Presentation of the project carried out within the subject of BIAI

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Fruit Image Classification using CNN

Dataset samples


















As we can see, there are 9 classes in the dataset, each containing 40 images.

- Apple
- Banana
- Cherry
- Chickoo
- Grapes
- Kiwi
- Mango
- Orange
- Strawberry

The dataset was loaded from Google Drive and contains 9 fruit classes, with 40 images per class. All images are organized into subdirectories, one per class.

```
from google.colab import drive

drive.mount('/content/drive')


dataset_path = "/content/drive/MyDrive/fruitdataset"
```

This block initializes the ImageDataGenerator used for real-time image preprocessing and augmentation.It rescales pixel values and applies random transformations to increase data variability and improve model generalization

```
train_val_datagen = ImageDataGenerator(
    rescale=1.0 / 255,
    validation_split=VAL_SPLIT,
    rotation_range=20,
    width_shift_range=0.1,
    height_shift_range=0.1,
    zoom_range=0.1,
    horizontal_flip=True,
    fill_mode="nearest",
)
```

This section creates two data generators from the same directory:
Training generator - uses 80% of the data (subset="training") and shuffles the images.Validation generator – uses the remaining 20% (subset="validation") without shuffling, ensuring consistent evaluation.Both generators resize images to the target size and apply the same preprocessing pipeline.

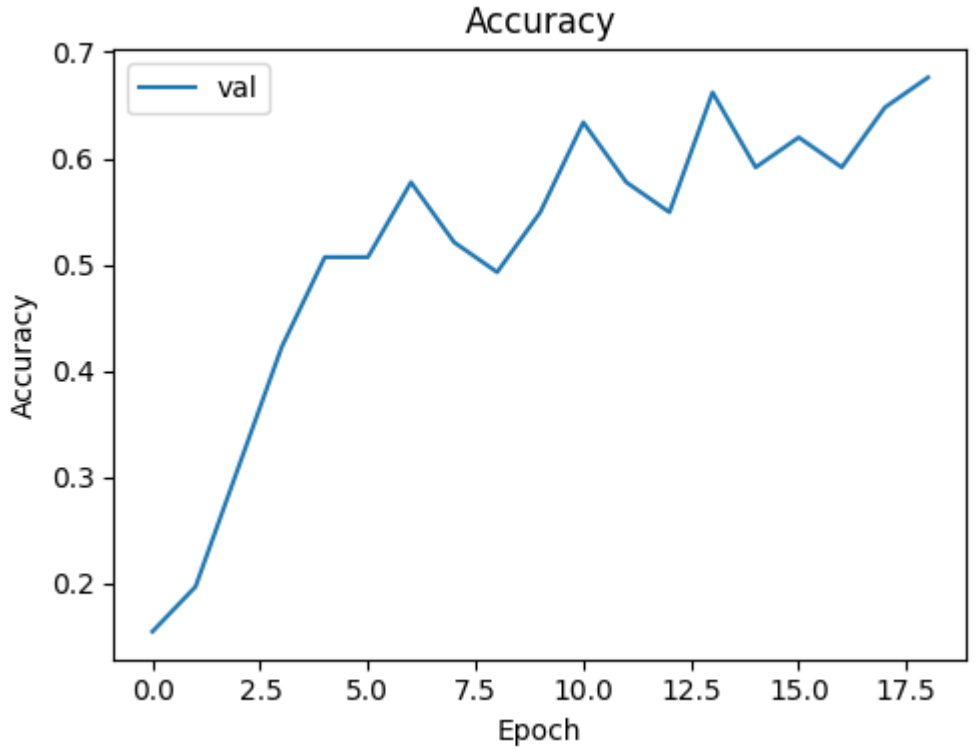
```
train_gen = train_val_datagen.flow_from_directory(
    directory=dataset_path,
    target_size=IMG_SIZE,
    batch_size=BATCH_SIZE,
    class_mode="categorical",
    subset="training",
    shuffle=True,
    seed=SEED,
)

val_gen = train_val_datagen.flow_from_directory(
    directory=dataset_path,
    target_size=IMG_SIZE,
    batch_size=BATCH_SIZE,
    class_mode="categorical",
    subset="validation",
    shuffle=False,
    seed=SEED,
)
```

