TRAFFIC SIGN CLASSIFICATION

By:

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Need

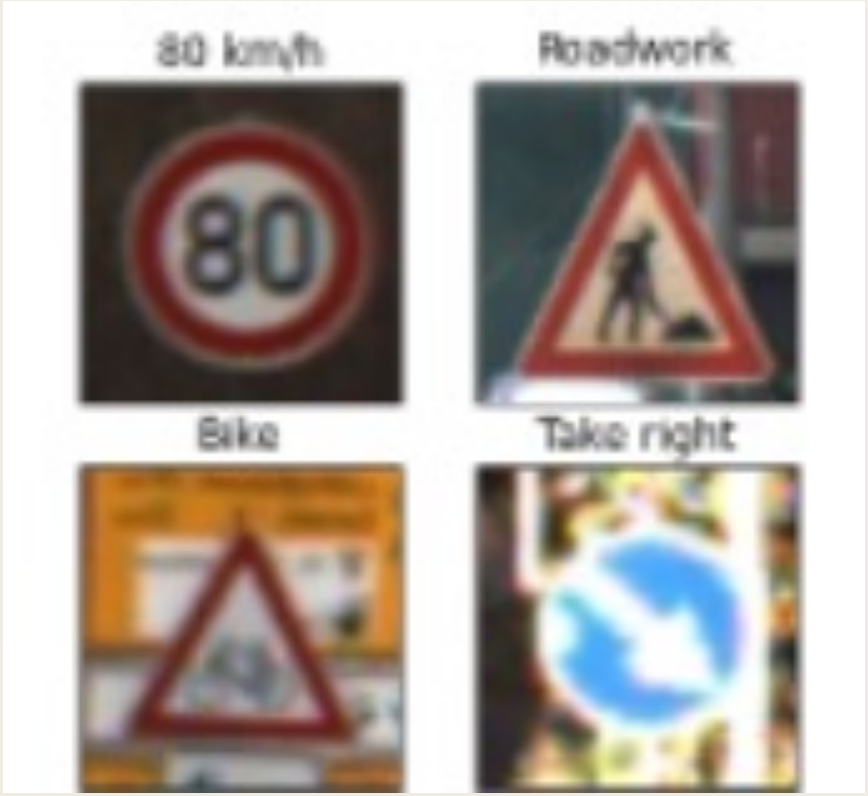
- The rise of autonomous vehicles
  - *From Fiction to Actual Reality*
- Interaction of machines and humans
- Safety

How

- Identify & Classify Traffic Signs
- Deep Learning Technique
  - *Convolutional Neural Network*

Data

- German Traffic Sign Recognition
- 43 Classes
- 50k Images
  - 15x15 pixels to 250x250 pixels



