Model Training Report

Configuration and Parameters:
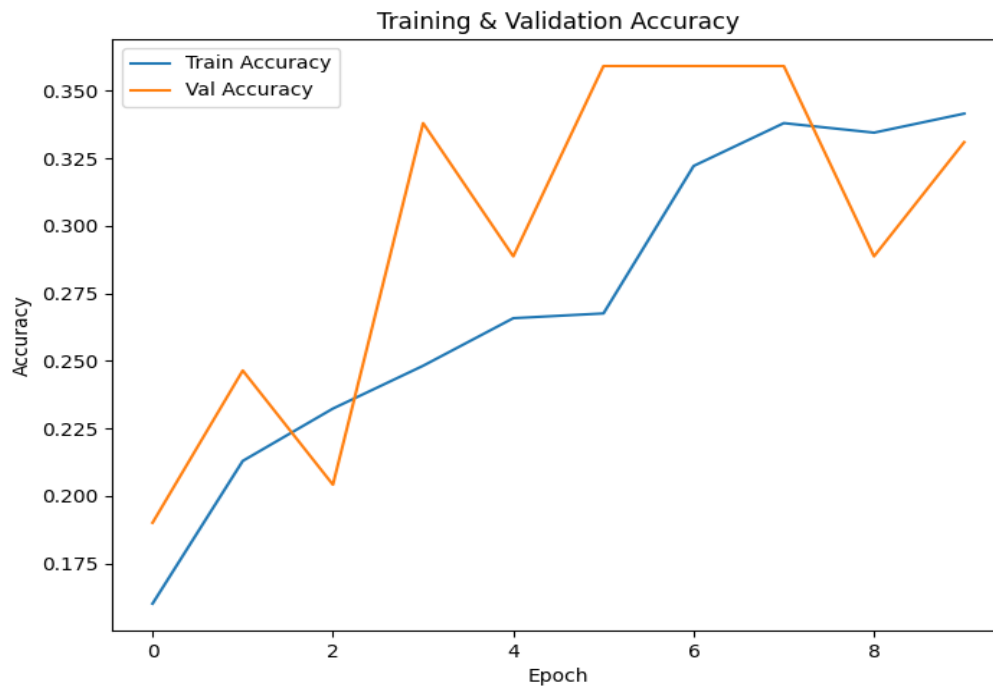
Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Epochs: 10
Gaussian Noise STD: 0.03
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 222, 222, 32)	896
max_pooling2d (MaxPooling2D)	(None, 111, 111, 32)	0
conv2d_1 (Conv2D)	(None, 109, 109, 64)	18,496
max_pooling2d_1 (MaxPooling2D)	(None, 54, 54, 64)	0
conv2d_2 (Conv2D)	(None, 52, 52, 128)	73,856
max_pooling2d_2 (MaxPooling2D)	(None, 26, 26, 128)	0
flatten (Flatten)	(None, 86528)	0
dense (Dense)	(None, 128)	11,075,712
dropout (Dropout)	(None, 128)	0
dense_1 (Dense)	(None, 8)	1,032

```
 Total params: 33,509,978 (127.83 MB)
 Trainable params: 11,169,992 (42.61 MB)
 Non-trainable params: 0 (0.00 B)
 Optimizer params: 22,339,986 (85.22 MB)
```

Test Accuracy: 0.3165

Training Accuracy over Epochs:

Model Training Report
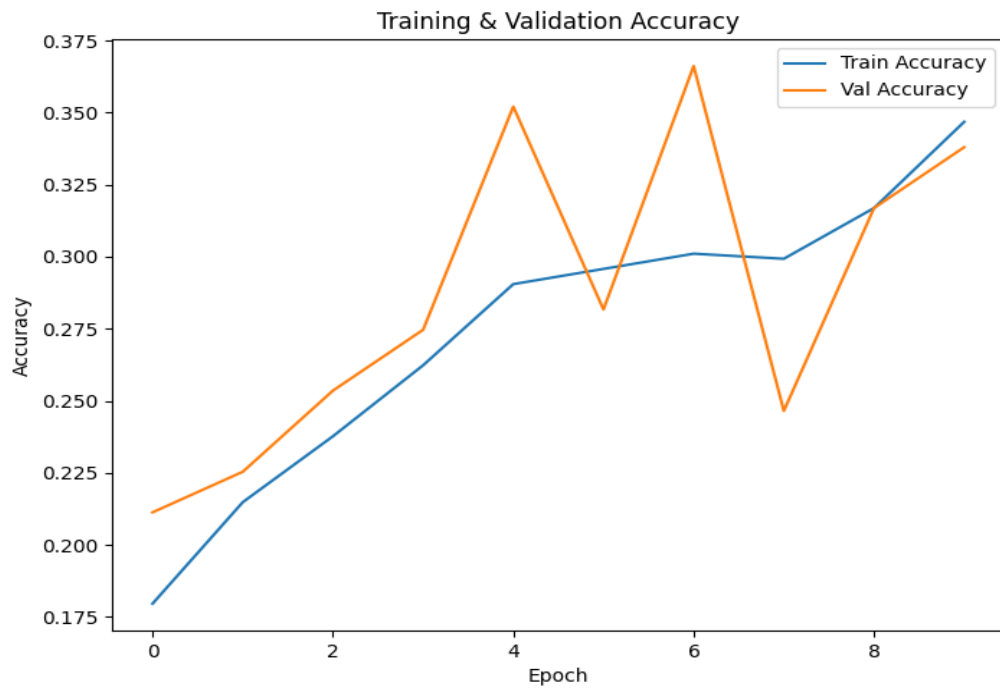
Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Epochs: 10
Gaussian Noise STD: 0.03
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 222, 222, 32)	896
max_pooling2d (MaxPooling2D)	(None, 111, 111, 32)	0
conv2d_1 (Conv2D)	(None, 109, 109, 64)	18,496
max_pooling2d_1 (MaxPooling2D)	(None, 54, 54, 64)	0
conv2d_2 (Conv2D)	(None, 52, 52, 128)	73,856
max_pooling2d_2 (MaxPooling2D)	(None, 26, 26, 128)	0
flatten (Flatten)	(None, 86528)	0
dense (Dense)	(None, 128)	11,075,712
dropout (Dropout)	(None, 128)	0
dense_1 (Dense)	(None, 8)	1,032

```
 Total params: 33,509,978 (127.83 MB)
 Trainable params: 11,169,992 (42.61 MB)
 Non-trainable params: 0 (0.00 B)
 Optimizer params: 22,339,986 (85.22 MB)
```

Test Accuracy: 0.2785

Training Accuracy over Epochs:

Model Training Report

Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Epochs: 10
Gaussian Noise STD: 0.03
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79
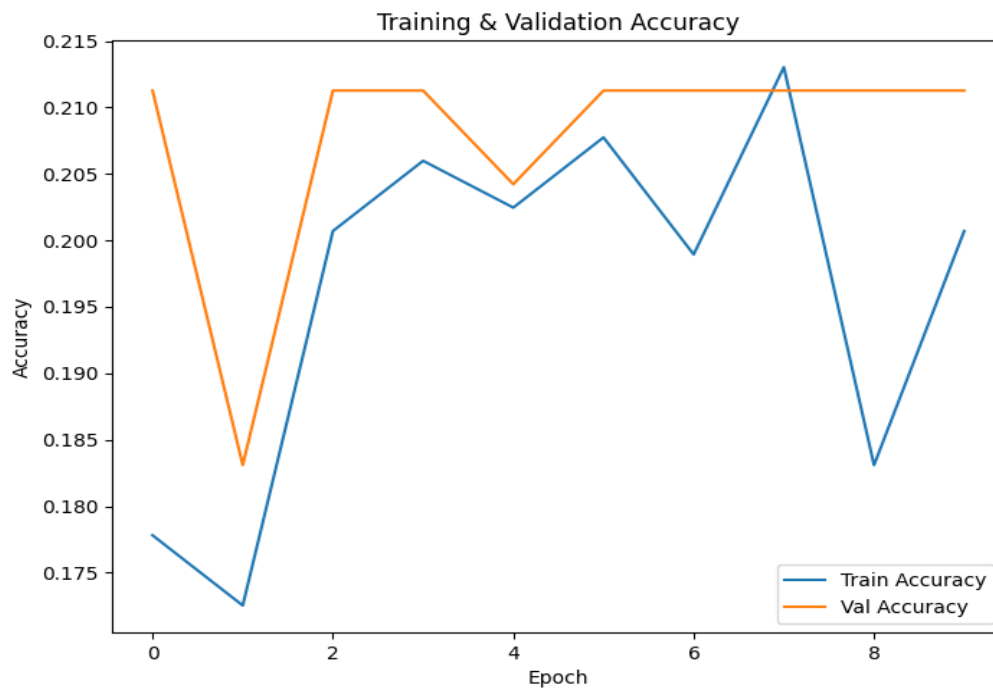**Comments:** Increased augmentation by adding random brightness

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 222, 222, 32)	896
max_pooling2d (MaxPooling2D)	(None, 111, 111, 32)	0
conv2d_1 (Conv2D)	(None, 109, 109, 64)	18,496
max_pooling2d_1 (MaxPooling2D)	(None, 54, 54, 64)	0
conv2d_2 (Conv2D)	(None, 52, 52, 128)	73,856
max_pooling2d_2 (MaxPooling2D)	(None, 26, 26, 128)	0
flatten (Flatten)	(None, 86528)	0
dense (Dense)	(None, 128)	11,075,712
dropout (Dropout)	(None, 128)	0
dense_1 (Dense)	(None, 8)	1,032

```
Total params: 33,509,978 (127.83 MB)
Trainable params: 11,169,992 (42.61 MB)
Non-trainable params: 0 (0.00 B)
```

```
Optimizer params: 22,339,986 (85.22 MB)
```

Test Accuracy: 0.2152

Training Accuracy over Epochs:

