

# 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

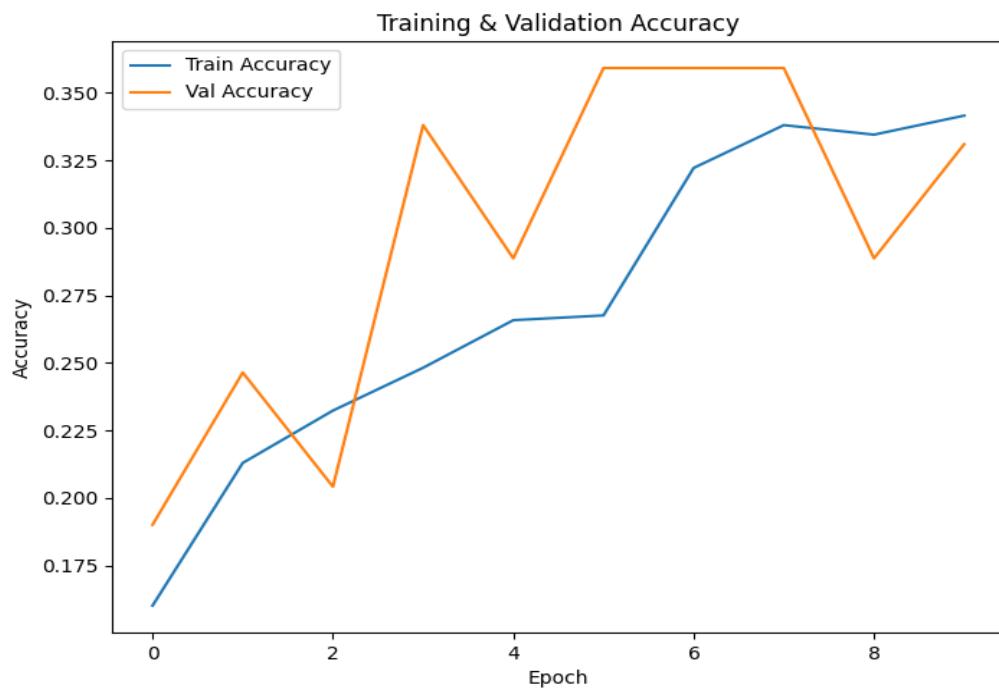
## Model Summary:

| 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

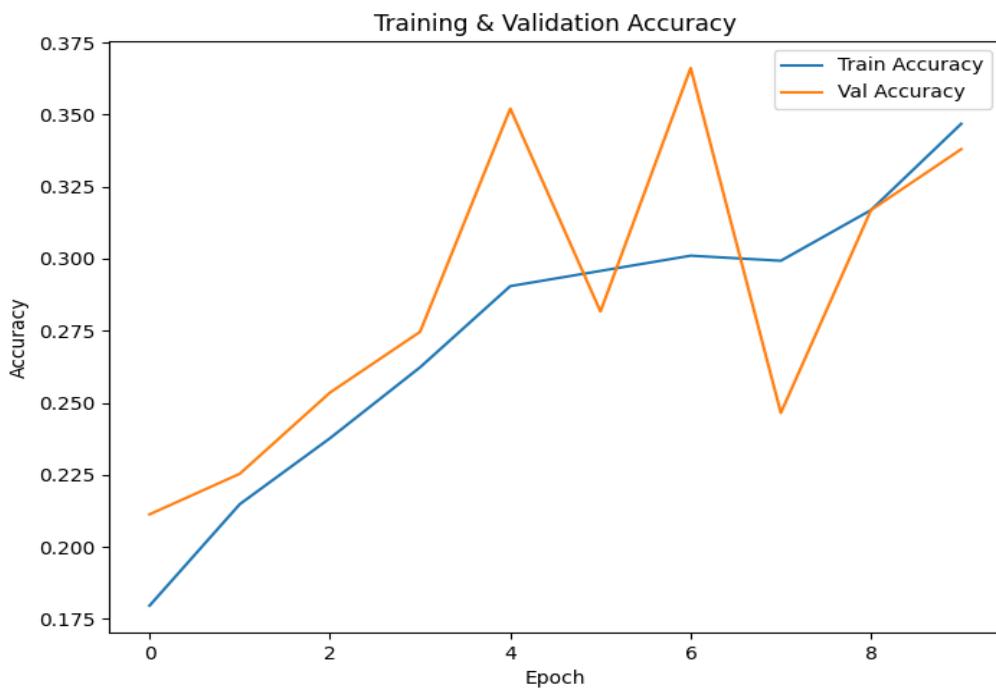
## Model Summary:

| 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:

| 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(1.3148148148149), 3: np.float64(0.64545454545455), 4: np.float64(1.1639344262295082), 5: np.float64(1.1451612903225807), 6: np.float64(1.3148148148149), 7: np.float64(1.3148148148149)}

