TRAFFIC SIGN CLASSIFICATION

By:

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Need

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

10.5% INCREASE FROM 2020

42,915

NUMBER OF PEOPLE KILLED IN MOTOR CRASHES IN 2021

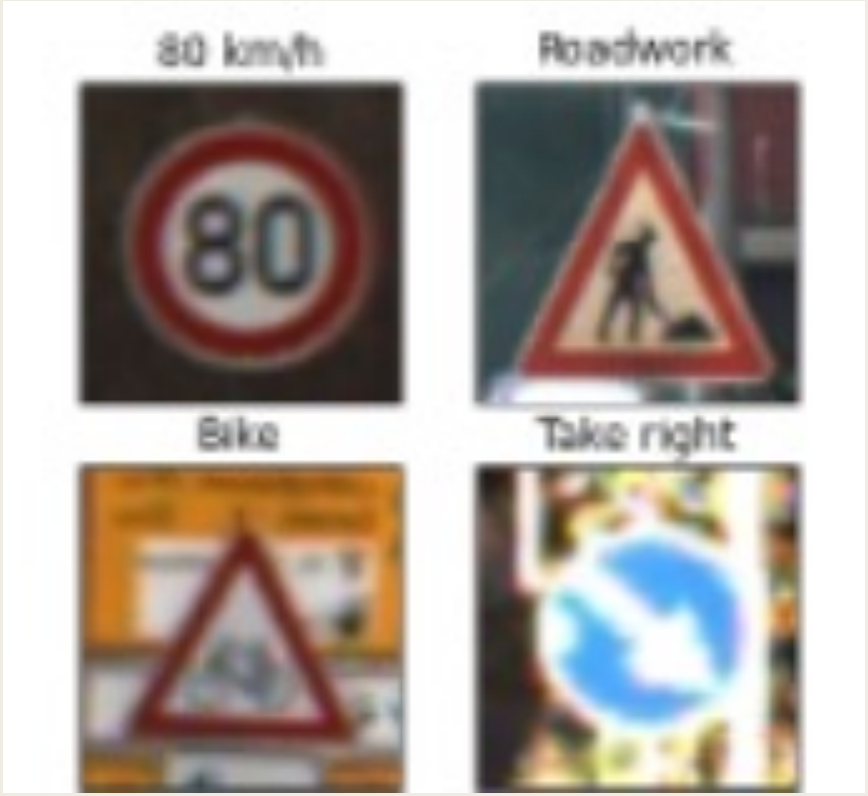
National Highway Traffic Safety Administration

Goal

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

Data

- German Traffic Sign Recognition
- 43 Classes
  - *Stop, Yield, Turn Right,…*
- 50k Images
  - 15x15 pixels to 250x250 pixels



