Garbage Classifier

(Whether a piece of garbage is Bio-Degradable or Non-Biodegradable)

Data Scouts

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Introduction

There is no denying the fact that the problem of garbage disposal is increasing day by day. As the population is increasing alarmingly so is the garbage on street. We are producing various kinds of waste materials due to our day to day activities and it is deteriorating the ecosystem of our planet which poses a threat to human survival. Consumers also can be confused about how to determine the correct way to dispose of a large variety of materials.

The waste materials can be classified broadly into the following 6 categories:

1. Cardboard
2. Glass
3. Metal
4. Plastic
5. Paper
6. Trash

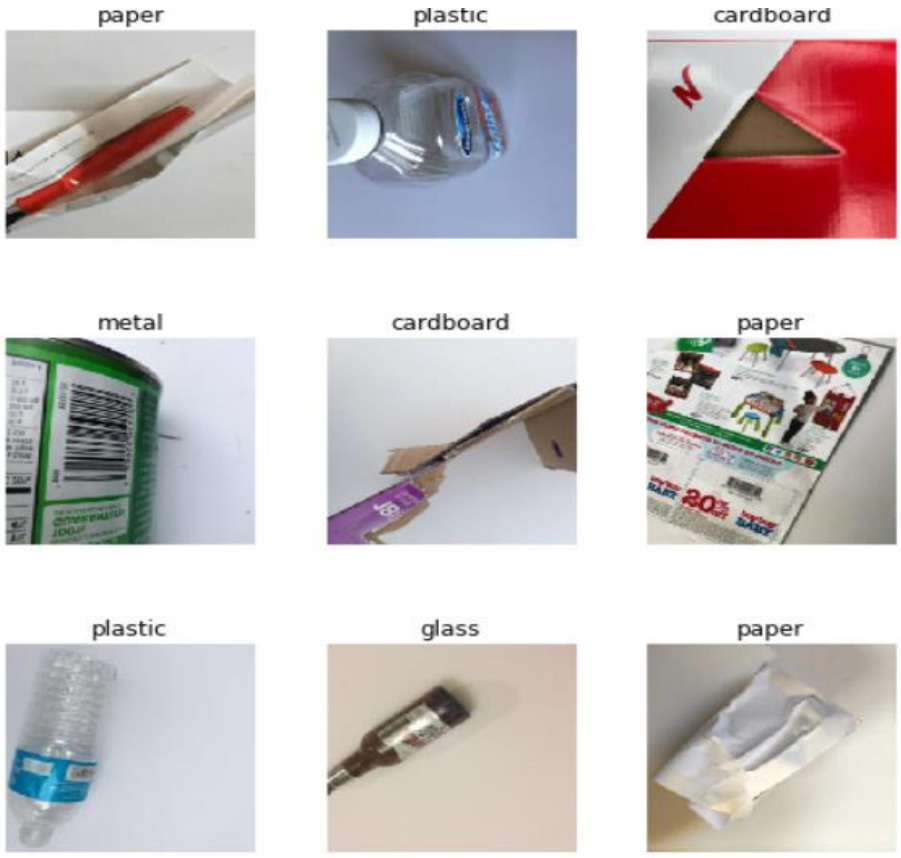
We are proposing a model which classifies garbage into the 2 broad categories i.e. Biodegradable or Non-biodegradable by tagging them as one of the above mentioned type. We have trained a CNN model using pre-trained ResNet-34 and ResNet-50 architecture.

Dataset Configuration

The dataset spans six classes: glass, paper, cardboard, plastic, metal, and trash. Currently, the dataset consists of 2527 images:

- 501 glass
- 594 paper
- 403 cardboard
- 482 plastic
- 410 metal
- 137 trash

Each image has dimensions 500x375 with JPG format.



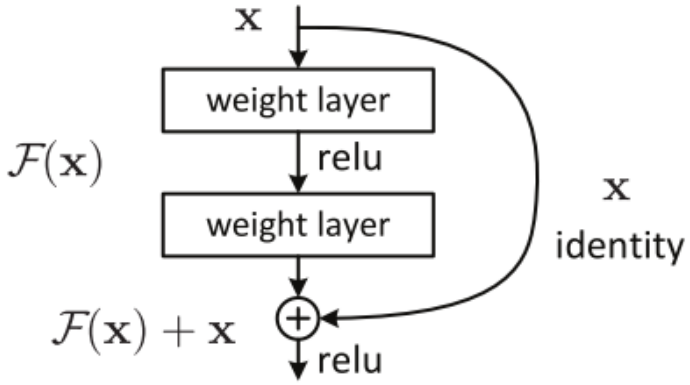
Libraries used

1. Fast.ai (https://github.com/fastai)
2. Starlette(Web-App API)
3. Uvicorn
4. Pytorch(Numerical Computations)
5. Numpy

Model and Training

We used fast.ai to create an ImageDataBunch which is used for data pre-processing. It divides the dataset into training and validation set in the ratio 80:20 respectively.

