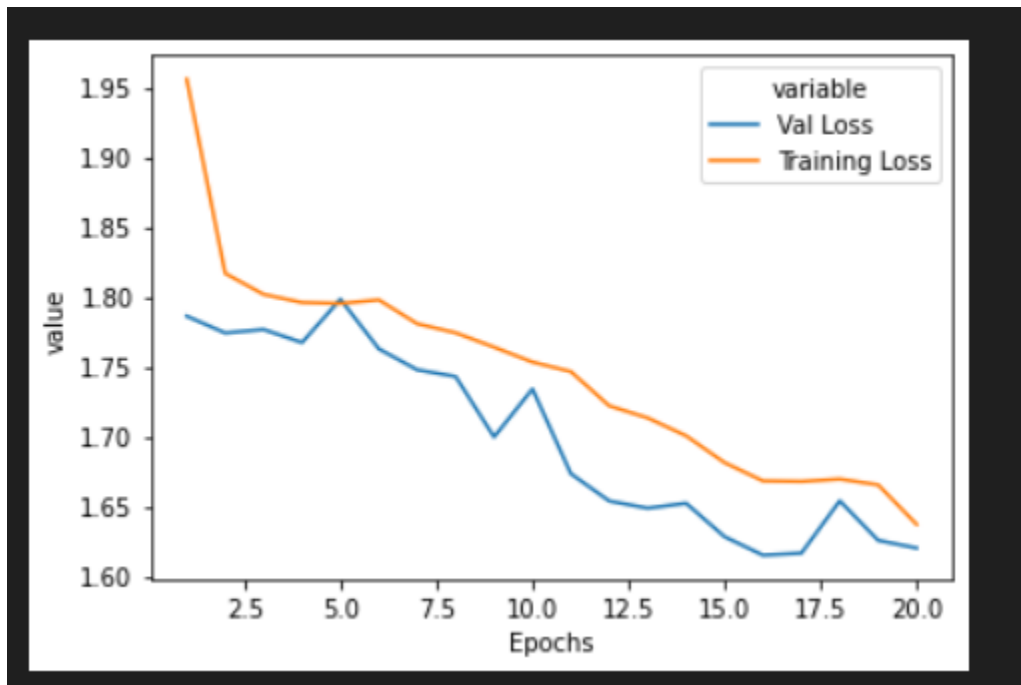


First Model Summary

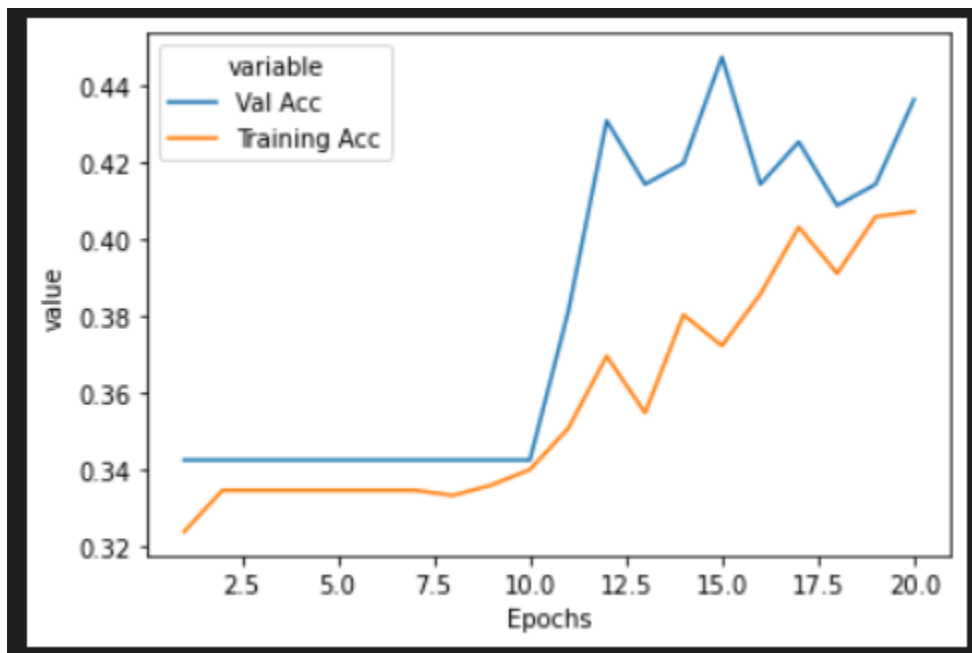
Model: "sequential"