Model Training Report

Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: np.float64(1.3653846153846154), 1: np.float64(0.5867768595041323), 2: np.float64(1.3148148148148149), 3: np.float64(0.6454545454545455), 4: np.float64(1.1639344262295082), 5: np.float64(1.1451612903225807), 6: np.float64(1.3148148148148149), 7: np.float64(1.3148148148148149)}
Epochs: 10
Gaussian Noise STD: 0.03
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Apply class weights for balancing

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 222, 222, 32)	896
max_pooling2d (MaxPooling2D)	(None, 111, 111, 32)	0
conv2d_1 (Conv2D)	(None, 109, 109, 64)	18,496
max_pooling2d_1 (MaxPooling2D)	(None, 54, 54, 64)	0
conv2d_2 (Conv2D)	(None, 52, 52, 128)	73,856
max_pooling2d_2 (MaxPooling2D)	(None, 26, 26, 128)	0
flatten (Flatten)	(None, 86528)	0
dense (Dense)	(None, 128)	11,075,712
dropout (Dropout)	(None, 128)	0
dense_1 (Dense)	(None, 8)	1,032

■■■
■■■■■■■■■■■■■■■■

```
Total params: 33,509,978 (127.83 MB)
Trainable params: 11,169,992 (42.61 MB)
Non-trainable params: 0 (0.00 B)
Optimizer params: 22,339,986 (85.22 MB)
```

Test Accuracy: 0.1013

Training Accuracy over Epochs:

Model Training Report

Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: np.float64(1.3653846153846154), 1: np.float64(0.5867768595041323), 2: np.float64(1.3148148148148149), 3: np.float64(0.6454545454545455), 4: np.float64(1.1639344262295082), 5: np.float64(1.1451612903225807), 6: np.float64(1.3148148148148149), 7: np.float64(1.3148148148148149)}
Epochs: 10
Gaussian Noise STD: 0.03
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79
**Comments:** Applied real random brightness augmentation

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 222, 222, 32)	896
max_pooling2d (MaxPooling2D)	(None, 111, 111, 32)	0
conv2d_1 (Conv2D)	(None, 109, 109, 64)	18,496
max_pooling2d_1 (MaxPooling2D)	(None, 54, 54, 64)	0
conv2d_2 (Conv2D)	(None, 52, 52, 128)	73,856
max_pooling2d_2 (MaxPooling2D)	(None, 26, 26, 128)	0
flatten (Flatten)	(None, 86528)	0
dense (Dense)	(None, 128)	11,075,712
dropout (Dropout)	(None, 128)	0
dense_1 (Dense)	(None, 8)	1,032

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```
Total params: 33,509,978 (127.83 MB)
Trainable params: 11,169,992 (42.61 MB)
Non-trainable params: 0 (0.00 B)
Optimizer params: 22,339,986 (85.22 MB)
```

Test Accuracy: 0.3544

Training Accuracy over Epochs:
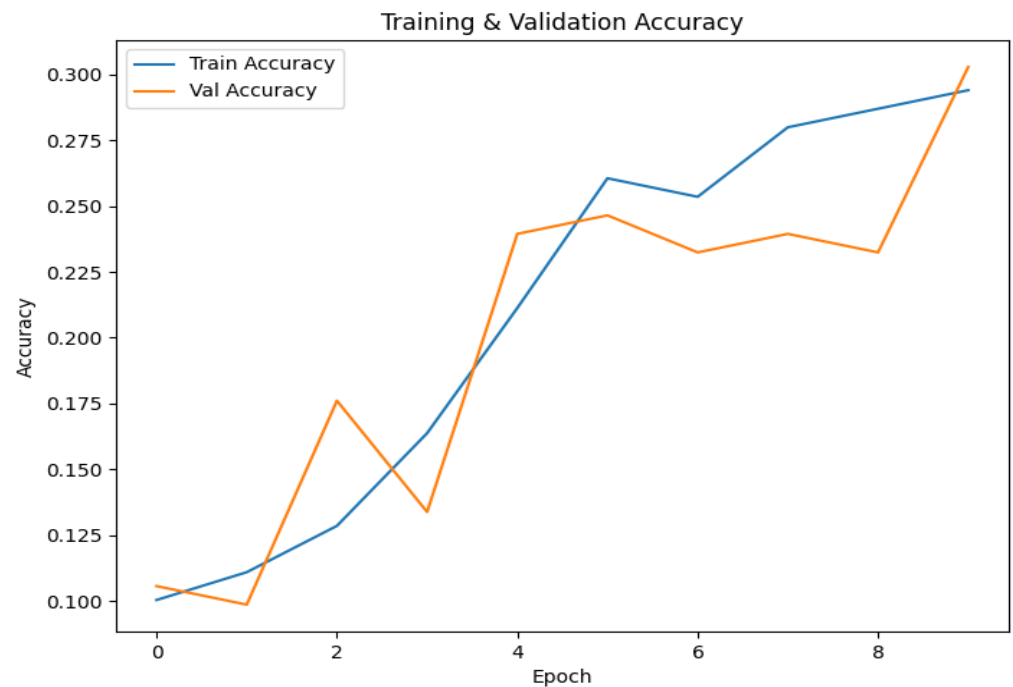
Training & Validation Accuracy

Model Training Report
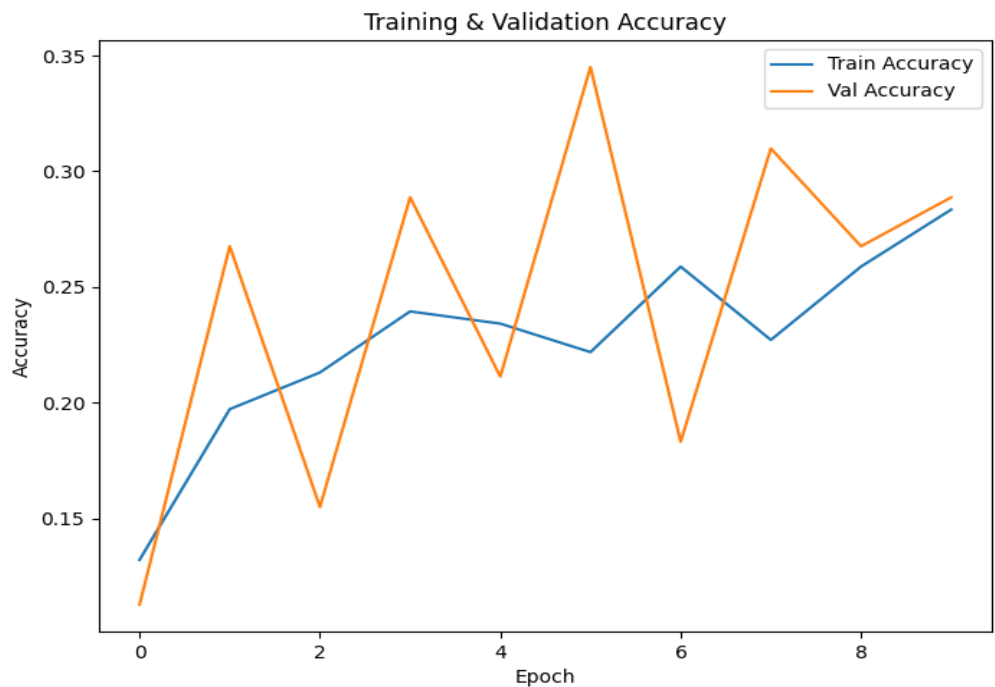
Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: np.float64(1.3653846153846154), 1: np.float64(0.5867768595041323), 2: np.float64(1.3148148148148149), 3: np.float64(0.6454545454545455), 4: np.float64(1.1639344262295082), 5: np.float64(1.1451612903225807), 6: np.float64(1.3148148148148149), 7: np.float64(1.3148148148148149)}
Epochs: 10
Gaussian Noise STD: 0.03
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Applied real random translation augmentation

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 222, 222, 32)	896
max_pooling2d (MaxPooling2D)	(None, 111, 111, 32)	0
conv2d_1 (Conv2D)	(None, 109, 109, 64)	18,496
max_pooling2d_1 (MaxPooling2D)	(None, 54, 54, 64)	0
conv2d_2 (Conv2D)	(None, 52, 52, 128)	73,856
max_pooling2d_2 (MaxPooling2D)	(None, 26, 26, 128)	0
flatten (Flatten)	(None, 86528)	0
dense (Dense)	(None, 128)	11,075,712
dropout (Dropout)	(None, 128)	0
dense_1 (Dense)	(None, 8)	1,032

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```
Total params: 33,509,978 (127.83 MB)
Trainable params: 11,169,992 (42.61 MB)
Non-trainable params: 0 (0.00 B)
Optimizer params: 22,339,986 (85.22 MB)
```

Test Accuracy: 0.2532

Training Accuracy over Epochs:

Model Training Report

Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Epochs: 10
Data Augmentation: RandomFlip(horizontal), RandomRotation(0.1 radians), RandomZoom(0.1), RandomContrast(0.1), RandomBrightness(0.1)RandomTranslation(0.05, 0.05)
Gaussian Noise STD: 0.03
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Reduced random translation augmentation to 5%

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 222, 222, 32)	896
max_pooling2d (MaxPooling2D)	(None, 111, 111, 32)	0
conv2d_1 (Conv2D)	(None, 109, 109, 64)	18,496
max_pooling2d_1 (MaxPooling2D)	(None, 54, 54, 64)	0
conv2d_2 (Conv2D)	(None, 52, 52, 128)	73,856
max_pooling2d_2 (MaxPooling2D)	(None, 26, 26, 128)	0
flatten (Flatten)	(None, 86528)	0
dense (Dense)	(None, 128)	11,075,712
dropout (Dropout)	(None, 128)	0
dense_1 (Dense)	(None, 8)	1,032

