Recycling Classifier

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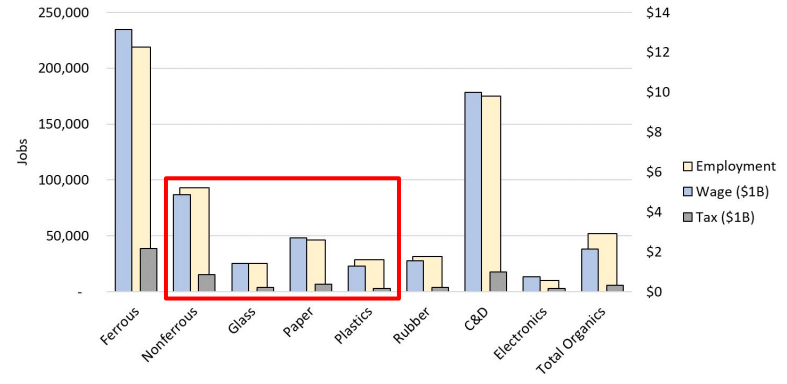
Business Understanding

2020 Environmental Protection Agency (EPA) Economic Report Key Findings

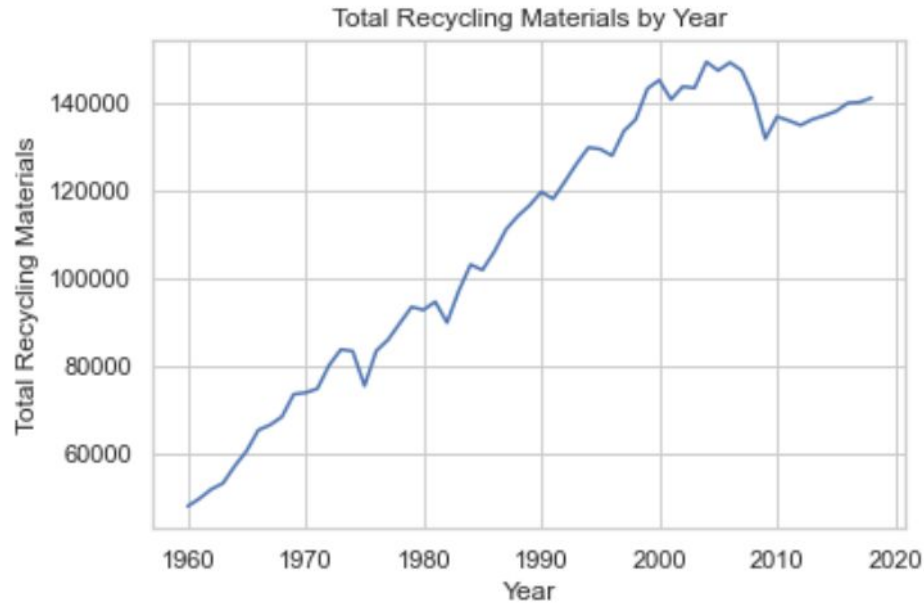The US recycling industry made that year:

- **681,000 jobs**
- **$37.8 billion in wages**
- **$5.5 billion in tax revenues**

1.17 jobs, **$65,230 wages** and **$9,420 tax revenues** for every **1,000 tons** of recyclables collected and recycled.

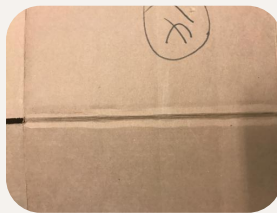Jobs, Wages and Tax Revenues due to Recycling

Business Understanding

Total Recycling Materials by Year

Data Understanding

Material	Images
Cardboard	403
Glass	501
Metal	410
Paper	530
Plastic	482
Carton	488
Trash	137

Glass

Cardboard

Metal

Carton

Paper

Trash

Plastic

Modeling

Best CNN

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 126, 126, 32)	896
max_pooling2d (MaxPooling2D)	(None, 63, 63, 32)	0
dropout_1 (Dropout)	(None, 63, 63, 32)	0
conv2d_1 (Conv2D)	(None, 61, 61, 64)	18496
max_pooling2d_1 (MaxPooling2D)	(None, 30, 30, 64)	0
dropout_2 (Dropout)	(None, 30, 30, 64)	0
conv2d_2 (Conv2D)	(None, 28, 28, 128)	73856
max_pooling2d_2 (MaxPooling2D)	(None, 14, 14, 128)	0
dropout_3 (Dropout)	(None, 14, 14, 128)	0
flatten_1 (Flatten)	(None, 25088)	0
dense_1 (Dense)	(None, 128)	3211392
dropout_4 (Dropout)	(None, 128)	0
dense_2 (Dense)	(None, 7)	903

