Cody VanGosen

Southern New Hampshire University

CS-499 Computer Science Capstone

Professor Kraya

April 13, 2025

**Milestone Four Narrative**

**Module Six Journal**

Two emerging technologies I believe are reshaping the future of computer science are quantum computing and large language models (LLMs). Much like how the rise of cloud computing and smartphones changed the baseline expectations for scalability and accessibility, these technologies are redefining both how we compute and how we interact with systems.

Quantum computing is often described as the next frontier in processing power. By leveraging quantum bits (qubits), which can represent multiple states simultaneously, quantum systems can solve specific classes of problems far faster than classical computers. One notable use case is in factoring large integers—something that would undermine most modern cryptographic systems if achieved at scale. Companies like IBM and Google have already demonstrated quantum supremacy in narrow benchmarks, and tools like Qiskit are making quantum programming more accessible (Preskill, 2018). While quantum computing is not yet mainstream, its potential to revolutionize data encryption, scientific simulations, and optimization problems is enormous. As someone interested in system-level thinking, I recognize that understanding the constraints and capabilities of quantum algorithms may soon be as essential as understanding cloud architecture is today.

Large language models, particularly those driving generative AI like ChatGPT, Codex, and Claude, represent a more immediate transformation. These models have already begun changing the nature of software engineering work. From writing boilerplate code to debugging and even generating documentation, LLMs are integrating into the development cycle as collaborative agents rather than passive tools. This significantly impacts the demand for developers who are not just fluent in coding but also in prompt engineering, ethical oversight, and model fine-tuning (Bommasani et al., 2021). As someone already collaborating with these models in both academic and professional spaces, I see their potential to augment creativity and accelerate development cycles—particularly for those who can critically evaluate and guide these models' output.

In terms of broader impacts, quantum computing could challenge the very foundation of data security, requiring communities and industries to rethink how we store and protect sensitive information. Meanwhile, LLMs are influencing everything from education to hiring, as written expression and cognitive labor become partially automated. These tools also carry the risk of misinformation, algorithmic bias, and job displacement, making ethical reflection and human-centric design more important than ever.

At this stage in my capstone, I have successfully met all three outcome categories: software design and engineering, algorithms and data structures, and databases. Each artifact has been enhanced, tested, and uploaded to my ePortfolio. The OpenGL 3D scene was enhanced for lighting realism and modular structure, while the second artifact optimized algorithmic performance through recursive scene graph traversal. Finally, the third project now supports persistent scoring using local JSON storage, completing the requirements for data handling and persistence.

**Links to completed ePortfolio:**

* <https://codyvangosen.github.io>
* <https://github.com/codyvangosen/codyvangosen.github.io>

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| --- | --- | --- | --- |
| **Checkpoint** | **Software Design and Engineering** | **Algorithms and Data Structures** | **Databases** |
| |  | | --- | | **Name of Artifact Used** |  |  | | --- | |  | | |  | | --- | | OpenGL 3D Scene Project – Charcuterie Board (from CS-330) |  |  | | --- | |  | | |  | | --- | | Same as Software – Scene Graph and Recursive Traversal |  |  | | --- | |  | | |  | | --- | | OpenGL Breakout Game – High Score System with JSON Persistence |  |  | | --- | |  | |
| |  | | --- | | **Status of Initial Enhancement** |  |  | | --- | |  | | |  | | --- | | Completed. Implemented lighting models and refactored transformation logic. |  |  | | --- | |  | | |  | | --- | | Completed. Refactored code to use hierarchical data structures and recursion. |  |  | | --- | |  | | |  | | --- | | Completed. JSON schema developed for storing/retrieving scores. |  |  | | --- | |  | |
| |  | | --- | | **Submission Status** |  |  | | --- | |  | | Submitted | Submitted | Submitted |
| **Status of Final Enhancement** | |  | | --- | | Finalized and fully tested |  |  | | --- | |  | | |  | | --- | | Finalized and validated |  |  | | --- | |  | | Finalized, including UI scoring and data persistence mechanisms |
| |  | | --- | | **Uploaded to ePortfolio** |  |  | | --- | |  | | |  | | --- | | Yes – With all documentation and screenshots |  |  | | --- | |  | | |  | | --- | | Yes – With performance validation and full walkthrough |  |  | | --- | |  | | |  | | --- | | Yes – Code, render, and high score system uploaded |  |  | | --- | |  | |
| |  | | --- | | **Status of Finalized ePortfolio** |  |  | | --- | |  | | |  | | --- | | Fully deployed with all enhancements, narratives, and media |  |  | | --- | |  | | |  | | --- | | Complete. All elements are present and documented. |  |  | | --- | |  | | Finalized. All rubric components met and uploaded successfully. |

**References**

Bommasani, R., Hudson, D. A., Adeli, E., Altman, R., Arora, S., von Arx, S., ... & Liang, P. (2021). On the opportunities and risks of foundation models. *arXiv preprint* arXiv:2108.07258. https://doi.org/10.48550/arXiv.2108.07258

Preskill, J. (2018). Quantum Computing in the NISQ era and beyond. *Quantum*, 2, 79. https://doi.org/10.22331/q-2018-08-06-79