Anyone who has spent time as a pedestrian in the United States knows the feeling of being on an unsafe and unpleasant street with cars whizzing by. In the town in which our college is located ("the Town"), this unease is a result of a deliberate planning choice resulting from a century of traffic engineers changing the physical landscape to favor cars over people. While cars are counted to gauge road usage patterns automatically every three years (or more frequently) for up to two-week periods, pedestrians and cyclists are only counted sporadically under a tedious manual counting process that can be subject to errors. Shifting the focus from cars by automating counts for vulnerable road users (i.e., pedestrians, cyclists, and those who cannot drive due to ability or economic status) will help the Town and planning engineers create more pedestrian and cycling friendly spaces that are safe and welcoming to those of all income and ability levels.

Key stakeholders and our project's sponsor, a filmmaker and the chair of the Town Bike Walk committee, helped align our specifications with real-world usage. Our objectives were clear: we needed to design a (1) portable, (2) inexpensive, (3) easy to set up and maintain, and most importantly (4) automated and accurate method for counting pedestrians and cyclists. This data collection is required to both design streets equitably and safely, and verify the impacts of new bike and pedestrian infrastructure. We verified these specifications with two professional engineers who work in transportation design and who are passionate about inclusivity and who helped us understand the concept of "complete street" design.

Although some competition for this type of tool exists in the market, each currently-available option fails at least one of our specifications. Tech-heavy solutions were expensive and while non-camera based approaches also exist, they are generally not accurate, not portable, or cannot distinguish between different road users.

Our device is called the **Bike Walk Census Tool.** It is a machine-learning (ML) based solution that consists of two parts: a video recording device, which can be installed anywhere and is powered by a solar panel and battery pack to enhance recording longevity, and a separate device running an ML model for automatically counting traffic in recorded video. It is temperature- and weather-resistant, modular, and can record video at all times of day with minimal to no user input. All processing is done on a separate computer supplied by us (or a user's personal computer) to reduce our cost of production to just over $500 per recording device.

The Bike Walk Census Tool is very accurate at just over 85% accuracy in daytime conditions. In particular, because it consistently counts approximately 85% of road users in each class, it can be used in comparison with data counted using other census methods by multiplying it by a correction factor of around 1.17. Furthermore, it can be used for year-over-year comparisons to determine if infrastructural or other changes affect the quantity and type of user within a space.

To ensure the device is used often and by as many people as possible, we designed easy-to-understand front end software to make the data transfer process between the device and our hardware trivial. Furthermore, we have written extensive documentation in case of component failure or if users want to make more devices of their own. The Town is making use of the third prototype of our design to get more information about pedestrian and bike use of intersections and paths. The design process to build this tool helped us combine our studies in computer and mechanical engineering with our passion for non-vehicular travel. We envision a future in which the Bike Walk Census Tool revolutionizes counting, and we can't wait to bring you with us.