Layer (type)	Output Shape	Param #
=====		
cnv_layer_1 (Conv2D)	(None, 224, 224, 32)	896
max_pool_layer_1 (MaxPooling2D)	(None, 112, 112, 32)	0
cnv_layer_2 (Conv2D)	(None, 112, 112, 32)	9248
max_pool_layer_2 (MaxPooling2D)	(None, 56, 56, 32)	0
global_average_pooling2d (GlobalAveragePooling2D)	(None, 32)	0
dense_layer_1 (Dense)	(None, 128)	4224
dense_layer_2 (Dense)	(None, 128)	16512
output (Dense)	(None, 9)	1161
=====		
Total params: 32,041		
Trainable params: 32,041		
Non-trainable params: 0		
=====		

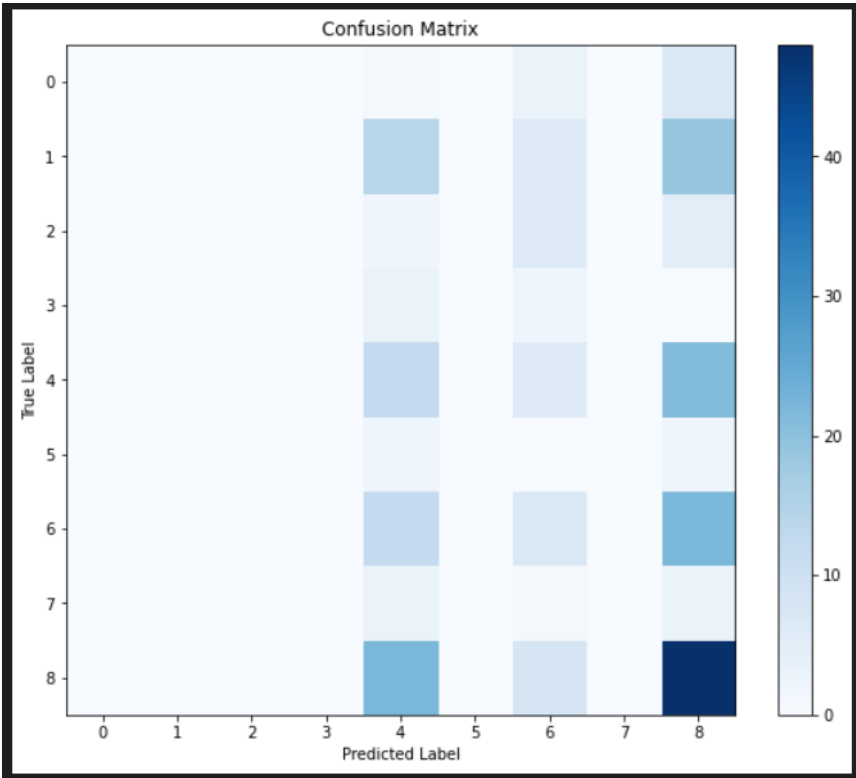
First Model Loss Over Epochs



First Model Accuracy Over Epochs



First Model Confusion Matrix



First Model Classification Report

Classification Report				
	precision	recall	f1-score	support
0	0.00	0.00	0.00	11
1	0.00	0.00	0.00	39
2	0.00	0.00	0.00	13
3	0.00	0.00	0.00	5
4	0.17	0.31	0.22	39
5	0.00	0.00	0.00	4
6	0.18	0.17	0.17	41
7	0.00	0.00	0.00	7
8	0.38	0.62	0.47	78
accuracy			0.28	237
macro avg	0.08	0.12	0.10	237
weighted avg	0.18	0.28	0.22	237

Transfer Learning Model Summary

Model: "sequential_1"

