Waste Image Classification

A potential strategy for increasing the purity of recyclable waste

The Data: Images

Created by Mindy Yang & Gary Thung

403 Cardboard

501 Glass

410 Metal

594 Paper

482 Plastic

137 Trash

The tool: Deep Neural Networks

Compute Intensive

The best model in this project has 22,910,480 parameters

Time Intensive

Testing models is slow because each one takes so long to run

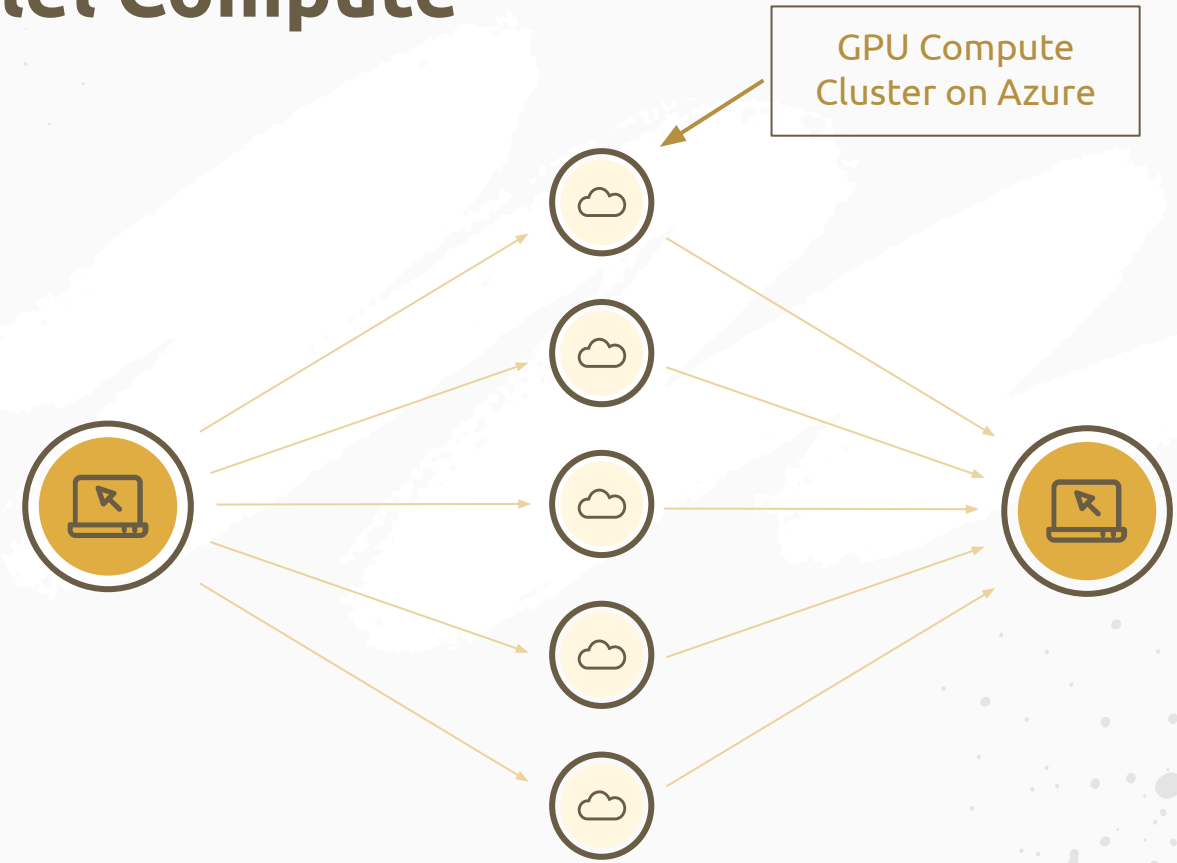
Faster on a GPU

Graphical Processing Units are optimized for performing operations on matrices

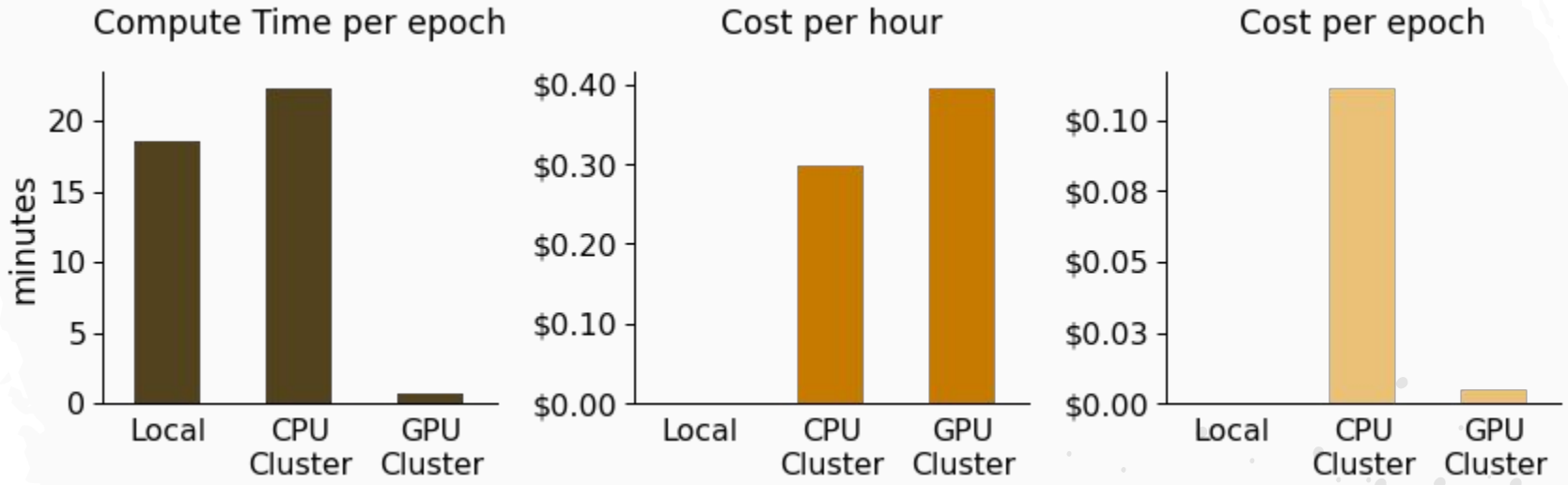
Climate/NGO Commitments

	Google Compute Cloud	Microsoft Azure	Amazon Web Services
% renewable energy	100%	60%	42%
Energy Emissions Offset	100%	100+%	50%
Renewable by	2017	2025	2025
Goal	Net 0	Net Negative	Net 0
Nonprofit support	$0	$3500/yr	$2000/yr (-$175 admin fee)

Parallel Compute



Cloud Cost


Compute Time per epoch
minutes
0
5
10
15
20
Local
CPU Cluster
GPU Cluster
Cost per hour
$0.00
