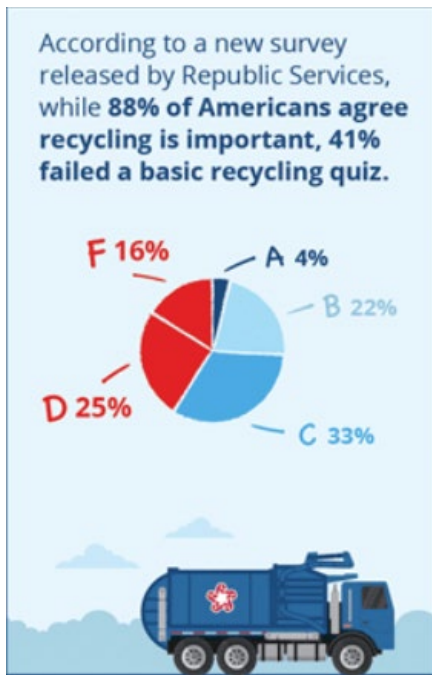# Image Based Recycling Recognition Device To Increase Household Sustainability Efforts

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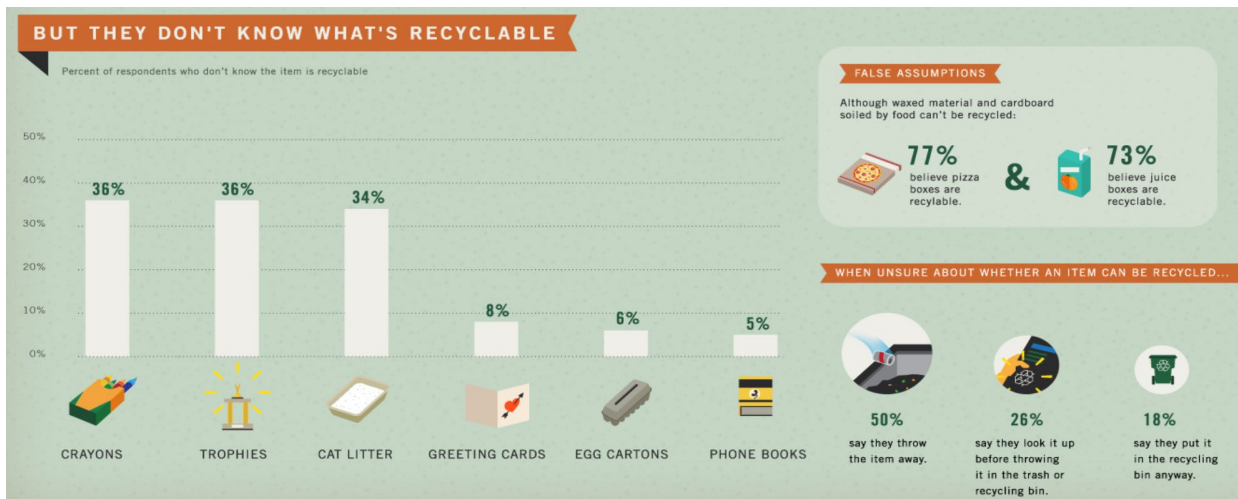
Abstract[1]

The newest trend of sustainability has exploded around the world. Everywhere you go companies are ditching traditional plastics for more sustainable and eco-friendly options. The words ``recyclable", "plant-based", and "biodegradable" are plastered in large fonts everywhere for consumers to see. While companies are too concerned with jumping on the sustainability bandwagon no one is informing consumers about how to dispose of their new supposably sustainable products. "The EPA estimates that 75% of the American waste stream is recyclable, but we only recycle about 30% of it" (11 facts about recycling). Recycling Across America, a globally recognized nonprofit focused on educating the public on recycling explains that the recycling crisis is not a result of people not wanting to recycle but a result of confusing and inconsistent labeling and lack of education that results in the contamination of our recyclables. In America we have an average contamination rate of 25%. Oftentimes non-recyclable trash such as plastic bags gets in recycle bins creating contamination at the recycling plants that is harmful to its machinery, in the last 2 years California alone has shut down almost a thousand recycling plants. Other forms of contamination most notably food waste contaminates the recyclables sometimes making an entire bin no longer eligible for recycling sending that entire bin to the landfill, "The EPA estimates that 75% of the American waste stream is recyclable, but we only recycle about 30% of it" (11 facts about recycling). As more and more items are ending up in landfills we are also contributing to an increase in greenhouse gas emissions. Even for individuals trying to learn how to properly recycle there is not enough information for an average consumer to recycle everything properly. [2]

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[1] Republic Services, America Just Got Schooled: Nearly Half of Americans Fail Recycling Quiz, 2019, https://www.republicservices.com/blog/nearly-half-of-consumers-fail-recycling-quiz

[2] Column Five Media, The Recycle Chronicles Lack of Knowledge Hinders Recycling Efforts, 2017, https://www.huffpost.com/entry/recycling-survey-results-infographic_n_1455906

BUT THEY DON'T KNOW WHAT'S RECYCLABLE

Percent of respondents who don't know the item is recyclable

- CRAYONS 36%
- TROPHIES 36%
- CAT LITTER 34%
- GREETING CARDS 8%
- EGG CARTONS 6%
- PHONE BOOKS 5%

FALSE ASSUMPTIONS

Although waxed material and cardboard soiled by food can't be recycled:

77% believe pizza boxes are recylable. & 73% believe juice boxes are recyclable.

WHEN UNSURE ABOUT WHETHER AN ITEM CAN BE RECYCLED…

- 50% say they throw the item away.
- 26% say they look it up before throwing it in the trash or recycling bin.
- 18% say they put it in the recycling bin anyway.

This project aims to create an Internet of things (IoT) device that will make information about composting and recycling more accessible to the everyday consumer. The most common issue that inhibits consumers from recycling is not having the adequate information readily available. By using a Raspberry Pi powered camera and object recognition software, users will be able to scan the product they wish to dispose of and information on how to properly dispose of it will appear on the accompanying website. The Raspberry Pi will be responsible for powering the camera and utilizing TensorFlow, an open source machine learning library, to identify the items being shown to the camera. We will be using this machine learning software and training it to create our own dataset of commonly mistaken recyclable household items. After the Raspberry Pi is able to identify the object it will relay the recycling information to an accompanying web address. The Raspberry Pi will communicate with the webpage through the wifi signal they both share allowing the user to read this information on any device of their choosing. On the webpage the user will be given information on the necessary steps needed to properly dispose of the item such as recycling, composting, or general trash. This should help users decipher between the different types of recycling and link helpful resources to understand the steps necessary to dispose of the item. With the endless variety of materials it is easy to forget the proper disposal method but with our device that will no longer be a worry, all the information you need will be at the tip of your fingers.

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2. "America Got Schooled: Nearly Half of Consumers Fail Recycling Quiz"*Republic Services*, 22 July 2019, https://www.republicservices.com/blog/nearly-half-of-consumers-fail-recycling-quiz
3. "Infographic: What Do You Know about Recycling?" *HuffPost*, HuffPost, 7 Dec. 2017, https://www.huffpost.com/entry/recycling-survey-results-infographic_n_1455906
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5. "11 Facts about Recycling." *DoSomething.org*, https://www.dosomething.org/us/facts/11-facts-about-recycling