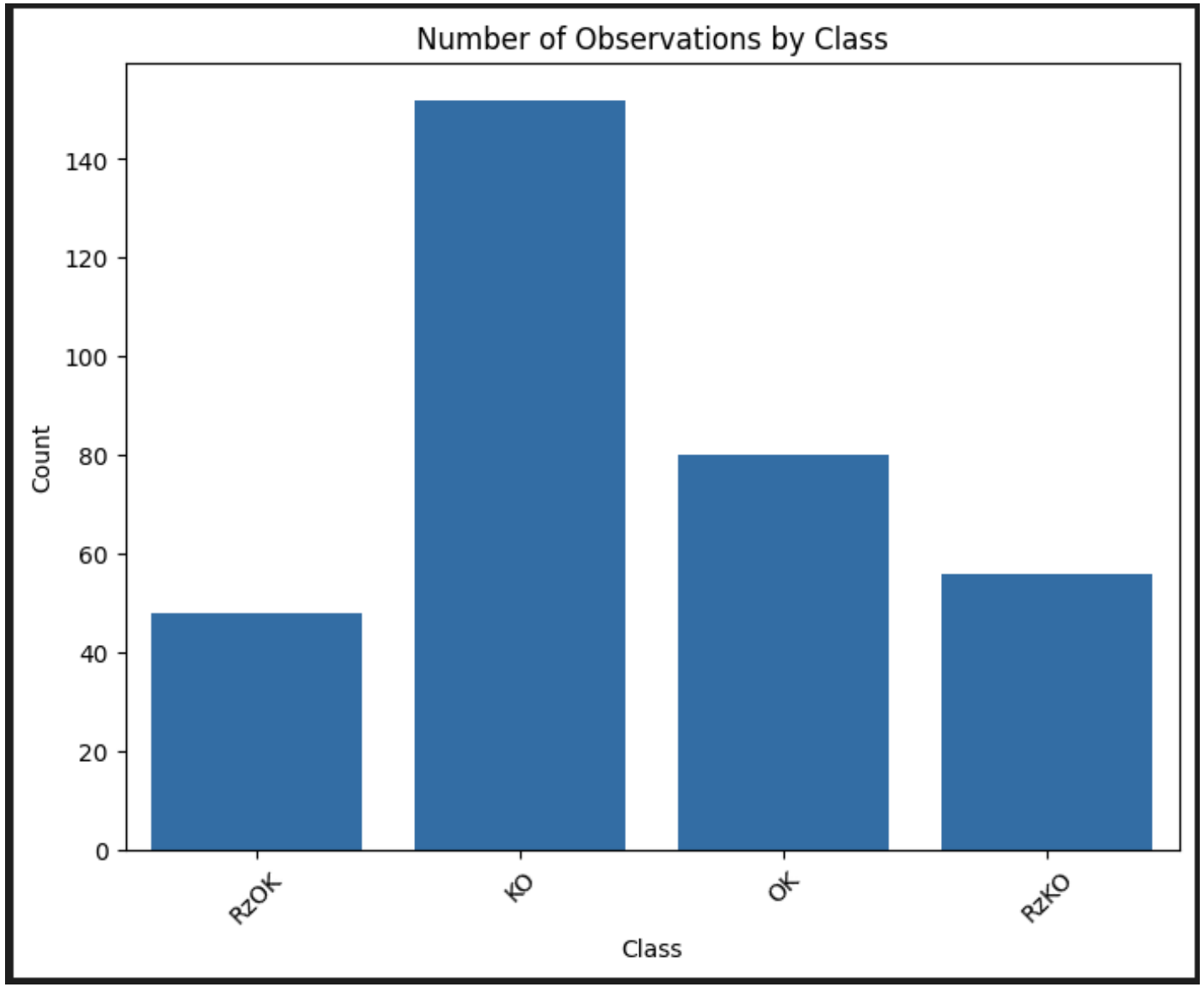
IMPLEMENTATION

November 2024

TRAIN DATASET

- 4 classes
  - KO: 140 samples
  - OK: 80 samples
  - RzKO: 55 samples
  - RzOK: 50 samples

DATASET


Number of Observations by Class
Count
0
20
40
60
80
100
120
140
RzOK
KO
OK
RzKO
Class

