Klasifikasi Ruangan di Gedung Pascasarjana PENS

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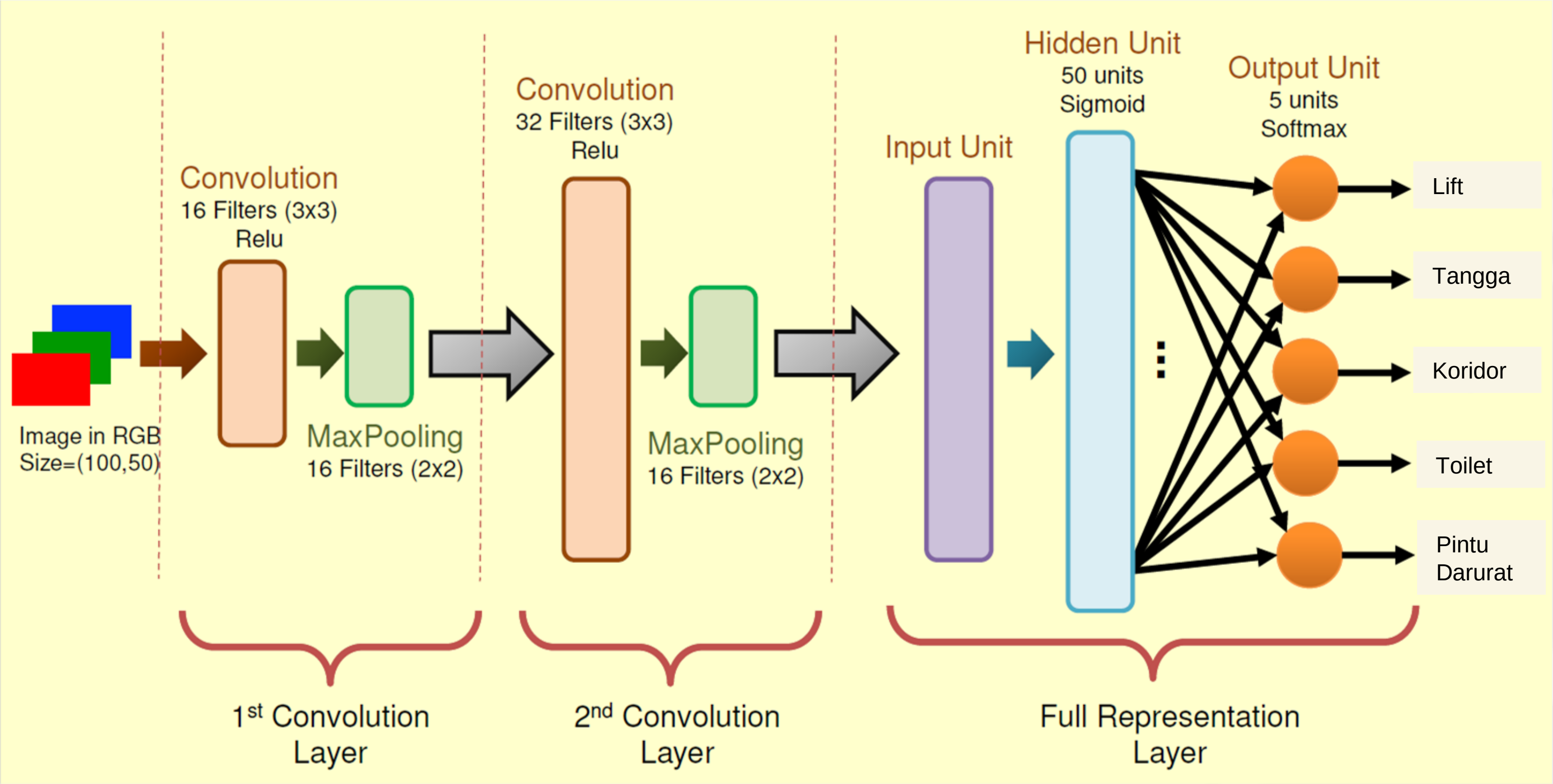
Pendahuluan



Melakukan Klasifikasi Gambar

Gambar diklasifikasikan dalam 6 macam, yaitu:

- Lift
- Tangga
- Koridor
- Buntu
- Toilet
- Pintu Darurat

Semua gambar yang didapatkan kemudian dibagi menjadi tiga bagian, yaitu data training, validation, dan test.

Code

Membuka direktori

```
%cd /content/drive/MyDrive/CNN_Image4_5
```

Membaca folder dataset

```
import os
base_dir = "/content/drive/MyDrive/CNN_Image4_5/dataset"
train_dir = os.path.join(base_dir, 'train')
validation_dir = os.path.join(base_dir, 'validation')
test_dir = os.path.join(base_dir, 'test')
folders=os.listdir(train_dir)
```

Melakukan preprocessing gambar dengan menggunakan ImageDataGenerator

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
train_datagen = ImageDataGenerator(rescale=1./255)
val_datagen = ImageDataGenerator(rescale=1./255)
train_generator = train_datagen.flow_from_directory(
train_dir,
target_size=(100, 50),
batch_size=1)
validation_generator = val_datagen.flow_from_directory(
validation_dir,
target_size=(100, 50),
batch_size=1)
```

Melakukan Identifikasi class train dan class validation

```
class_names_train = train_generator.class_indices
class_names_validation = validation_generator.class_indices

print("Nama Kelas Train:", class_names_train)
print("Nama Kelas Validation:", class_names_validation)
```

Menggunakan keras dan import layers dan model

