Garbage Classification

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Roadmapa projektu:

- Analiza tematu
- Analiza danych
- Stworzenie modelu
- Stworzenie aplikacji

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Analiza tematu:

- Czym dysponujemy?
- Co chcemy osiągnąć?
- Jak chcemy to osiągnąć?
- Dla kogo osiągamy cel?

Analiza danych:

- Zasadniczy dataset
- Alternatywny dataset
- Liczba fotografii
- Rozmiary fotografii

```
(384, 512, 3)
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(384, 512, 3)
(384, 512, 3)
```

```
Images of label "cardboard":    403
Images of label "glass":        501
Images of label "metal":        410
Images of label "paper":        594
Images of label "plastic":      482
Images of label "trash":        137
```

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Analiza danych:

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Wnioski:

- Dysponujemy małą liczbą fotografii
- „Trash” jest niedoreprezentowaną klasą
- „Trash” posiada wprowadzające w błąd fotografie
- Różnice w oświetleniu oraz kącie wykonywania fotografii

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Praca nad modelem:

- Nigdy nie ufaj split-folders

- ImageDataGenerator Twoim przyjacielem

```
train_datagen = ImageDataGenerator(rescale = 1./255,
                                   shear_range=0.1,
                                   zoom_range=0.1,
                                   width_shift_range=0.1,
                                   height_shift_range=0.1,
                                   horizontal_flip=True,
                                   vertical_flip=True)
```

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Praca nad modelem:

- Ustaw właściwy batch_size

```
training_set = train_datagen.flow_from_directory(file_path, target_size = (384, 512),
                                                 batch_size = 120, class_mode = "categorical")
```

- Oszczędź swój czas dzięki EarlyStopping

- Sekretny składnik: learning_rate

```
first_model.compile(optimizer=tf.keras.optimizers.Adam(learning_rate=0.001),
                    loss="sparse_categorical_crossentropy",
                    metrics=["accuracy"])
```

