## Introduction

My name is Kaleb Bishop, and my senior design project is focused on developing an application that allows users with allergies to scan text or images of their meals to detect potential allergens. Along with my teammates—Eric Buffington, Matthew Bryant, and Hung Nguyen—we are working together to create a solution that combines advanced machine learning with practical, real-world applications. From an academic perspective, this project is an opportunity to apply the diverse technical skills we’ve gained throughout our computer science education while addressing a real-world problem that can impact many lives. Our goal is to give users peace of mind by helping them identify allergens in their meals quickly and accurately. This tool will enable users to scan ingredient lists or even images of their food, using machine learning to analyze and detect any potential allergens. Although our initial focus is on food allergies, this project has the potential to expand into other areas, such as medication allergies. This aspect is particularly meaningful to me because my fiancé has allergies to certain medicines, which has deepened my understanding of how critical it is to avoid accidental exposure to allergens. By combining practicality with advanced technology, we aim to create a simple yet powerful solution that improves the safety and confidence of those with allergies.

## College Curriculum

Several key courses from my college experience have equipped me with the skills necessary for this project. User Interface I has been instrumental in developing my ability to create intuitive and effective frontend designs, which will help as we build the user interface for the application. The backend and AI model will be influenced by courses like Artificial Intelligence, where I learned about machine learning frameworks such as TensorFlow, which we plan to use for image recognition. Additionally, Data Structures and Database Theory have provided the foundational knowledge for designing an efficient system to store and retrieve allergen data. The mathematical concepts from Linear Algebra will also be useful as we train our AI model to process and analyze images for allergen detection. Collectively, these courses have honed my problem-solving skills and technical abilities, preparing me to tackle the challenges of this project.

## Co-op Experiences

My co-op experience at Midmark has further enhanced my ability to contribute to this project. At Midmark, I worked in test automation, frontend development using React, backend development in C#, and SQL database management. These experiences taught me how to build full-stack applications, which is directly relevant to developing the web version of our application. I also gained experience with Scrum and Azure DevOps, which will be essential for project management and ensuring our team stays on track. One of the most valuable lessons I learned during my co-op was how to balance technical and non-technical tasks, such as coordinating with team members and gathering customer requirements. These skills will help me not only contribute to the technical aspects of the project but also work effectively in a team to meet our project goals.

## Motivation

I’m excited about this project because of its potential to make a significant impact on the health and well-being of people with allergies. Although I don’t have personal food allergies, my fiancé’s experiences with allergic reactions to certain medications have opened my eyes to how critical it is to identify potential allergens quickly and accurately. This project allows me to channel that personal connection into creating a tool that could help prevent dangerous situations for others. I’m also motivated by the broader societal implications of this work. With food allergies becoming increasingly common, there’s a real need for simple, accessible technology that empowers users to make informed choices about what they eat. Furthermore, the transparency aspect—where users will be able to see the confidence levels of our AI model—makes the project even more appealing, as it aligns with my values of honesty and safety in software development. I see this project as more than just a school assignment; it’s a chance to create something meaningful that could genuinely improve people’s lives. The possibility of expanding this tool in the future to cover other allergens, like medications, gives me even more motivation to ensure its success.

## Preliminary Approach

Our preliminary approach involves creating a web-based Minimum Viable Product (MVP) that features a camera interface and outputs potential allergens based on the scanned text or image. We aim to design the interface to be as simple and intuitive as possible, with a focus on transparency. Users will see the confidence level of the AI’s predictions, and even slight suspicions of allergens will be reported to ensure safety. The biggest technical challenge we anticipate is connecting our trained AI model with the database to deliver accurate allergen information. Over time, we plan to allow users to contribute to and expand the allergen database, making it more comprehensive. Success for me will be marked by the completion of key milestones, such as successfully integrating the AI model, launching the MVP, and gathering feedback from early users. I will measure my contributions based on how well our application performs in real-world testing and whether it meets users’ needs effectively.