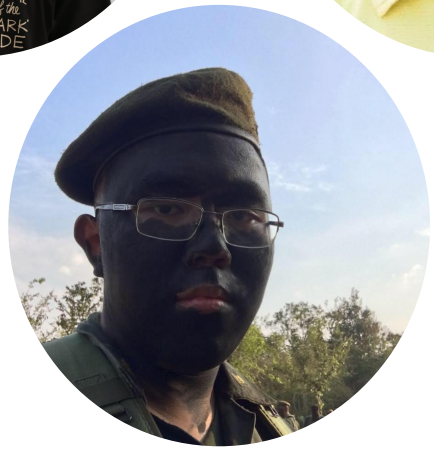
# Thai Dessert Classification

EGCO486
Image Processing

# Members

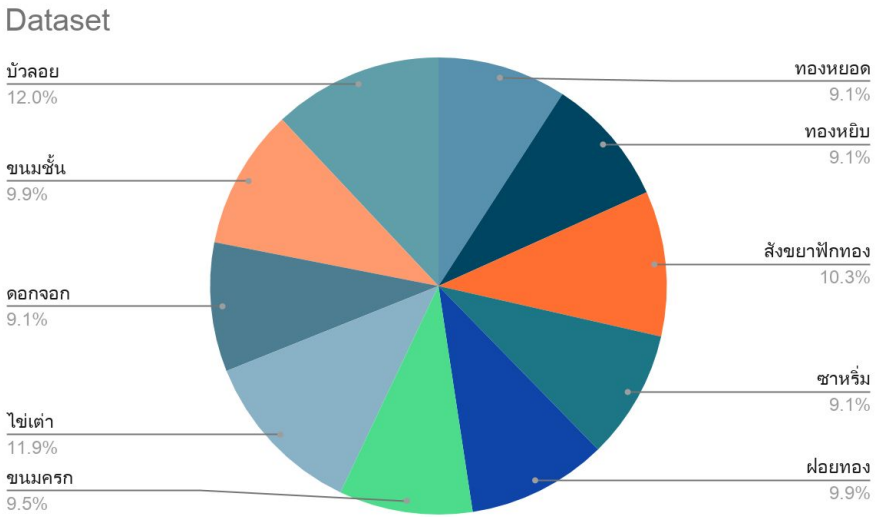




# Dataset

- ทองหยอด จำนวน 200 รูป
- ทองหยิบ จำนวน 200 รูป
- สังขยาฟักทอง จำนวน 225 รูป
- ซาหริ่ม จำนวน 200 รูป
- ฝอยทอง จำนวน 217 รูป
- ขนมครก จำนวน 207 รูป
- ไข่เต่า จำนวน 260 รูป
- ดอกจอก จำนวน 200 รูป
- ขนมชั้น จำนวน 217 รูป
- บัวลอย จำนวน 263 รูป

รวมทั้งหมด 2189 รูป











# Data Preparation

1. Download images with Chrome Extension Fatkun Batch Download Image
2. Store downloaded images in Google Drive with separate folder


3. Read and split data 80 to train 20 to validation using tf.keras.preprocessing.image_dataset_from_directory
4. Resize image to 160x160
5. Increase dataset by using augmentation method

# Image Load Configuration

```
train_batches = tf.keras.preprocessing.image_dataset_from_directory(
  dataset_path,
  validation_split=0.2,
  subset="training",
  seed=123,
  shuffle = True,
  image_size=(img_height, img_width),
  batch_size=BATCH_SIZE,
  label_mode='categorical')
```

```
validation_batches = tf.keras.preprocessing.image_dataset_from_directory(
  dataset_path,
  validation_split=0.2,
  subset="validation",
  seed=123,
  shuffle = True,
  image_size=(img_height, img_width),
  batch_size=BATCH_SIZE,
  label_mode='categorical')
```

# Augmented Example




# Methods Used

1

## InceptionV3

widely-used image recognition **model** that has been shown to attain greater than 78.1% accuracy on the ImageNet dataset

2

## MobileNetV2

Light weight model
Faster - low latency - designed for limited resource

3

## Xception

The pretrained network can classify images into 1000 object categories, such as keyboard, mouse, pencil, and many animals.