```
from tensorflow.keras import layers
from tensorflow.keras import Model
img_input = layers.Input(shape=(100, 50, 3))
x = layers.Conv2D(16, 3, activation='relu')(img_input)
x = layers.MaxPooling2D(2)(x)
x = layers.Conv2D(32, 3, activation='relu')(x)
x = layers.MaxPooling2D(2)(x)
x = layers.Flatten()(x)
x = layers.Dense(50, activation='sigmoid')(x)
output = layers.Dense(5, activation='softmax')(x)
model = Model(img_input, output)
model.compile(loss='mean_squared_error', optimizer='SGD', metrics=['acc'])
```

Melakukan training data dengan 100 iterasi

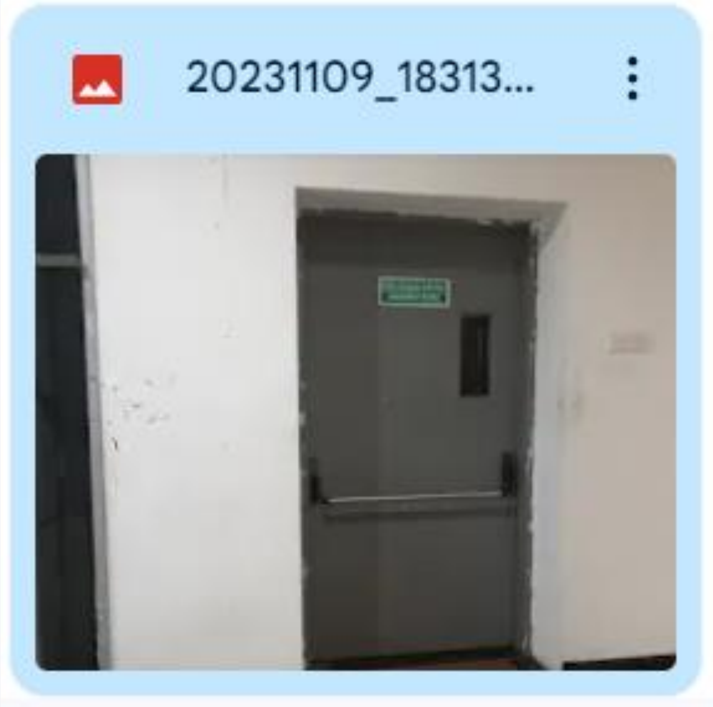
```
history = model.fit_generator(
train_generator,
steps_per_epoch=70,
epochs=100,
validation_data=validation_generator,
validation_steps=20,
verbose=2)
```

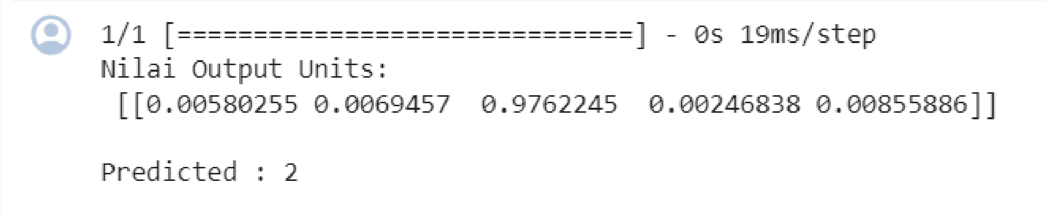
Menampilkan hasil akurasi dan loss dari data training dan validation

```
import matplotlib.pyplot as plt
acc = history.history['acc']
val_acc = history.history['val_acc']
loss = history.history['loss']
val_loss = history.history['val_loss']
epochs = range(len(acc))
plt.plot(epochs, acc, color='b', label='Train Accuracy')
plt.plot(epochs, val_acc, color='r', label='Validation Accuracy')
plt.title('Training and validation accuracy')
plt.legend()
plt.figure()
plt.plot(epochs, loss, color='b', label='Train Loss')
plt.plot(epochs, val_loss, color='r', label='Validation Loss')
plt.title('Training and validation loss')
plt.legend()
```

Menentukan nilai output (hasil prediksi). Penentuan kelas yaitu berdasarkan nilai prediksi tertinggi

```
from keras.preprocessing.image import img_to_array, load_img
import numpy as np
img = load_img(test_dir+'/20231109_183136.jpg', False, target_size=(100,50))
x = img_to_array(img)
x = np.expand_dims(x, axis=0)
preds = model.predict(x)
print("Nilai Output Units:\n", preds)
index_preds = np.argmax(preds)
print("\nPredicted :", index_preds)
```

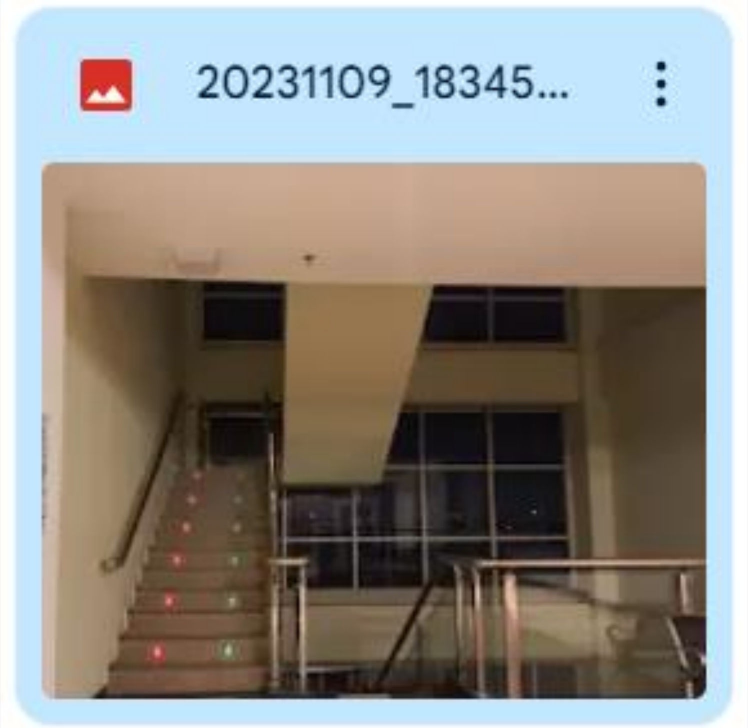


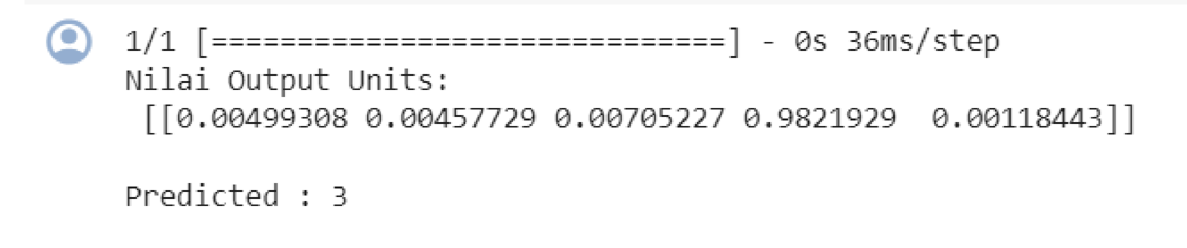


```
1/1 [==============================] - 0s 19ms/step
Nilai Output Units:
 [[0.00580255 0.0069457  0.9762245  0.00246838 0.00855886]]

Predicted : 2
```

Menentukan nilai output (hasil prediksi). Penentuan kelas yaitu berdasarkan nilai prediksi tertinggi

