VEHICLE MODEL RECOGNITION

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OBJECTIVE

Build and apply a model to recognize vehicles by their make and model.
Applying this tool to a small sample of Volkswagens as proof of concept.

"What is that thing?" - My Grandma

STARTING SIMPLE

Training data collected consisted of 6 recent models from Volkswagen of Americas current line-up. Some trim levels like Golf and GTI were combined due to them having the same body but different trim features such as wheels, bumper designs, and headlights.

Data Collection

Over 150 photos of each model were collected using a command line python program to search keywords/key-phrases on Google Images.

https://github.com/hardikvasa/google-images-download

Keywords Searched

- 2015 Volkswagen Golf, 2016 Volkswagen Golf, 2017Volkswagen GTI, 2018 Volkswagen GTI, 2018 Volkswagen Golf
- 2014 Volkswagen Jetta, 2016 Volkswagen Jetta GLI, 2016 Volkswagen Jetta, 2017 Volkswagen Jetta GLI
- 2013 Volkswagen Tiguan, 2014 Volkswagen Tiguan, 2015 Volkswagen Tiguan, 2016 Volkswagen Tiguan
- 2018 Volkswagen Atlas, 2019 Volkswagen Atlas, 2018 Volkswagen Atlas 4motion, 2020 Volkswagen Atlas
- 2014 Volkswagen Passat, 2015 Volkswagen Passat, 2016 Volkswagen Passat, 2017 Volkswagen Passat
- 2016 Volkswagen Golf Sportwagen, 2017 Volkswagen Golf All Track, 2018 Volkswagen Golf Sportwagen, 2019 Volkswagen Golf Sportwagen

EDA

Advertisements

Interiors

Low quality images / Miscellaneous

PREPROCESSING

Keras Preprocessing

- Resize images to 600x400 (16:10)

- shear_range : Shear angle in degrees

- zoom_range : Range for random zoom.

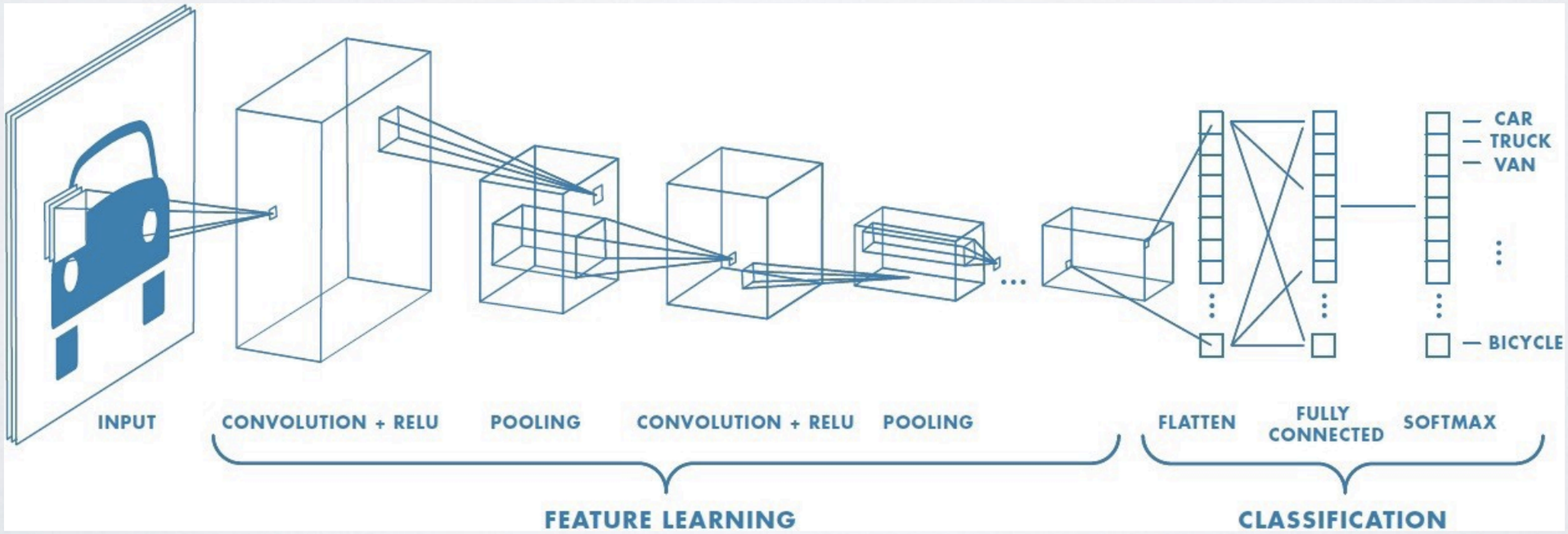
- horizontal_flip: Randomly flip inputs horizontally.

Model

Convolutional Neural Network

- Why?
- Less Preprocessing than other methods
- Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other
- Successfully capture the Spatial and Temporal dependencies in an image through the application of relevant filters
- Back propagation to optimize for loss
- Pulls features of images that humans typically wouldn't

I was curious.