# Model Summary

```
global_average_layer = GlobalAveragePooling2D()
preds = Dense(10,activation='softmax')
base_learning_rate = 0.0001
initial_epochs = 50

Fine tuning at last 3 layer
fine_tune_epochs = 20
```

# Test Method

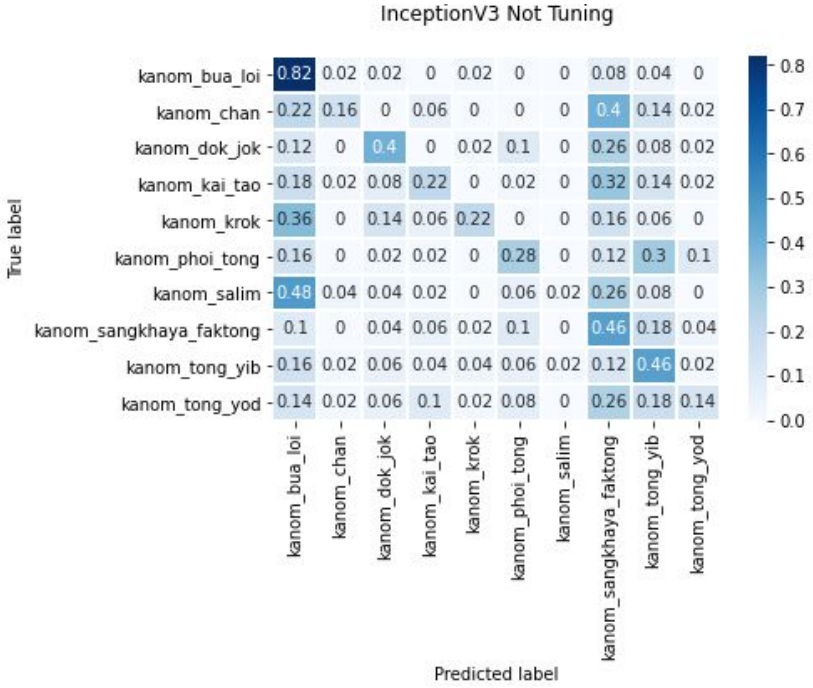
```
test_generator = ImageDataGenerator()
test_data_generator = test_generator.flow_from_directory(
    dataset_test_path,
    target_size=(160, 160),
    batch_size=32,
    shuffle=False)
test_steps_per_epoch = np.math.ceil(test_data_generator.samples / test_data_generator.batch_size)

predictions = modelXecption.predict_generator(test_data_generator, steps=test_steps_per_epoch)
# Get most likely class
predicted_classes = np.argmax(predictions, axis=1)
true_classes = test_data_generator.classes
class_labels = list(test_data_generator.class_indices.keys())

report = classification_report(true_classes, predicted_classes, target_names=class_labels)
print(report)
```

# Result

## InceptionV3 (Not Tuned)

Found 500 images belonging to 10 classes.

| | precision | recall | f1-score |
|---|---|---|---|
| kanom_bua_loi | 0.30 | 0.82 | 0.44 |
| kanom_chan | 0.57 | 0.16 | 0.25 |
| kanom_dok_jok | 0.47 | 0.40 | 0.43 |
| kanom_kai_tao | 0.38 | 0.22 | 0.28 |
| kanom_krok | 0.65 | 0.22 | 0.33 |
| kanom_phoi_tong | 0.40 | 0.28 | 0.33 |
| kanom_salim | 0.50 | 0.02 | 0.04 |
| kanom_sangkhaya_faktong | 0.19 | 0.46 | 0.27 |
| kanom_tong_yib | 0.28 | 0.46 | 0.35 |
| kanom_tong_yod | 0.39 | 0.14 | 0.21 |
| accuracy | | | 0.32 |
| macro avg | 0.41 | 0.32 | 0.29 |
| weighted avg | 0.41 | 0.32 | 0.29 |