```
from keras.preprocessing.image import img_to_array, load_img
import numpy as np
img = load_img(test_dir+'/20231109_183454.jpg', False, target_size=(100,50))
x = img_to_array(img)
x = np.expand_dims(x, axis=0)
preds = model.predict(x)
print("Nilai Output Units:\n", preds)
index_preds = np.argmax(preds)
print("\nPredicted :", index_preds)
```

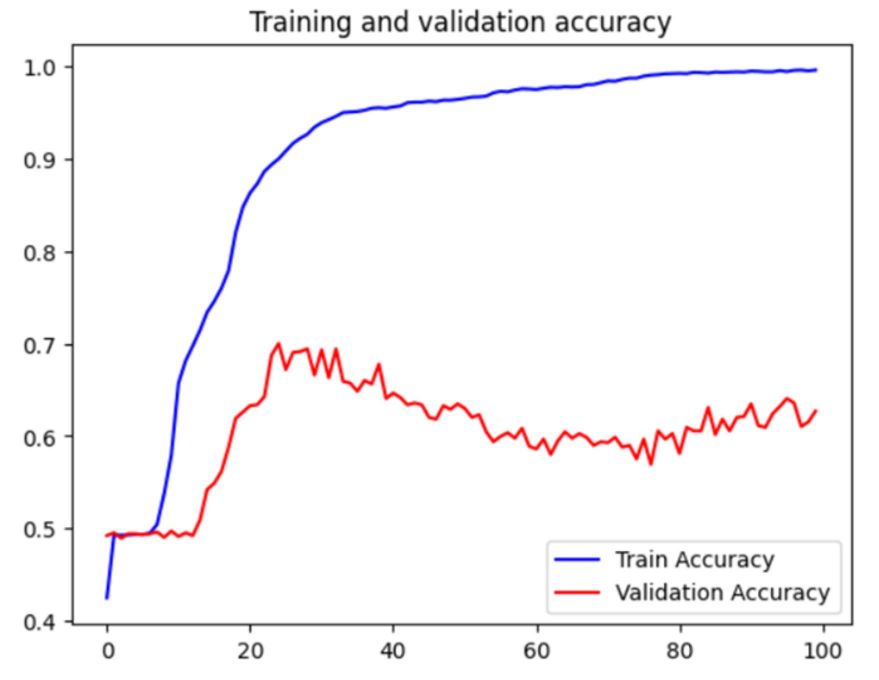


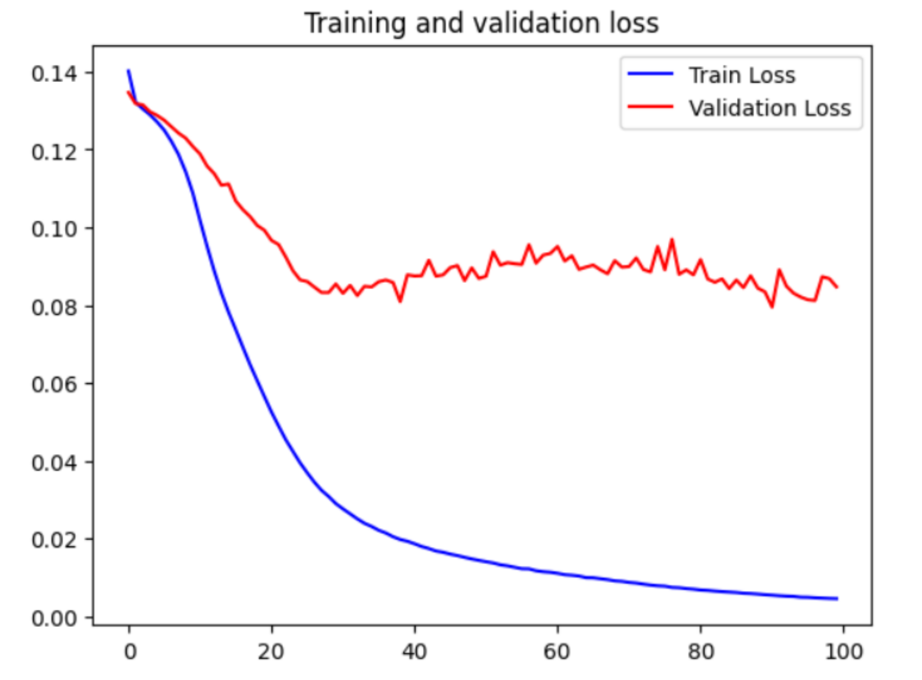


```
1/1 [==============================] - 0s 36ms/step
Nilai Output Units:
 [[0.00499308 0.00457729 0.00705227 0.9821929  0.00118443]]