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```
Total params: 33,509,978 (127.83 MB)
Trainable params: 11,169,992 (42.61 MB)
Non-trainable params: 0 (0.00 B)
Optimizer params: 22,339,986 (85.22 MB)
```

Test Accuracy: 0.1519

Training Accuracy over Epochs:

Model Training Report
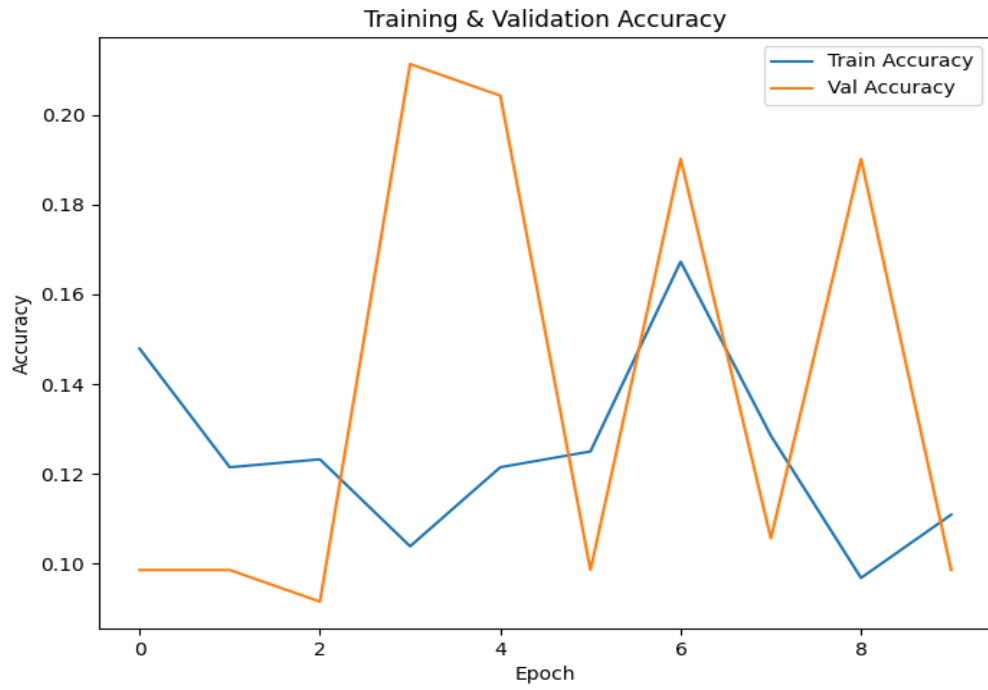
Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Epochs: 10
Data Augmentation: RandomFlip(horizontal), RandomRotation(0.1 radians), RandomZoom(0.1), RandomContrast(0.1), RandomBrightness(0.1)RandomTranslation(0.05, 0.05)
Gaussian Noise STD: 0.03
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Implemented transfer learning with EfficientNetB0

Model Summary:

```
Model: "sequential_1"

 Layer (type)                    Output Shape                    Param #

 efficientnetb0 (Functional)     (None, 7, 7, 1280)              4,049,571

 global_average_pooling2d        (None, 1280)                            0
 (GlobalAveragePooling2D)

 dropout (Dropout)               (None, 1280)                            0

 dense (Dense)                   (None, 8)                          10,248

 Total params: 4,080,317 (15.57 MB)
 Trainable params: 10,248 (40.03 KB)
 Non-trainable params: 4,049,571 (15.45 MB)
 Optimizer params: 20,498 (80.07 KB)
```

Test Accuracy: 0.1013

Training Accuracy over Epochs:

Training & Validation Accuracy

Model Training Report
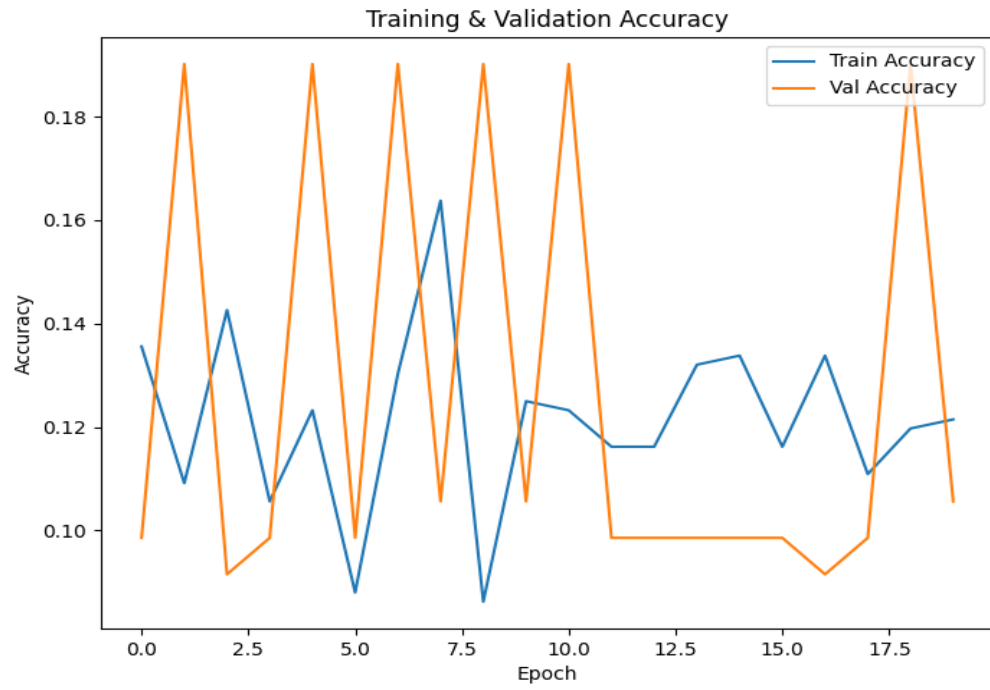
Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Epochs: 20
Data Augmentation: RandomFlip(horizontal), RandomRotation(0.1 radians), RandomZoom(0.1), RandomContrast(0.1), RandomBrightness(0.1)RandomTranslation(0.05, 0.05)
Gaussian Noise STD: 0.05
Salt-Pepper Noise Amount: 0.02
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Using EfficientNetB0, increased to 20 epochs

Model Summary:

```
Model: "sequential_1"
┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━┓
┃ Layer (type)                    ┃ Output Shape           ┃        Param # ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━┩
│ efficientnetb0 (Functional)     │ (None, 7, 7, 1280)     │      4,049,571 │
├─────────────────────────────────┼────────────────────────┼────────────────┤
│ global_average_pooling2d        │ (None, 1280)           │              0 │
│ (GlobalAveragePooling2D)        │                        │                │
├─────────────────────────────────┼────────────────────────┼────────────────┤
│ dropout (Dropout)               │ (None, 1280)           │              0 │
├─────────────────────────────────┼────────────────────────┼────────────────┤
│ dense (Dense)                   │ (None, 8)              │         10,248 │
└─────────────────────────────────┴────────────────────────┴────────────────┘
 Total params: 4,080,317 (15.57 MB)
 Trainable params: 10,248 (40.03 KB)
 Non-trainable params: 4,049,571 (15.45 MB)
 Optimizer params: 20,498 (80.07 KB)
```

Test Accuracy: 0.1139

Training Accuracy over Epochs:

Training & Validation Accuracy

Model Training Report
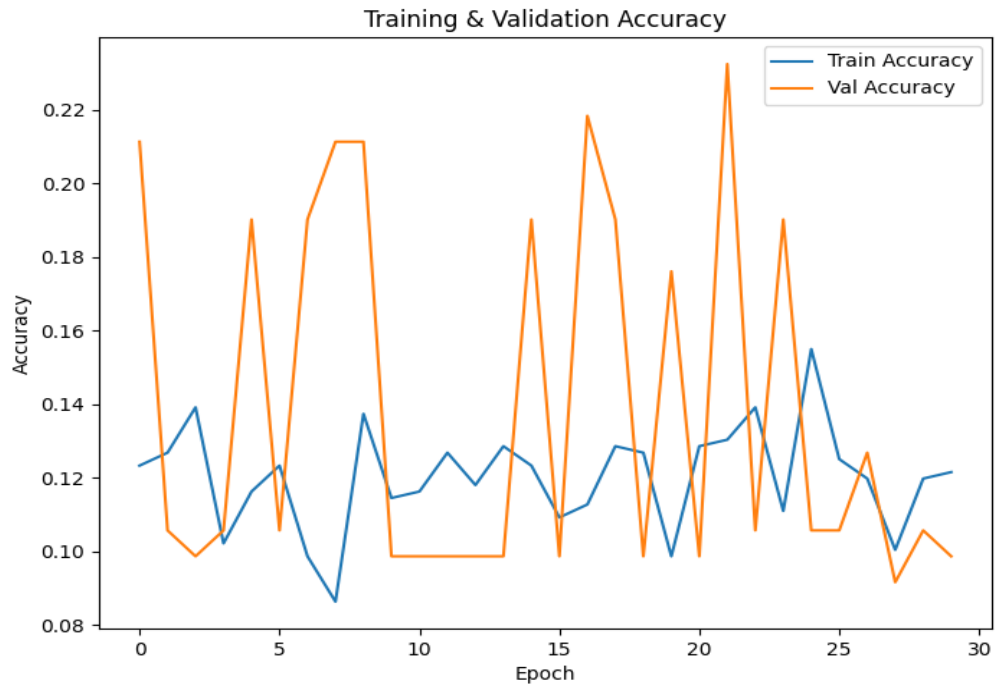
Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Epochs: 30
Data Augmentation: RandomFlip(horizontal), RandomRotation(0.1 radians), RandomZoom(0.1), RandomContrast(0.1), RandomBrightness(0.1)RandomTranslation(0.05, 0.05)
Gaussian Noise STD: 0.05
Salt-Pepper Noise Amount: 0.02
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Using EfficientNetB0, increased to 30 epochs

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
efficientnetb0 (Functional)	(None, 7, 7, 1280)	4,049,571
global_average_pooling2d (GlobalAveragePooling2D)	(None, 1280)	0
dropout (Dropout)	(None, 1280)	0
dense (Dense)	(None, 8)	10,248