TEST DATASET

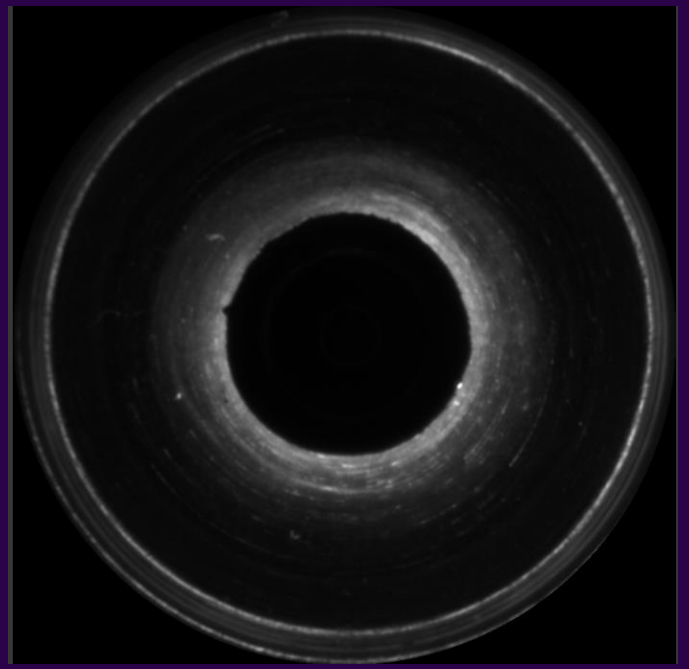
- 4 classes
  - KO: 16 samples
  - OK: 9 samples
  - RzKO: 14 samples
  - RzOK: 16 samples

MODELS

1. MobileNetV3Large
2. EfficientNet B0
3. Resnet50

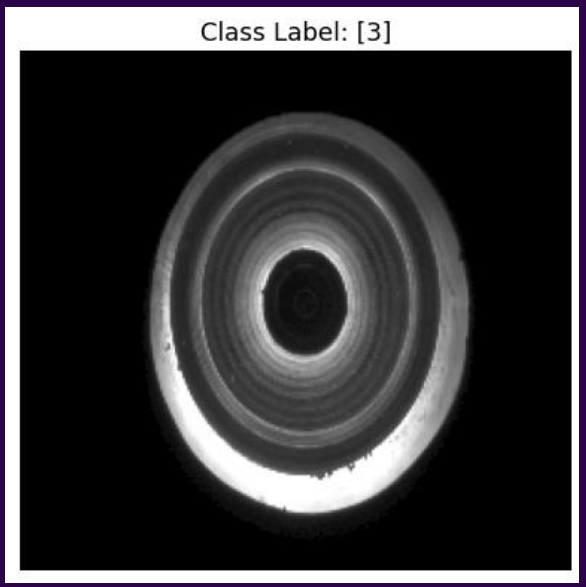
CROP

- In this model, I crop central part of all images in our dataset to only train model on the part which we expect anomaly
- Hese you can see result after apply crop function on images in dataset



GAMMA TRANSFORM

- Apply gamma on all dataset
- add new images to dataset
- Dataset contain normal images + gamma version
- gamma_value = 1.5



