The project will be focused on web-based game development. Along with this primary focus, there will be a focus on computer networking, artificial intelligence, and databases. The game will be called “Pixel Coliseum”. It will be a 2D, top-down, round-based survival game, playable in the browser. The map will be a small arena, where a single or multiple players fight off waves of AI-controlled enemies. The arena will contain obstacles, as well as various weapon types and power ups that can be picked up. Key planned features include online co-operative multiplayer, intelligent AI opponents, integrated in-game chat, and persistent stat tracking via a database.

I’m a fifth-year Computer Science student, so I’ve taken all the typical CS classes in the curriculum. My first 2 years were spent at Cincinnati State, so my classes were a bit different in the beginning. I think the classes that will apply most to this project are CS4065 (Computer Networks and Networked Computing), CS4033 (Artificial Intelligence: Principles and Applications), CS4092 (Database Design and Development), CS4039 (Programming Languages), and CS2028 (Data Structures & Algorithms). CS4065 will be useful because the project will involve sockets, client-server models, latency, packet loss, etc. CS4033 will be useful because the algorithms and behavior modeling that I learned in that class will be used to develop more intelligent AI in the game. CS4092 will be great because I will be using a database to store long term data like player stats. CS4039 gives me strength in using TypeScript + Node.js effectively and understanding runtime trade-offs. Finally, CS2028 will be used quite a bit because I will need to use various data structures and algorithms in my code. I have not taken CS4052 (Software Engineering) yet, but I think that would’ve been a great course to have taken. It didn’t quite fit into my schedule since I’m a transfer student, so I’m taking it next semester.

I have done co-ops with 2 different companies. For 3 semesters, I worked with a Department of Defense contracting company called Peerless Technologies. I was a Software Engineer Intern. During my time there, I primarily did C++ development with Qt, QML, CMake, and Vcpkg by participating in the design and development of an application from the ground up. This was my first real experience using a framework. I also worked on a DevOps pipeline, unit testing, along with intra-process and network communication using Protobuf, OpenDIS, and UDP sockets. After my time at Peerless Technologies, I did a co-op rotation with Marathon Petroleum Corporation. I has an individual project where I created a tool that automated the process of moving all of our web application configuration over to Azure. I also worked on and maintained several business-savy web applications. This gave me hands on experience with C#, .NET framework, NuGet, XAML, Azure, Microsoft SQL Server, CI/CD pipelines, and Snyk for security vulnerabilities. The experience I gained with version control at both companies will help me out with my capstone. My capstone will use a different tech stack than the ones I used during my co-ops. This is because I want to

diversify my skillset. I used a little bit of JavaScript at Marathon, so I can apply this knowledge when I use TypeScript. The overall programming and problem solving that I did on co-op will certainly help me as well. Having experience with frameworks will also help me learn the new frameworks that I'll be using. I will also apply my SQL skills that I gained while at Marathon for the database I'll be using. At both companies, I gained experience demonstrating software and giving presentations. This should be quite useful when it comes time to demo my app and give any presentations.

I am motivated to pursue Pixel Coliseum because it blends several areas of computer science that I am passionate about into a single, challenging project. I have always been interested in real-time systems and networking, and this project will allow me to apply concepts from my coursework in Computer Networks to create an online multiplayer experience. I am also excited to design intelligent AI opponents that use principles from my AI course to create more engaging gameplay. Beyond the technical interests, I am excited about game development as it requires creativity, problem solving, and provides a fun experience for the users. Developing a browser game means that the final product can be easily accessible and testable by a wide audience, which makes me want to polish it to a high standard. The chance to work full stack further inspires me because I will gain more experience across multiple domains while working on a project I truly enjoy.

My preliminary approach to designing a solution begins with breaking the project into clear milestones: first building the core arena and character mechanics, then adding multiplayer networking, followed by AI logic, chat, and stat tracking. I plan to use TypeScript with Phaser 3 on the frontend and Node.js with Colyseus on the backend, while PostgreSQL will serve as the database for persistent statistics. To ensure quality, I will adopt an iterative development cycle where I continuously test and refine features through both automated testing and real play sessions. My expected results include a working browser game that supports online co-operative multiplayer matches, adaptive AI opponents, a functional chat system, and a leaderboard driven by persistent stat tracking. I will consider the project successful if the game is stable, playable, and demonstrates technical depth across networking, AI, and database integration. To self-evaluate, I will measure my progress against the milestones, gain feedback from peers and faculty during playtests, and verify that all planned features are implemented and well-documented. Ultimately, I will know I have done a good job when the final system is both technically sound and fun for others to experience.