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CS-499 Computer Science Capstone

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**Module Five Journal**

Two emerging trends in computer science that I believe will reshape the field are Edge Computing and AI-Powered Code Generation. These developments not only reflect a shift in how data is processed, and software is written but also carry significant implications for the workforce, including the changing role of mid-level developers and managers.

Edge Computing is becoming increasingly vital as devices, sensors, and machines generate massive amounts of data in real time. By processing data at or near the source—rather than relying on centralized cloud servers—edge computing reduces latency, enhances privacy, and supports real-time decision-making. This is especially important in sectors like autonomous vehicles, IoT networks, and remote healthcare, where instant feedback is critical (Shi et al., 2016). In computer science, this trend necessitates new architectural strategies that balance cloud resources with decentralized edge nodes. For me, this is particularly relevant as I look toward a career involving system optimization and distributed architectures. Working at Amazon, I already see how localized fulfillment systems benefit from similar edge principles, and I plan to explore how these frameworks can improve logistics and warehouse robotics.

AI-Powered Code Generation, on the other hand, represents a more controversial—yet equally transformative—trend. Tools like GitHub Copilot and Amazon CodeWhisperer are not just productivity boosters; they are quickly evolving into autonomous contributors capable of generating full-featured modules, identifying security flaws, and even reviewing pull requests. While these tools empower junior developers and reduce the burden of repetitive tasks, they also pose a challenge to the traditional "middle developer" role—the individuals who historically bridged the gap between junior execution and senior design. As these AI tools grow more sophisticated, we may see a reduction in demand for mid-level coding roles and even middle management positions that rely heavily on manual task tracking or oversight. Instead, emphasis will shift toward strategic thinking, prompt engineering, ethical oversight, and systems integration—areas where human judgment still outpaces machine logic (Vasudevan, 2023).

This is especially relevant to my professional path. As I aim to transition from operations into a more technical software role within Amazon or a similar organization, I understand the need to develop a niche that goes beyond syntax. Emphasizing architectural thinking, system-level design, and collaboration with intelligent agents will allow me to thrive in a landscape where baseline coding skills may no longer differentiate candidates. These trends reinforce the value of adaptability, and I am excited to continue building expertise in human-AI collaboration.

At this stage in the capstone, I have completed outcomes related to software design, algorithmic optimization, and system refactoring. I have implemented vector-based rendering logic, reduced code redundancy through loops and data structures, and documented enhancements clearly. The remaining outcomes—focused on database integration and full portfolio deployment—will be achieved in the coming week as I finalize my third category enhancement.

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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) | OpenGL 3D Scene Project – Same artifact planned | OpenGL Breakout Game – High Scores/Multiplayer |
| **Status of Initial Enhancement** | |  | | --- | | Completed. Implemented dynamic lighting, point and directional sources, and improved shading for realism. |  |  | | --- | |  | | Completed. Refactored transformation logic with vectors and arrays. SceneNode structure introduced for rendering hierarchy. | |  | | --- | | Not yet started. Planned immediately after Algorithms category is finalized. |  |  | | --- | |  | |
| **Submission Status** | |  | | --- | | Submitted. |  |  | | --- | |  | | |  | | --- | | Submission in progress. Code complete and undergoing README finalization. |  |  | | --- | |  | | |  |  |  | | --- | --- | --- | | |  | | --- | | Not yet submitted. |  |  | | --- | |  | |  |  | | --- | |  | |
| **Status of Final Enhancement** | |  | | --- | | Complete. GitHub ePortfolio work is being completed before uploading. |  |  | | --- | |  | | |  | | --- | | Final testing is complete. Scene graph system functioning as intended. |  |  | | --- | |  | | |  | | --- | | Planning underway. Database schema will support local and networked multiplayer scoring. |  |  | | --- | |  | |
| **Uploaded to ePortfolio** | Not yet uploaded. GitHub Pages repository is set up and will be used to host the enhanced artifact. | |  | | --- | | Pending. Artifact to be uploaded with full documentation and linked media. |  |  | | --- | |  | | Not applicable at this stage. |
| **Status of Finalized ePortfolio** | |  | | --- | | Software section nearly finished. Will finalize once all documentation is cross-linked. |  |  | | --- | |  | | |  | | --- | | Section outline prepared. Upload and polish targeted within 48 hours. |  |  | | --- | |  | | Placeholder exists. Will be built out after database enhancement is coded and reviewed. |

**References**

Shi, W., Cao, J., Zhang, Q., Li, Y., & Xu, L. (2016). *Edge computing: Vision and challenges*. IEEE Internet of Things Journal, 3(5), 637–646. https://doi.org/10.1109/JIOT.2016.2579198

Vasudevan, V. (2023). *Will AI replace programmers or redefine their role?*. Communications of the ACM, 66(7), 20–23. https://doi.org/10.1145/3597152