```
 Total params: 4,080,317 (15.57 MB)
 Trainable params: 10,248 (40.03 KB)
 Non-trainable params: 4,049,571 (15.45 MB)
 Optimizer params: 20,498 (80.07 KB)
```

Test Accuracy: 0.0886

Training Accuracy over Epochs:

Training & Validation Accuracy

Model Training Report
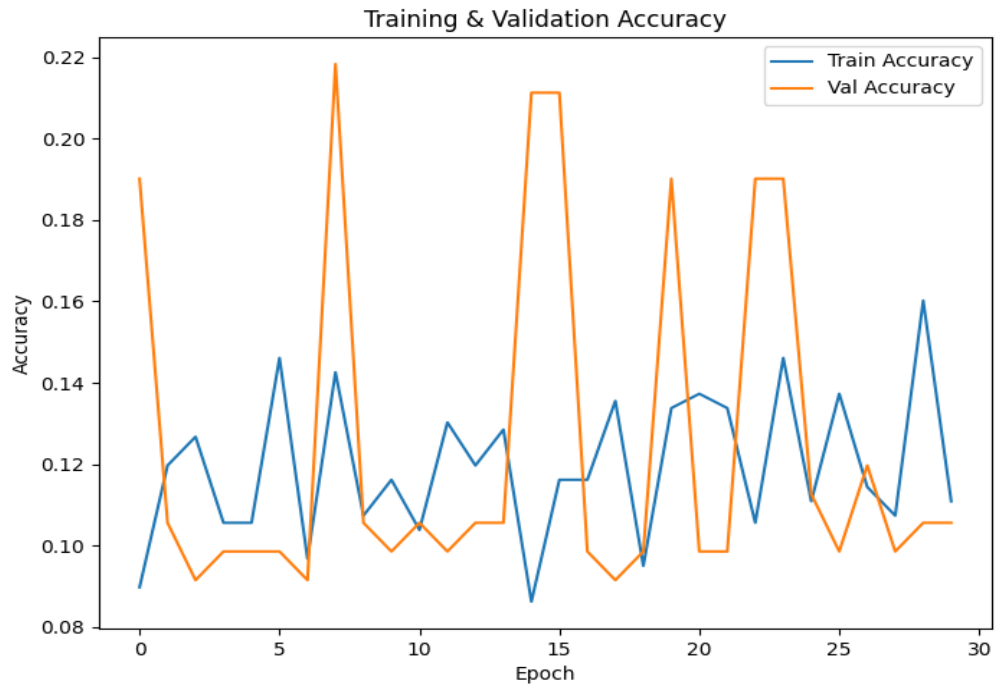
Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Epochs: 30
Data Augmentation: RandomFlip(horizontal), RandomRotation(0.1 radians), RandomZoom(0.1), RandomContrast(0.1), RandomBrightness(0.1)RandomTranslation(0.01, 0.01)
Gaussian Noise STD: 0.02
Salt-Pepper Noise Amount: 0.02
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Using EfficientNetB0, increased to 30 epochs, reduced gaussian

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
efficientnetb0 (Functional)	(None, 7, 7, 1280)	4,049,571
global_average_pooling2d (GlobalAveragePooling2D)	(None, 1280)	0
dropout (Dropout)	(None, 1280)	0
dense (Dense)	(None, 8)	10,248

```
 Total params: 4,080,317 (15.57 MB)
 Trainable params: 10,248 (40.03 KB)
 Non-trainable params: 4,049,571 (15.45 MB)
 Optimizer params: 20,498 (80.07 KB)
```

Test Accuracy: 0.0759

Training Accuracy over Epochs:

Training & Validation Accuracy

Model Training Report

Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Base Epochs: 10
Epochs: 30
Data Augmentation: RandomFlip(horizontal), RandomRotation(0.1 radians), RandomZoom(0.1), RandomContrast(0.1), RandomBrightness(0.1)
Gaussian Noise STD: 0.05
Salt-Pepper Noise Amount: 0.02
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Using EfficientNetB0, train deeper layers

Model Summary:

```
Model: "sequential_1"

■ Layer (type)                  ■ Output Shape          ■      Param # ■

■ efficientnetb0 (Functional)   ■ (None, 7, 7, 1280)    ■    4,049,571 ■

■ global_average_pooling2d      ■ (None, 1280)          ■            0 ■
■ (GlobalAveragePooling2D)      ■                       ■              ■

■ dropout (Dropout)             ■ (None, 1280)          ■            0 ■

■ dense (Dense)                 ■ (None, 8)             ■       10,248 ■

 Total params: 12,095,413 (46.14 MB)
 Trainable params: 4,017,796 (15.33 MB)
 Non-trainable params: 42,023 (164.16 KB)
 Optimizer params: 8,035,594 (30.65 MB)
```

Test Accuracy: 0.1266

Training Accuracy over Epochs:

Training & Validation Accuracy

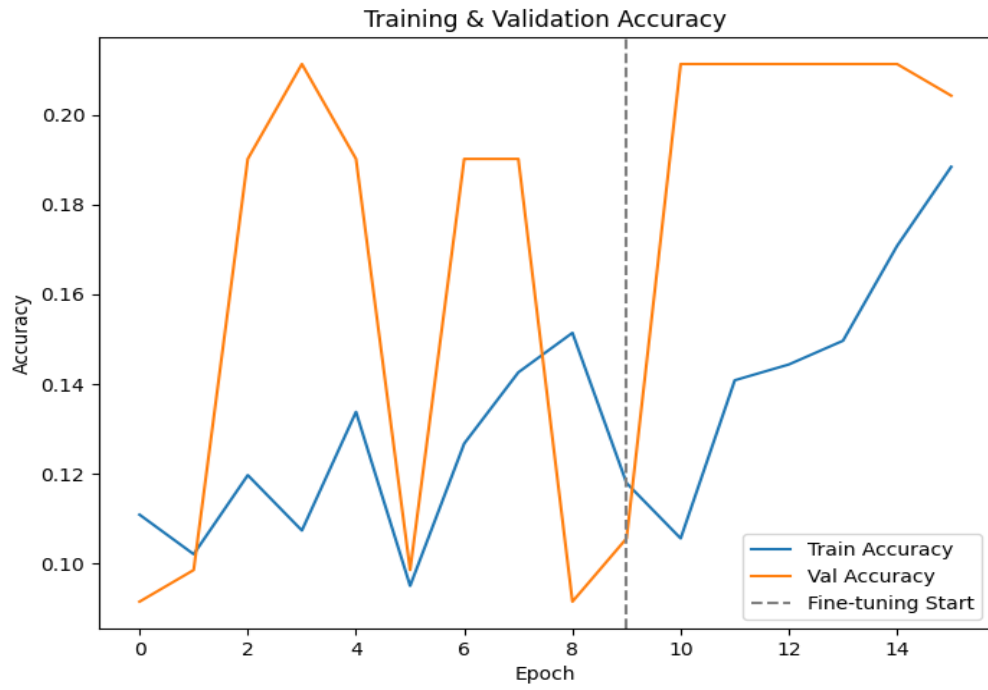# Model Training Report

Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Base Epochs: 10
Epochs: 30
Data Augmentation: RandomFlip(horizontal), RandomRotation(0.1 radians), RandomZoom(0.1), RandomContrast(0.1), RandomBrightness(0.1)
Gaussian Noise STD: 0.05
Salt-Pepper Noise Amount: 0.02
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Using EfficientNetB0, train deeper layers, early stopping

Model Summary:

```
Model: "sequential_1"

 Layer (type)                      Output Shape                    Param #

 efficientnetb0 (Functional)       (None, 7, 7, 1280)              4,049,571

 global_average_pooling2d          (None, 1280)                    0
 (GlobalAveragePooling2D)

 dropout (Dropout)                 (None, 1280)                    0

 dense (Dense)                     (None, 8)                       10,248

 Total params: 12,095,413 (46.14 MB)
 Trainable params: 4,017,796 (15.33 MB)
 Non-trainable params: 42,023 (164.16 KB)
 Optimizer params: 8,035,594 (30.65 MB)
```

Test Accuracy: 0.2152

Training Accuracy over Epochs:

Training & Validation Accuracy

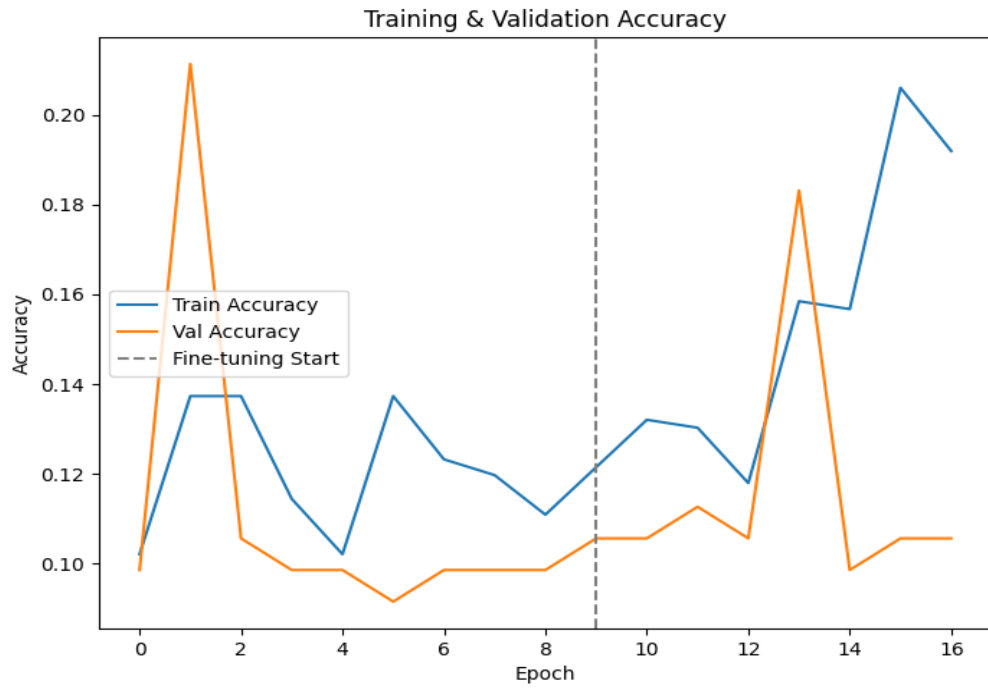# Model Training Report

Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Base Epochs: 10
Epochs: 30
Data Augmentation: RandomFlip(none), RandomRotation(0.05 radians), RandomZoom(0.05), RandomContrast(0.05), RandomBrightness(0.05)
Gaussian Noise STD: 0.01
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Using EfficientNetB0, train deeper layers, early stopping, reduced aggressive augmentation

Model Summary:

```
Model: "sequential_1"

 Layer (type)                    Output Shape                  Param #

 efficientnetb0 (Functional)     (None, 7, 7, 1280)            4,049,571

 global_average_pooling2d        (None, 1280)                  0
 (GlobalAveragePooling2D)

 dropout (Dropout)               (None, 1280)                  0

 dense (Dense)                   (None, 8)                     10,248

 Total params: 12,095,413 (46.14 MB)
 Trainable params: 4,017,796 (15.33 MB)
 Non-trainable params: 42,023 (164.16 KB)
 Optimizer params: 8,035,594 (30.65 MB)
```

Test Accuracy: 0.1139

Training Accuracy over Epochs:

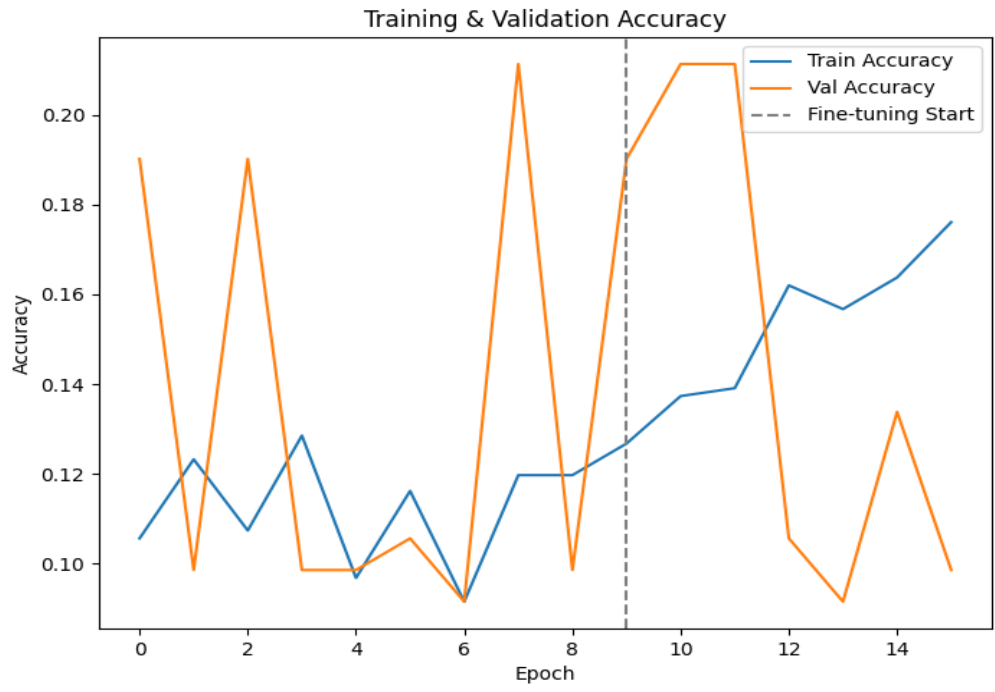# Model Training Report

Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Base Epochs: 10
Epochs: 30
Data Augmentation: RandomFlip(none), RandomRotation(0.05 radians), RandomZoom(0.05), RandomContrast(0.05), RandomBrightness(0.05)
Gaussian Noise STD: 0.0
Salt-Pepper Noise Amount: 0.0
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Using EfficientNetB0, train deeper layers, early stopping, removed gaussian and salt and pepper

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
efficientnetb0 (Functional)	(None, 7, 7, 1280)	4,049,571
global_average_pooling2d (GlobalAveragePooling2D)	(None, 1280)	0
dropout (Dropout)	(None, 1280)	0
dense (Dense)	(None, 8)	10,248

```
 Total params: 12,095,413 (46.14 MB)
 Trainable params: 4,017,796 (15.33 MB)
 Non-trainable params: 42,023 (164.16 KB)
 Optimizer params: 8,035,594 (30.65 MB)
```

Test Accuracy: 0.2152

Training Accuracy over Epochs:

Training & Validation Accuracy

Model Training Report

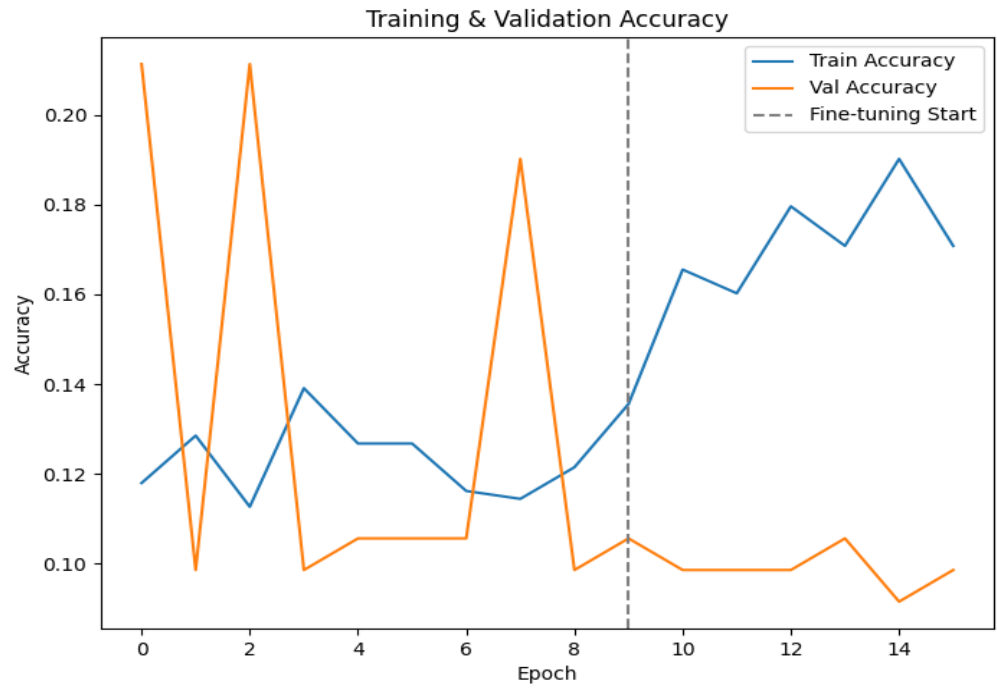## Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Base Epochs: 10
Epochs: 30
Data Augmentation: RandomFlip(none), RandomRotation(0.05 radians), RandomZoom(0.05), RandomContrast(0.05), RandomBrightness(0.05)
Gaussian Noise STD: 0.0
Salt-Pepper Noise Amount: 0.0
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Using EfficientNetB0, fine tune only the top 20 layers, actually removed gaussian and salt & pepper

Model Summary:

```
Model: "sequential_1"

 Layer (type)                    Output Shape               Param #

 efficientnetb0 (Functional)     (None, 7, 7, 1280)          4,049,571

 global_average_pooling2d        (None, 1280)                        0
 (GlobalAveragePooling2D)

 dropout (Dropout)               (None, 1280)                        0

 dense (Dense)                   (None, 8)                      10,248

 Total params: 6,782,237 (25.87 MB)
 Trainable params: 1,361,208 (5.19 MB)
 Non-trainable params: 2,698,611 (10.29 MB)
 Optimizer params: 2,722,418 (10.39 MB)
```

Test Accuracy: 0.0886

Training Accuracy over Epochs:

Training & Validation Accuracy

Model Training Report
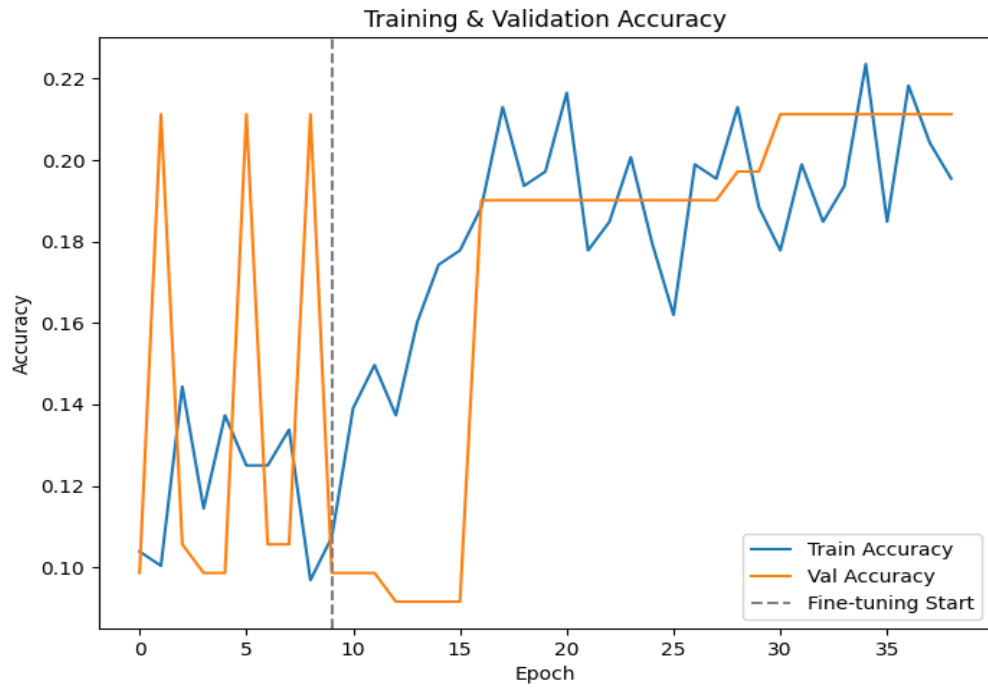
Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Base Epochs: 10
Epochs: 30
Data Augmentation: RandomFlip(horizontal), RandomRotation(0.1 radians), RandomZoom(0.1), RandomContrast(0.1), RandomBrightness(0.1)
Gaussian Noise STD: 0.01
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Using EfficientNetB0, fine tune only the top 50 layers, increased augmentation

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
efficientnetb0 (Functional)	(None, 7, 7, 1280)	4,049,571
global_average_pooling2d (GlobalAveragePooling2D)	(None, 1280)	0
dropout (Dropout)	(None, 1280)	0
dense (Dense)	(None, 8)	10,248

