

Contamination threatens the recycling industry

According to the Willamette Week News, at least 9 percent of what people put into recycling containers is not actually recyclable. This means that recycling services have to spend a significant amount of money to sort out the recyclables from the trash, making recycling less affordable and sustainable. Adding to the problem, major purchasers of the US's recycling have enacted stricter standards for contamination levels in their imports. China, which buys 60% of the world's recyclables, changed their policy to accept no more than 0.5% contamination, a long shot off from our 9% contamination.

Our project seeks to help this problem by leveraging AI to keep trash out of the recycling bins at the user level. By using an image classification machine learning model, the smart recycling bin can quickly tell if it is being presented with trash or recycling, and only unlock for recyclable items. The trick is to make sure the AI model is better than humans at discerning trash from recycling.

Managing items that go in recycling bins makes the recycled products cleaner and more reusable. This would increase the efficiency of recycling facilities across the world, making recycling more cost effective and widespread, therefore reducing landfill mass and conserving the environment.

Source:

<https://www.wweek.com/news/2018/06/06/recycling-is-religion-in-portland-but-its-in-crisis-because-we-keep-throwing-garbage-in-our-blue-bins/>

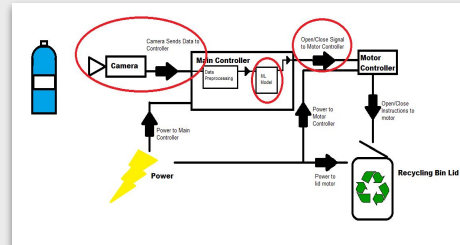


Smart Recycling Bin

An automated lockable recycling system that keeps bins garbage free.

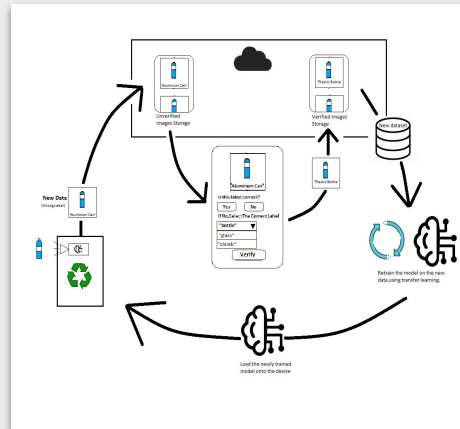
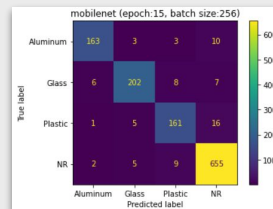
Waste Classification

Our bin will work by taking an image of the presented object, then passing that image to our custom trained image classification model. This will return a label for that image (either plastic, metal, glass, or non-recyclable). If the model classified the image as recyclable, the system will send a signal to a motor that will unlock the bin, allowing the user to put their recyclables in the bin. Otherwise, the bin will remain locked. Our project involves the software side of this system (circled in red).



Constantly learning model

Here we can see a full diagram of our end to end system. What makes our system unique is the constantly evolving and progressing nature. We allow the user to challenge the bin's decision, which will send the image to a cloud database that can then be reviewed by a maintainer. The reviewed and verified images can then form a new database that the model can be re-trained on. This will improve its accuracy over time, and prevent stale data such as a discontinued plastic bottle designs. We expect to see the confusion matrix (below) to improve as new data comes in and the model is retrained.



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