Predicted : 3
```

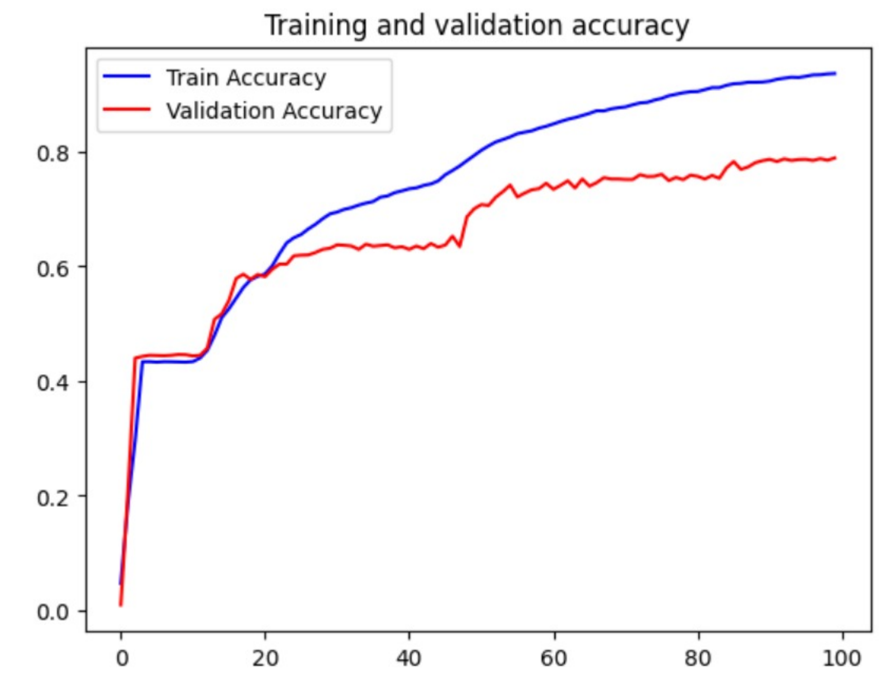
Hasil (Perbandingan dataset sebelumnya dengan dataset saat ini)

Dataset Sebelumnya

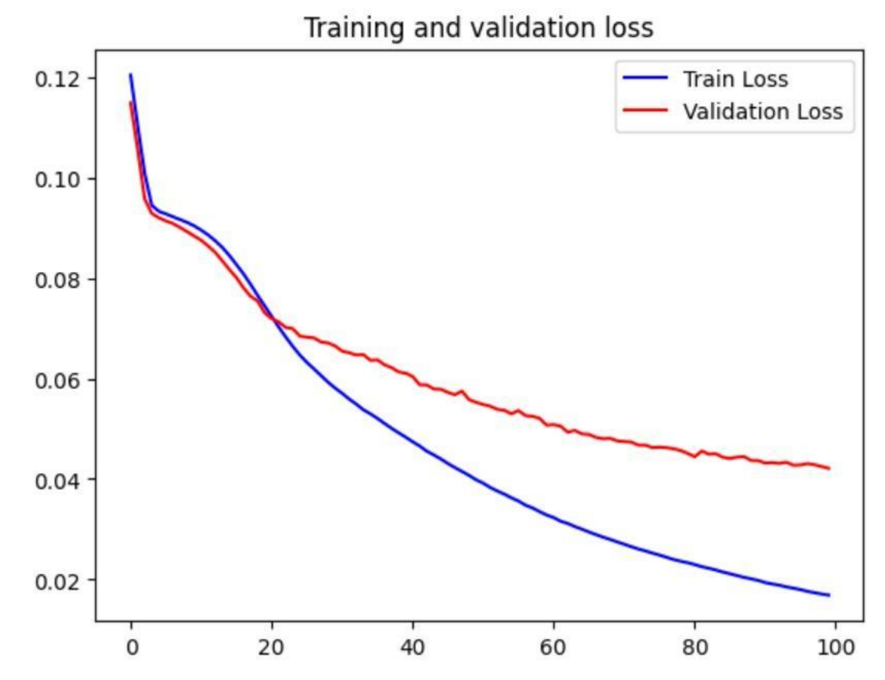




Dataset Kelas

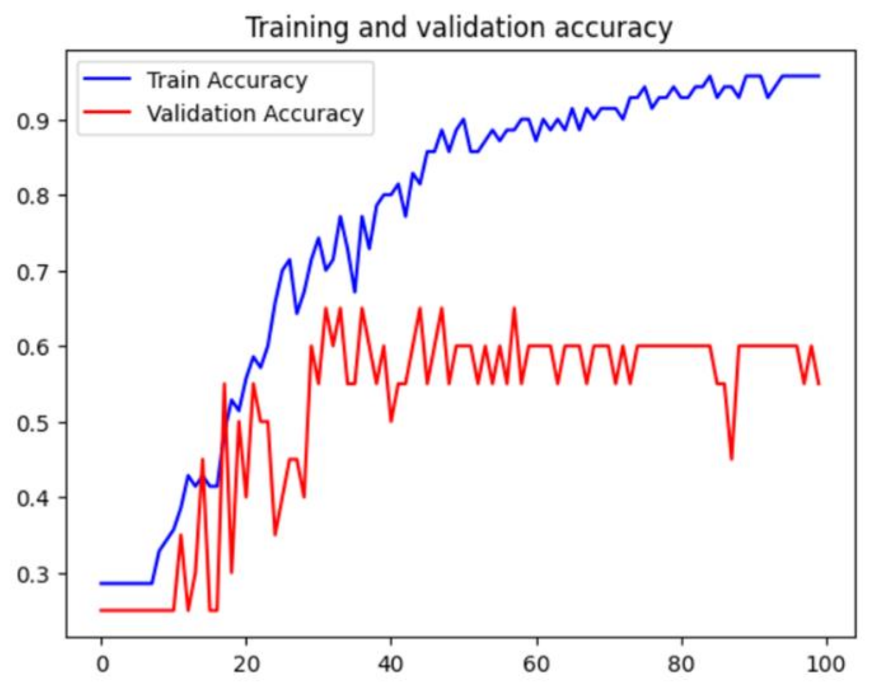


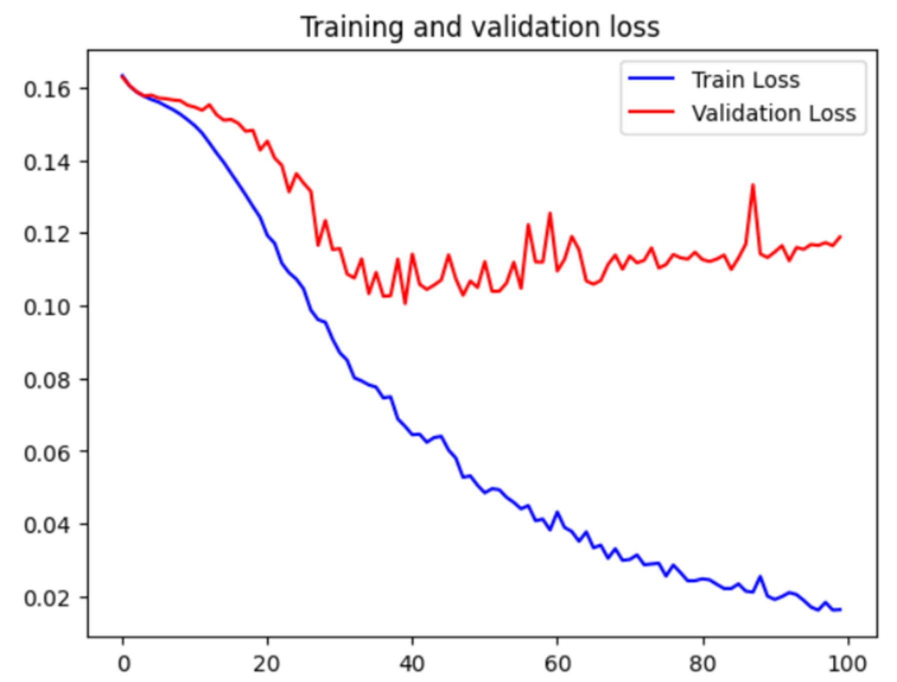
Training and validation accuracy



Training and validation loss

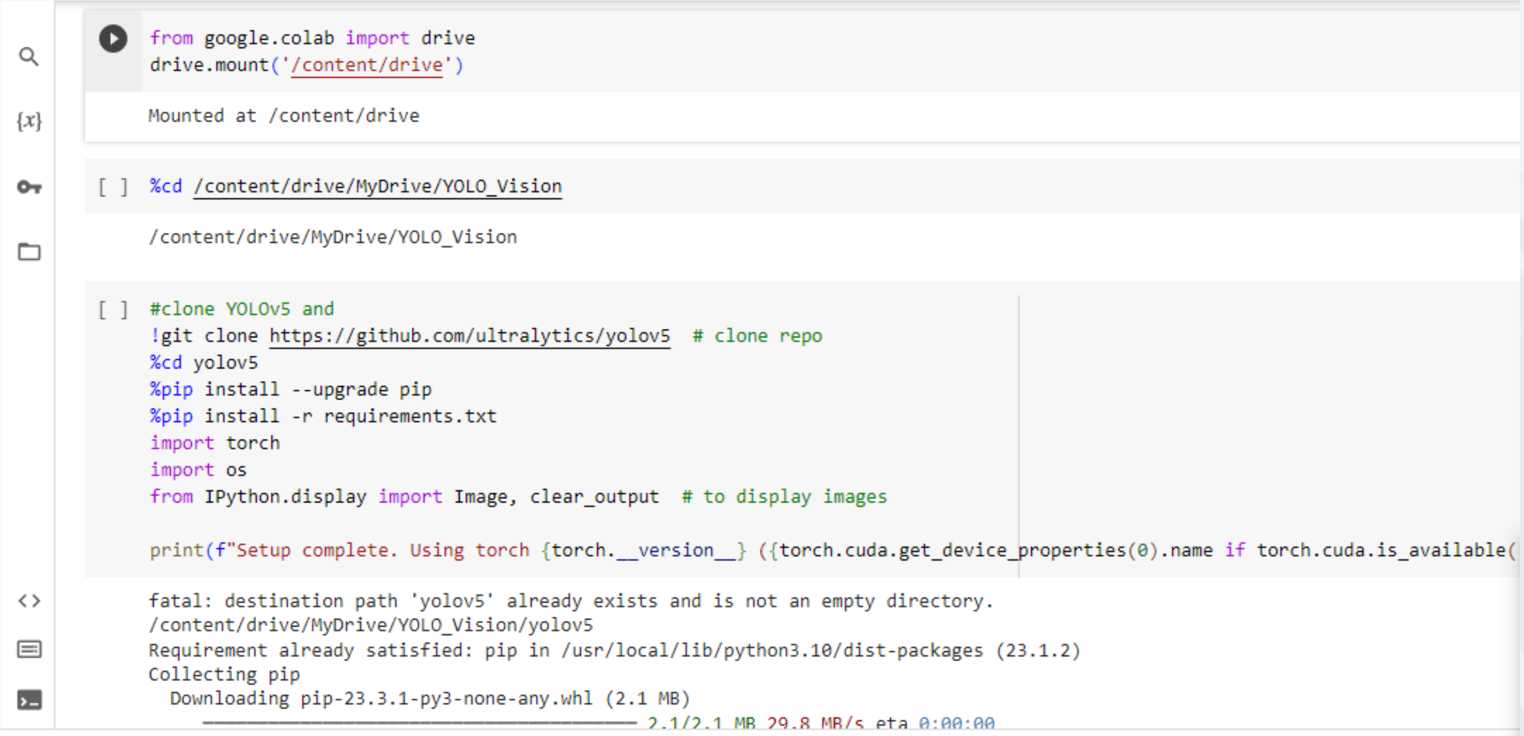
Dataset Kami





Percobaan ke 2 Menggunakan Yolo

Processing Using Yolo