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

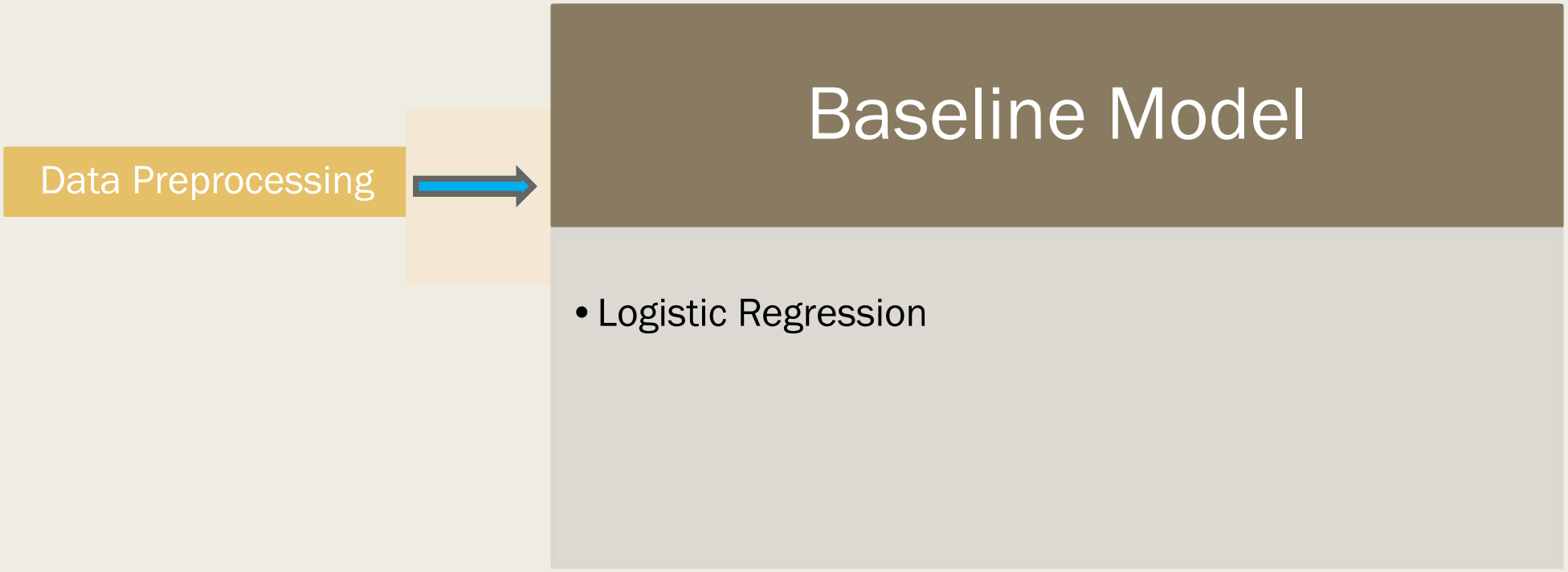
Sample Images

Process

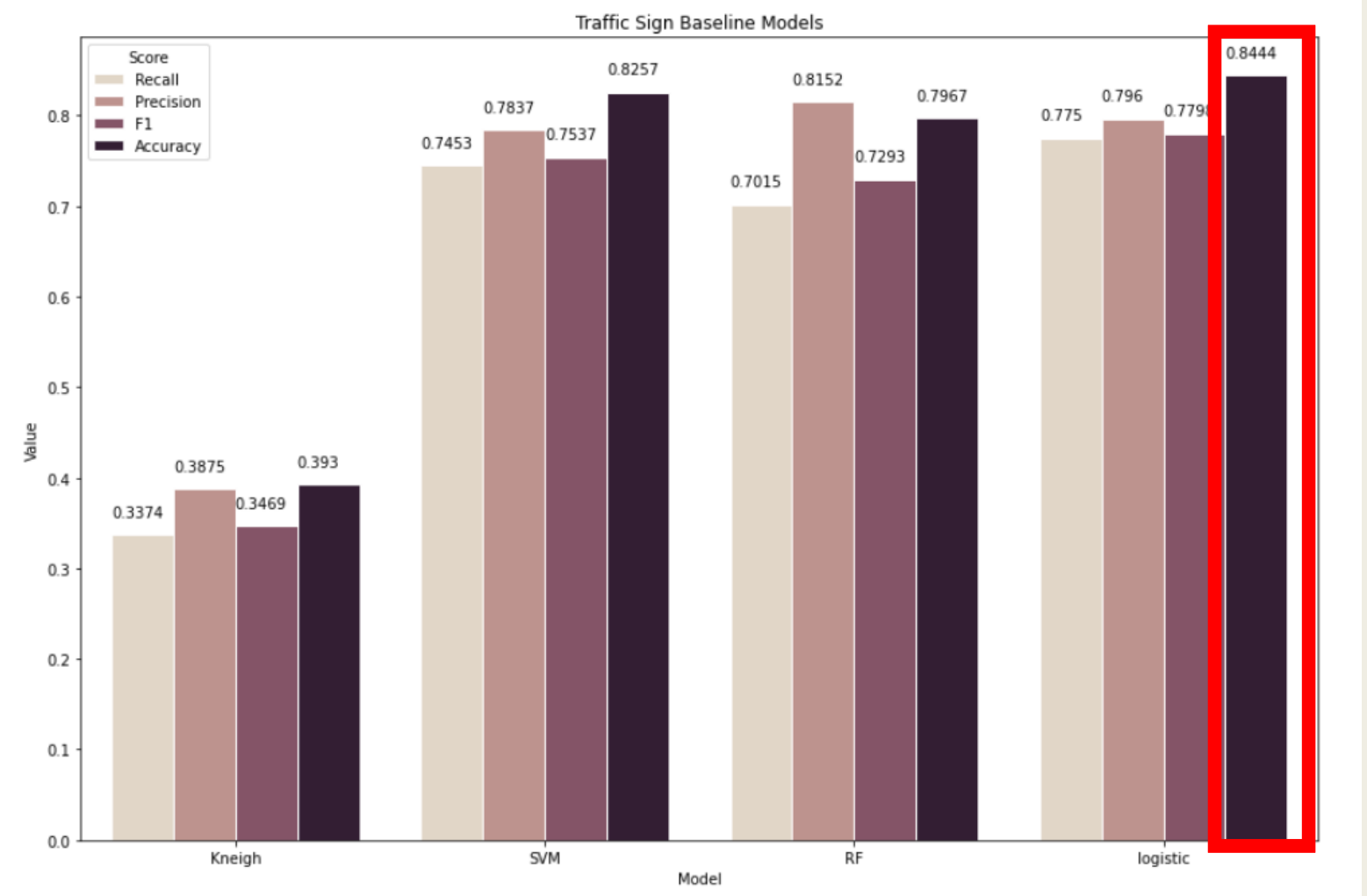
Data Preprocessing

- Directory
- Resize