**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"

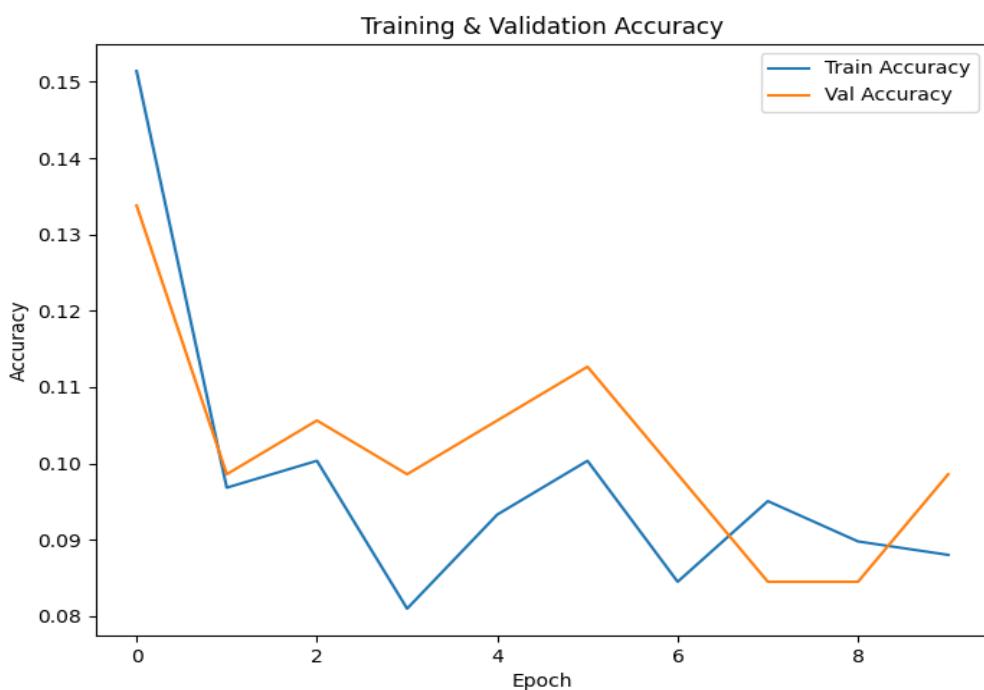
| Layer (type)                   | Output Shape         | Param #    |
|--------------------------------|----------------------|------------|
| conv2d (Conv2D)                | (None, 222, 222, 32) | 896        |
| max_pooling2d (MaxPooling2D)   | (None, 111, 111, 32) | 0          |
| conv2d_1 (Conv2D)              | (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      |

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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)
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**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(1.3148148148149), 3: np.float64(0.64545454545455), 4: np.float64(1.1639344262295082), 5: np.float64(1.1451612903225807), 6: np.float64(1.3148148148149), 7: np.float64(1.3148148148149)}

**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:

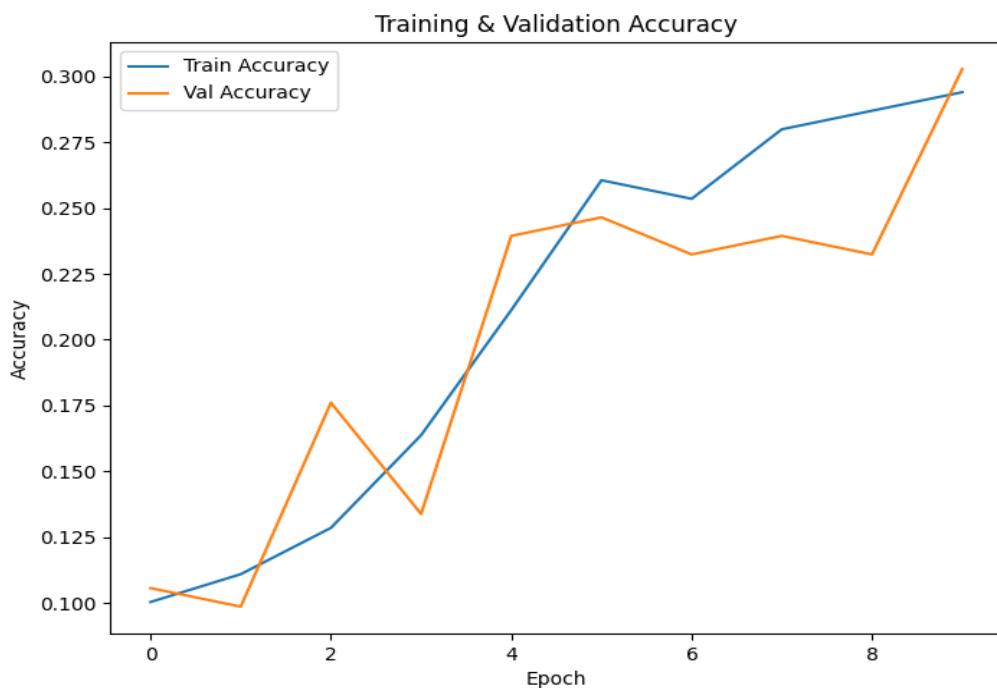
Model: "sequential\_1"