```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

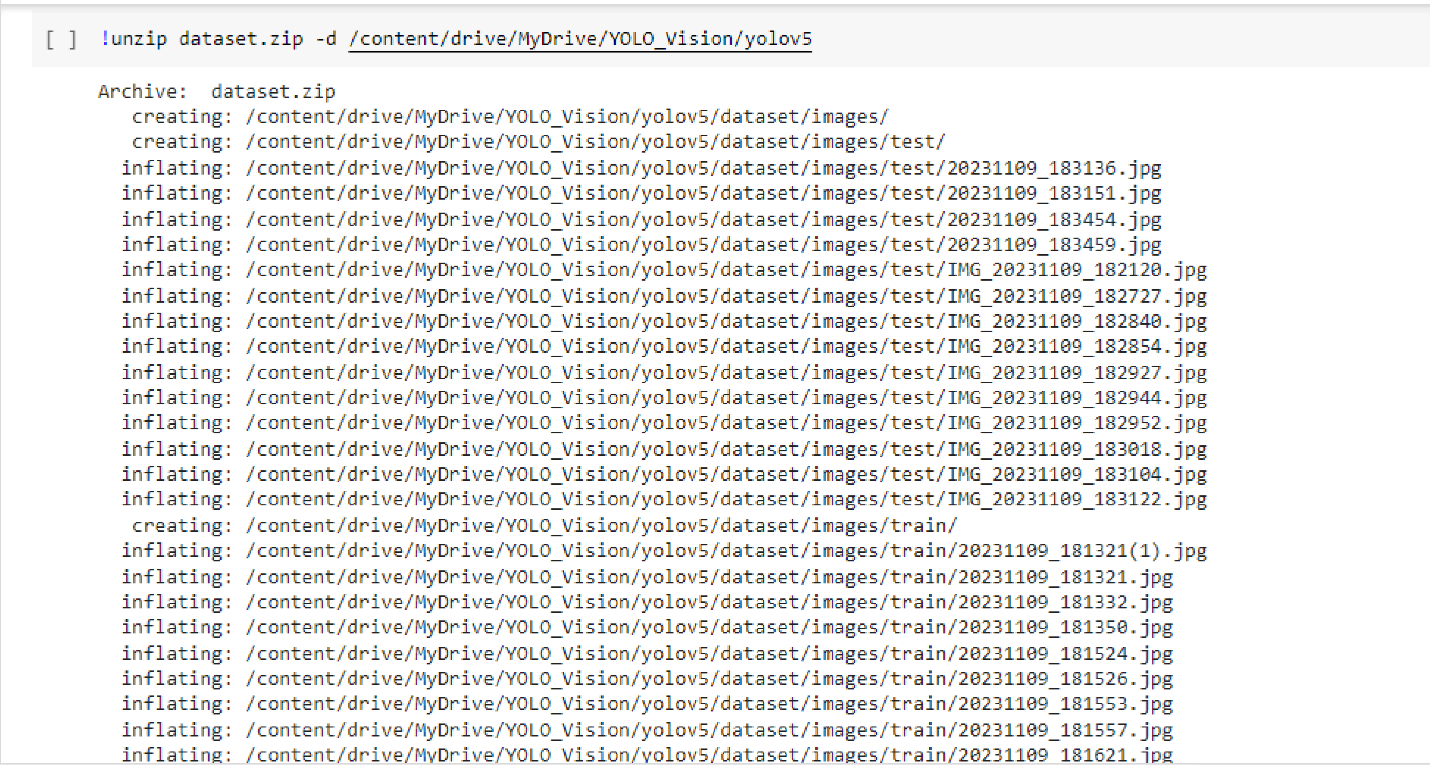
```
%cd /content/drive/MyDrive/YOLO_Vision
```

```
/content/drive/MyDrive/YOLO_Vision
```

```
#clone YOLOv5 and
!git clone https://github.com/ultralytics/yolov5  # clone repo
%cd yolov5
%pip install --upgrade pip
%pip install -r requirements.txt
import torch
import os
from IPython.display import Image, clear_output  # to display images

print(f"Setup complete. Using torch {torch.__version__} ({torch.cuda.get_device_properties(0).name if torch.cuda.is_available(
```

```
fatal: destination path 'yolov5' already exists and is not an empty directory.
/content/drive/MyDrive/YOLO_Vision/yolov5
Requirement already satisfied: pip in /usr/local/lib/python3.10/dist-packages (23.1.2)
Collecting pip
  Downloading pip-23.3.1-py3-none-any.whl (2.1 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 2.1/2.1 MB 29.8 MB/s eta 0:00:00
```