SCORING

- Training accuracy of 0.75

68/68 [==] - 620s 9s/step - loss: 0.7325 - acc: 0.7510 - val_loss: 1.1476 - val_acc: 0.5781

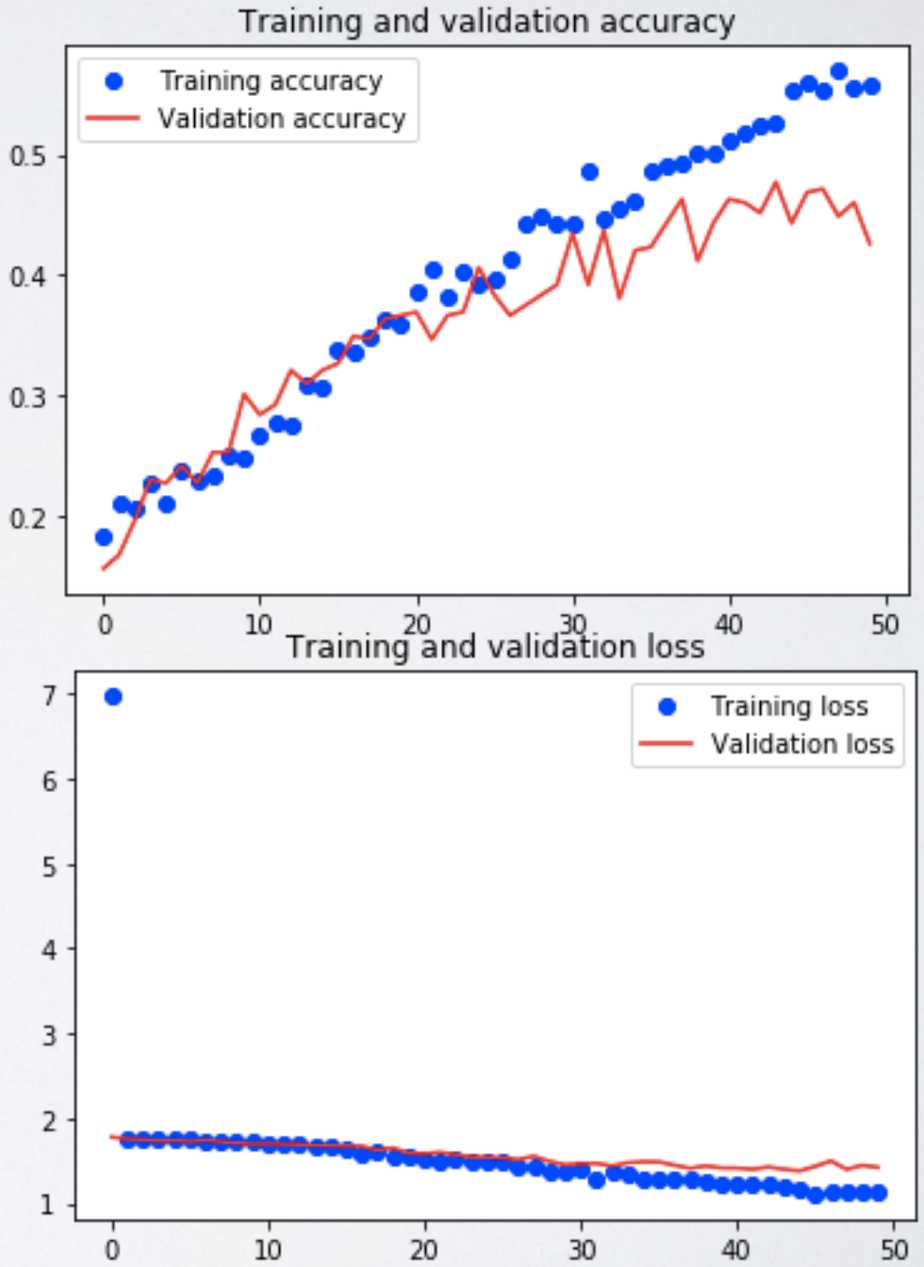
- Validation accuracy of 0.58

22/22 [==] - 85s 4s/step - loss: 1.1498 - acc: 0.5852

- Baseline Score of 0.22

Class imbalances

Golf_GTI_R	0.227831
Tiguan	0.186903
Jetta_Jetta_GLI	0.173943
Golf_Sportwagen_Golf_Alltrack	0.168486
Passat	0.134379
Atlas	0.108458



TESTING

- Will it work on my car?

TESTING

- Will it work on my car?

2016 Golf Sportwagen

<u>Prediction probability:</u>

- Sportwagen / Alltrack 69%

- Golf / GTI / R 21%

TESTING

- Will it work cars other than a golf?

2016 Passat SE

TESTING

- Will it work cars other than a golf?

2016 Passat SE

<u>Prediction probability:</u>

- Passat 26%

- Golf / GTI / R 21%

USES

- Government use such as surveillance and highway patrol.
- Apps and Games
- Marketing possibilities for dealerships and auto manufacturers. (shopping tool)
- If further developed it could be used for other data objectives and challenges

FUTURE IMPROVEMENTS

- More Data
- Better Data
- Import and utilize a more built out model
  - LeNet
  - AlexNet
  - VGGNet
  - GoogLeNet
  - ResNet
  - ZFNet
- Improve hardware to run model using GPU
- Further research and experimentation into preprocessing parameters

Expandability

- Can add as many classes "models" as needed

end