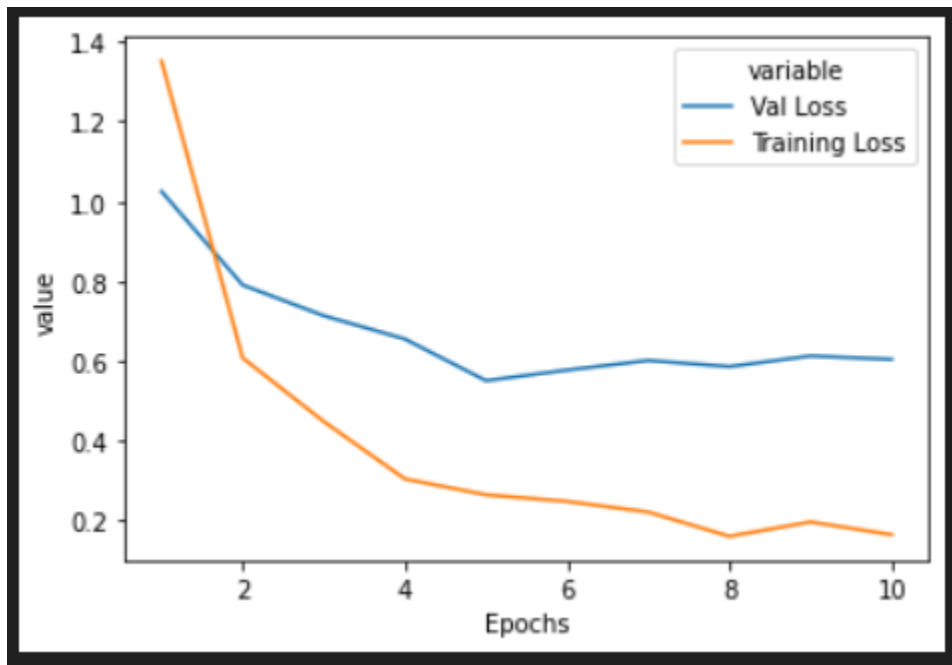
Layer (type)	Output Shape	Param #
mobilenetv2_1.00_224 (Functional)	(None, 7, 7, 1280)	2257984
global_average_pooling2d_1 (GlobalAveragePooling2D)	(None, 1280)	0
dropout (Dropout)	(None, 1280)	0
dense_layer_1 (Dense)	(None, 256)	327936
batch_normalization (Batch Normalization)	(None, 256)	1024
dropout_1 (Dropout)	(None, 256)	0
dense_layer_2 (Dense)	(None, 128)	32896
batch_normalization_1 (Batch Normalization)	(None, 128)	512
dropout_2 (Dropout)	(None, 128)	0
output (Dense)	(None, 9)	1161

=====
Total params: 2,621,513
Trainable params: 362,761
Non-trainable params: 2,258,752

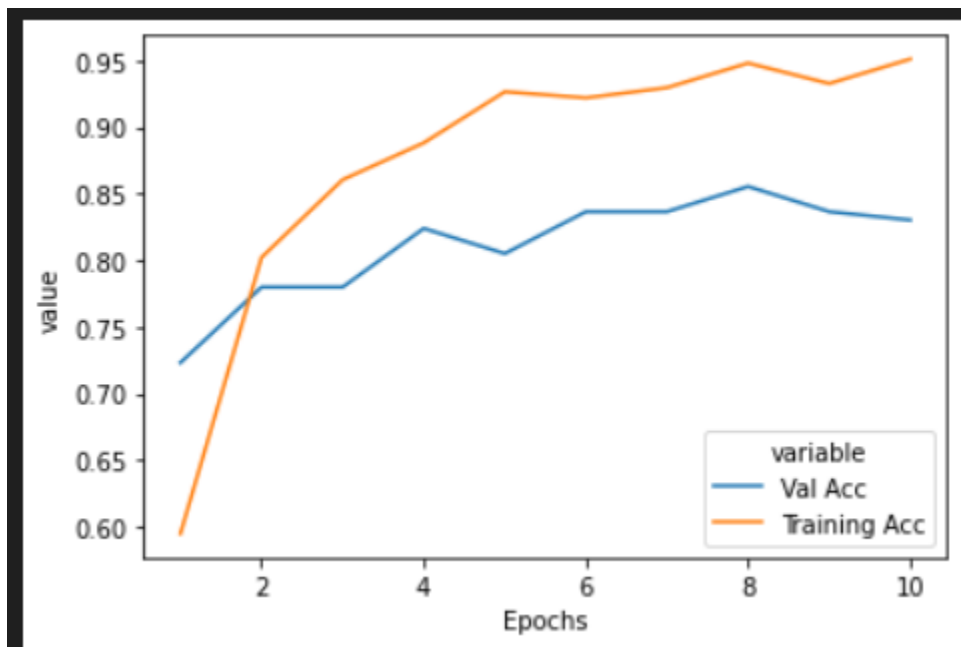
Early Stopping

```
Epoch 1/50
21/21 [=====] - 29s 1s/step - loss: 1.3521 - accuracy: 0.5951 - precision: 0.7376 - recall: 0.3510 - val_loss: 1.0249 - val_accuracy: 0.7233 - val
Epoch 2/50
21/21 [=====] - 22s 1s/step - loss: 0.6072 - accuracy: 0.8021 - precision: 0.8671 - recall: 0.7408 - val_loss: 0.7902 - val_accuracy: 0.7799 - val
Epoch 3/50
21/21 [=====] - 22s 1s/step - loss: 0.4479 - accuracy: 0.8604 - precision: 0.9041 - recall: 0.8098 - val_loss: 0.7131 - val_accuracy: 0.7799 - val
Epoch 4/50
21/21 [=====] - 22s 1s/step - loss: 0.3039 - accuracy: 0.8880 - precision: 0.9347 - recall: 0.8558 - val_loss: 0.6547 - val_accuracy: 0.8239 - val
Epoch 5/50
21/21 [=====] - 22s 1s/step - loss: 0.2641 - accuracy: 0.9264 - precision: 0.9463 - recall: 0.8911 - val_loss: 0.5503 - val_accuracy: 0.8050 - val
Epoch 6/50
21/21 [=====] - 22s 1s/step - loss: 0.2475 - accuracy: 0.9218 - precision: 0.9430 - recall: 0.8880 - val_loss: 0.5769 - val_accuracy: 0.8365 - val
Epoch 7/50
21/21 [=====] - 24s 1s/step - loss: 0.2208 - accuracy: 0.9294 - precision: 0.9535 - recall: 0.9110 - val_loss: 0.6009 - val_accuracy: 0.8365 - val
Epoch 8/50
21/21 [=====] - 22s 1s/step - loss: 0.1600 - accuracy: 0.9479 - precision: 0.9635 - recall: 0.9325 - val_loss: 0.5855 - val_accuracy: 0.8553 - val
Epoch 9/50
21/21 [=====] - 23s 1s/step - loss: 0.1961 - accuracy: 0.9325 - precision: 0.9555 - recall: 0.9218 - val_loss: 0.6123 - val_accuracy: 0.8365 - val
Epoch 10/50
21/21 [=====] - ETA: 0s - loss: 0.1641 - accuracy: 0.9509 - precision: 0.9577 - recall: 0.9371Restoring model weights from the end of the best ep
21/21 [=====] - 22s 1s/step - loss: 0.1641 - accuracy: 0.9509 - precision: 0.9577 - recall: 0.9371 - val_loss: 0.6037 - val_accuracy: 0.8302 - val
Epoch 10: early stopping
```