  - 30x30
  - 32x32
  - 50x50

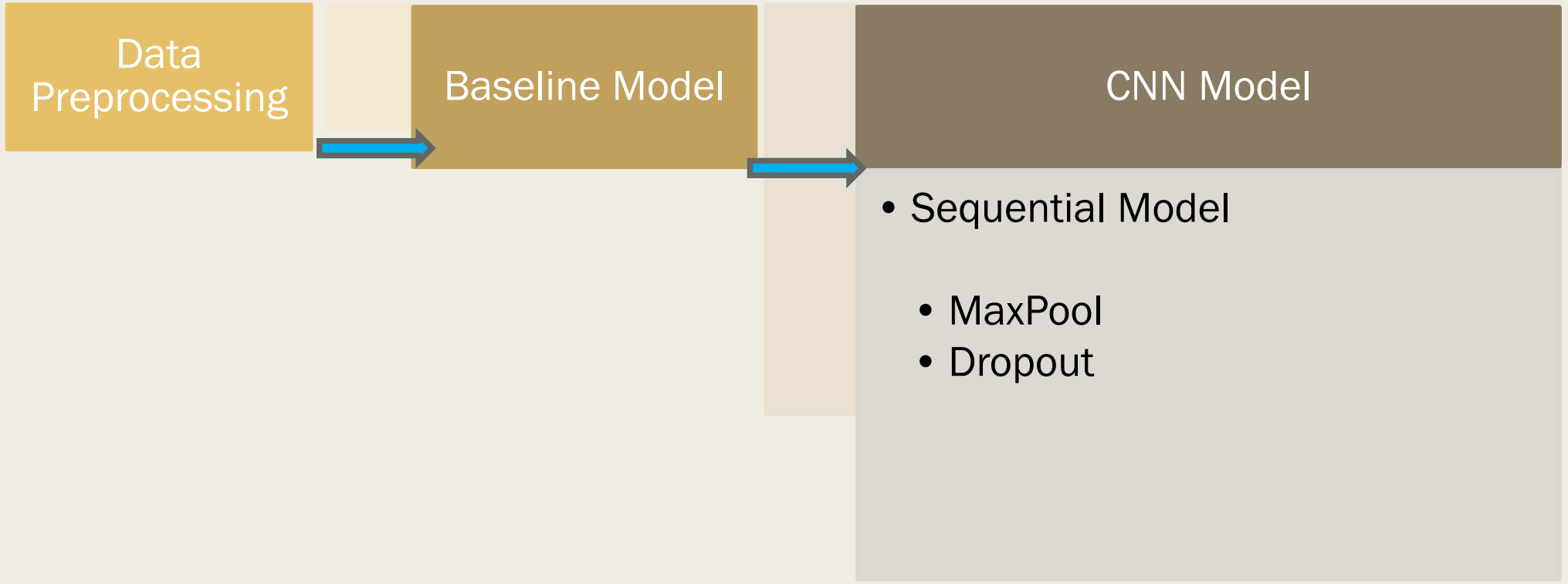
Process



Baseline Modeling



Process


Data Preprocessing
Baseline Model
CNN Model
• Sequential Model
• MaxPool
• Dropout