| 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:



# 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(1.3148148148149), 3: np.float64(0.64545454545455), 4: np.float64(1.1639344262295082), 5: np.float64(1.1451612903225807), 6: np.float64(1.3148148148149), 7: np.float64(1.3148148148149)}

**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%

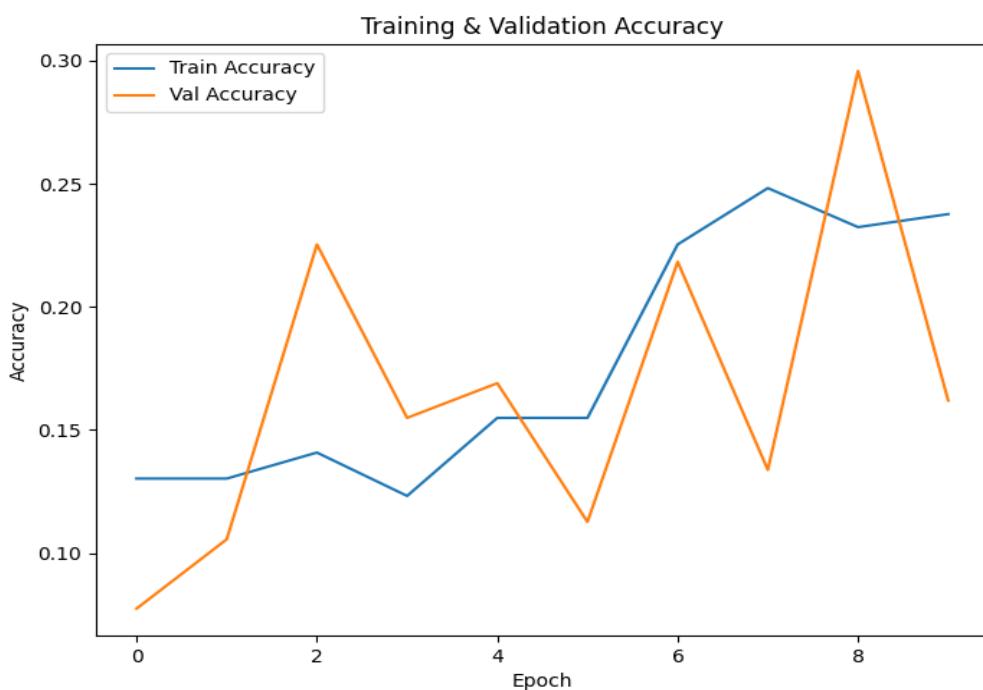
## Model Summary:

| 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:** 0.1519

## Training Accuracy over Epochs:



# Model Training Report

## Configuration and Parameters:

**Image Size:** (224, 224)

**Image S1C. (E)**

### **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}

**Class Weight**  
**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

## Salt-Pepper No Train Size: 568

**Train Size:** 568  
**Validation Size:** 142

## Validation Size

**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<br>(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:** 0.1013

## Training Accuracy over Epochs:



# Model Training Report

### **Configuration and Parameters:**

**Image Size:** (224, 224)

**Image S1C. (E)**

### **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}

**Class Weight**  
**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

## Salt-Pepper No Train Size: 568

**Train Size:** 568  
**Validation Size:** 143

## Validation Size

**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<br>(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:** 0.1139