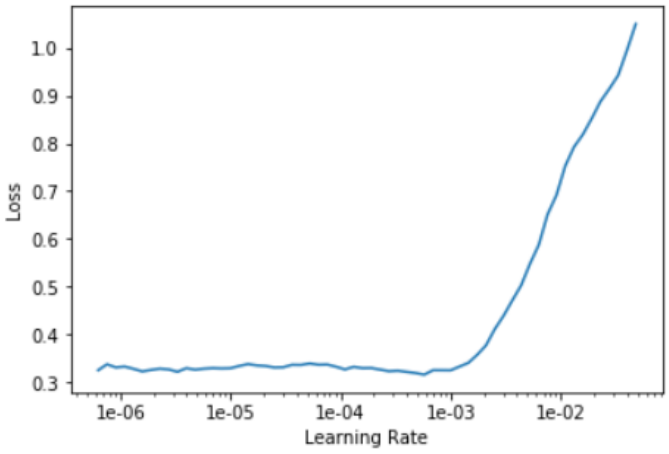
It also provides useful techniques such as scaling, normalising and transforming of the images, which can be fed into the learner for training. We have used Residual Network with 34 and 50 hidden layers architectures respectively.



The above picture describes the basic working of ResNet-34 and its identity function.

Results

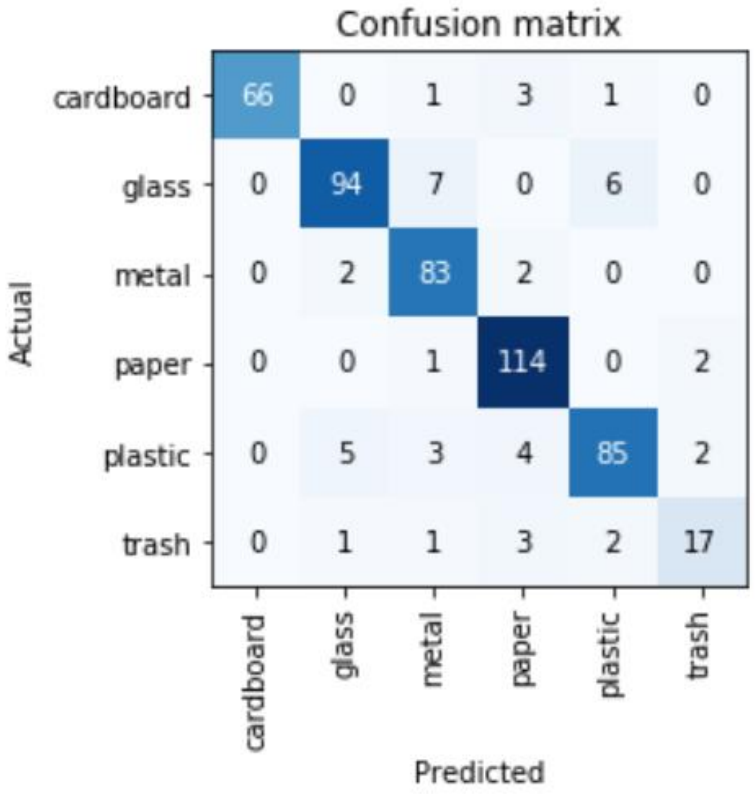
Resnet-34



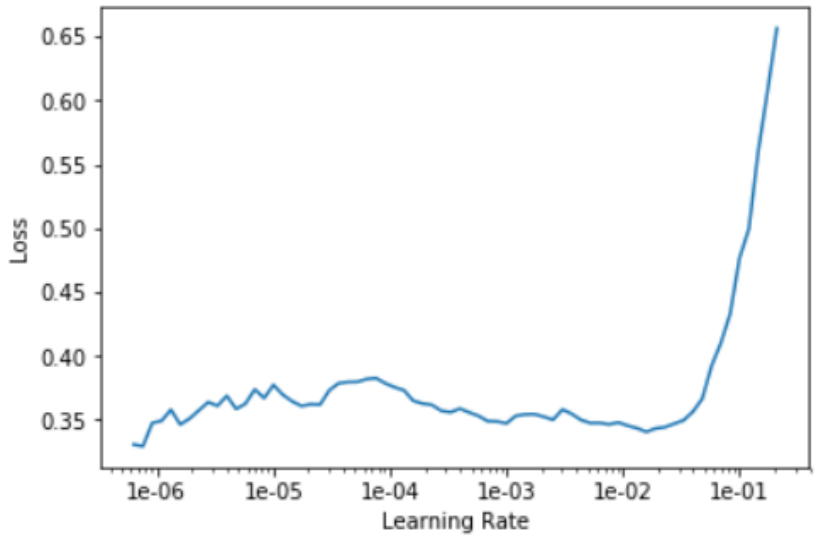
Plot of Losses against Learning Rate.

We selected a learning rate between 1e-04 and 1e-03 (Sliced in order to inculcate Learning Rate Decay) and got an accuracy of 90.89%.

epoch	train_loss	valid_loss	accuracy	time
0	0.420595	0.655564	0.805941	00:36
1	0.315304	0.307791	0.908911	00:36



Resnet-50



Plot of Losses against Learning Rate.

We selected a learning rate between 1e-03 and 1e-02 (Sliced in order to inculcate Learning Rate Decay) and got an accuracy of 90.69%.

epoch	train_loss	valid_loss	accuracy	time
0	0.196229	0.288792	0.904950	00:46
1	0.227410	0.421924	0.871287	00:46
2	0.226292	0.456009	0.887129	00:43
3	0.197774	0.382900	0.897030	00:44
4	0.157276	0.349377	0.906931	00:44

Conclusion-

Resnet-34 performed marginally better than the Resnet-50 due to less amount of data used for training purposes.