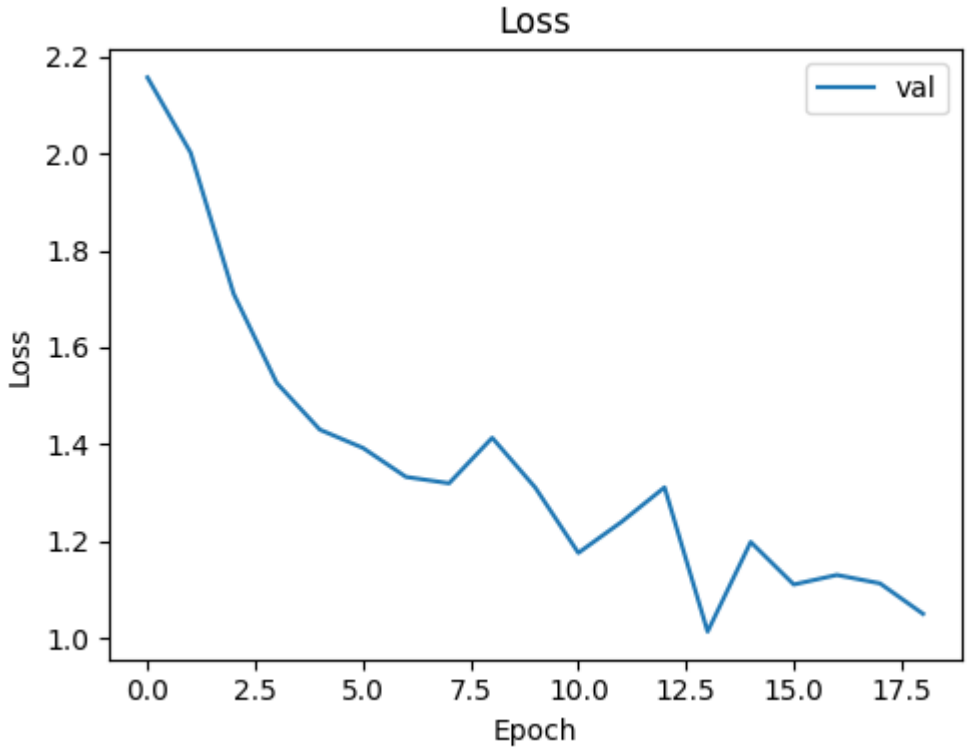
Model

Layer (type)	Output Shape	Param #
conv2d_3 (Conv2D)	(None, 126, 126, 32)	896
max_pooling2d_3 (MaxPooling2D)	(None, 63, 63, 32)	0
conv2d_4 (Conv2D)	(None, 61, 61, 64)	18,496
max_pooling2d_4 (MaxPooling2D)	(None, 30, 30, 64)	0
conv2d_5 (Conv2D)	(None, 28, 28, 128)	73,856
max_pooling2d_5 (MaxPooling2D)	(None, 14, 14, 128)	0
flatten_1 (Flatten)	(None, 25088)	0
dense_2 (Dense)	(None, 128)	3,211,392
dropout_1 (Dropout)	(None, 128)	0
dense_3 (Dense)	(None, 9)	1,161

