Trash Management System Using Deep Learning

By, Team Invincibles

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CMPE 258 – Deep Learning

Significance To The Real World

The accumulation of solid waste in the urban area is becoming a great concern, and it would result in environmental pollution and may be hazardous to human health if it is not properly managed. It is important to have an advanced intelligent waste management system to manage a variety of waste materials. One of the most important steps of waste management is the separation of the waste into the different components and this process normally done manually by hand-picking.

Data Set

Kaggle dataset :Garbage classification

Link: **https://www.kaggle.com/asdasdasasdas/garbage-classification**

Related work and Alternatives Explored

Model Number	Model Type	#GPU/TPU	BATCH SIZE	LEARNING RATE	MAX_EPOCHS	mem/GPU or TPU	METRIC TYPE	ACCURACY %	LOSS	LOSS TYPE	OPTIMIZER	MAX RUN TIME
1	Simple CNN	TPU	Worker=4	0.001	10	17.69 GB	Accuracy, MSE	53.57	1.2041	categorical crossentropy	ADAM	**470 seconds**
2	CNN FINE TUNED	TPU	Workers=10	0.001	10	22.12 GB	Accuracy, MSE	30.67	1.7208	kullback leibler divergence	NADAM	520 Seconds
3	CNN FINE TUNED with opt	TPU	Workers=10	0.003	10	26.12 GB	Accuracy, MSE	22.5	1.7254	kullback leibler divergence	RMS PROP	510 Seconds
4	VGG16 with TRANSFER LEARNING	TPU	200	0.002	10	32.06 GB	Accuracy, MSE	57.95	1.1153	Categorical crossentropy	NADAM	190 Seconds
5	VGG16 scratch code	TPU	Worker=4	0.001	10	25.02 GB	Accuracy	47.05	1.8325	categorical crossentropy	ADAM	450 Seconds
6	Inception V3 with Transfer Learning	TPU	300	0.0002	10	4.3 GB	Accuracy, MSE	71.7	1.0657	categorical crossentropy	RMS PROP	100 Seconds
7	RESNET 50 with Transfer Learning	TPU	300	0.0003	10	4.79 GB	Accuracy, MSE	73.96	0.78	categorical crossentropy	AdaGrad	160 seconds
8	RESNET 50 with Scratch code	TPU	100	0.0001	5	5.02 GB	Accuracy	73.3	4.1	Binary cross entropy	Adam	170 Seconds
9	MobileNetV2 with Transfer Learning	TPU	32	0.0001	50	12.50 GB	Accuracy	98.48	0.048	categorical crossentropy	RMS PROP	20 Minutes

Model Tuning

1. Attempted to tune multiple hyper parameter for the simple CNN,ResNet50 and VGG 16 models.

2. Utilized keras-Auto tuner for searching the best parameter for activation functions, loss and evaluation metrics.

   Below are the critical parameters tried upon the code :

Activation functions : Softmax, Relu, Tanh, Sigmoid
Metrics: Accuracy, MSE
Loss: Sparse Categorical entropy, binary cross entropy, KL Divergence.

Model Metrics – Visualization Technique

1. Metrics used: Accuracy, Mean Square Error

2. Visualizations: Tensor Board , CV2

Model is deployed using Flask python web frame work in aws ec2 instance

Technical Challenges

1. Thought of expanding the data set by more labels which we faced as a trivial challenge.

2. System performance upon running the code. Which we overcome by trying on Colab Pro

3. Tried implementing Tensorflow extended and also able to show the stats and visualization. Faced challenges on modeling in tensorflow extended.s

Team Work

Shreyus Puthiyapurail : Data collection and processing.

Atul Shah : Feature analysis and engineering.

Srilalitha Veerubhotla : Developing and testing model accuracy.

Shailesh Prasad M : Apply and Review other model for accuracy

Q & A

Thank You