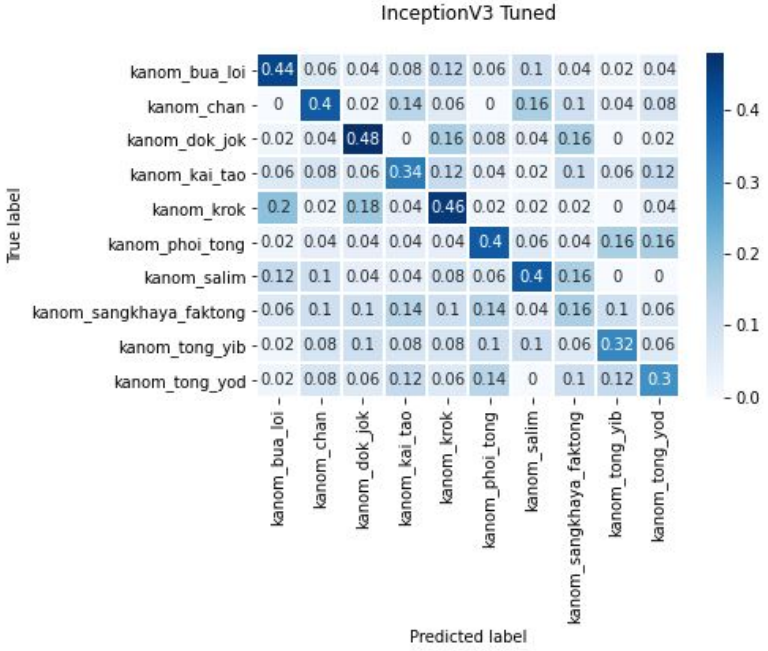


# Result

## InceptionV3 (Tuned)

Found 500 images belonging to 10 classes.

| | precision | recall | f1-score |
|---|---|---|---|
| kanom_bua_loi | 0.46 | 0.44 | 0.45 |
| kanom_chan | 0.40 | 0.40 | 0.40 |
| kanom_dok_jok | 0.43 | 0.48 | 0.45 |
| kanom_kai_tao | 0.33 | 0.34 | 0.34 |
| kanom_krok | 0.36 | 0.46 | 0.40 |
| kanom_phoi_tong | 0.38 | 0.40 | 0.39 |
| kanom_salim | 0.43 | 0.40 | 0.41 |
| kanom_sangkhaya_faktong | 0.17 | 0.16 | 0.16 |
| kanom_tong_yib | 0.39 | 0.32 | 0.35 |
| kanom_tong_yod | 0.34 | 0.30 | 0.32 |
| accuracy | | | 0.37 |
| macro avg | 0.37 | 0.37 | 0.37 |
| weighted avg | 0.37 | 0.37 | 0.37 |

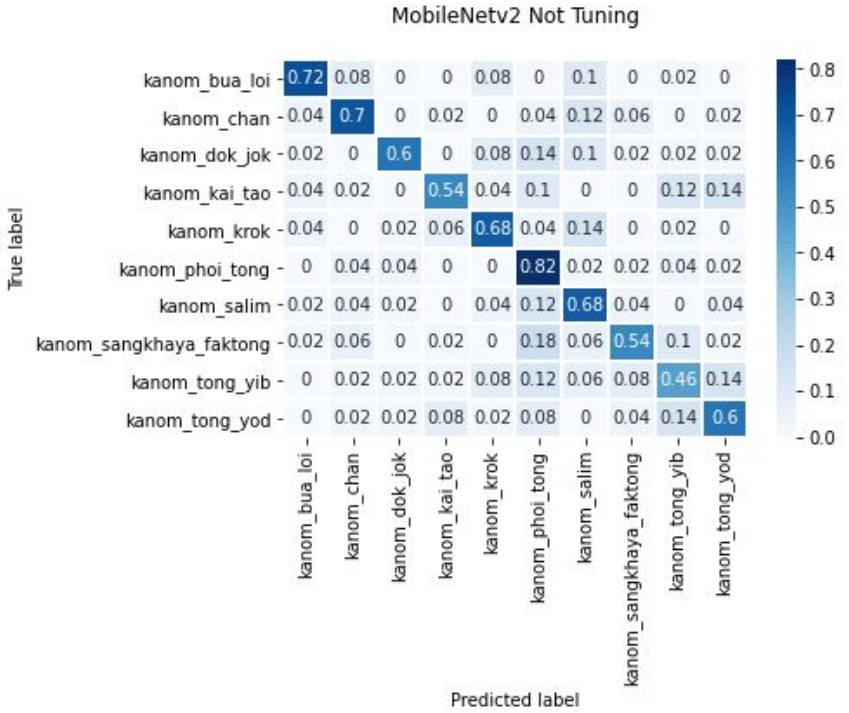


# Result

## MobileNetV2 (Not Tuned)

Found 500 images belonging to 10 classes.