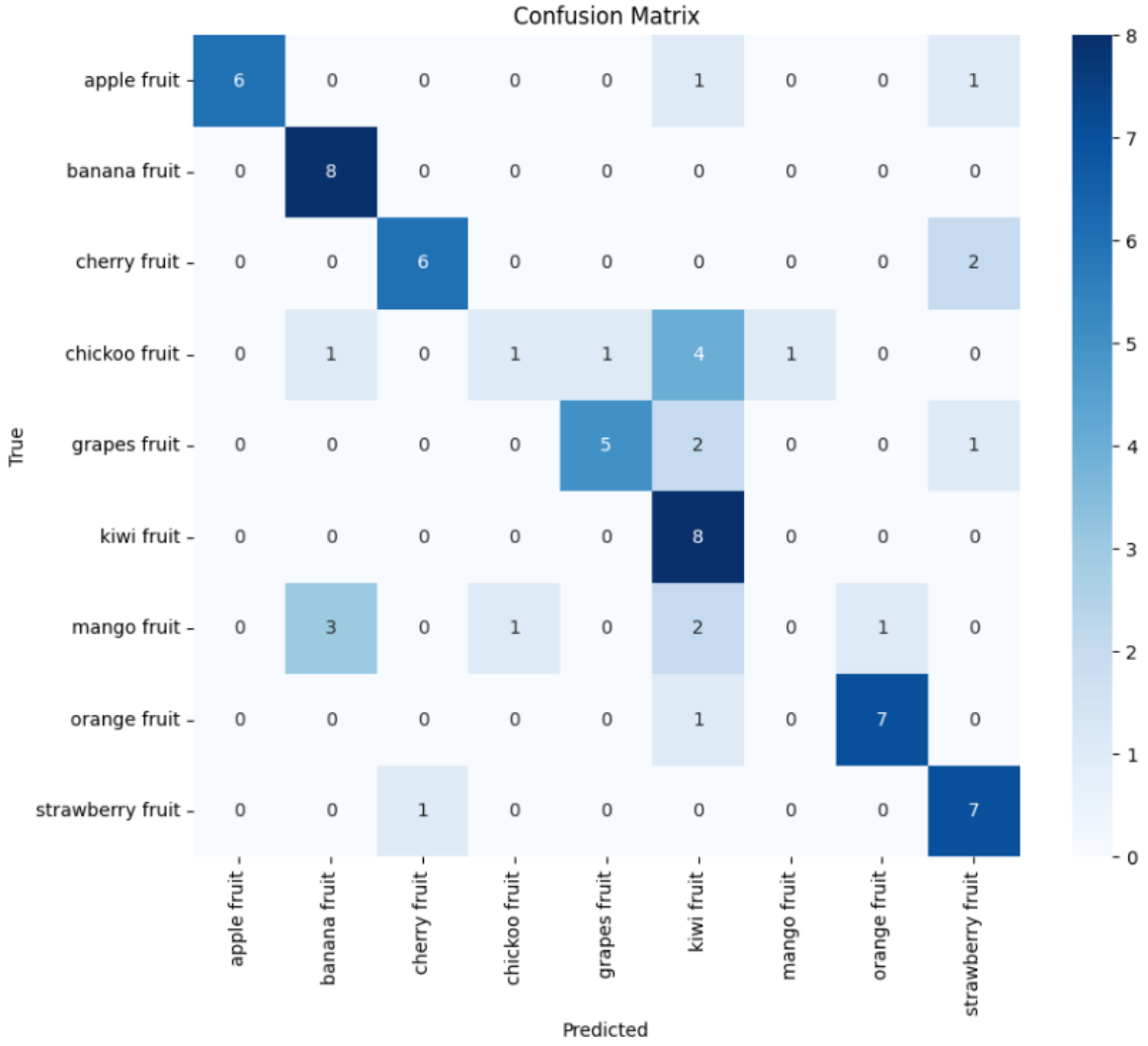
Total params: 3,305,801 (12.61 MB)
Trainable params: 3,305,801 (12.61 MB)
Non-trainable params: 0 (0.00 B)

