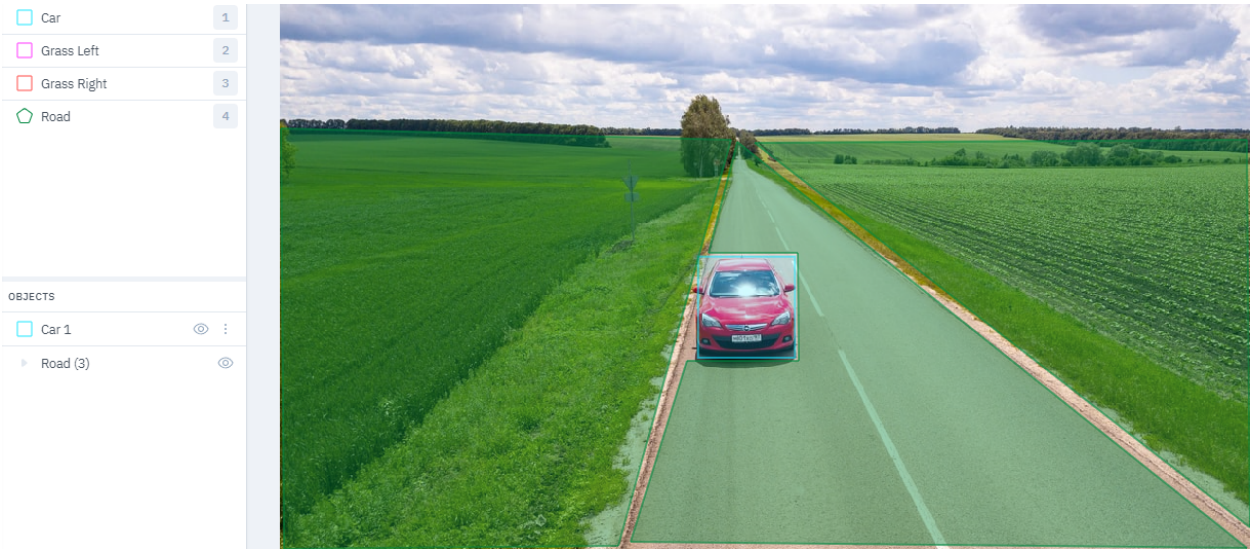
Introduction

Greetings! My name is Mohammad Zafar and I am currently in my first year of Electronic Systems Engineering at the University of Regina. I learned about the Let's Solve It program through an email I received last year, which led me to invite four of my colleagues from Regina and Toronto to collaborate on the project. The program was a great opportunity to apply the knowledge we learned in school in a practical environment along with solving real world problems. Our team decided to create a Suspicious Driving Detection Model that detects if a car is off the road. This was a meaningful problem for us because it had the potential to help people that were stranded or even catch possible reckless drivers.

The Project

Our team's goal is to make a suspicious driving detection model that is effective enough to be used by the government in order to crack down on reckless drivers and help people in danger. The model is trained using an initial dataset of over a thousand images from highways, intersections, and roundabouts. Most of this data is fetched through Ontario 511's traffic API. Additionally, the cameras on the site update every few minutes, making it much easier to get pictures in different weather and lighting conditions. After obtaining this data, we needed a way to turn these photos into a dataset to train our model. For this, we used LabelBox, which allows us to quickly select certain parts of an image, like vehicles, roads, and ditches. After some research, we decided to use semantic

image segmentation to annotate our images. This technique allows us to label individual pixels of an image, making tracking more detailed and accurate than traditional object detection.



An example of Object Detection Labeling

While some of our members worked on labeling photos for our dataset, the others worked on a “training script” using PyTorch, which will help train our model and function as image recognition as well.

Roadblocks

Although our team consisted of students deeply interested in software and computer science, we had never made an effective machine learning model that solves a legitimate issue. By decomposing the problem we were trying to solve into an effective plan, we were able to figure out exactly what we had to do and what we needed to learn in order to create the model. With the help of our mentor, resources from Borealis AI, and access to Stanford’s convolutional neural networks course, we were able to fill in our gaps

in knowledge and proceed with making a viable model. Another problem we encountered was the limited amount of rare occurrences in our photos. These rare occurrences include cars off the road, varying weather conditions, and drivers breaking laws. Our main focus was gathering as many photos of cars off the road as possible since the model needed many examples in order to be successful. To solve this, we simulated what a car off the road would look like based on reference photos and created similar images with the help of photo editing tools like Photoshop and GIMP. This was done as a last resort after searching through many other sites finding these specific cases.

Reflections and Conclusion

Although the Let's Solve It program is coming to a close, we plan on improving our model further. This includes creating more varied datasets to increase detection accuracy in unique traffic and weather conditions and being able to detect speeding and swerving drivers. Our overall goal is to have this software implemented on government-owned cameras nationwide. There are thousands of public traffic cameras across Canada, with many of them having the chance to capture traffic violations and people in need. Our model can be a viable and cost effective method that can help cut down on these incidents. We're incredibly grateful to the Borealis AI team for allowing us to work with them and we'll definitely implement what we have learned in our future projects and careers!