My senior design project focuses on developing a deep learning-based image recognition system for automated, real-time inventory management. This project serves as an opportunity to apply computer science principles to a practical and real-world problem. This project will use computer vision models to identify products, track their quantities, and update inventory records without requiring manual input. Additionally, it will create a database to store all those data. This combines my interests in artificial intelligence and systems development into one cohesive solution. Making the system precise, effective, and able to manage real-world circumstances like changing lighting is the difficult part. This project will help me transform my theoretical knowledge into a tool that might boost productivity and cut expenses in sectors that rely on precise inventory management.

I studied Computer Science for my bachelor's degree. This curriculum provided me the technical foundation necessary for this project. I learned how to design efficient programs in my Data Structures and Algorithms classes, which is critical for processing large volumes of image data in real time. "Operating Systems" class gave me a deeper understanding of concurrency and resource management, knowledge that will help me optimize system performance under continuous workloads. "Software Engineering" class taught me valuable lessons in modular design, testing, and collaborative development. Most importantly, "Artificial Intelligence" and "Database Design" classes introduced me to concepts that are vital for this project. I learned about machine learning and neural networks, directly relevant to training and refining our image recognition models and learned about efficiently managing data.

I did my co-ops in two companies, one in Honeywell as a Software Engineer Intern and another in Intelligent Robotics and Autonomous Systems (IRAS) lab at University of Cincinnati as a Research Intern. My co-op experiences have reinforced classroom lessons by giving me opportunities to apply them in professional settings. As a Software Engineer intern at Honeywell, I developed simulation tools which sharpened my software development skills in C#, Python and SQL. I learned debugging complex systems under tight deadlines and learned to work collaboratively with other team members to continuously make improvements to the software. Later, while working in IRAS lab, I developed machine learning models to classify and analyze large image datasets. This gave me first-hand experience with neural networks, dataset preprocessing, and evaluating model performance. Alongside the technical growth, I developed non-technical skills such as adapting to feedback, collaboration, and presenting results to the stakeholders. These experiences taught me how to bridge the gap between research and deployment, a skill I will apply directly to building an inventory management system that is both reliable and practical.

I am motivated to participate in this project because it addresses a real-world challenge that has broad applications in retail, logistics, and supply chain management. Inventory management is a time-consuming process prone to human error, and I am excited about designing a solution that uses artificial intelligence to automate it. This project also excites me because it aligns with my career goals in artificial intelligence, allowing me to strengthen my expertise while contributing to a meaningful solution. Additionally, I am motivated by the opportunity to collaborate with peers, combine our diverse skill sets, and learn from one another. The project's technical

difficulty, real-world application, and opportunity for personal development all combine to make me want to give it my best.

The project will be divided into four main phases a part of my first approach: data collection, model training, system integration, and testing. I will start by collaborating with my group to compile a large dataset of inventory photos, making sure to include changes in lighting, object arrangement, and orientation. I will then help train and optimize neural networks for precise object detection and counting. I will then concentrate on integrating the recognition model with a database that provides real-time inventory level changes. My anticipated outcome is a system that can accurately identify products and update records with minimal latency. I will evaluate my contributions by setting measurable goals, such as achieving a target accuracy rate for recognition, maintaining stable performance under continuous operation, and delivering clear, well-documented code. I will know that our team has done a good job when the system performs consistently, contributes to team success, and meets the needs of real-world users.