Accuracy & Loss





Confusion Matrix



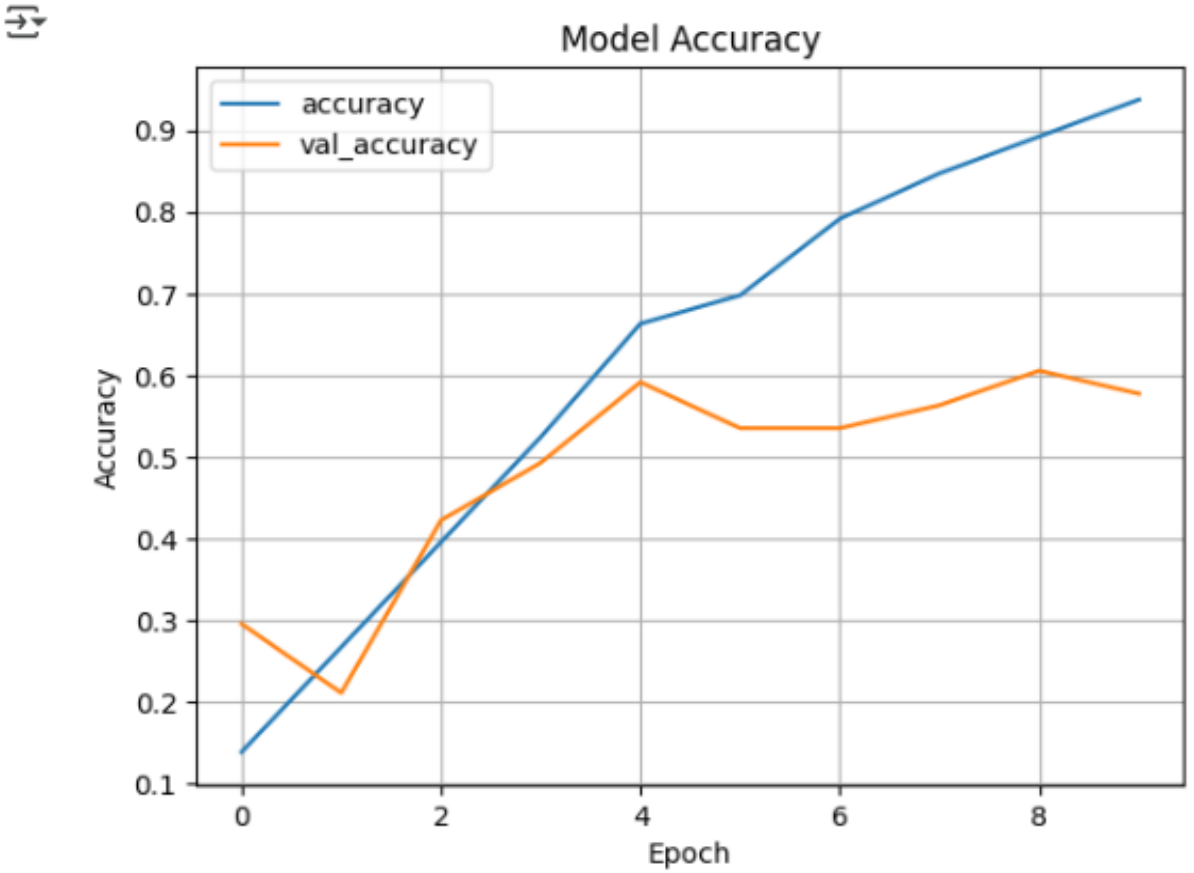
TEST

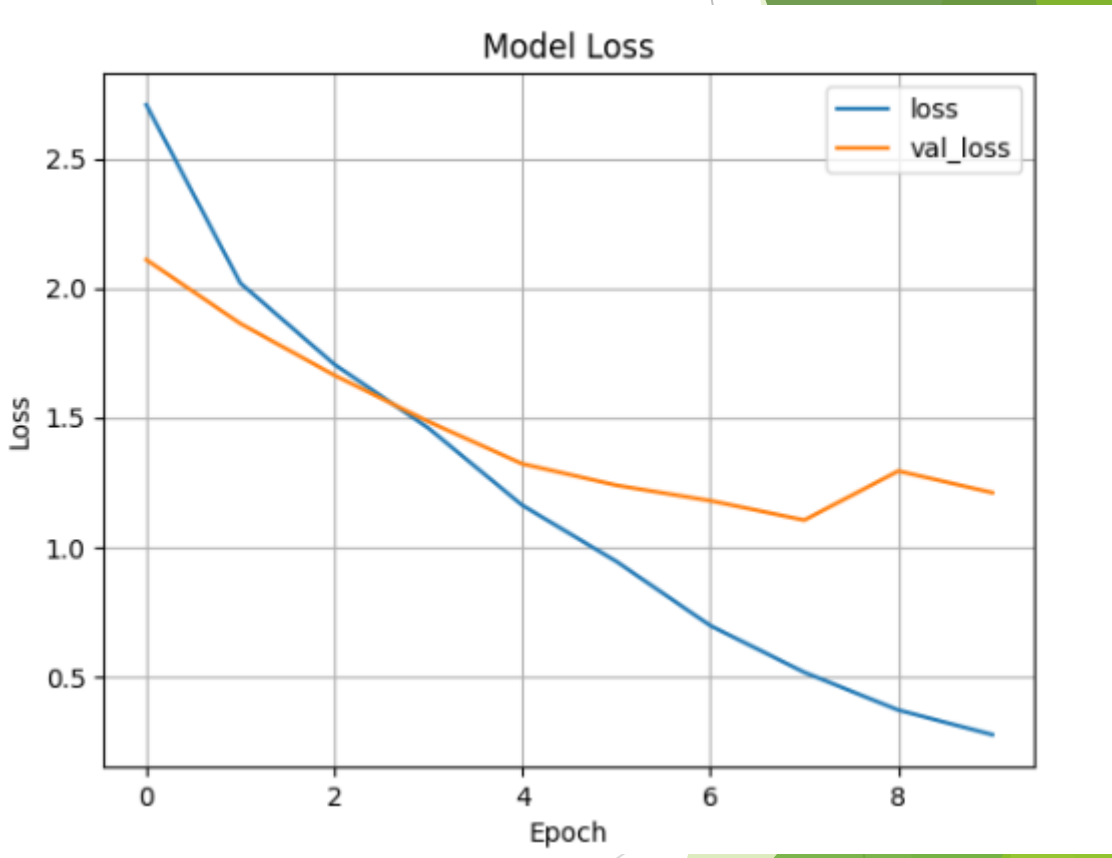
Prediction: banana fruit (56.58%)

```
Top 3 predictions:
banana fruit: 56.58%
mango fruit: 30.37%
orange fruit: 8.48%
```