CNN Network Structure

- Sequential Model
  - Activation Function -> Relu
  - Regularization -> Dropout
  - Optimizers -> Adam

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 Result

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

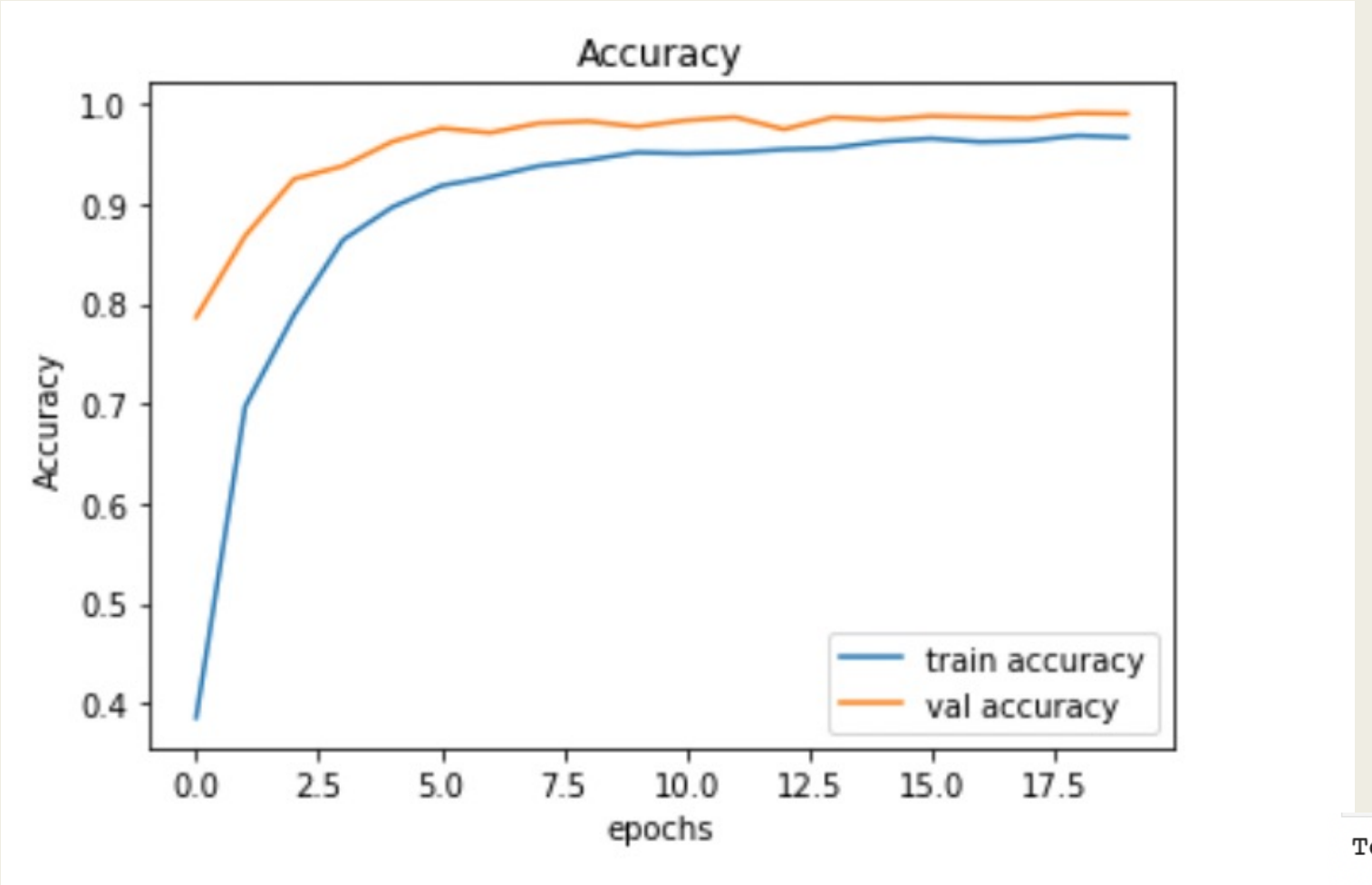
Test accuracy: 89.02612826603325

CNN Tuned Model

Layer (type)	Output Shape	Param #	
conv2d (Conv2D)	(None, 26, 26, 32)	2432	
conv2d_1 (Conv2D)	(None, 22, 22, 32)	25632	Added
