

5-1 Journal: Computer Science Trends and Artifact Update

Part One:

1. What is the significance of each trend?

Virtual Reality (VR): VR has become a significant trend due to its ability to create immersive experiences that has the potential to transform various sectors. Its ability to provide interactive environments and realistic simulations means that it is widely used in things like gaming, training, healthcare and even education (Imran et al., 2021; Li et al., 2024; Mohsen & Alangari, 2024). For example, VR can be used in medical training to simulate procedures like surgeries, thereby offering doctors or medical students a risk-free environment to practice procedures (Xie et al., 2021).

Additionally, it is also applied in scientific research to enable detailed visualisations of molecular structures, opening the doors to new insights and discoveries (Matthews, 2018).

Bioinformatics: Bioinformatics refers to an interdisciplinary field which merges computer science, information technology and biology. It is used to interpret biological data, including DNA sequencing, gene expression analysis and protein structure prediction (Patel et al., 2021). This field has also driven contributions towards advancements in algorithm design – these are helpful towards managing and interpreting large datasets (Leung, 2024).

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

Virtual Reality (VR): VR can enhance learning and training by creating immersive learning environments that enhance theoretical understanding and practical skills (Yang et al., 2024). It also facilitates deeper collaboration among professionals and researchers. For example, virtual laboratories allow scientists to work together in a shared digital space, which overcomes geographical barriers. This has been particularly noteworthy during the COVID-19 pandemic, where the virtual world was

central to how many things were done (Pells, 2023). VR also provides a controlled environment in which experiments that are otherwise difficult or impossible in real-life situations (Pells, 2023). Integrating VR into Computer Science means that we are able to foster interdisciplinary research, particularly in combining fields such as psychology, education and engineering (Cipresso et al., 2018). As someone who spends a lot of time creating virtual environments on Unreal Engine, I've been fortunate to have created a game environment in which my friends and I can interact through virtual reality in our own clubhouse.

Bioinformatics: Challenges in bioinformatics make it necessary for us to create new algorithms to sequence alignment, structural prediction and evolutionary analysis. These will also make their way beyond just biology, thereby enhancing machine learning and artificial intelligence (Carleton, 2021). Bioinformatics also relies greatly on Machine Learning and Artificial Intelligence (AI) to make sense of complex biological data. This relationship encourages an acceleration in advancements in AI as new biological datasets provide unique opportunities (as well as challenges) in refining these models (Shukla et al., 2024).

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

Virtual Reality: VR allows consumers to experience products in a virtual environment before purchasing, leading to more informed decisions and increased satisfaction (Suh & Lee, 2005). It also provides immersive experiences in movies, gaming and educational content (Cipresso et al., 2018). The potential of VR to provide realistic simulations and training scenarios means that industries such as aviation, healthcare and manufacturing. It also allows for remote collaboration by creating virtual meeting spaces where workers can interact as if they were in the same room, thereby increasing productivity and improving communication (Kuleto et al., 2024). On a more personal level, though it was not a publicised project, I've built my dream home in VR and walked through it as a form of motivation for myself.

Bioinformatics: Consumers benefit from bioinformatics through advanced health monitoring tools that analyse biological data to predict and prevent diseases (Capps et al., 2019). As for workers, medical professionals may find that these tools can help to more accurately diagnose diseases and develop treatment plans based on genetic data,

meaning that they are further enabled to provide more personalised care (Ouzounis, 2012).

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

Virtual Reality: As someone who frequently uses things like Autodesk Maya and Unreal Engine to create VR environments, whether it's designing my dream home, an office space or even fictional worlds worth exploring, VR provides me with a platform to expand my creative work while pushing boundaries in both the academic and professional spheres. My goal of becoming an academic could tie in with my VR skills as I can utilise this technology to create immersive environments for research, teaching or even experimental simulations. On a more personal level, through using my VR device, I've experienced becoming a fighter pilot (something I've wanted to do for a long time), walked the streets of Jerusalem, and even managed to see my house before it was built. Now, I have a personal goal of re-creating the home that I once lived in for 25 years in virtual reality so that I can re-live my childhood memories once more. If I had to link this to a course at SNHU, I think the closest fit would be CS 330 – Computational Graphics and Visualisation. In the class, I created a 3D scene, and although I did believe it to be slightly unnecessarily difficult (OpenGL was not my favourite), I had fun tweaking my code to see what would go best with the image I was creating.

