development. Additionally, I have made significant progress in refining my ePortfolio artifacts, with final security enhancements being the next priority.