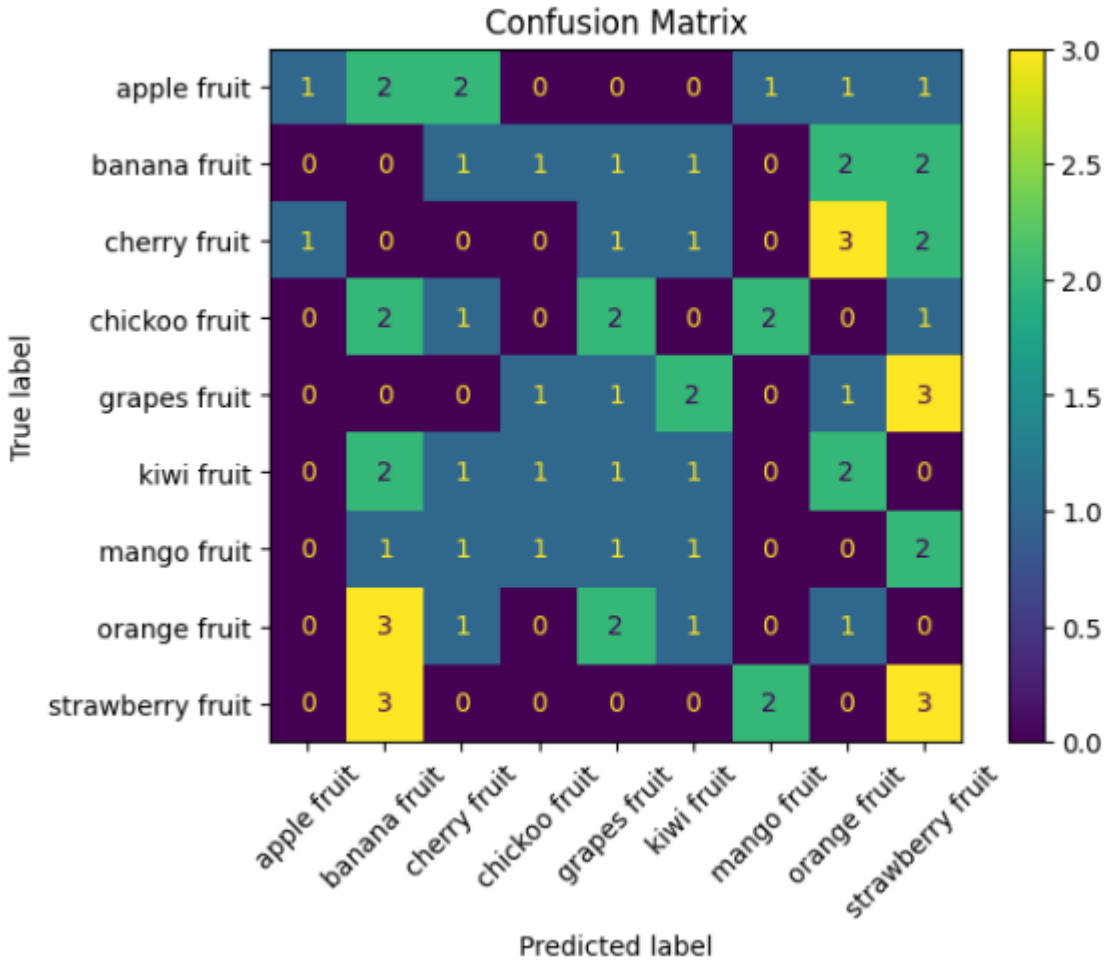
Model 2

Accuracy & Loss





Confusion Matrix



TEST

Predykcja: orange fruit (43.63%)

```
TOP 3 przewidywania:
orange fruit: 43.63%
banana fruit: 35.45%
mango fruit: 11.25%
```

Model 1 vs. Model 2

Model: "sequential"

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 98, 98, 32)	896
max_pooling2d (MaxPooling2D)	(None, 49, 49, 32)	0
conv2d_1 (Conv2D)	(None, 47, 47, 64)	18,496
max_pooling2d_1 (MaxPooling2D)	(None, 23, 23, 64)	0
flatten (Flatten)	(None, 33856)	0
dense (Dense)	(None, 64)	2,166,848
dense_1 (Dense)	(None, 9)	585

Total params: 2,186,825 (8.34 MB)
Trainable params: 2,186,825 (8.34 MB)
Non-trainable params: 0 (0.00 B)

Layer (type)	Output Shape	Param #
conv2d_3 (Conv2D)	(None, 126, 126, 32)	896
max_pooling2d_3 (MaxPooling2D)	(None, 63, 63, 32)	0
conv2d_4 (Conv2D)	(None, 61, 61, 64)	18,496
max_pooling2d_4 (MaxPooling2D)	(None, 30, 30, 64)	0
conv2d_5 (Conv2D)	(None, 28, 28, 128)	73,856
max_pooling2d_5 (MaxPooling2D)	(None, 14, 14, 128)	0
flatten_1 (Flatten)	(None, 25088)	0
dense_2 (Dense)	(None, 128)	3,211,392
dropout_1 (Dropout)	(None, 128)	0
dense_3 (Dense)	(None, 9)	1,161

Total params: 3,305,801 (12.61 MB)
Trainable params: 3,305,801 (12.61 MB)
Non-trainable params: 0 (0.00 B)

Thanks for watching