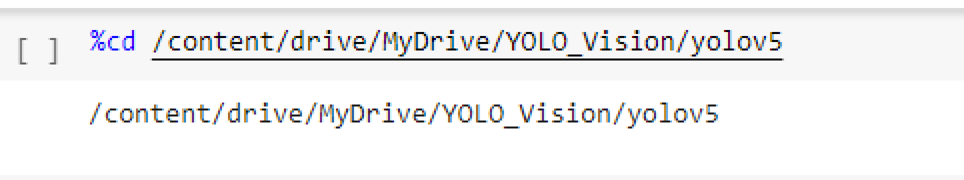
Processing Using Yolo



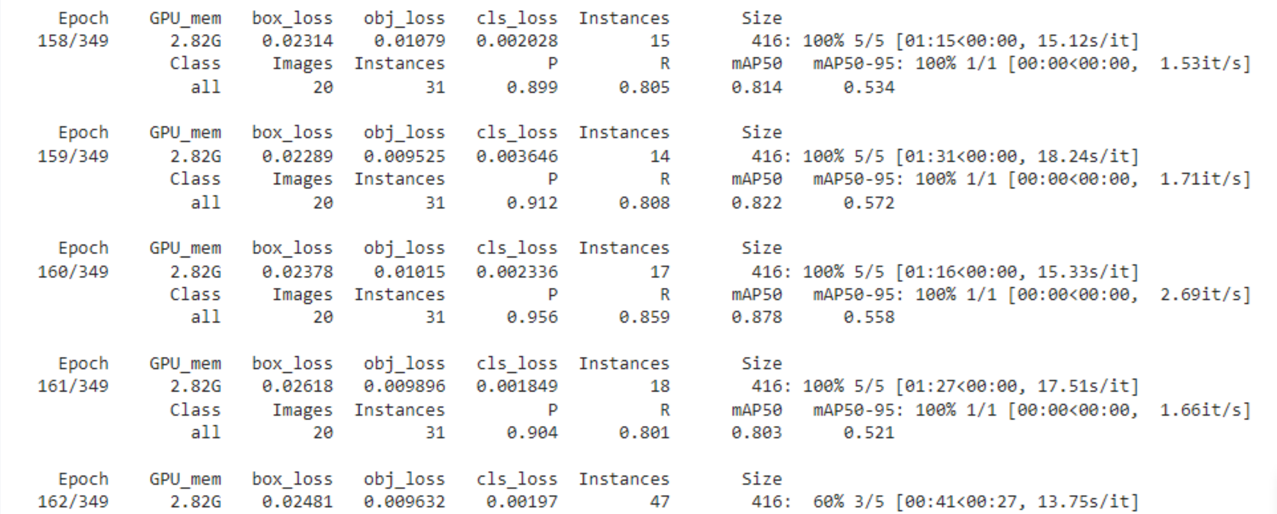
```
[ ]  !unzip dataset.zip -d /content/drive/MyDrive/YOLO_Vision/yolov5
```

```
Archive:  dataset.zip
   creating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/
   creating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/20231109_183136.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/20231109_183151.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/20231109_183454.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/20231109_183459.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/IMG_20231109_182120.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/IMG_20231109_182727.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/IMG_20231109_182840.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/IMG_20231109_182854.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/IMG_20231109_182927.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/IMG_20231109_182944.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/IMG_20231109_182952.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/IMG_20231109_183018.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/IMG_20231109_183104.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/test/IMG_20231109_183122.jpg
   creating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/train/
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/train/20231109_181321(1).jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/train/20231109_181321.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/train/20231109_181332.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/train/20231109_181350.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/train/20231109_181524.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/train/20231109_181526.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/train/20231109_181553.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/train/20231109_181557.jpg
  inflating: /content/drive/MyDrive/YOLO_Vision/yolov5/dataset/images/train/20231109_181621.jpg
```

Processing Using Yolo

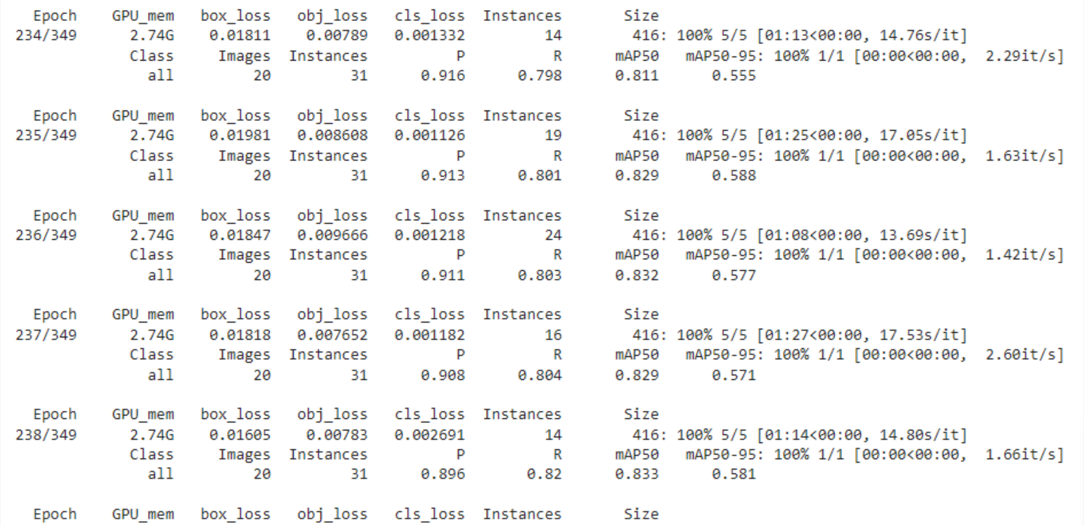


```
[ ]  %cd /content/drive/MyDrive/YOLO_Vision/yolov5

     /content/drive/MyDrive/YOLO_Vision/yolov5
```

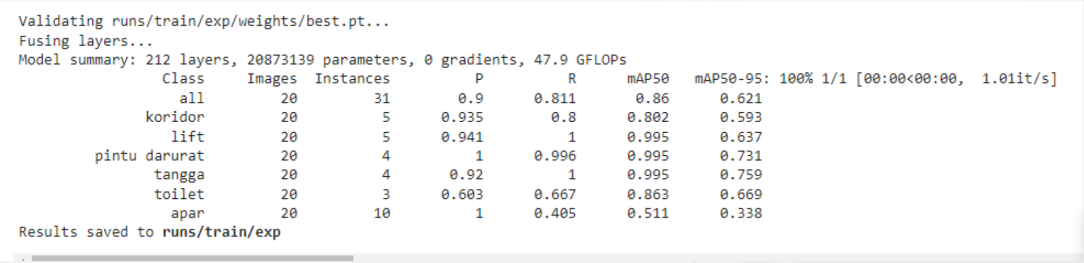


```
      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
    158/349      2.82G    0.02314    0.01079   0.002028         15        416: 100% 5/5 [01:15<00:00, 15.12s/it]
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100% 1/1 [00:00<00:00,  1.53it/s]
                   all         20         31      0.899      0.805      0.814      0.534

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
    159/349      2.82G    0.02289   0.009525   0.003646         14        416: 100% 5/5 [01:31<00:00, 18.24s/it]
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100% 1/1 [00:00<00:00,  1.71it/s]
                   all         20         31      0.912      0.808      0.822      0.572

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
    160/349      2.82G    0.02378    0.01015   0.002336         17        416: 100% 5/5 [01:16<00:00, 15.33s/it]
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100% 1/1 [00:00<00:00,  2.69it/s]
                   all         20         31      0.956      0.859      0.878      0.558

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
    161/349      2.82G    0.02618   0.009896   0.001849         18        416: 100% 5/5 [01:27<00:00, 17.51s/it]
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100% 1/1 [00:00<00:00,  1.66it/s]
                   all         20         31      0.904      0.801      0.803      0.521

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
    162/349      2.82G    0.02481   0.009632    0.00197         47        416:  60% 3/5 [00:41<00:27, 13.75s/it]
```