https://benchmark.ini.rub.de/gtsrb_dataset.html

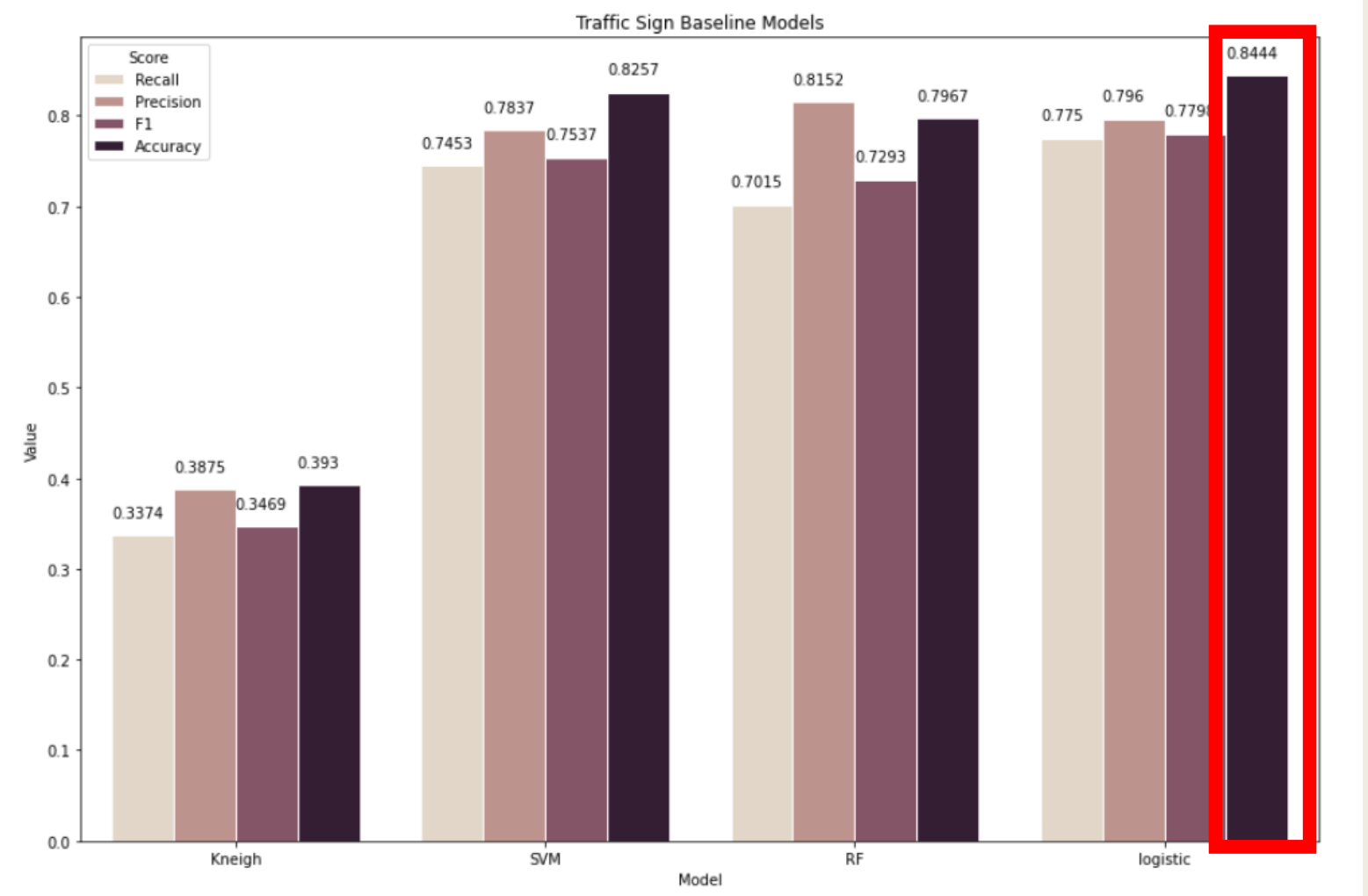
Sample Data


Road up for track
Only straight and right
Slippery road
80 km/h end
30 km/h
Deer
80 km/h
Give way
30 km/h
No overtaking

Process

Data Preprocessing	Baseline Model	CNN Model	Transfer Learning
• Resize	• Logistic Regression	• Sequential Model	• VGG19

Baseline Modeling



CNN Initial Model

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 26, 26, 32)	2432
max_pooling2d (MaxPooling2D)	(None, 13, 13, 32)	0
dropout (Dropout)	(None, 13, 13, 32)	0
conv2d_1 (Conv2D)	(None, 11, 11, 64)	18496
max_pooling2d_1 (MaxPooling2	(None, 5, 5, 64)	0
dropout_1 (Dropout)	(None, 5, 5, 64)	0
flatten (Flatten)	(None, 1600)	0
dense (Dense)	(None, 128)	204928
dropout_2 (Dropout)	(None, 128)	0
dense_1 (Dense)	(None, 43)	5547

Total params: 231,403
Trainable params: 231,403
Non-trainable params: 0

CNN Tuned Model

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 26, 26, 32)	2432
conv2d_1 (Conv2D)	(None, 22, 22, 32)	25632
max_pooling2d (MaxPooling2D)	(None, 11, 11, 32)	0
dropout (Dropout)	(None, 11, 11, 32)	0
conv2d_2 (Conv2D)	(None, 9, 9, 64)	18496
conv2d_3 (Conv2D)	(None, 7, 7, 64)	36928
max_pooling2d_1 (MaxPooling2	(None, 3, 3, 64)	0
dropout_1 (Dropout)	(None, 3, 3, 64)	0
flatten (Flatten)	(None, 576)	0
dense (Dense)	(None, 256)	147712
dense_1 (Dense)	(None, 128)	32896
dropout_2 (Dropout)	(None, 128)	0
dense_2 (Dense)	(None, 43)	5547