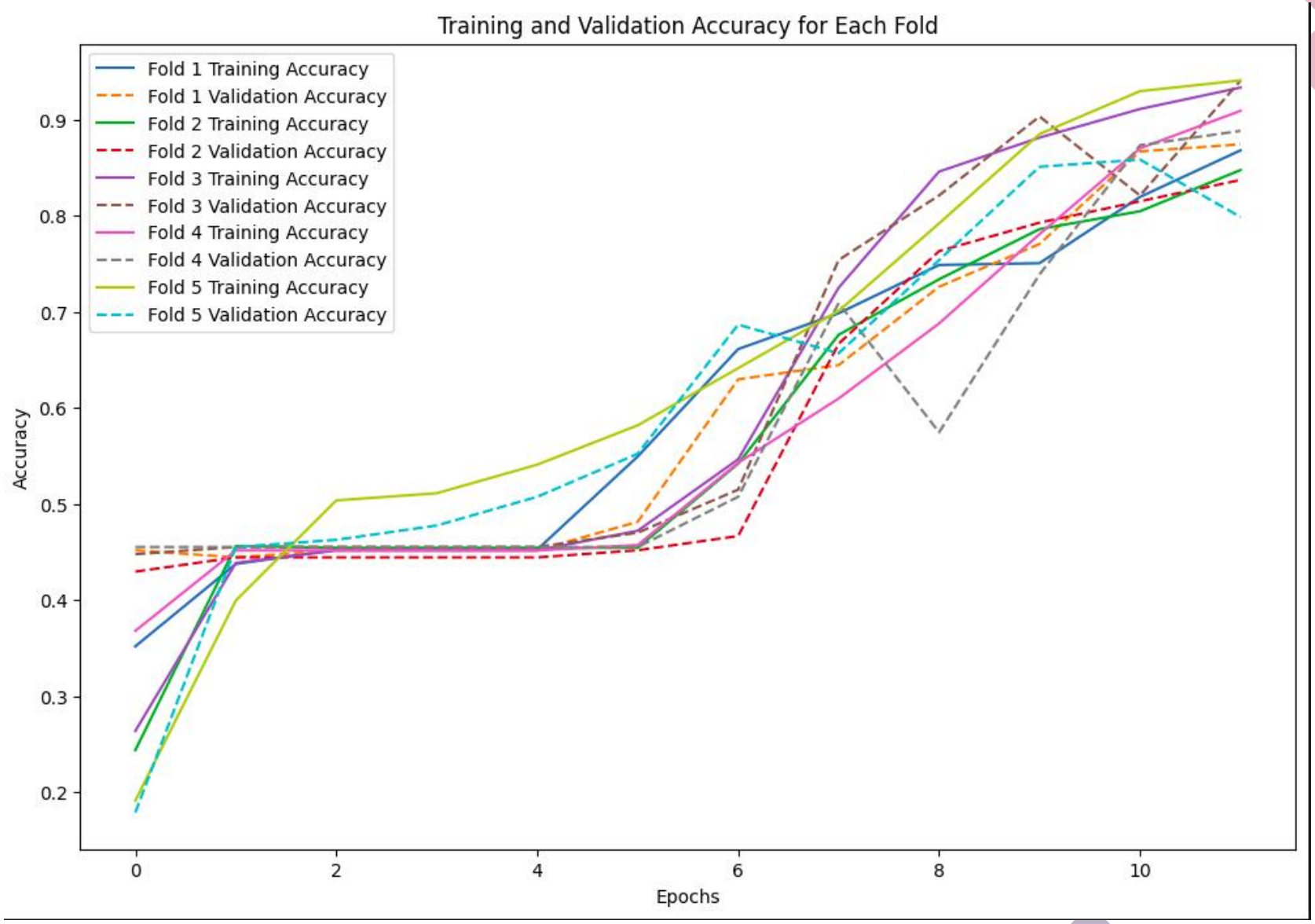
CROSS VALIDATION

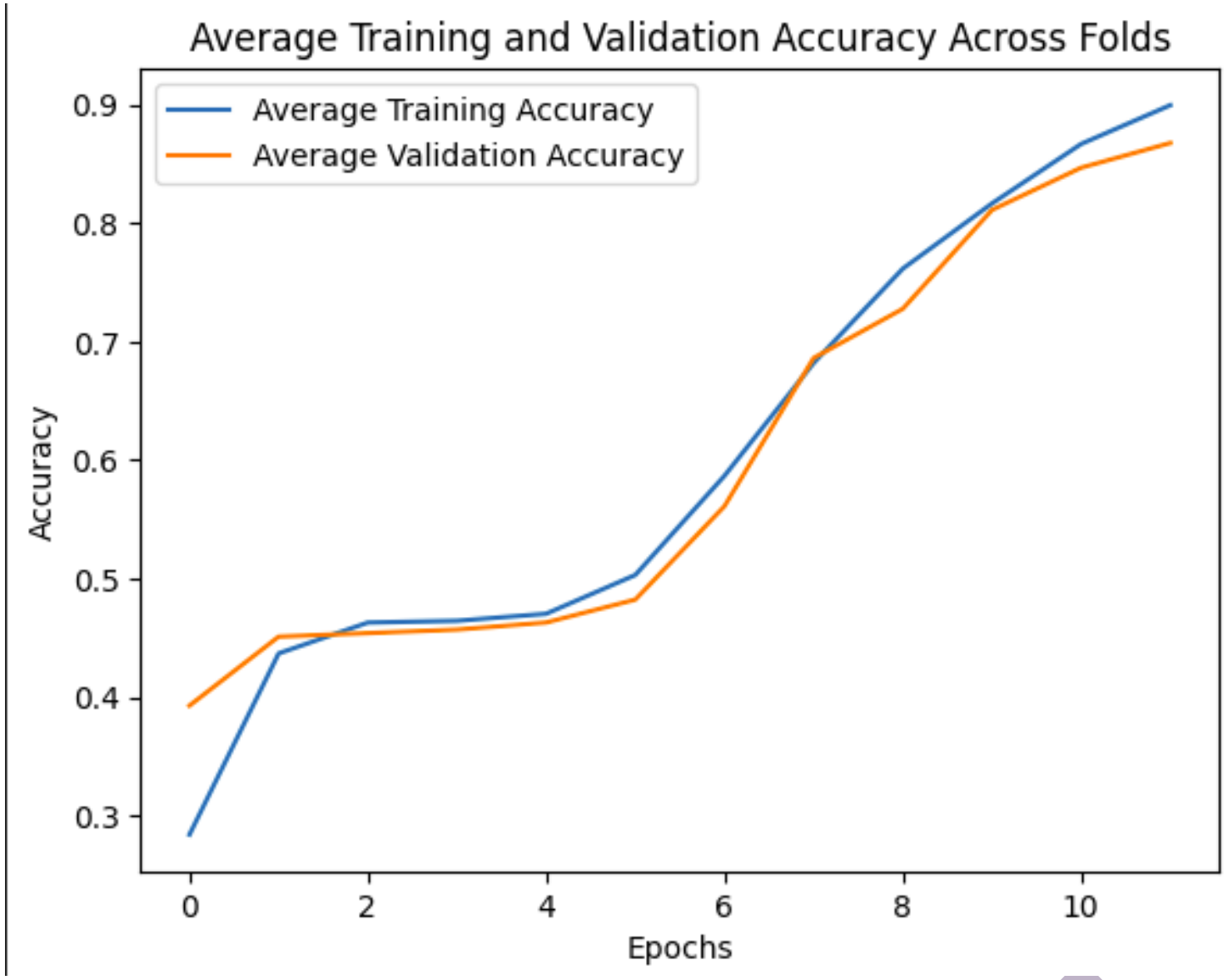
- Use StratifiedKFold
- 5 FOLDS
- Save weights of best cross-validation
- ResNet50 classifier
- Loss function: sparse categorical crossentropy
- Optimizer: SGD
- Learning rate: Cosine Decay with Warm-Up
  - weight_decay=5e-4,
  - momentum=0.9
- Train for 13 epochs
- gamma_value = 1.6

CROSS VALIDATION

- Input image: (224,224)
- BATCH SIZE = 32

RESULT FOR CROSS VALIDATION


Training and Validation Accuracy for Each Fold
Fold 1 Training Accuracy
Fold 1 Validation Accuracy
Fold 2 Training Accuracy
Fold 2 Validation Accuracy
Fold 3 Training Accuracy
Fold 3 Validation Accuracy
Fold 4 Training Accuracy
Fold 4 Validation Accuracy
Fold 5 Training Accuracy
Fold 5 Validation Accuracy
Accuracy
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Epochs
0
2
4
6
8
10