$0.10
$0.20
$0.30
$0.40
Local
CPU Cluster
GPU Cluster
Cost per epoch
$0.00
$0.03
$0.05
$0.08
$0.10
Local
CPU Cluster
GPU Cluster

The final model: Xception

134 Layers

22,910,480 possible adjustments

Pretrained

On imagenet dataset with 1000 categories

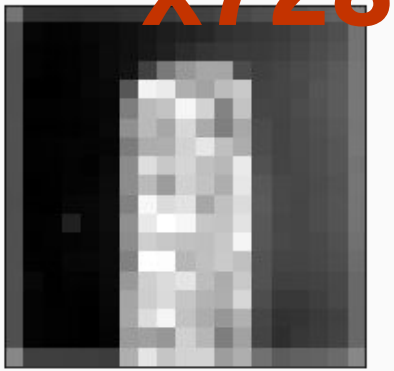
How the model “sees”

- Filters move across the images looking for different details
- Those details form abstractions of the images

x128

x256

x728



x1024

Predictive Accuracy: 91.1%

plastic

plastic

plastic

paper

glass

paper

glass

plastic

Recommendations

- Increase number of images in dataset
- Review categories

Future Work

- Evaluate Trash vs Recyclable first, then recycling type
- Can the difference between types of plastics?
- If this proves effective release versions for as cell phone apps and for recycling facilities.

Thank you!

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See github.com/benbogart/waste-classification/ for more a more detailed report.