Result using yolo



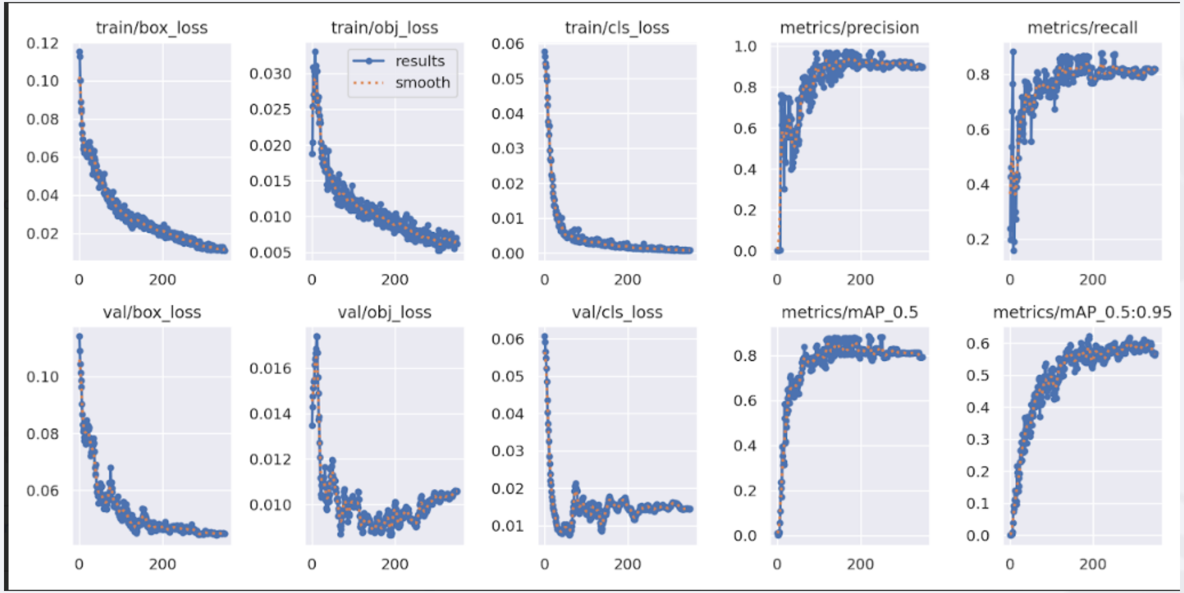
```
      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
    234/349      2.74G    0.01811    0.00789   0.001332         14        416: 100% 5/5 [01:13<00:00, 14.76s/it]
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100% 1/1 [00:00<00:00,  2.29it/s]
                   all         20         31      0.916      0.798      0.811      0.555

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
    235/349      2.74G    0.01981   0.008608   0.001126         19        416: 100% 5/5 [01:25<00:00, 17.05s/it]
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100% 1/1 [00:00<00:00,  1.63it/s]
                   all         20         31      0.913      0.801      0.829      0.588

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
    236/349      2.74G    0.01847   0.009666   0.001218         24        416: 100% 5/5 [01:08<00:00, 13.69s/it]
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100% 1/1 [00:00<00:00,  1.42it/s]
                   all         20         31      0.911      0.803      0.832      0.577

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
    237/349      2.74G    0.01818   0.007652   0.001182         16        416: 100% 5/5 [01:27<00:00, 17.53s/it]
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100% 1/1 [00:00<00:00,  2.60it/s]
                   all         20         31      0.908      0.804      0.829      0.571

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
    238/349      2.74G    0.01605    0.00783   0.002691         14        416: 100% 5/5 [01:14<00:00, 14.80s/it]
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100% 1/1 [00:00<00:00,  1.66it/s]
                   all         20         31      0.896       0.82      0.833      0.581

      Epoch    GPU_mem   box_loss   obj_loss   cls_loss  Instances       Size
```



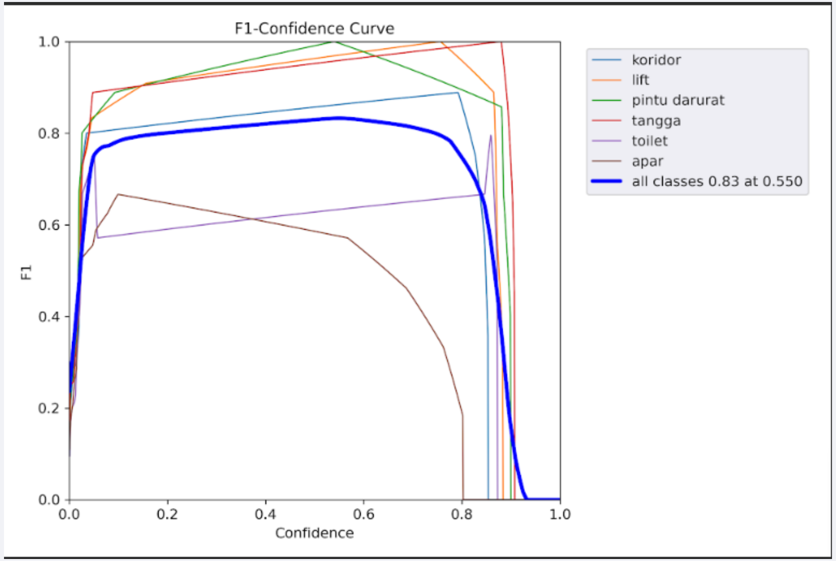
```
Validating runs/train/exp/weights/best.pt...
Fusing layers...
Model summary: 212 layers, 20873139 parameters, 0 gradients, 47.9 GFLOPs
                 Class     Images  Instances          P          R      mAP50   mAP50-95: 100% 1/1 [00:00<00:00,  1.01it/s]
                   all         20         31        0.9      0.811       0.86      0.621
               koridor         20          5      0.935        0.8      0.802      0.593
                  lift         20          5      0.941          1      0.995      0.637
         pintu darurat         20          4          1      0.996      0.995      0.731
                tangga         20          4       0.92          1      0.995      0.759
                toilet         20          3      0.603      0.667      0.863      0.669
                  apar         20         10          1      0.405      0.511      0.338
Results saved to runs/train/exp
```