| | precision | recall | f1-score |
|---|---|---|---|
| kanom_bua_loi | 0.80 | 0.72 | 0.76 |
| kanom_chan | 0.71 | 0.70 | 0.71 |
| kanom_dok_jok | 0.83 | 0.60 | 0.70 |
| kanom_kai_tao | 0.73 | 0.54 | 0.62 |
| kanom_krok | 0.67 | 0.68 | 0.67 |
| kanom_phoi_tong | 0.50 | 0.82 | 0.62 |
| kanom_salim | 0.53 | 0.68 | 0.60 |
| kanom_sangkhaya_faktong | 0.68 | 0.54 | 0.60 |
| kanom_tong_yib | 0.50 | 0.46 | 0.48 |
| kanom_tong_yod | 0.60 | 0.60 | 0.60 |
| accuracy | | | 0.63 |
| macro avg | 0.66 | 0.63 | 0.64 |
| weighted avg | 0.66 | 0.63 | 0.64 |

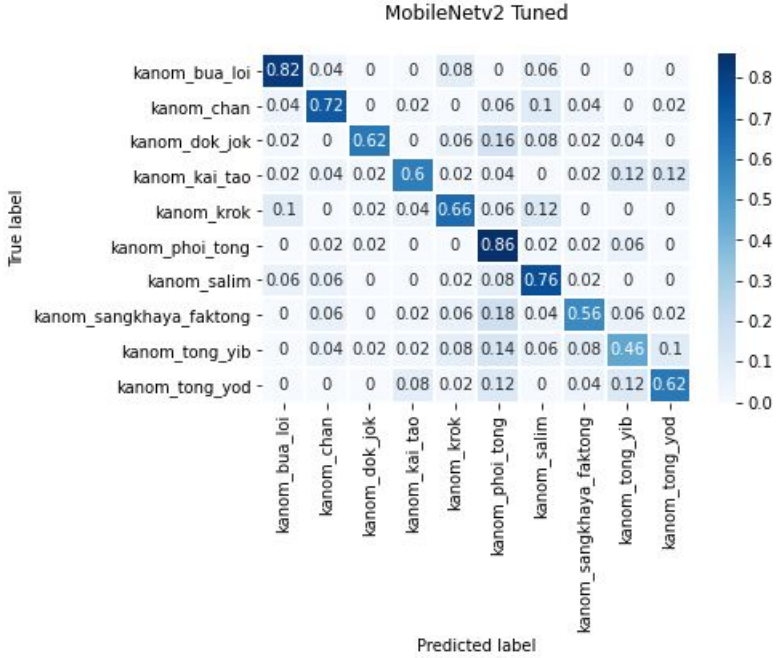


# Result

## MobileNetV2 (Tuned)

Found 500 images belonging to 10 classes.

| | precision | recall | f1-score |
|---|---|---|---|
| kanom_bua_loi | 0.77 | 0.82 | 0.80 |
| kanom_chan | 0.73 | 0.72 | 0.73 |
| kanom_dok_jok | 0.89 | 0.62 | 0.73 |
| kanom_kai_tao | 0.77 | 0.60 | 0.67 |
| kanom_krok | 0.66 | 0.66 | 0.66 |
| kanom_phoi_tong | 0.51 | 0.86 | 0.64 |
| kanom_salim | 0.61 | 0.76 | 0.68 |
| kanom_sangkhaya_faktong | 0.70 | 0.56 | 0.62 |
| kanom_tong_yib | 0.53 | 0.46 | 0.49 |
| kanom_tong_yod | 0.70 | 0.62 | 0.66 |
| accuracy | | | 0.67 |
| macro avg | 0.69 | 0.67 | 0.67 |
| weighted avg | 0.69 | 0.67 | 0.67 |