Total params: 3,305,543
Trainable params: 3,305,543
Non-trainable params: 0

- 3 Convolutional layers
- 3 Max pooling
- 4 Dropout
- 2 Dense

First VGG16

Model: "sequential_7"

Layer (type)	Output Shape	Param #
vgg16 (Functional)	(None, 4, 4, 512)	14714688
conv2d_15 (Conv2D)	(None, 4, 4, 64)	294976
max_pooling2d_9 (MaxPooling2D)	(None, 2, 2, 64)	0
dropout_8 (Dropout)	(None, 2, 2, 64)	0
conv2d_16 (Conv2D)	(None, 2, 2, 128)	73856
max_pooling2d_10 (MaxPooling2D)	(None, 1, 1, 128)	0
dropout_9 (Dropout)	(None, 1, 1, 128)	0
flatten (Flatten)	(None, 128)	0
dense (Dense)	(None, 128)	16512
dropout_10 (Dropout)	(None, 128)	0
dense_1 (Dense)	(None, 7)	903

Total params: 15,100,935
Trainable params: 386,247
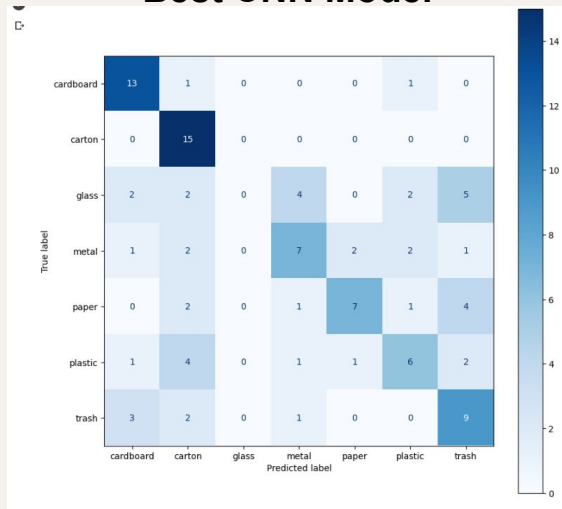Non-trainable params: 14,714,688

- VGG16
- Best CNN

Second VGG16

Layer (type)	Output Shape	Param #
vgg16 (Functional)	(None, 4, 4, 512)	14714688
flatten (Flatten)	(None, 8192)	0
dense (Dense)	(None, 7)	57351

Total params: 14,772,039
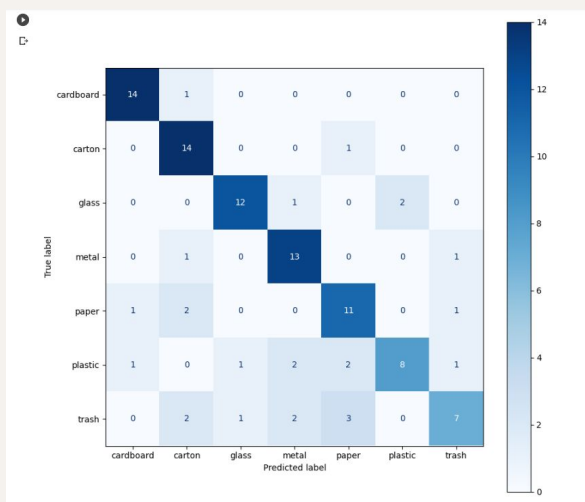Trainable params: 57,351
Non-trainable params: 14,714,688

- VGG16

Model Evaluation

Best CNN Model

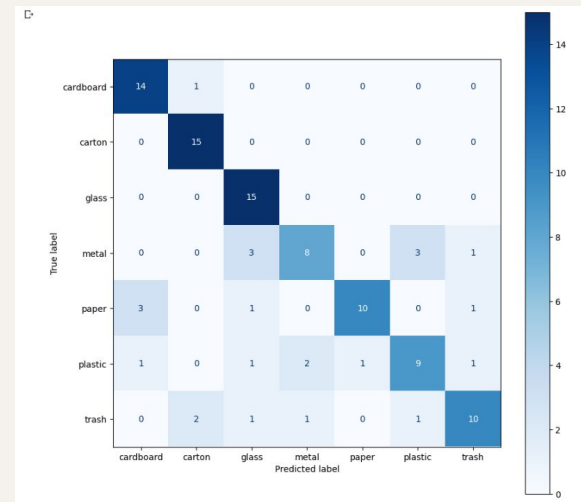54% Accuracy

VGG16 & Best CNN

73% Accuracy

VGG16

77% Accuracy

Recommendations

Next Steps

Translate the model into a user friendly application and track user usage to see if it has correlation with an increase in recyclable materials.

- Get more images to balance the classes.
- Try more combinations of layers and regularization

Recycling Classifier

Upload an image and the classifier will predict what type of recycling it is.

Choose an image...

☁ Drag and drop file here
Limit 200MB per file • JPG

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Thank you!