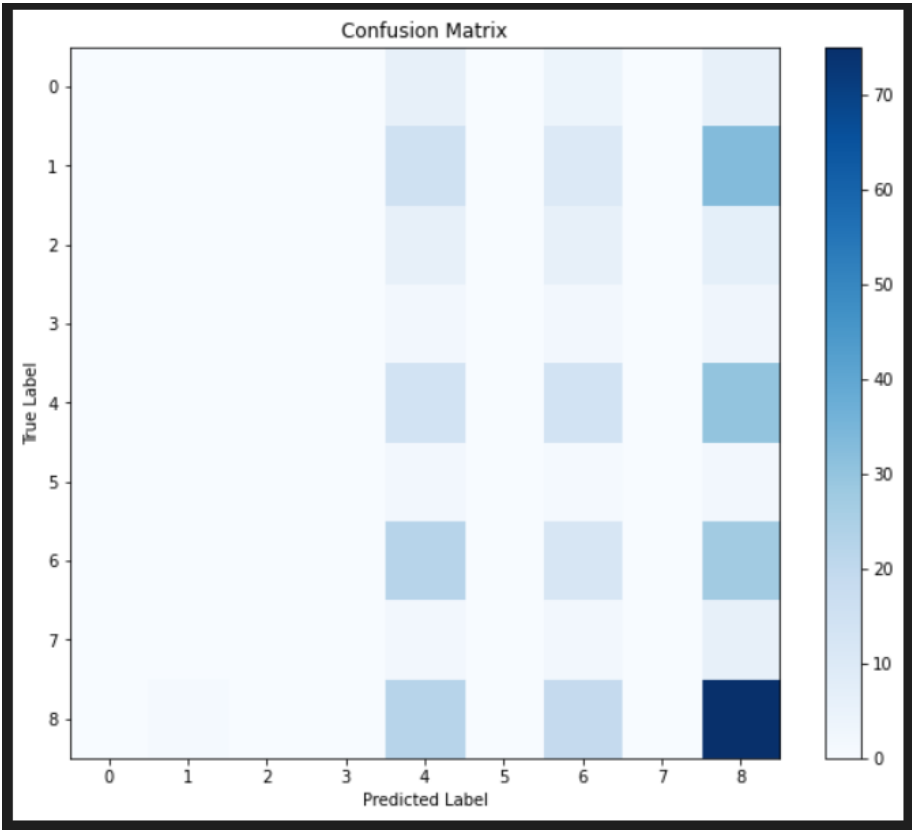
Transfer Learning Model Loss Over Epochs



Transfer Learning Model Accuracy Over Epochs



Transfer Learning Model Confusion Matrix



Transfer Learning Model Classification Report

Classification Report				
	precision	recall	f1-score	support
0	0.00	0.00	0.00	16
1	0.00	0.00	0.00	58
2	0.00	0.00	0.00	19
3	0.00	0.00	0.00	7
4	0.15	0.24	0.19	58
5	0.00	0.00	0.00	5
6	0.17	0.20	0.18	61
7	0.00	0.00	0.00	10
8	0.40	0.64	0.49	117
accuracy			0.29	351
macro avg	0.08	0.12	0.10	351
weighted avg	0.19	0.29	0.23	351