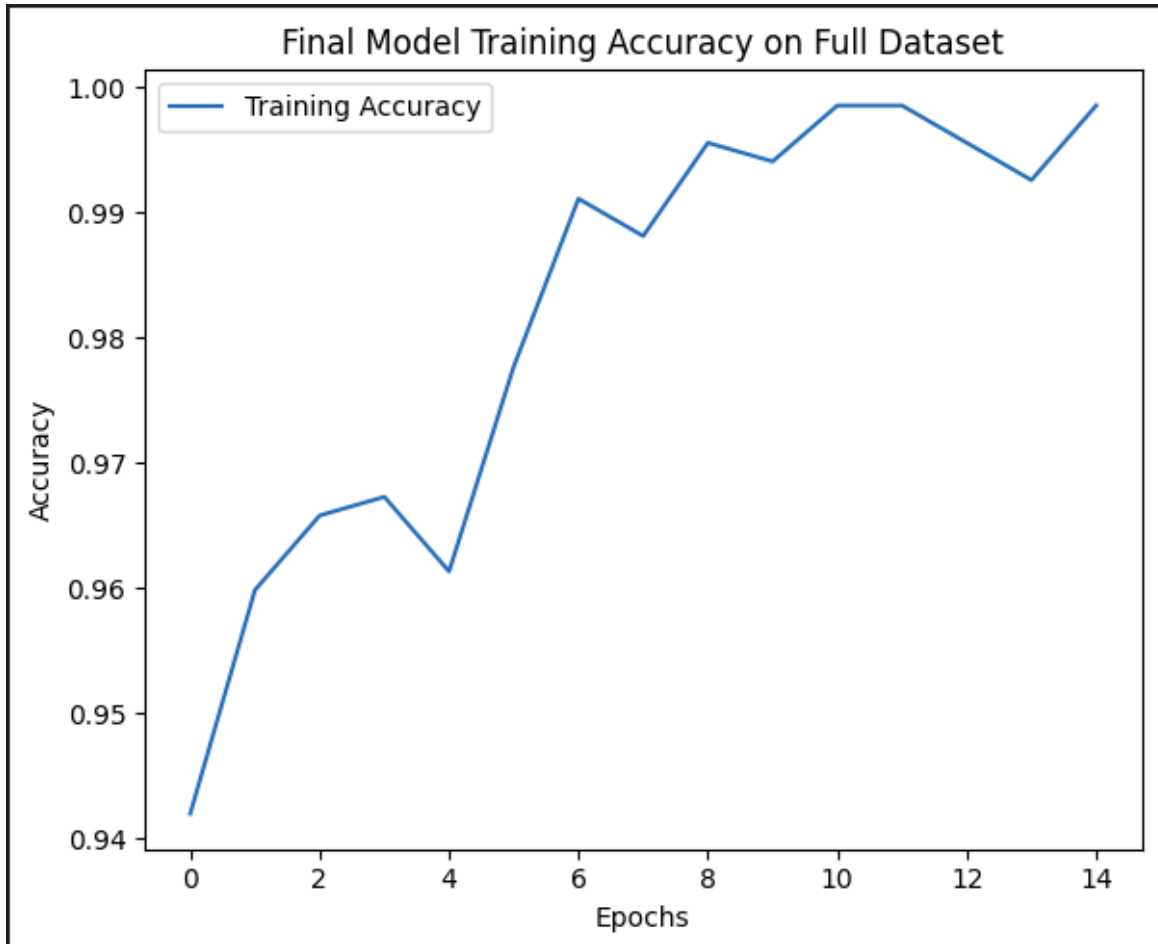

Average Training and Validation Accuracy Across Folds
Average Training Accuracy
Average Validation Accuracy
Accuracy
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0
2
4
6
8
10
Epochs

