My senior design project is focused on developing AI vision goggles for the visually impaired. From my individual academic perspective, this project is about applying the software engineering and artificial intelligence concepts I have studied to a practical real application. Our goal is to create a system that uses computer vision to identify objects and Retrieval Augmented Generation (called RAG) to provide auditory descriptions for the user. In my role as API Designer and Software Lead, my focus will be on the software architecture that connects these different technologies. This involves designing the data pathways and ensuring the system is responsive enough for a person to use effectively. This project is an opportunity to use my skills to build a technology that can improve someone's quality of life.

The knowledge from my college curriculum will directly guide the development of this project. For example, my Image Processing course (EECE 5142) provided a foundation in the principles of object detection, which is the main function of our device. My work in Databases (CS4092 Database Development) will be critical for designing the database schema needed to store data for a personalized user experience and fast retrieval. The concepts from Software Engineering (EECE3093C) and Algorithms (CS4071) will also be applied directly to my work on the system design and API development to ensure the code is efficient. These courses provided technical skills for the project and taught a structured way to solve problems, which will be important for my leadership role.

In addition to my coursework, my co-op experiences have given me the practical skills needed for this project. During my time as a Software Engineering Intern at Midmark Corporation, I developed internal C# tools and optimized RESTful APIs, which is the same type of work required for this project's software architecture. At MRI Software, I gained more experience by developing over ten C# .NET API endpoints, which improved my understanding of full-stack development and data security. My co-ops at Midmark, MRI Software, and Leonardo DRS also taught me how to work in an Agile team using Scrum methodologies. This experience with industry practices will help me lead the software development effort and ensure all the parts of our project integrate correctly into a final product.

My motivation for this project comes from its alignment with my interests in artificial intelligence and its potential to solve a meaningful problem. The goal is to build a device that can interpret the visual world and communicate it to a person who is visually impaired, which is a significant technical challenge. This project has a clear purpose to provide a tangible benefit and help a user navigate their environment more independently. I am also motivated by the opportunity to work with advanced technologies like Retrieval Augmented Generation. This technology will allow our system to provide more contextually aware descriptions than a standard object detection system could. The combination of a difficult technical problem and a socially beneficial application makes this an ideal capstone project.

My preliminary approach to designing the solution will be to create a modular system. As the API Designer and Software Lead, I will define a set of RESTful APIs for each of the main components. These are the hardware interface, the computer vision model, the RAG integration, and the database. This approach will allow each team member to develop their component independently before we begin integration. The expected result is a functional prototype of the goggles that can identify objects in real time and provide clear, coherent auditory feedback. I will evaluate my own contributions based on the performance and reliability of the APIs I design and the successful integration of all software components. I will know I have done a good job when our team has produced a robust prototype that meets our design goals and offers a genuinely useful experience to the user.