```
 Total params: 9,134,045 (34.84 MB)
 Trainable params: 2,537,112 (9.68 MB)
 Non-trainable params: 1,522,707 (5.81 MB)
 Optimizer params: 5,074,226 (19.36 MB)
```

Test Accuracy: 0.2152

Training Accuracy over Epochs:

Training & Validation Accuracy

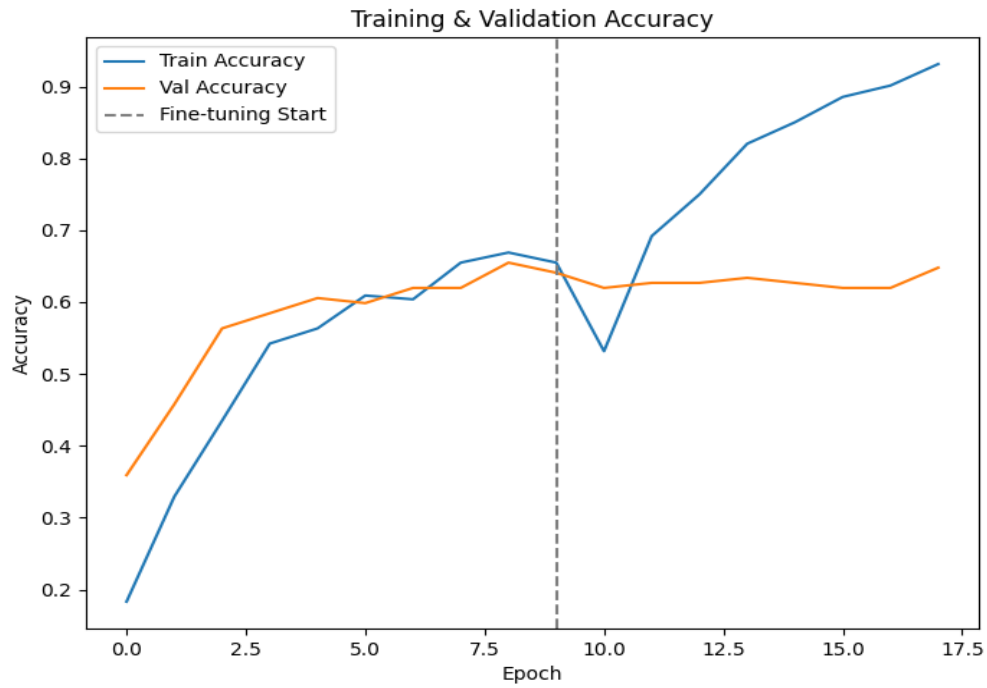# Model Training Report

Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Base Epochs: 10
Epochs: 30
Data Augmentation: RandomFlip(horizontal), RandomRotation(0.1 radians), RandomZoom(0.1), RandomContrast(0.1), RandomBrightness(0.1)
Gaussian Noise STD: 0
Salt-Pepper Noise Amount: 0.0
Train Size: 568
Validation Size: 142
Test Size: 79
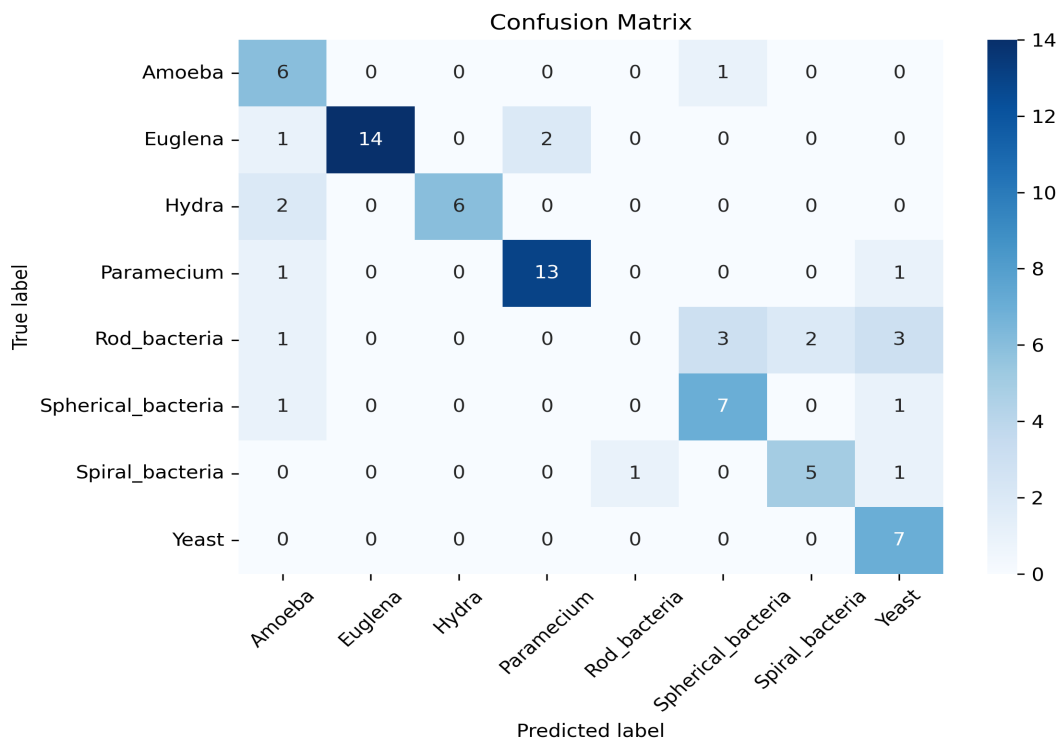**Comments:** Using MobileNetV2

Model Summary:

```
Model: "sequential_1"
┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━┓
┃ Layer (type)                    ┃ Output Shape          ┃        Param # ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━┩
│ mobilenetv2_1.00_224 (Functional) │ (None, 7, 7, 1280)  │      2,257,984 │
├─────────────────────────────────┼───────────────────────┼────────────────┤
│ global_average_pooling2d        │ (None, 1280)          │              0 │
│ (GlobalAveragePooling2D)        │                       │                │
├─────────────────────────────────┼───────────────────────┼────────────────┤
│ dropout (Dropout)               │ (None, 1280)          │              0 │
├─────────────────────────────────┼───────────────────────┼────────────────┤
│ dense (Dense)                   │ (None, 8)             │         10,248 │
└─────────────────────────────────┴───────────────────────┴────────────────┘
 Total params: 5,998,937 (22.88 MB)
 Trainable params: 1,865,352 (7.12 MB)
 Non-trainable params: 402,880 (1.54 MB)
 Optimizer params: 3,730,705 (14.23 MB)
```

Test Accuracy: 0.7342

Training Accuracy over Epochs:

Training & Validation Accuracy

Confusion Matrix:

Confusion Matrix

Model Training Report

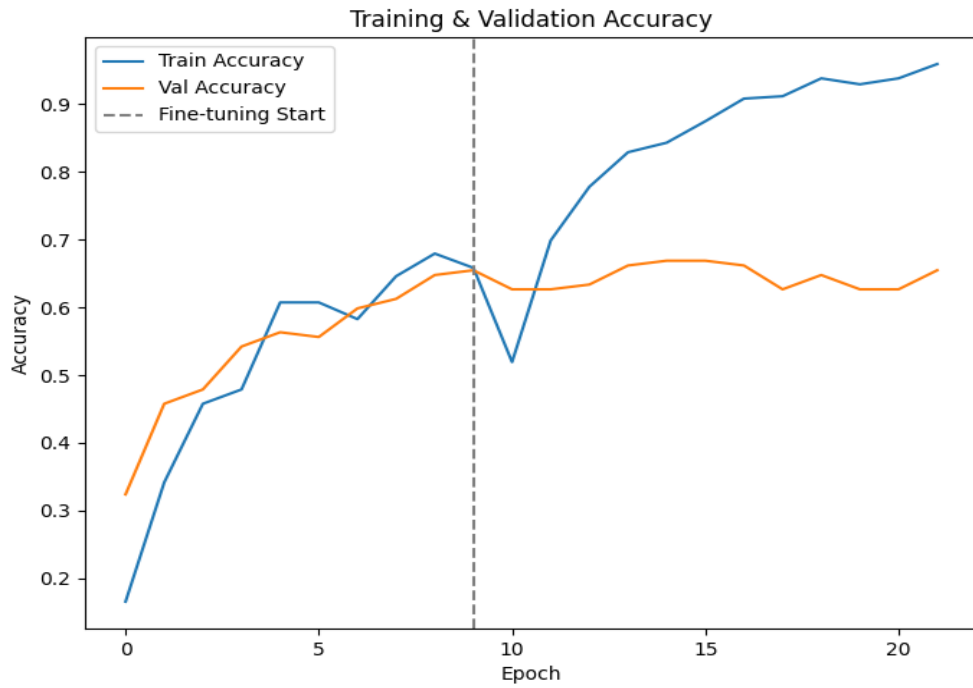## Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Base Epochs: 10
Epochs: 30
Data Augmentation: RandomFlip(horizontal), RandomRotation(0.1 radians), RandomZoom(0.1), RandomContrast(0.1), RandomBrightness(0.1)
Gaussian Noise STD: 0.01
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79
**Comments:** Using MobileNetV2, reintroduced salt and pepper + gaussian

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
mobilenetv2_1.00_224 (Functional)	(None, 7, 7, 1280)	2,257,984
global_average_pooling2d (GlobalAveragePooling2D)	(None, 1280)	0
dropout (Dropout)	(None, 1280)	0
dense (Dense)	(None, 8)	10,248