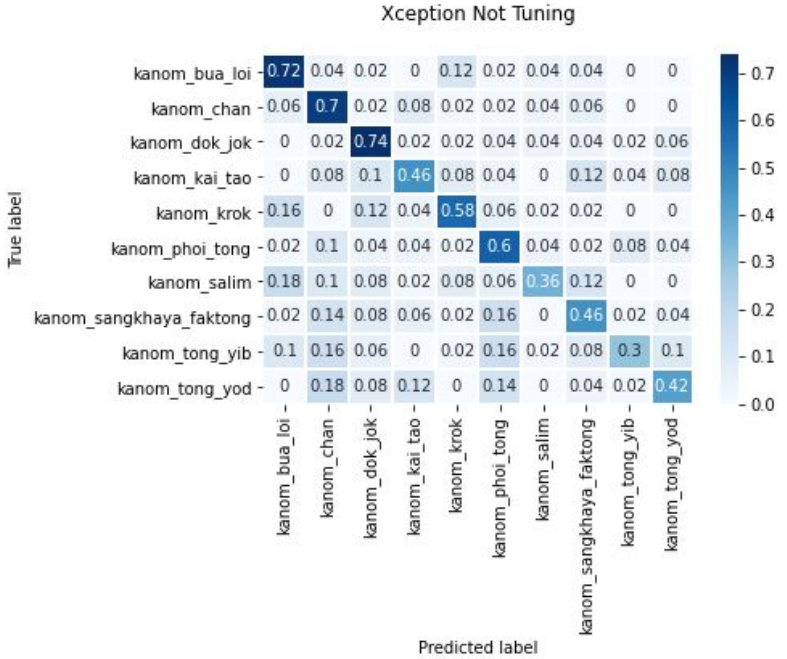


# Result

## Xception (Not Tuned)

Found 500 images belonging to 10 classes.

| | precision | recall | f1-score |
|---|---|---|---|
| kanom_bua_loi | 0.57 | 0.72 | 0.64 |
| kanom_chan | 0.46 | 0.70 | 0.56 |
| kanom_dok_jok | 0.55 | 0.74 | 0.63 |
| kanom_kai_tao | 0.55 | 0.46 | 0.50 |
| kanom_krok | 0.60 | 0.58 | 0.59 |
| kanom_phoi_tong | 0.46 | 0.60 | 0.52 |
| kanom_salim | 0.64 | 0.36 | 0.46 |
| kanom_sangkhaya_faktong | 0.46 | 0.46 | 0.46 |
| kanom_tong_yib | 0.62 | 0.30 | 0.41 |
| kanom_tong_yod | 0.57 | 0.42 | 0.48 |
| accuracy | | | 0.53 |
| macro avg | 0.55 | 0.53 | 0.52 |
| weighted avg | 0.55 | 0.53 | 0.52 |



# Result

## Xception (Tuned)

Found 500 images belonging to 10 classes.

| | precision | recall | f1-score |
|---|---|---|---|
| kanom_bua_loi | 0.44 | 0.78 | 0.56 |
| kanom_chan | 0.48 | 0.28 | 0.35 |
| kanom_dok_jok | 0.45 | 0.56 | 0.50 |
| kanom_kai_tao | 0.34 | 0.54 | 0.42 |
| kanom_krok | 0.56 | 0.48 | 0.52 |
| kanom_phoi_tong | 0.37 | 0.52 | 0.43 |
| kanom_salim | 0.50 | 0.28 | 0.36 |
| kanom_sangkhaya_faktong | 0.34 | 0.26 | 0.30 |
| kanom_tong_yib | 0.36 | 0.08 | 0.13 |
| kanom_tong_yod | 0.39 | 0.38 | 0.38 |
| accuracy | | | 0.42 |
| macro avg | 0.42 | 0.42 | 0.39 |
| weighted avg | 0.42 | 0.42 | 0.39 |

# Discussion

| | InceptionV3 | MobileNetV2 | Xception |
|---|---|---|---|
| Accuracy | 0.32 | 0.67 | 0.53 |
| F1-score | 0.29 | 0.64 | 0.52 |
| Precision | 0.41 | 0.66 | 0.55 |
| Recall | 0.32 | 0.63 | 0.53 |

# Thank You For Your Attention

# DEMO TIME!