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	Added
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	Added
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

CNN Tuned Model Results

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Test accuracy:  93.05621536025338
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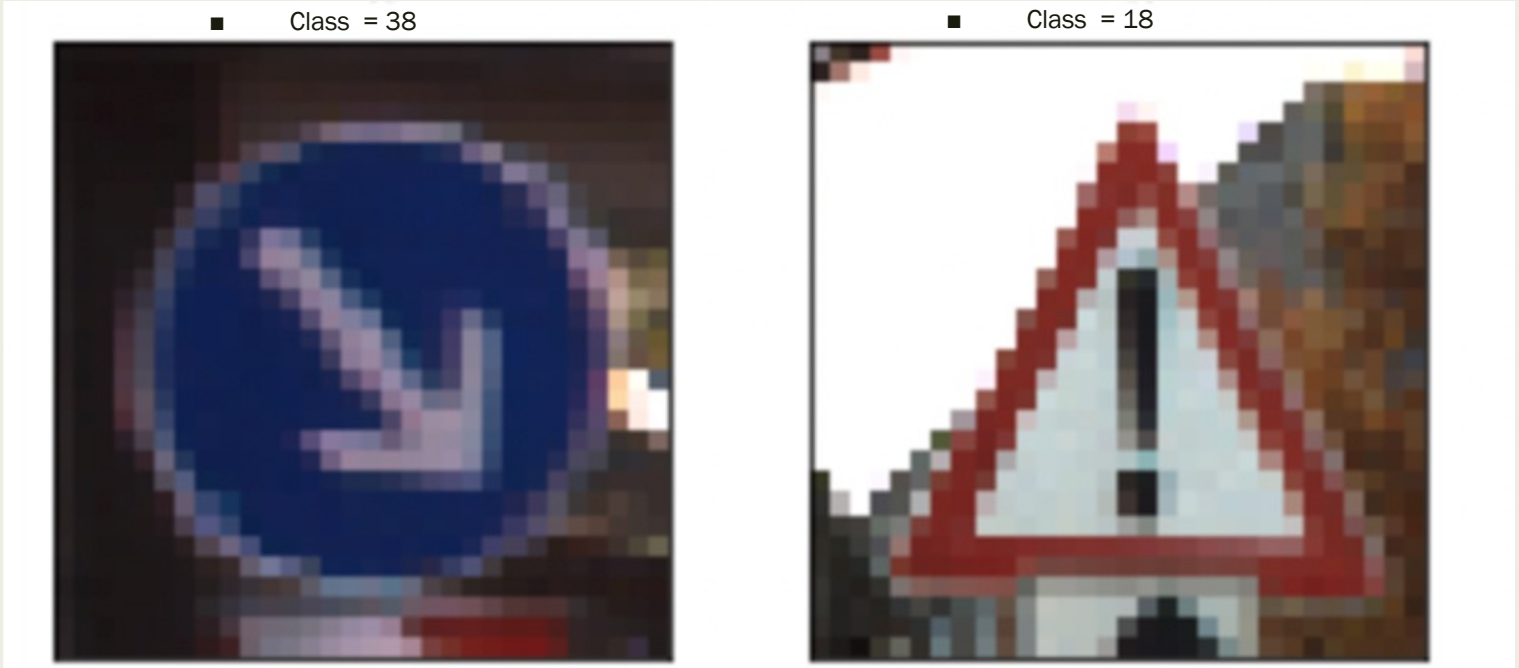
Evaluating the model



THANK YOU!