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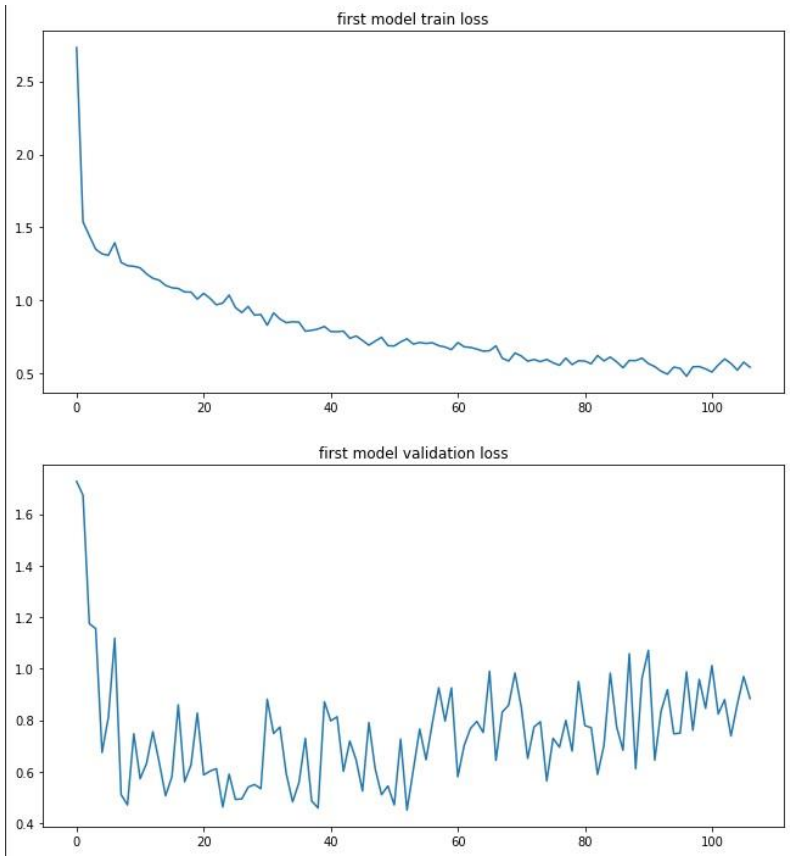
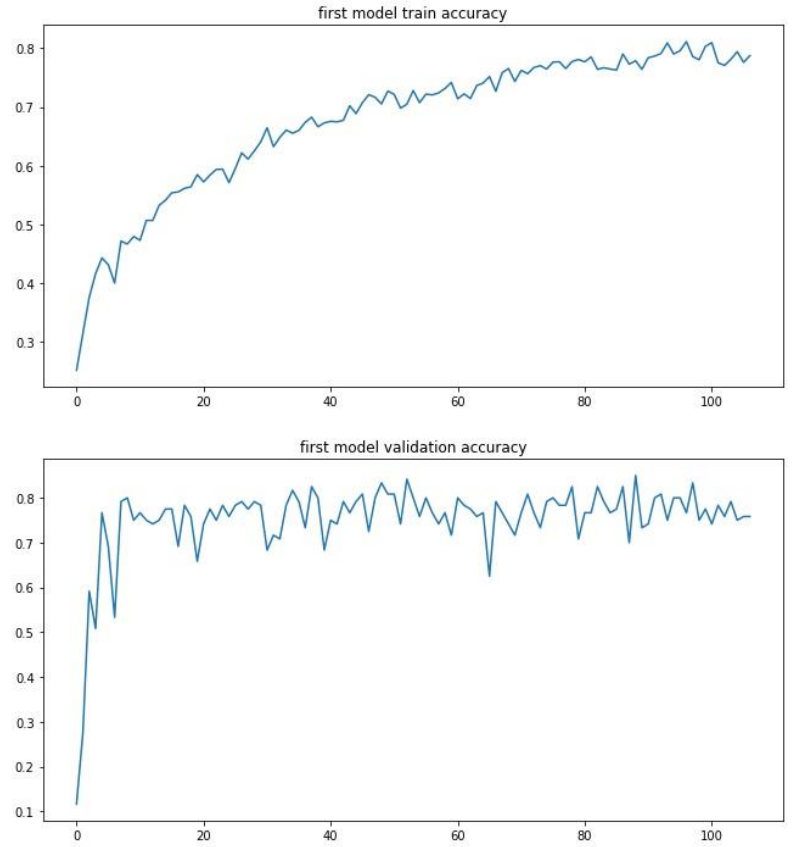
Model #1:

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 384, 512, 8)       224

 max_pooling2d (MaxPooling2D  (None, 192, 256, 8)      0
 )

 conv2d_1 (Conv2D)           (None, 192, 256, 10)      730

 max_pooling2d_1 (MaxPooling  (None, 96, 128, 10)      0
 2D)

 conv2d_2 (Conv2D)           (None, 96, 128, 12)       1092

 max_pooling2d_2 (MaxPooling  (None, 48, 64, 12)       0
 2D)

 conv2d_3 (Conv2D)           (None, 48, 64, 14)        1526

 max_pooling2d_3 (MaxPooling  (None, 24, 32, 14)       0
 2D)

 conv2d_4 (Conv2D)           (None, 24, 32, 16)        2032

 max_pooling2d_4 (MaxPooling  (None, 12, 16, 16)       0
 2D)

 conv2d_5 (Conv2D)           (None, 12, 16, 18)        2610

 max_pooling2d_5 (MaxPooling  (None, 6, 8, 18)         0
 2D)