```
 Total params: 5,998,937 (22.88 MB)
 Trainable params: 1,865,352 (7.12 MB)
 Non-trainable params: 402,880 (1.54 MB)
 Optimizer params: 3,730,705 (14.23 MB)
```

Test Accuracy: 0.7468

Training Accuracy over Epochs:
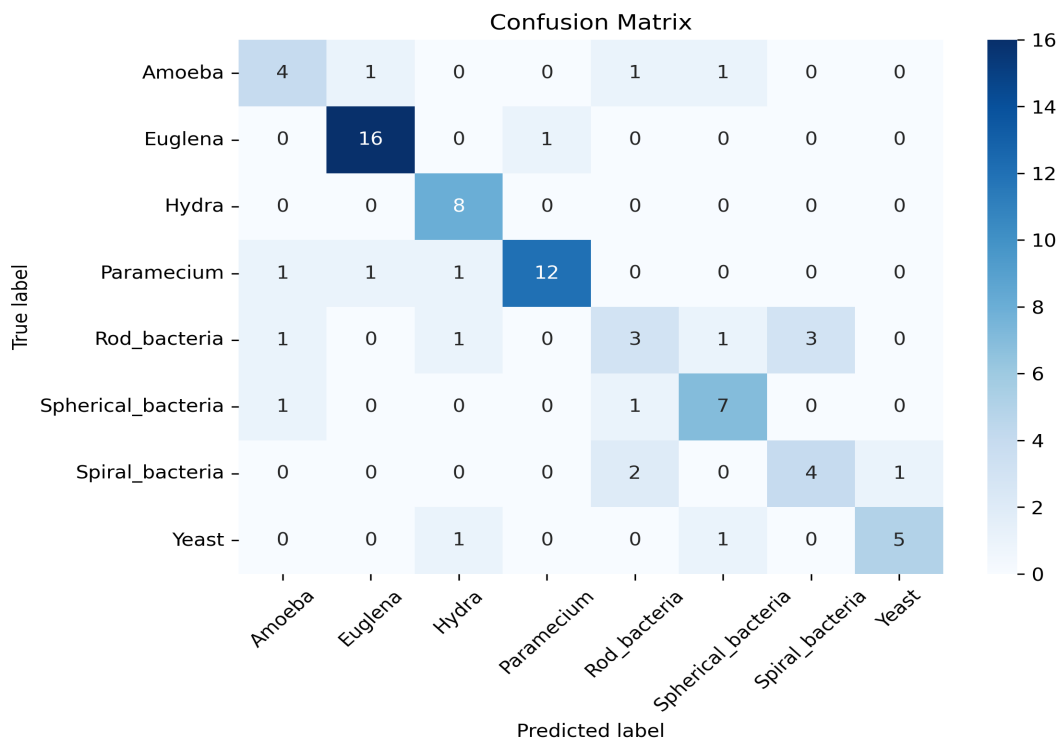
Training & Validation Accuracy

Confusion Matrix:

Confusion Matrix

Model Training Report
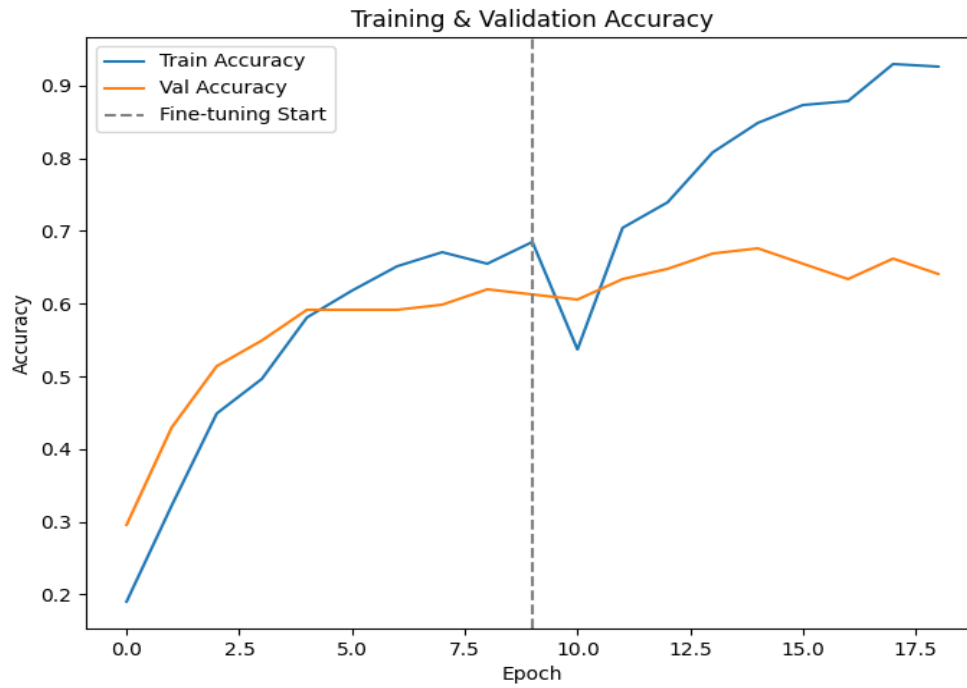
Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Base Epochs: 10
Epochs: 30
Data Augmentation: RandomFlip(horizontal), RandomRotation(0.1 radians), RandomZoom(0.1), RandomContrast(0.1), RandomBrightness(0.1)
Gaussian Noise STD: 0.05
Salt-Pepper Noise Amount: 0.05
Train Size: 568
Validation Size: 142
Test Size: 79
**Comments:** Using MobileNetV2, increased salt and pepper + gaussian

Model Summary:

```
Model: "sequential_1"

 Layer (type)                     Output Shape              Param #

 mobilenetv2_1.00_224 (Functional)  (None, 7, 7, 1280)         2,257,984

 global_average_pooling2d           (None, 1280)                       0
 (GlobalAveragePooling2D)

 dropout (Dropout)                  (None, 1280)                       0

 dense (Dense)                      (None, 8)                     10,248

 Total params: 5,998,937 (22.88 MB)
 Trainable params: 1,865,352 (7.12 MB)
 Non-trainable params: 402,880 (1.54 MB)
 Optimizer params: 3,730,705 (14.23 MB)
```

Test Accuracy: 0.7215

Training Accuracy over Epochs:
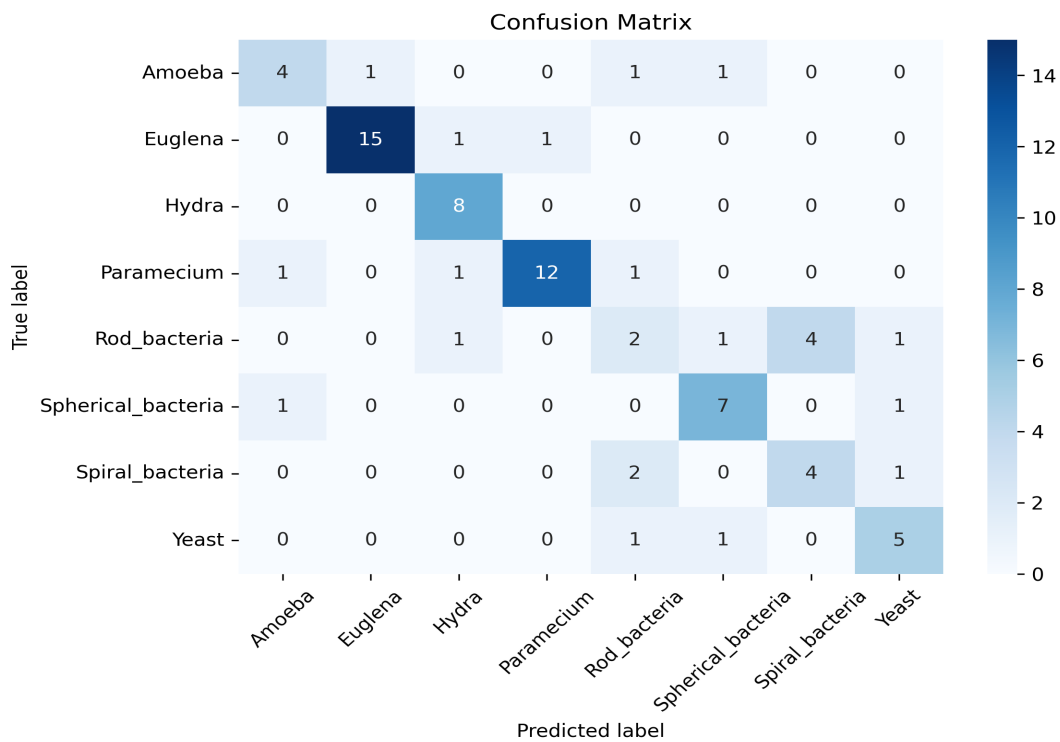
Training & Validation Accuracy

Confusion Matrix:

Confusion Matrix

Model Training Report

Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Base Epochs: 10
Epochs: 30
Data Augmentation: RandomFlip({FLIP}), RandomRotation({ROTATION} radians), RandomZoom({ZOOM}), RandomContrast({CONTRAST}), RandomBrightness({LAMBDA})
Gaussian Noise STD: 0.01
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Using MobileNetV2, reduced salt and pepper + gaussian, increased brightness and contrast

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
mobilenetv2_1.00_224 (Functional)	(None, 7, 7, 1280)	2,257,984
global_average_pooling2d (GlobalAveragePooling2D)	(None, 1280)	0
dropout (Dropout)	(None, 1280)	0
dense (Dense)	(None, 8)	10,248

