I am excited to embark on a project that combines my love for artificial intelligence and simulation. For my senior design project, I have chosen to explore the transformative potential of reinforcement learning within Unity, a platform renowned for its versatility in creating immersive virtual environments. This project not only aligns with my academic interests but also represents an opportunity to apply cutting-edge technology to practical applications. By delving into reinforcement learning, I aim to not only gain invaluable hands-on experience but also contribute to the growing field of intelligent virtual agents, a field with promising implications for the future of simulation and gaming technology. This journey promises to be both educational and rewarding, allowing me to showcase my skills while pushing the boundaries of what is possible within the realm of virtual agents and machine learning. Through this project, I look forward to pushing the boundaries of what is possible within the realm of virtual agents and machine learning, ultimately contributing to the development of more realistic and intelligent agents that can enhance various industries, from automation to environment adaptation.

My academic journey of my computer science bachelor's program has equipped me with a strong foundation in programming, data structures, and algorithms, which will serve as the bedrock for this project. Courses in machine learning and artificial intelligence have provided me with a comprehensive understanding of the principles underlying reinforcement learning, making it possible for me to implement and fine-tune the neural networks that will drive the virtual agents' decision-making processes. Additionally, coursework in software engineering and operating systems will be invaluable when it comes to integrating reinforcement learning libraries seamlessly into Unity's 3D engine, ensuring the project's technical feasibility and success. These academic experiences have not only sharpened my problem-solving skills but have also nurtured my creativity, enabling me to envision innovative solutions and explore uncharted territories in the realm of intelligent virtual agents within Unity. Furthermore, my involvement in computer science projects and extracurricular activities has honed my ability to work collaboratively and communicate complex technical concepts effectively, skills that will be essential when presenting and discussing the project's progress and findings with my peers and mentors. This holistic combination of academic knowledge and practical experience positions me well to excel in the challenges and opportunities that lie ahead in this ambitious senior design project.

Not only will my academic experience benefit this project, but my diverse experiences at Riverside Research have also provided me with a comprehensive skill set that will be instrumental in executing our senior design project effectively too. As a STEM intern, I honed my proficiency in version control workflows using Bitbucket and optimized Python environments, skills that will be invaluable for maintaining a streamlined and collaborative development process within our project team. Additionally, my tenure as a software engineer allowed me to master project management tools like JIRA and demonstrated my leadership abilities, which will be essential in overseeing the project's progress. Furthermore, my experience in advanced machine learning, such as segmentation and detection, equips me with the technical expertise required for implementing reinforcement learning within Unity effectively. Finally, my role as a machine learning intern has expanded my knowledge in areas such as Large Language Models and graph neural networks, aligning well with our project's objectives to enhance virtual agent intelligence. My experience in presenting technical findings and co-authoring research papers also prepares me for disseminating our project's results effectively to stakeholders and the broader academic community.

My motivation for this senior design project stems from a genuine passion for AI and immersive virtual environments. I'm eager to apply my academic and professional experiences to create adaptive virtual agents in Unity through reinforcement learning. Our preliminary approach involves defining scenarios, integrating reinforcement learning libraries, and developing neural networks for agent learning. We'll track progress with performance metrics and anticipate agents demonstrating enhanced problem-solving skills, enriching Unity simulations. Moreover, I believe this project's success will not only showcase the potential of AI-driven virtual agents but also open doors to exciting opportunities in fields such as game development, training simulations, and even human-computer interaction. By combining my passion with the practical skills I've acquired, I hope to contribute meaningfully to the ever-evolving landscape of AI-powered immersive experiences.

Expected outcomes include virtual agents exhibiting adaptive behavior to Unity's realism and interactivity. Success will be determined by meeting defined milestones and presenting our findings effectively. Continuous assessment, feedback from advisors and colleagues, and thorough documentation will be key to evaluating our contributions and ensuring that our project meets expectations in reinforcement learning within Unity for solving problems that require complex simulations. Additionally, our project aims to contribute valuable insights to the broader AI community by documenting our methodology and lessons learned in an accessible and informative manner. We anticipate that our work will serve as a useful resource for students, researchers, and developers interested in leveraging reinforcement learning within Unity for similar applications. Ultimately, our goal is not only to achieve adaptive behavior in virtual agents but also to foster knowledge sharing and collaboration within the AI and virtual environment development communities, leaving a lasting impact beyond the confines of our senior design project.