 dropout (Dropout)           (None, 6, 8, 18)          0

 flatten (Flatten)           (None, 864)               0

 dense (Dense)               (None, 5)                 4325

=================================================================
Total params: 12,539
Trainable params: 12,539
Non-trainable params: 0
```





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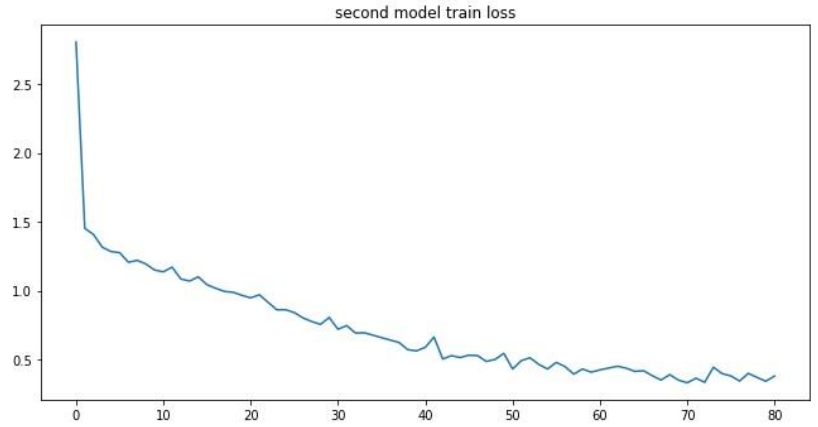
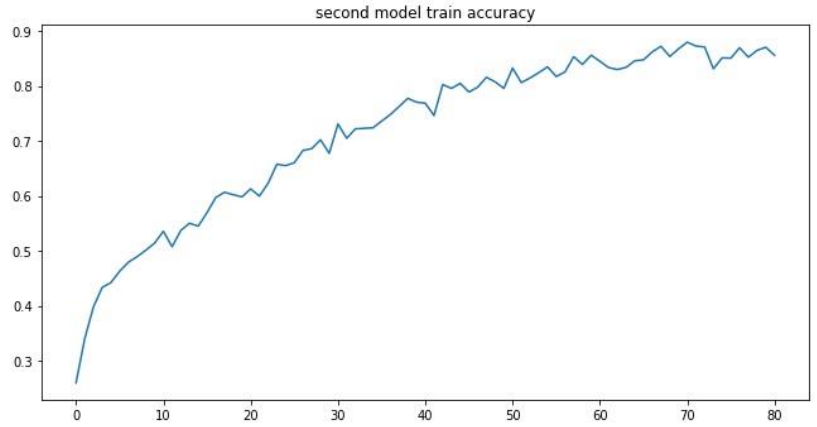
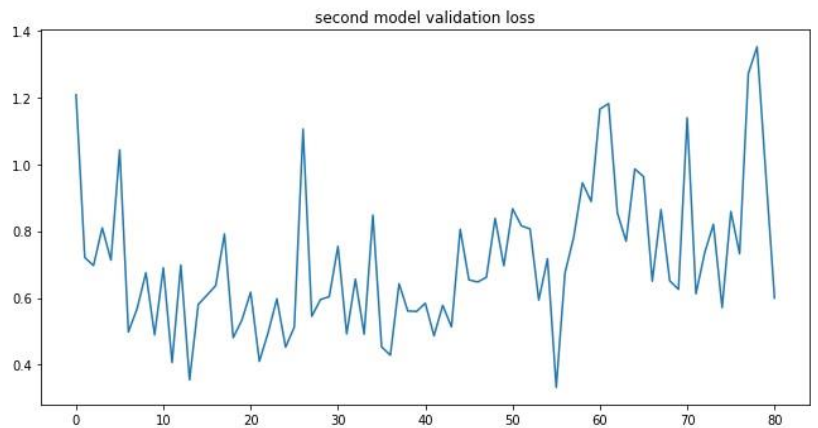
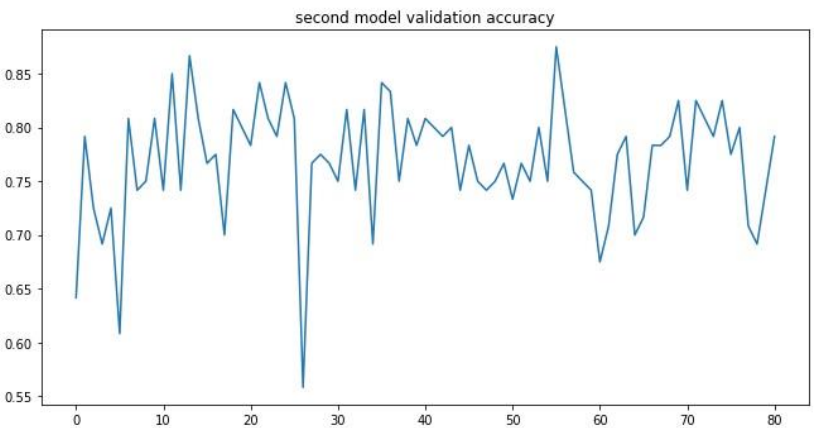
Model #2:

```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_6 (Conv2D)           (None, 384, 512, 8)       224

 max_pooling2d_6 (MaxPooling  (None, 192, 256, 8)      0
 2D)

 conv2d_7 (Conv2D)           (None, 192, 256, 16)      1168

 max_pooling2d_7 (MaxPooling  (None, 96, 128, 16)      0
 2D)

 conv2d_8 (Conv2D)           (None, 96, 128, 24)       3480

 max_pooling2d_8 (MaxPooling  (None, 48, 64, 24)       0
 2D)

 conv2d_9 (Conv2D)           (None, 48, 64, 32)        6944

 max_pooling2d_9 (MaxPooling  (None, 24, 32, 32)       0
 2D)

 conv2d_10 (Conv2D)          (None, 24, 32, 40)        11560

 max_pooling2d_10 (MaxPoolin  (None, 12, 16, 40)       0
 g2D)

 conv2d_11 (Conv2D)          (None, 12, 16, 48)        17328

 max_pooling2d_11 (MaxPoolin  (None, 6, 8, 48)         0
 g2D)

 dropout_1 (Dropout)         (None, 6, 8, 48)          0

 flatten_1 (Flatten)         (None, 2304)              0

 dense_1 (Dense)             (None, 5)                 11525

=================================================================
Total params: 52,229
Trainable params: 52,229
Non-trainable params: 0
_________________________________________________________________
```









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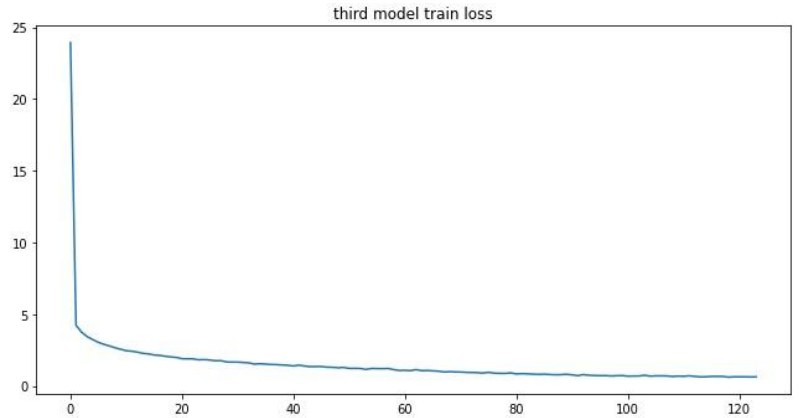
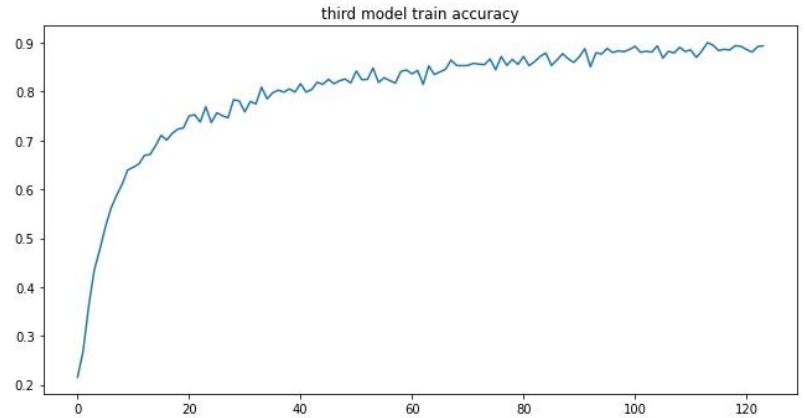
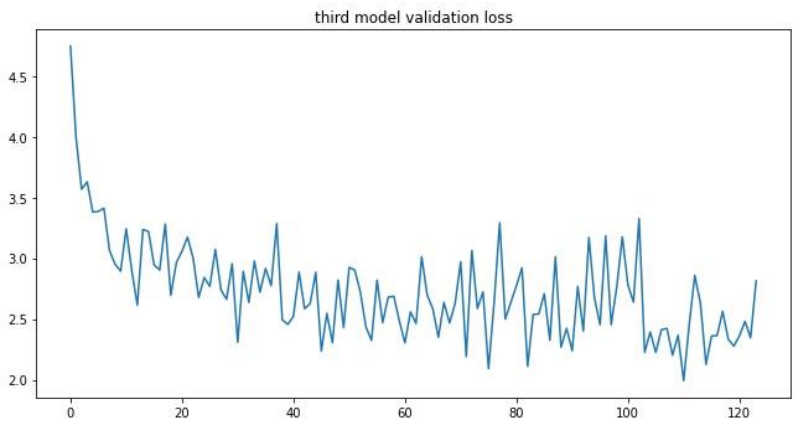
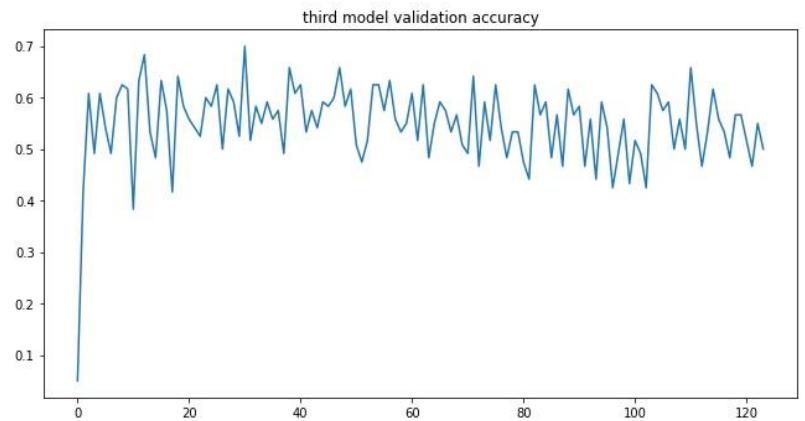
Model #3:

```
Model: "sequential_2"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_12 (Conv2D)          (None, 384, 512, 8)       224

 max_pooling2d_12 (MaxPoolin  (None, 192, 256, 8)      0
 g2D)

 conv2d_13 (Conv2D)          (None, 192, 256, 10)      730

 max_pooling2d_13 (MaxPoolin  (None, 96, 128, 10)      0
 g2D)

 conv2d_14 (Conv2D)          (None, 96, 128, 12)       1092

 max_pooling2d_14 (MaxPoolin  (None, 48, 64, 12)       0
 g2D)

 conv2d_15 (Conv2D)          (None, 48, 64, 14)        1526

 max_pooling2d_15 (MaxPoolin  (None, 24, 32, 14)       0
 g2D)

 dropout_2 (Dropout)         (None, 24, 32, 14)        0

 flatten_2 (Flatten)         (None, 10752)             0

 dense_2 (Dense)             (None, 5)                 53765

=================================================================
Total params: 57,337
Trainable params: 57,337
Non-trainable params: 0
_________________________________________________________________
```









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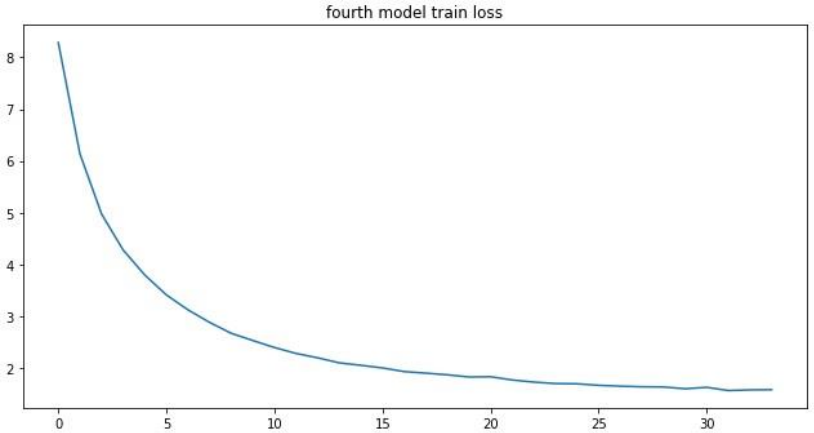
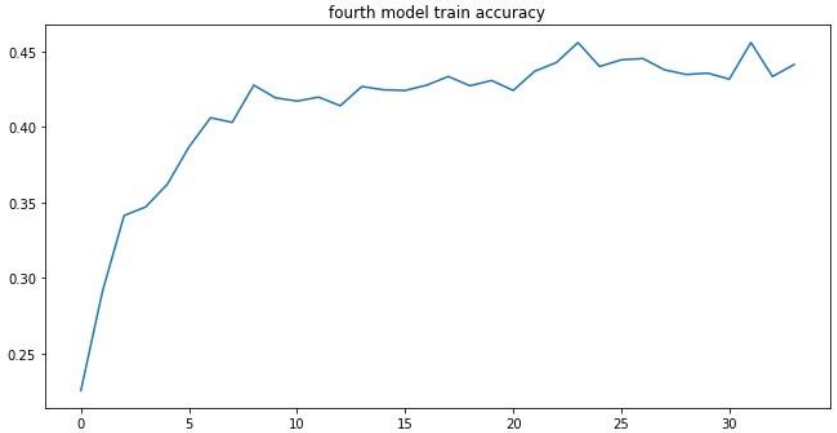
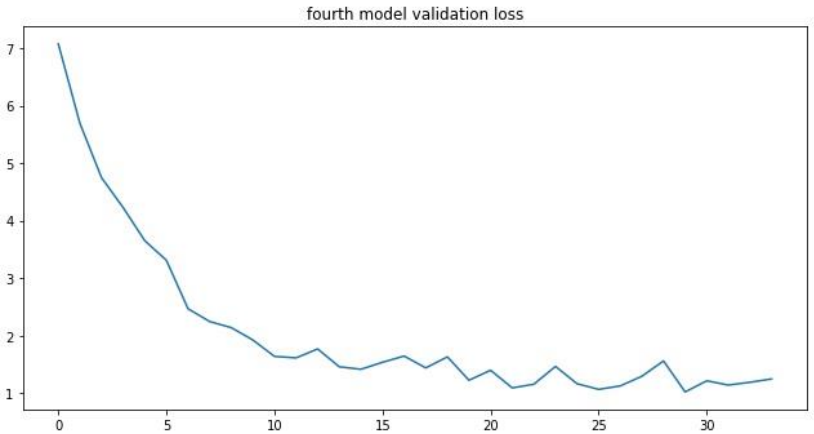
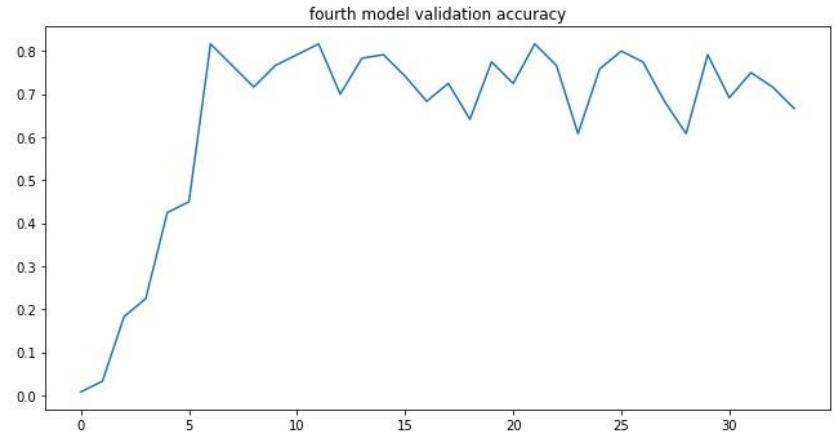
Model #4:

```
Model: "sequential_3"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_16 (Conv2D)          (None, 384, 512, 8)       224

 max_pooling2d_16 (MaxPoolin  (None, 192, 256, 8)      0
 g2D)

 conv2d_17 (Conv2D)          (None, 192, 256, 10)      730

 max_pooling2d_17 (MaxPoolin  (None, 96, 128, 10)      0
 g2D)

 conv2d_18 (Conv2D)          (None, 96, 128, 12)       1092

 max_pooling2d_18 (MaxPoolin  (None, 48, 64, 12)       0
 g2D)

 conv2d_19 (Conv2D)          (None, 48, 64, 14)        1526

 max_pooling2d_19 (MaxPoolin  (None, 24, 32, 14)       0
 g2D)