```
 Total params: 5,998,937 (22.88 MB)
 Trainable params: 1,865,352 (7.12 MB)
 Non-trainable params: 402,880 (1.54 MB)
 Optimizer params: 3,730,705 (14.23 MB)
```

Test Accuracy: 0.7595

Training Accuracy over Epochs:

Training & Validation Accuracy

Confusion Matrix:

Confusion Matrix

Model Training Report

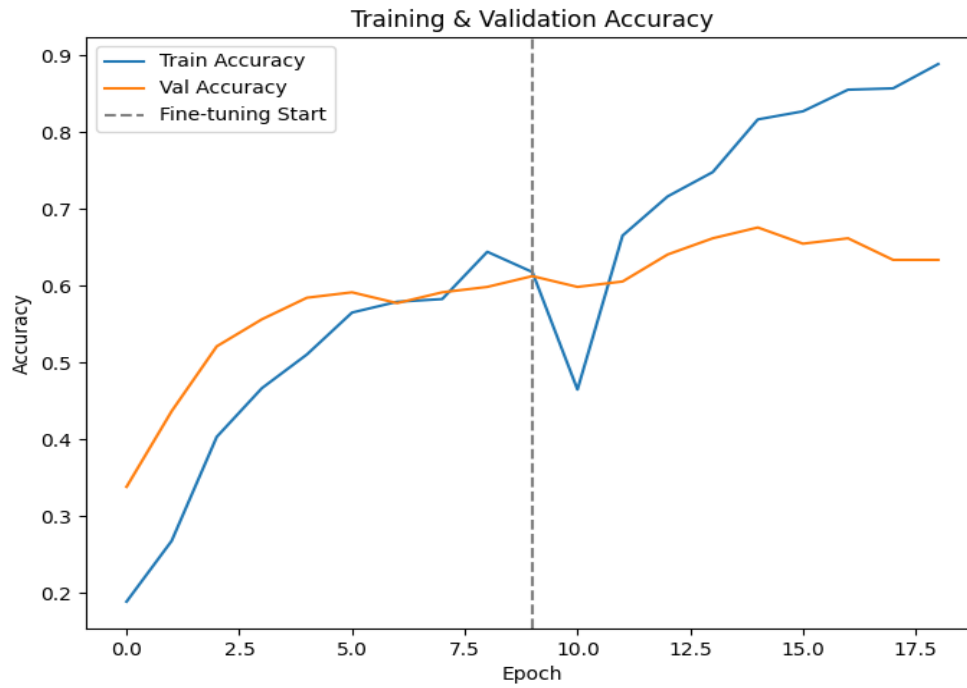## Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Base Epochs: 10
Epochs: 30
Data Augmentation: RandomFlip({FLIP}), RandomRotation({ROTATION} radians), RandomZoom({ZOOM}), RandomContrast({CONTRAST}), RandomBrightness({LAMBDA})
Gaussian Noise STD: 0.01
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79
**Comments:** Using MobileNetV2, stronger dropout

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
mobilenetv2_1.00_224 (Functional)	(None, 7, 7, 1280)	2,257,984
global_average_pooling2d (GlobalAveragePooling2D)	(None, 1280)	0
dropout (Dropout)	(None, 1280)	0
dense (Dense)	(None, 8)	10,248

```
 Total params: 5,998,937 (22.88 MB)
 Trainable params: 1,865,352 (7.12 MB)
 Non-trainable params: 402,880 (1.54 MB)
 Optimizer params: 3,730,705 (14.23 MB)
```

Test Accuracy: 0.7342

Training Accuracy over Epochs:

Confusion Matrix:
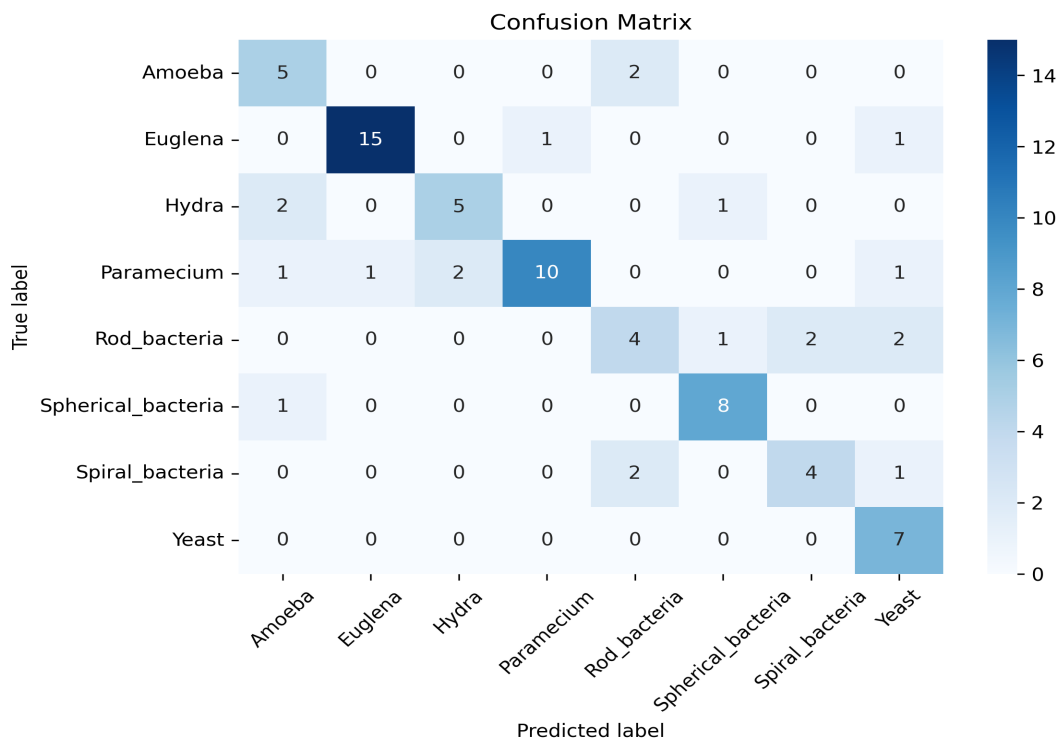
Model Training Report

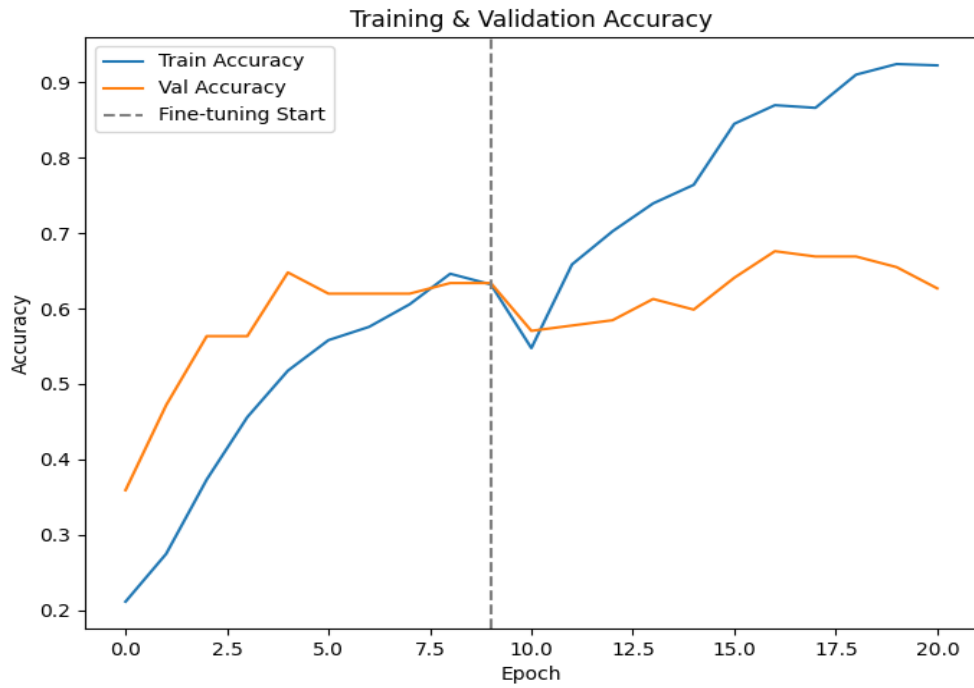## Configuration and Parameters:

Image Size: (224, 224)
Batch Size: 32
Number of Classes: 8
Class Weights: {0: 1.365, 1: 0.587, 2: 1.315, 3: 0.645, 4: 1.164, 5: 1.145, 6: 1.315, 7: 1.315}
Base Epochs: 10
Epochs: 30
Data Augmentation: RandomFlip({FLIP}), RandomRotation({ROTATION} radians), RandomZoom({ZOOM}), RandomContrast({CONTRAST}), RandomBrightness({LAMBDA})
Gaussian Noise STD: 0.01
Salt-Pepper Noise Amount: 0.01
Train Size: 568
Validation Size: 142
Test Size: 79
Comments: Using MobileNetV2, increased zoom and rotation augmentation

Model Summary:

```
Model: "sequential_1"
```

Layer (type)	Output Shape	Param #
mobilenetv2_1.00_224 (Functional)	(None, 7, 7, 1280)	2,257,984
global_average_pooling2d (GlobalAveragePooling2D)	(None, 1280)	0
dropout (Dropout)	(None, 1280)	0
dense (Dense)	(None, 8)	10,248

```
 Total params: 5,998,937 (22.88 MB)
 Trainable params: 1,865,352 (7.12 MB)
 Non-trainable params: 402,880 (1.54 MB)
 Optimizer params: 3,730,705 (14.23 MB)
```

Test Accuracy: 0.7722

Training Accuracy over Epochs:

Training & Validation Accuracy

Confusion Matrix:

Confusion Matrix