## Training Accuracy over Epochs:



# Model Training Report

## Configuration and Parameters:

**Image Size:** (224, 224)

**Image S1C. (E)**

### **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}

**Class Weight**  
**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

**Salt-Pepper No.**  
**Train Size:** 568

**Train Size:** 568  
**Validation Size:** 142

## Validation Size

**Comments:** Using EfficientNetB0, increased to 30 epochs

## Model Summary

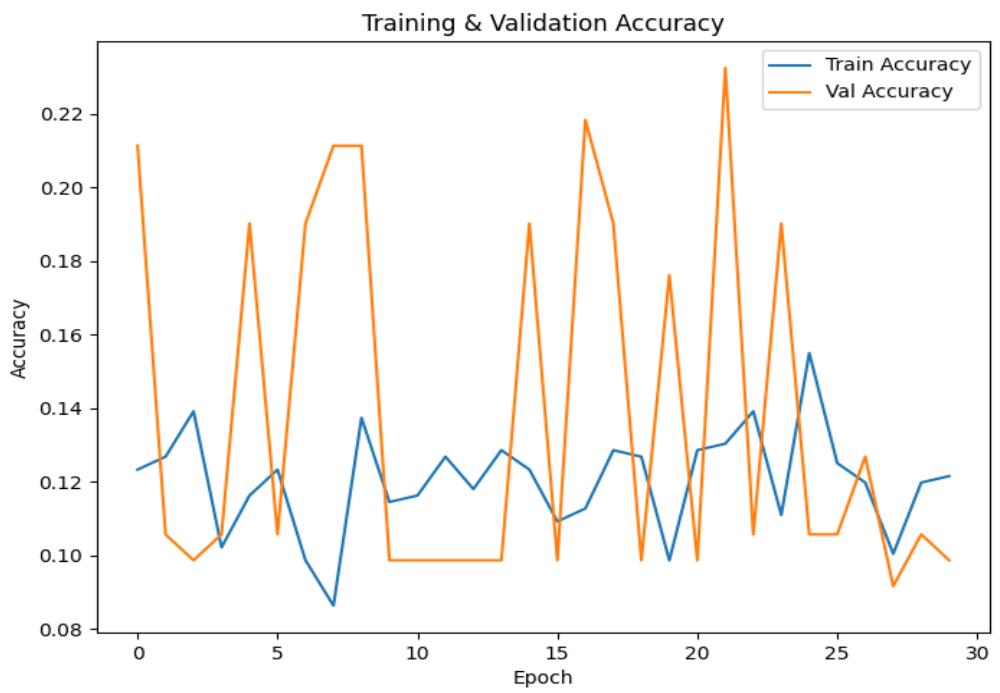
Model: "sequential\_1"

| Layer (type)                                         | Output Shape       | Param #   |
|------------------------------------------------------|--------------------|-----------|
| efficientnetb0 (Functional)                          | (None, 7, 7, 1280) | 4,049,571 |
| global_average_pooling2d<br>(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:



# 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"

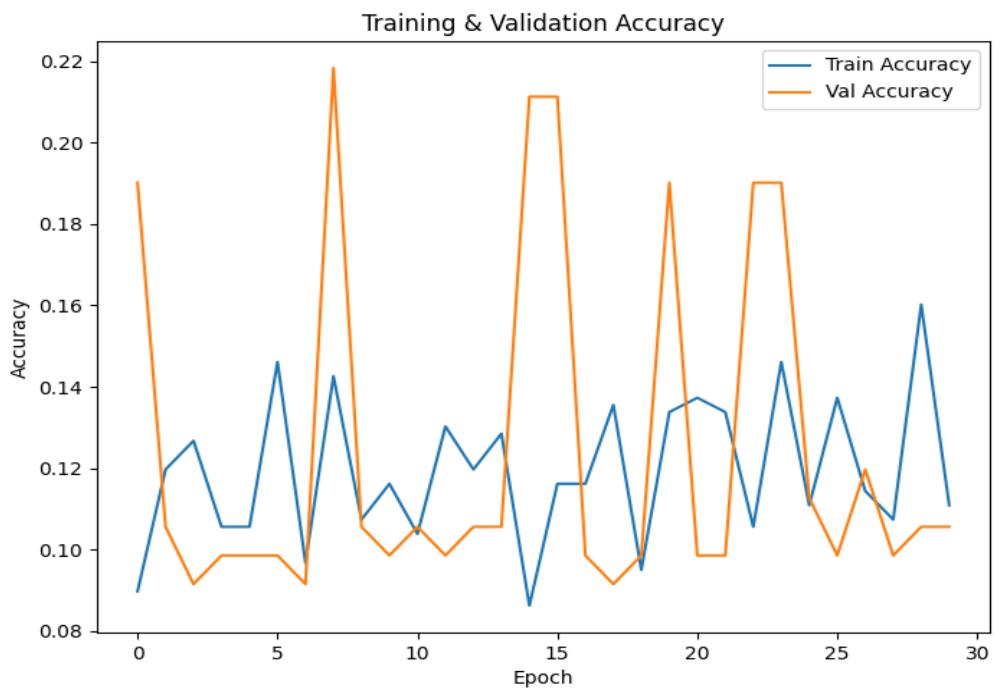
The diagram shows a Keras model structure with the following layers:

- Layer type: efficientnetb0 (Functional)
- Output Shape: (None, 7, 7, 1280)
- Param #: 4,049,571
- Layer type: global\_average\_pooling2d (GlobalAveragePooling2D)
- Output Shape: (None, 1280)
- Param #: 0
- Layer type: dropout (Dropout)
- Output Shape: (None, 1280)
- Param #: 0
- Layer type: dense (Dense)
- Output Shape: (None, 8)
- Param #: 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:



# 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

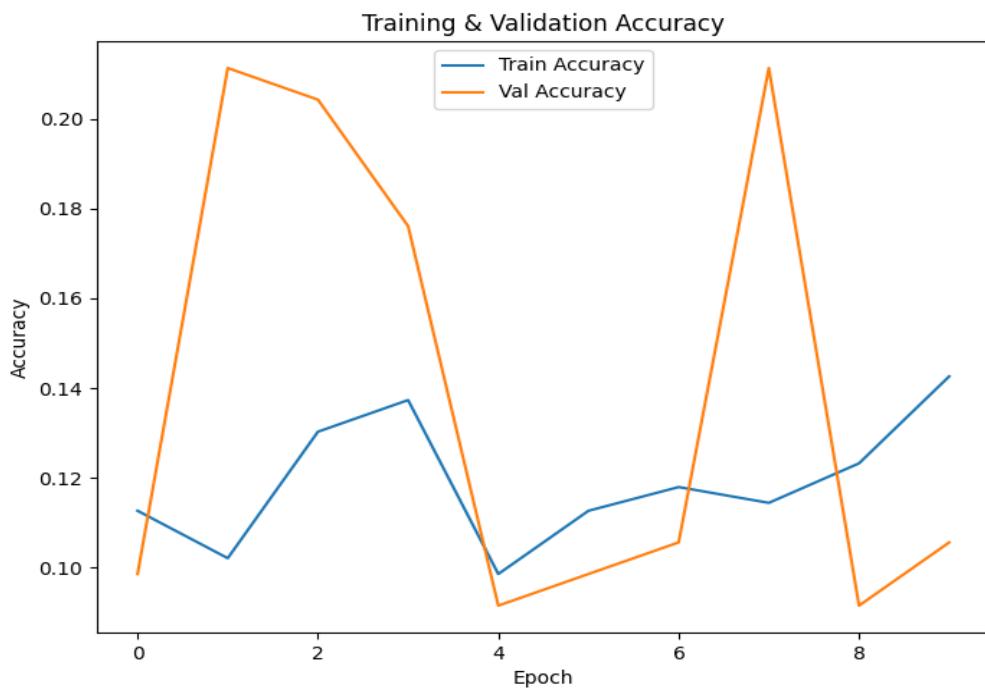
**Comments:** Using EfficientNetB0, train deeper layers

## Model Summary:

| Model: "sequential_1"                                |                    |           |
|------------------------------------------------------|--------------------|-----------|
| Layer (type)                                         | Output Shape       | Param #   |
| efficientnetb0 (Functional)                          | (None, 7, 7, 1280) | 4,049,571 |
| global_average_pooling2d<br>(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:** 0.1266

## 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(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<br>(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:



# 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

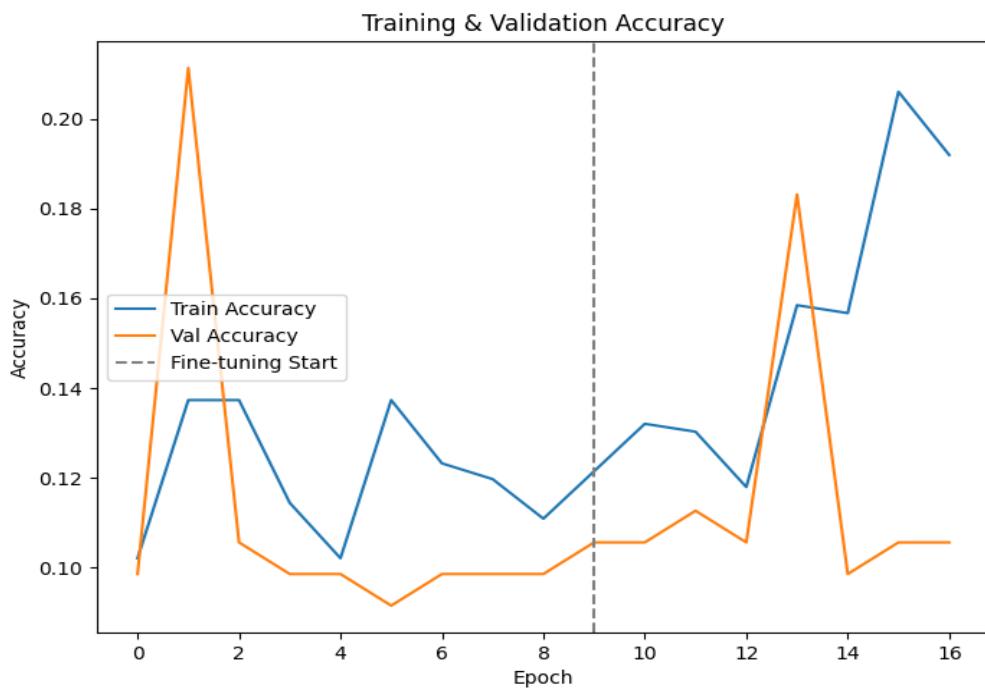
## Model Summary:

```
Model: "sequential_1"
[REDACTED]
[REDACTED]
■ Layer (type)           ■ Output Shape    ■ Param #
[REDACTED]
■ efficientnetb0 (Functional)   ■ (None, 7, 7, 1280) ■ 4,049,571 ■
[REDACTED]
[REDACTED]
■ global_average_pooling2d   ■ (None, 1280)    ■ 0 ■
■ (GlobalAveragePooling2D)
[REDACTED]
[REDACTED]
■ dropout (Dropout)        ■ (None, 1280)    ■ 0 ■
[REDACTED]
[REDACTED]
■ dense (Dense)           ■ (None, 8)      ■ 10,248 ■
[REDACTED]
[REDACTED]

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)

**Image 3.26. (E)**

### **Batch 3.2.3. 32**

**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

Base Epoch  
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

Salt-L Pepper N  
Train Size: 568

**Train Size: 368**

**Test Size: 79**

Comments: Usi

## Comments: Using Endpaper

pepper

## **Model Summary:**

Model: sequential\_1

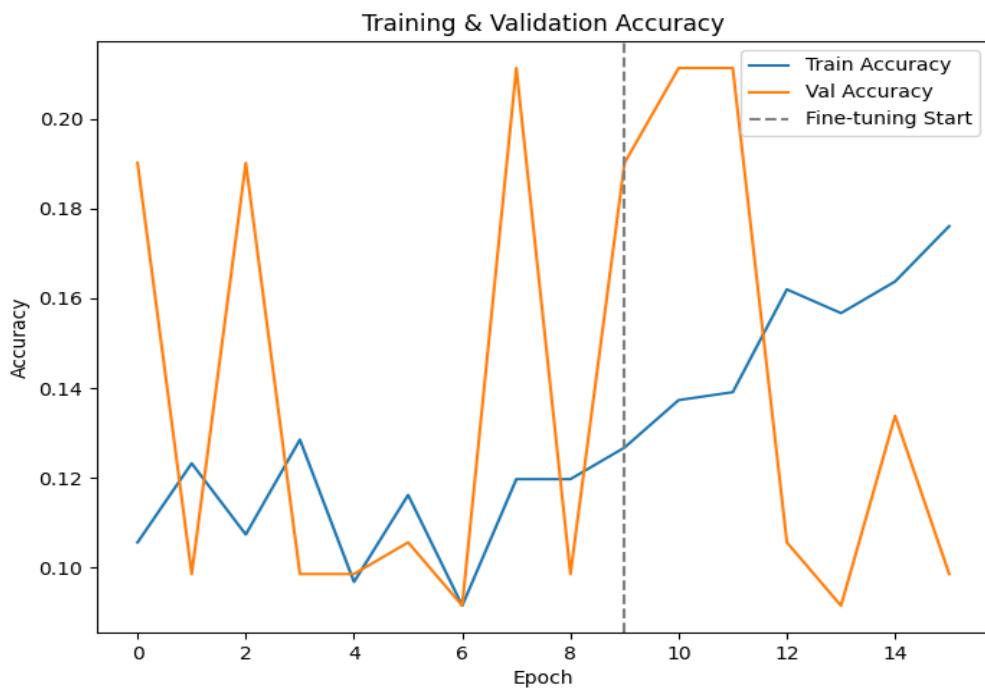
The diagram shows a Keras model structure with the following layers:

- Layer (type): efficientnetb0 (Functional)
- Output Shape: (None, 7, 7, 1280)
- Param #: 4,049,571
- Layer (type): global\_average\_pooling2d (GlobalAveragePooling2D)
- Output Shape: (None, 1280)
- Param #: 0
- Layer (type): dropout (Dropout)
- Output Shape: (None, 1280)
- Param #: 0
- Layer (type): dense (Dense)
- Output Shape: (None, 8)
- Param #: 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:



# Model Training Report

## Configuration and Parameters:

**Image Size:** (224, 224)

**Image 3.26. (E)**

**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}

**Class Weights:** [1  
**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

Salt-L Pepper N  