 conv2d_20 (Conv2D)          (None, 24, 32, 16)        2032

 max_pooling2d_20 (MaxPoolin  (None, 12, 16, 16)       0
 g2D)

 conv2d_21 (Conv2D)          (None, 12, 16, 18)        2610

 max_pooling2d_21 (MaxPoolin  (None, 6, 8, 18)         0
 g2D)

 dropout_3 (Dropout)         (None, 6, 8, 18)          0

 flatten_3 (Flatten)         (None, 864)               0

 dense_3 (Dense)             (None, 5)                 4325

=================================================================
Total params: 12,539
Trainable params: 12,539
Non-trainable params: 0
_________________________________________________________________
```









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Wnioski:

- Model osiąga wynik 80% na val_accuracy
- Model będzie wymagać nadzoru
- Model nie wymaga fotografii w wysokiej rozdzielczości
- Model działa dla fotografii wykonywanych dynamicznie

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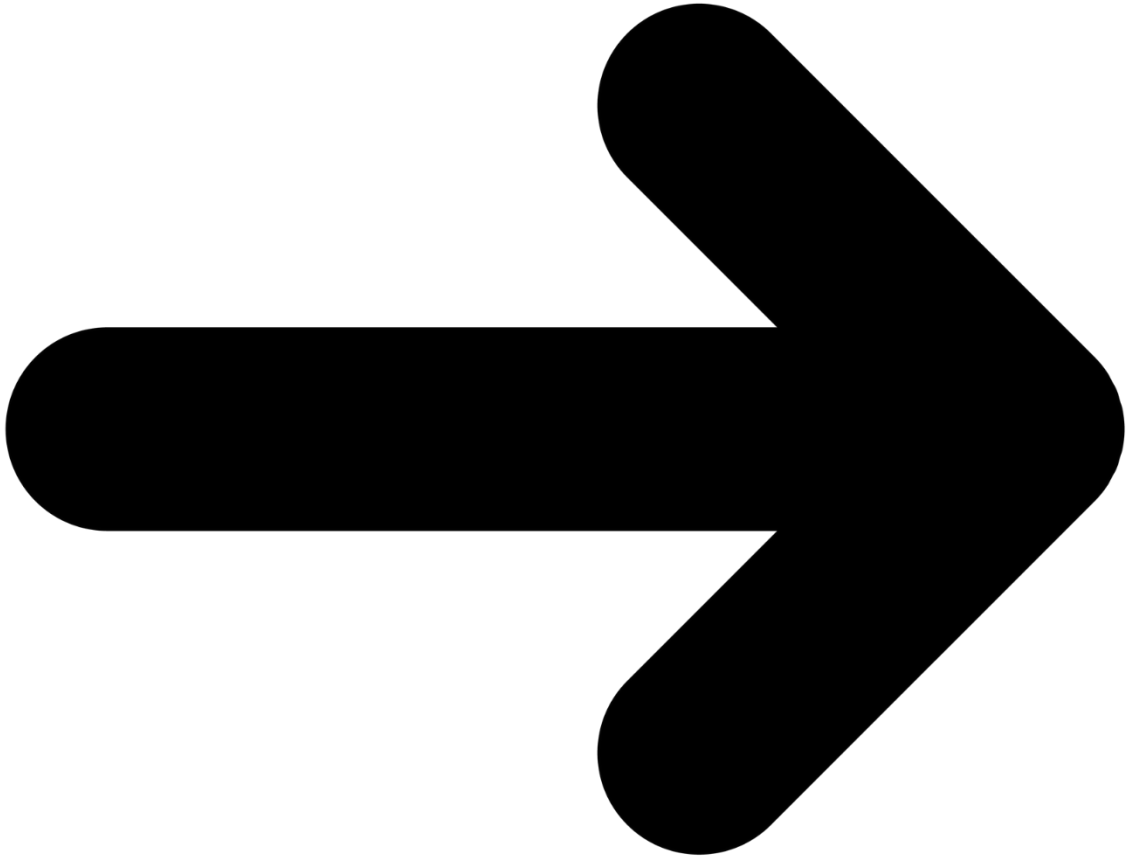
Aplikacja projektowa:



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