Bioinformatics: This particular element is slightly removed from my current focus. However, there are fascinating intersections between bioinformatics and VR. At this stage, I am still very early in my pursuit of academia, so perhaps being able to simulate in virtual reality would be helpful towards any of my academic or research endeavours in the future. Being able to present data in a manner that is digestible to others would open up a myriad of research opportunities, so this is something that I am looking forward to exploring in the future to come. If I had to link this to a course that I studied, I think the closest would be in CS 340 – Client/Server development and perhaps in IT 140, where I learned the combination of dealing with databases and how to deal with data in the best way possible.

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

I have achieved all the five course outcomes so far.

1. In Course Outcome One, which I met in all three enhancements, I encouraged collaboration by making my projects open-source. I ensured that my code is easy to understand, and in some cases, I've even given both technical and non-technical audiences an opportunity to interact with my finished product or contribute to its success. An example would be in my API for enhancement three, where I created a FastAPI to then insert into a re-created version of my Java Swing application (in TypeScript). I decided to make these separately and make the API available to the public so that anyone who wishes to use it may do so. I gave the public the opportunity to improve the API by raising an issue to let me know which destination and country they wanted added, and I committed to acknowledging their requests within three days. Furthermore, I also used Docker to mount my applications so that anyone can run the applications without having to install anything extra on their computers.
2. In Course Outcome Two, which I met in all my enhancements, every repository that held my original code and enhancements was accompanied with a detailed README document that details how to run and use whichever project they were looking at. I further met this outcome with my weekly journals and my written narratives, which explain the purpose and my thought process behind each week of work.
3. Course Outcome Three was met particularly in Enhancement Two. In this enhancement I used Dijkstra's Algorithm and the Depth-First Search to create a cheat for my Python game. This enabled the player to experience the game in a different way. Dijkstra's Algorithm and DFS showed the player the answers to the quizzes and also found a cheap way to get through to the goal of the game. This showcased my ability to solve complex problems using algorithmic principles while balancing design choices such as maintaining gameplay integrity and enhancing user experience.
4. Course Outcome Four was demonstrated in Enhancement One, where I used TypeScript, Next JS 14 and Tailwind to create a front-end that had better user experience. I also met this course outcome in Enhancement Three, where I demonstrated that I could also integrate an API into my web application.

These showcased that I could use modern web development frameworks in the right places when they were called for, and ultimately make something that was accessible to many. Furthermore, I also demonstrated separation of concerns, which is something that is very much overlooked in development, especially by beginner developers. Therefore, I showcased that I paid attention to industry standards in achieving industry-specific goals and to deliver value.

5. Course Outcome 5 was achieved in Enhancement Three, where I demonstrated a security-focused approach by deploying a FastAPI on my own subdomain, rather than simply connecting to a database via a .env file. This approach not only reduced potential attack surfaces, but also gave me greater control over security configurations such as managing access controls, ensuring data encryption and securing API endpoints. Through integrating this API into my application, I showcased a proactive security mindset, addressing potential vulnerabilities early in the development process to safeguard my data and my resources. By doing this, I show that I can anticipate adversarial exploits and mitigate security risks, ultimately ensuring the integrity and privacy of my application.

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

Checkpoint	Software Design and Engineering	Algorithms and Data Structures	Databases
Name of Artifact Used	CS 210 - Programming Languages Static Clock	IT140 - Introduction To Scripting Adventure Game	CS 250 - Software Development Lifecycle* Travel website
Status of Initial Enhancement	Completed. Enhancement made: - Front-end using Next JS 14, Tailwind and TypeScript.	Completed. Enhancement made: - Use Dijkstra's Algorithm to create a "cheat code" for players to find a simple way to get to the end of the game. - Depth First Search (DFS) for cheat mode to show answers to quiz questions.	Completed. Enhancement made: - Adding a database via FastAPI (Python) to a version of the "website" to dynamically populate it. - FastAPI with Destinations, Countries, Descriptions and Links created in Python, deployed on countriesapi.crabsticks.dev.
Submission Status	Submitted by Sunday 21/9/2024	Submitted 25/9/2024	Submitted.
Status of Final Enhancement	-	-	-
Uploaded to ePortfolio	Updates made to ePortfolio** as I make the enhancement.	Updates made to ePortfolio** as I make the enhancement.	Updates made to ePortfolio** as I make the enhancement.
Status of Finalized ePortfolio	-	-	-
<p><i>N.B: *Changed from using the same CS 210 Programming Languages as the concept was unclear according to comments in rubric.</i></p> <p><i>**ePortfolio will remain private as I am to be very watchful of my online presence at this time. I will be sending my final portfolio, Dockerised, and include a link.</i></p>			

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