PennState College of Education | CSATS Center for Science and the Schools

Research Experiences for Teachers and Young Scholars in Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST)

Applying Neural Networks to Recycling Plastics

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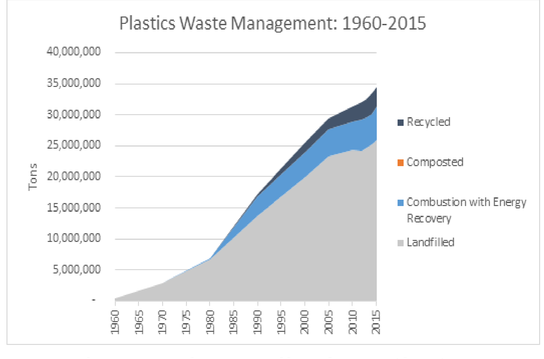
Overview

Plastic waste threatens wildlife with the release of harmful chemicals in to our environment. Several industries employ the strength and durability of plastic to their product line. 8 million metric tons of plastic end up in our oceans every year. This problem will continue until a suitable replacement is found or recycling is made easier. Recycling is a step in the right direction, but only 34% of Americans recycle on a varied basis. This is mostly due to the fact that it is not easily accomplished. A truly unique solution to this problem is computer science. The purpose of using computer science is to develop an app where the user simply takes a photo and the application will identify the plastic in the picture. The app will display where the nearest recycling center is as well.



The figures above display where plastic ends up if not disposed of properly.



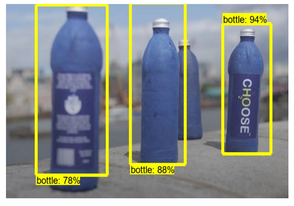
The figure shown above displays that we are making progress on recycling, but the amount of waste is far too high.

Objective

To develop an android app that is capable of identifying different types of recyclable plastic for the user. This will help accomplish the larger goal of reducing the amount of plastic waste in the world.

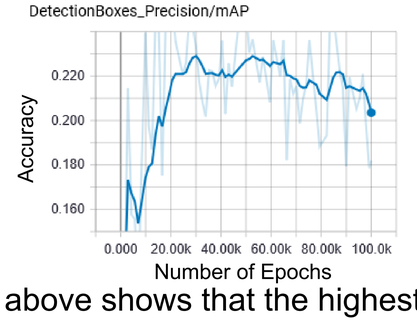
Methods

- Gather and annotate 1500 images of plastic
- Train a convolutional neural network (CNN) with the 1500 images
- Employ object recognition to identify plastic bottles
- Use new images as input to test network



Results

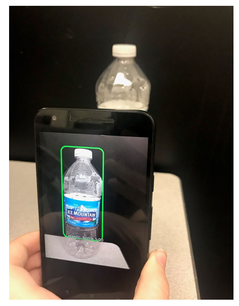
- After training on 1500 images the app was most accurate on bags.
- The app was not able to differentiate between metal and plastic water bottles.



The figure above shows that the highest accuracy percentage we obtained over the 100,000 epochs was approximately 24 percent.

Findings

This app was trained on bags, cups, and bottles. When the first training was completed it was most accurate on bags. However, cups and bottles were difficult to identify consequently we had to train it again. After the second training, the accuracy of the model increased. The end result was not as accurate as it needs to be.



The figure above displays the demo app classifying a plastic bottle.

Implications

- The app can be used to display the nearest recycling center for the user.
- Display how much of an impact the user is having by recycling.
- Provide methods of reducing plastic usage.
- Display alternatives to the plastic products
- Inform the user of the harmful impact plastic has on the environment.
- Use this platform for glass and other recyclable materials.

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All images with ★ are from google images

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