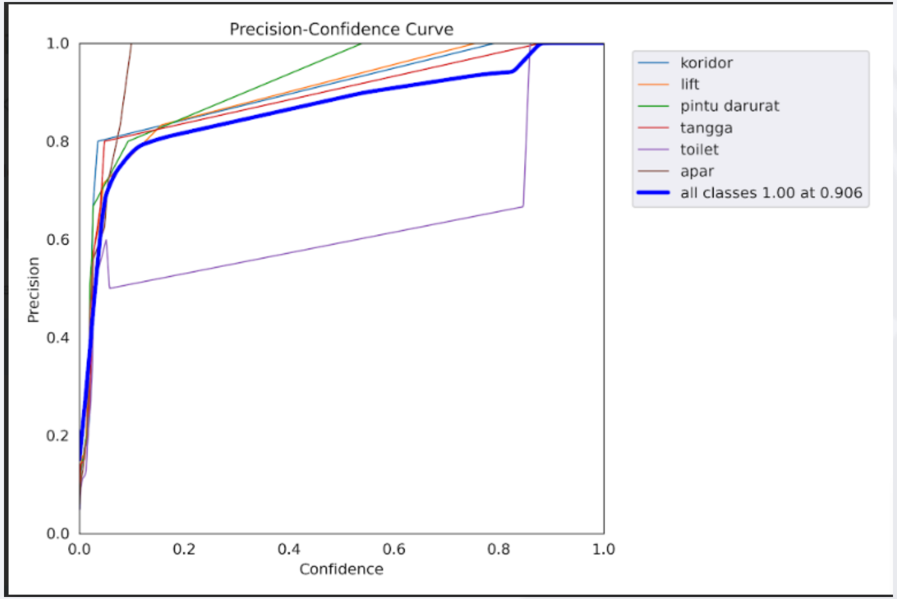
Result using yolo

Result with yolo

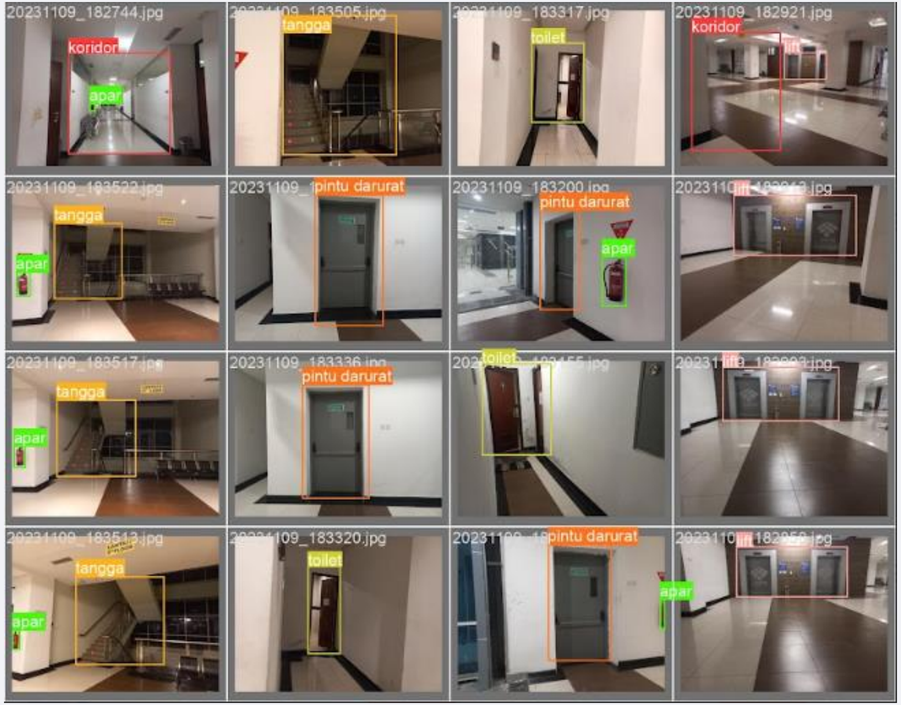


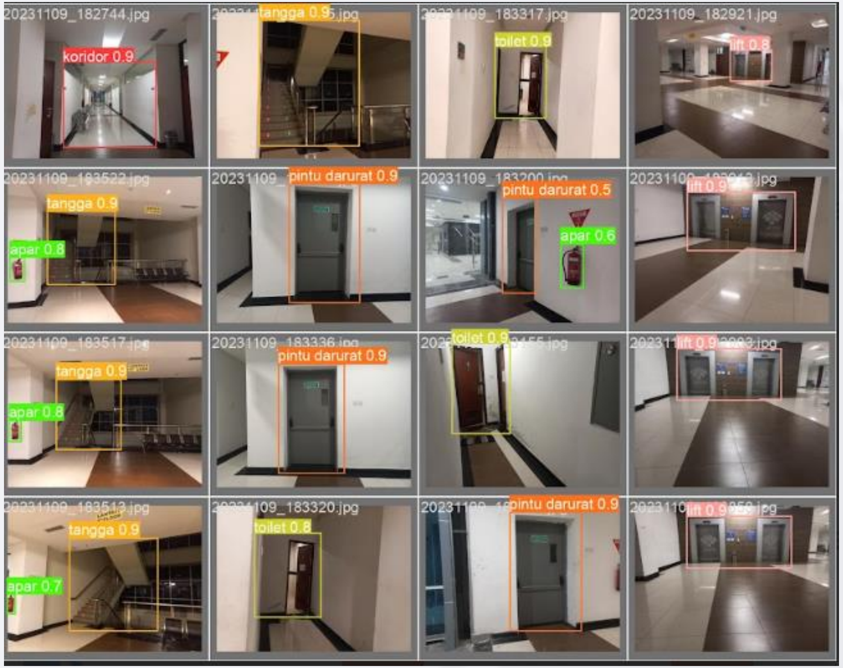
Result using yolo





Result using yolo





Perbandingan dengan metode yang digunakan kelompok lain

Kelompok	Metode	Dataset yang digunakan	Loss	Hasil Akurasi
Kelompok 1	CNN custom 2 layer	Ada 8 class names ['apar': 0, 'kelas': 1, 'koridor': 2, 'lift': 3, 'orang': 4, 'pintu_darurat': 5, 'pintu_ruang': 6, 'tangga': 7]	0.0169	0.936
	Yolo	Ada 6 class names: ["koridor", "lift", "pintu darurat", "tangga", "toilet", "apar"]	0.0007749	0.83
Kelompok 2	CNN custom	Ada 5 class names: ["koridor", "lift", "pintu darurat", "pintu_ruangan", "tangga”]	0.02	0.98
Kelompok 3	VGG16	-	0.0645	0.982

LinkCode

cnncustom:https://colab.research.google.com/drive/17cvyHYcCU9Zd_8FAL6VYJLNl-Y6mBq2C?usp=drive_link

yolo : https://colab.research.google.com/drive/1_9hkuF6cve2F_V_5QUblb-RFirSlYtTL#scrollTo=DZM4Mvp8j-gp

Link Youtube

https://youtu.be/3TIM57JCgXo

Terimakasih