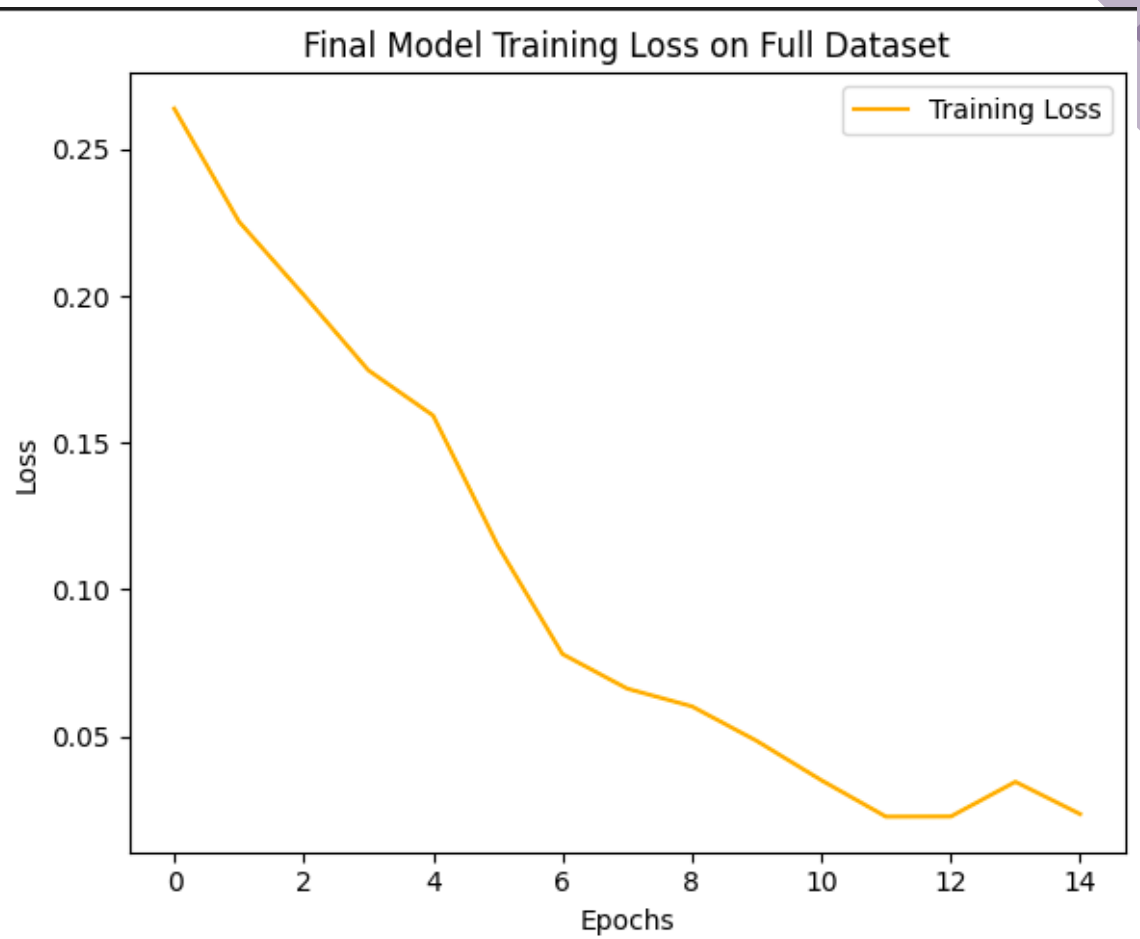
MAIN MODEL

- Load best weights from cross-validation
- Use whole dataset for train
- Loss function: sparse categorical crossentropy
- Optimizer: SGD
- Learning rate: Cosine Decay with Warm-Up
  - weight_decay=5e-4
  - momentum=0.9
- Train for 15 epochs