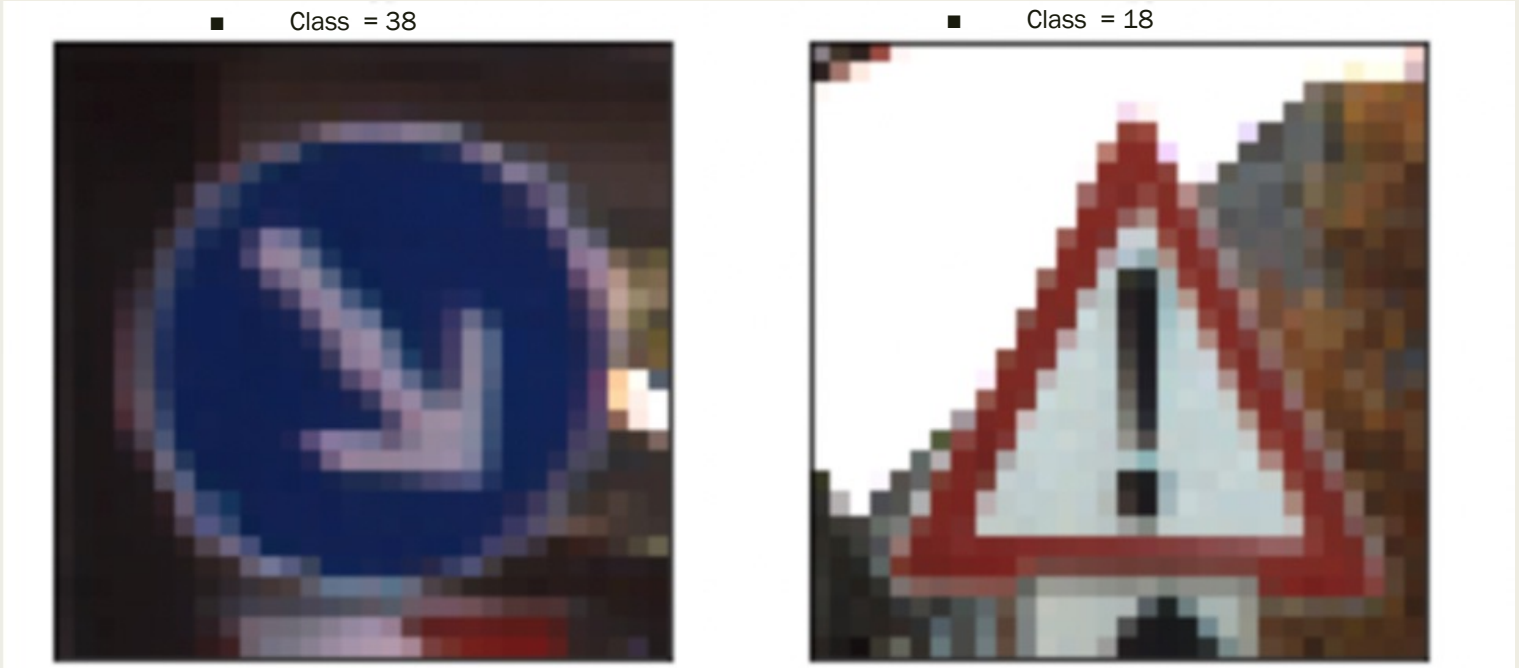
Total params: 269,643
Trainable params: 269,643
Non-trainable params: 0

VGG Transfer Learning

Layer (type)	Output Shape	Param #
vgg19 (Functional)	(None, 1, 1, 512)	20024384
batch_normalization (BatchNo	(None, 1, 1, 512)	2048
flatten (Flatten)	(None, 512)	0
dense (Dense)	(None, 1024)	525312
dense_1 (Dense)	(None, 43)	44075

Total params: 20,595,819
Trainable params: 20,594,795
Non-trainable params: 1,024

Evaluating the model



THANK YOU!