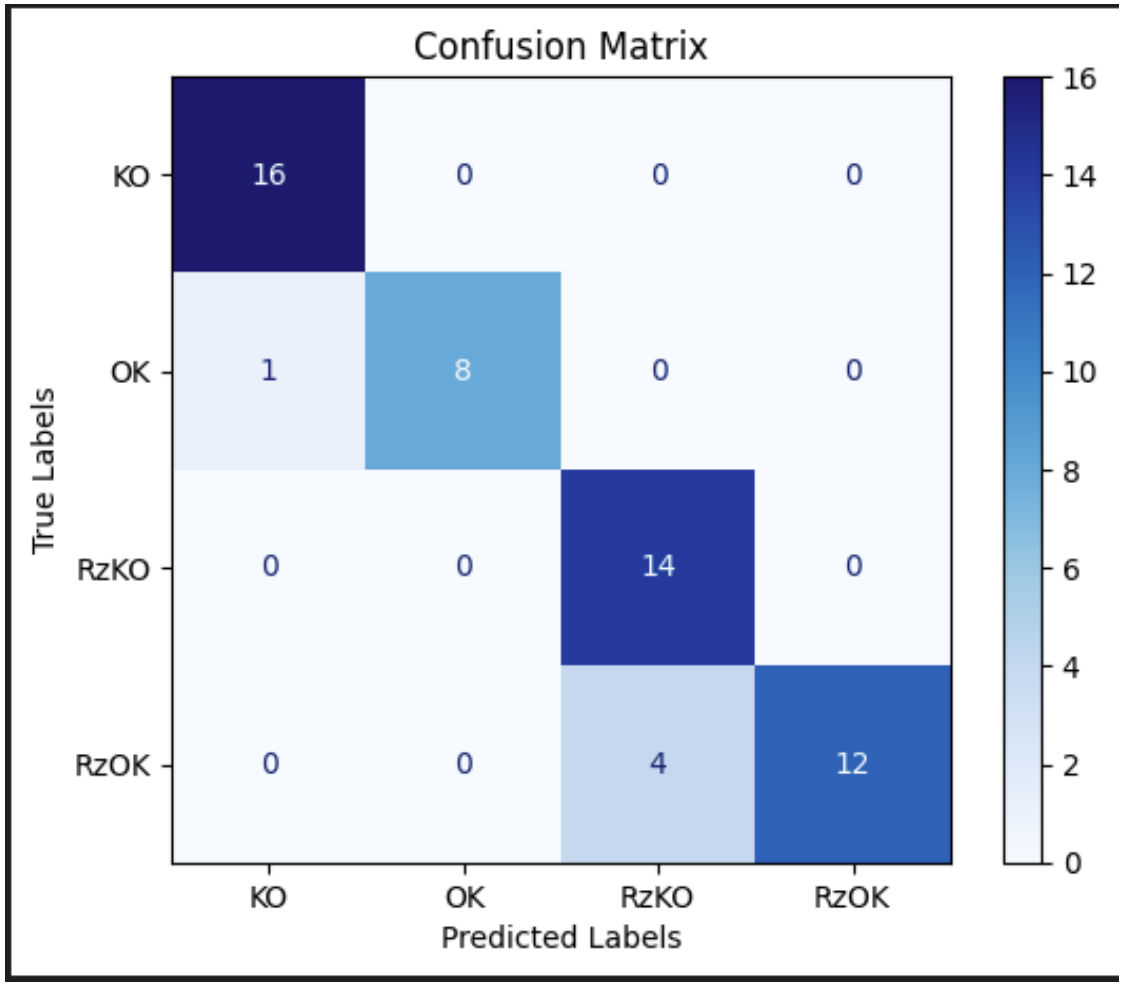
TRAINING FINAL MODEL

```
Epoch 1/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 35s 881ms/step - accuracy: 0.9365 - loss: 0.2882
Epoch 2/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 21s 392ms/step - accuracy: 0.9642 - loss: 0.2439
Epoch 3/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 6s 256ms/step - accuracy: 0.9761 - loss: 0.2015
Epoch 4/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 6s 260ms/step - accuracy: 0.9643 - loss: 0.1888
Epoch 5/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 6s 263ms/step - accuracy: 0.9631 - loss: 0.1649
Epoch 6/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 11s 499ms/step - accuracy: 0.9721 - loss: 0.1314
Epoch 7/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 6s 260ms/step - accuracy: 0.9941 - loss: 0.0847
Epoch 8/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 6s 260ms/step - accuracy: 0.9948 - loss: 0.0668
Epoch 9/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 6s 258ms/step - accuracy: 0.9963 - loss: 0.0669
Epoch 10/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 6s 257ms/step - accuracy: 0.9963 - loss: 0.0510
Epoch 11/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 6s 257ms/step - accuracy: 0.9969 - loss: 0.0439
Epoch 12/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 6s 256ms/step - accuracy: 0.9990 - loss: 0.0237
Epoch 13/15
...
Epoch 14/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 6s 255ms/step - accuracy: 0.9926 - loss: 0.0358
Epoch 15/15
21/21 ━━━━━━━━━━━━━━━━━━━━ 6s 255ms/step - accuracy: 0.9997 - loss: 0.0236
```


Final Model Training Accuracy on Full Dataset
Training Accuracy
Accuracy
Epochs
1.00
0.99
0.98
0.97
0.96
0.95
0.94
0
2
4
6
8
10
12
14


Final Model Training Loss on Full Dataset
Training Loss
Loss
Epochs
0.25
0.20
0.15
0.10
0.05
0
2
4
6
8
10
12
14

RESULT FOR FINAL MODEL




```
Found 55 files belonging to 4 classes.
Class names: ['KO', 'OK', 'RzKO', 'RzOK']
2/2 ━━━━━━━━━━━━━━━━━━━━ 1s 238ms/step - accuracy: 0.8977 - loss: 0.3074

Test Loss: 0.28312137722969055
Test Accuracy: 0.9090908765792847
1/1 ━━━━━━━━━━━━━━━━━━━━ 2s 2s/step
1/1 ━━━━━━━━━━━━━━━━━━━━ 1s 1s/step
```