Train Size: 568

**Train Size: 368**

Valuation Size: 14  
Test Size: 79

Comments: I

**Comments:** Use 8 paper

& pepper

## **Model Summary:**

Model: sequential\_1

This diagram visualizes the Keras model structure. It consists of a grid where each row represents a layer. The first column shows the layer type (e.g., Layer, efficientnetb0, global\_average\_pooling2d, dropout, dense). The second column shows the output shape. The third column shows the number of parameters. The fourth column contains a series of black squares representing the layer's architecture.

| Layer (type)                                         | Output Shape       | Param #   |
|------------------------------------------------------|--------------------|-----------|
| efficientnetb0 (Functional)                          | (None, 7, 7, 1280) | 4,049,571 |
| global_average_pooling2d<br>(GlobalAveragePooling2D) | (None, 1280)       | 0         |
| 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:



# 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

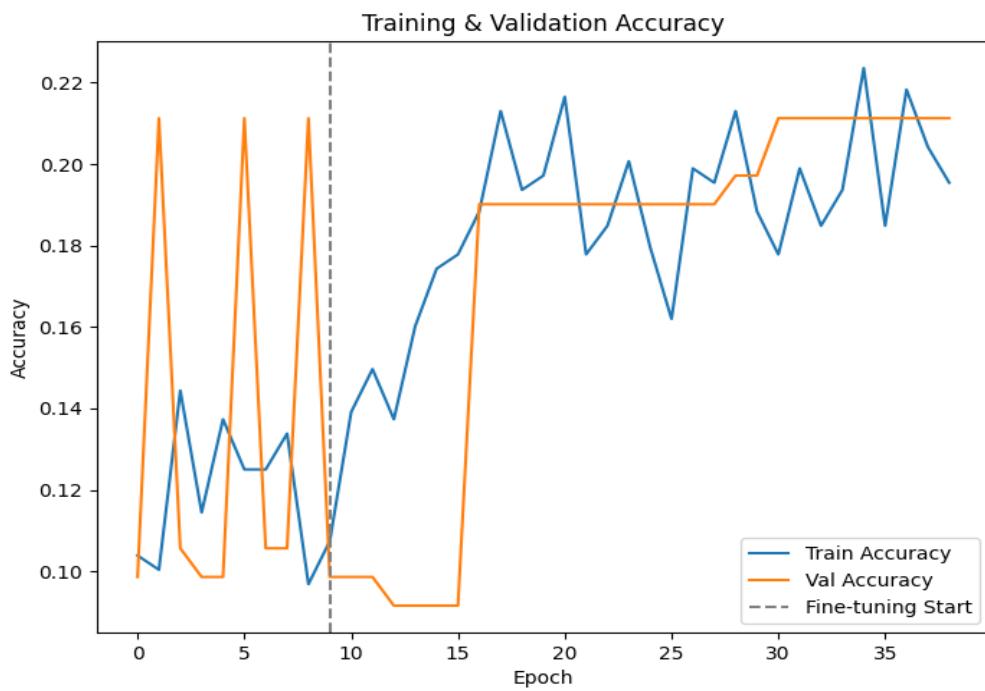
## Model Summary:

| Layer (type)                                         | Output Shape       | Param #   |
|------------------------------------------------------|--------------------|-----------|
| efficientnetb0 (Functional)                          | (None, 7, 7, 1280) | 4,049,571 |
| global_average_pooling2d<br>(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:



# 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

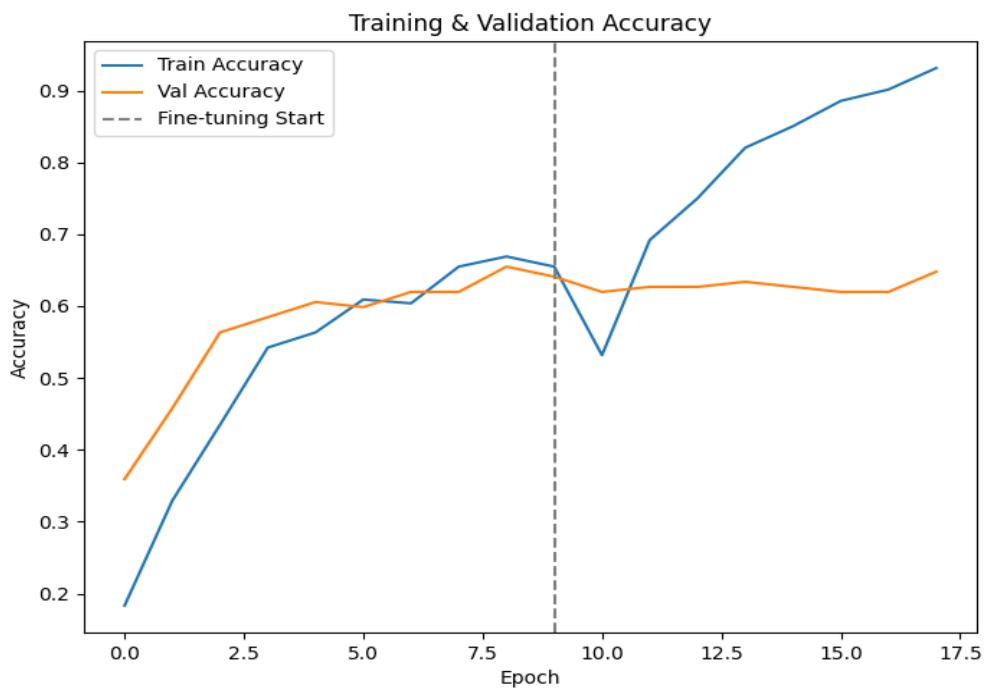
## Model Summary:

```
Model: "sequential_1"
[REDACTED]
[REDACTED]
■ Layer (type)           ■ Output Shape    ■ Param #
[REDACTED]
■ mobilenetv2_1.00_224 (Functional) ■ (None, 7, 7, 1280) ■ 2,257,984 ■
[REDACTED]
■ global_average_pooling2d   ■ (None, 1280)   ■ 0 ■
■ (GlobalAveragePooling2D)   ■                   ■
[REDACTED]
■ dropout (Dropout)        ■ (None, 1280)   ■ 0 ■
[REDACTED]
■ dense (Dense)           ■ (None, 8)      ■ 10,248 ■
[REDACTED]

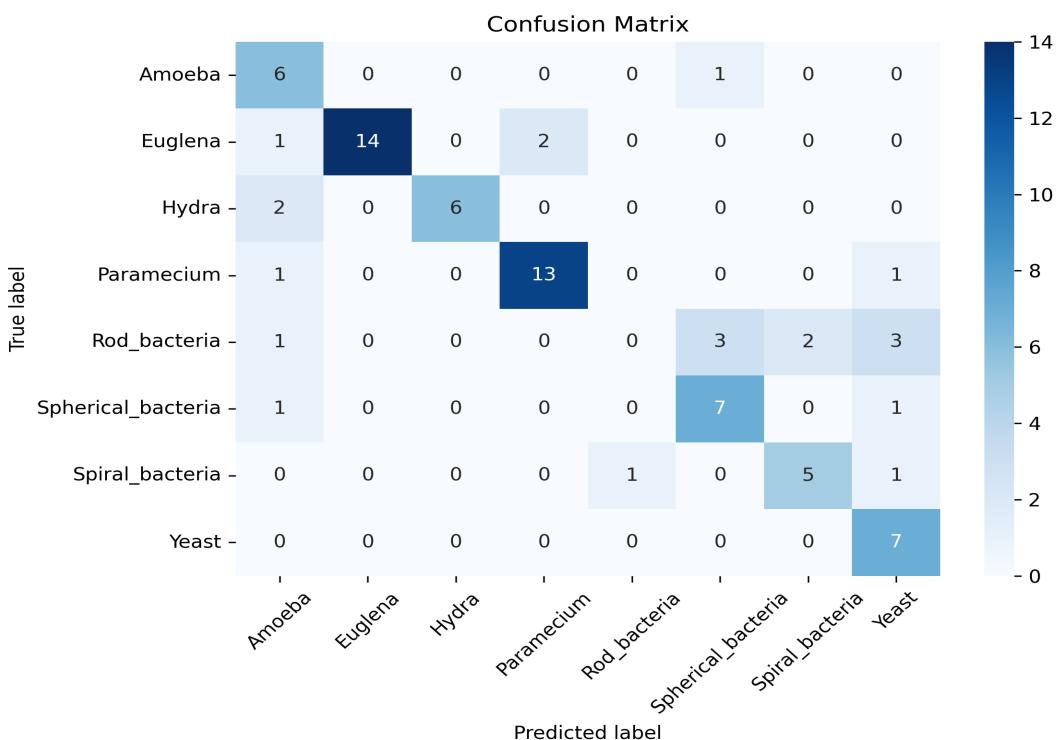
Total params: 5,998,937 (22.88 MB)
Trainable params: 1,865,352 (7.12 MB)
Non-trainable params: 402,880 (1.54 MB)
Optimizer params: 3,730,705 (14.23 MB)
```

**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(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

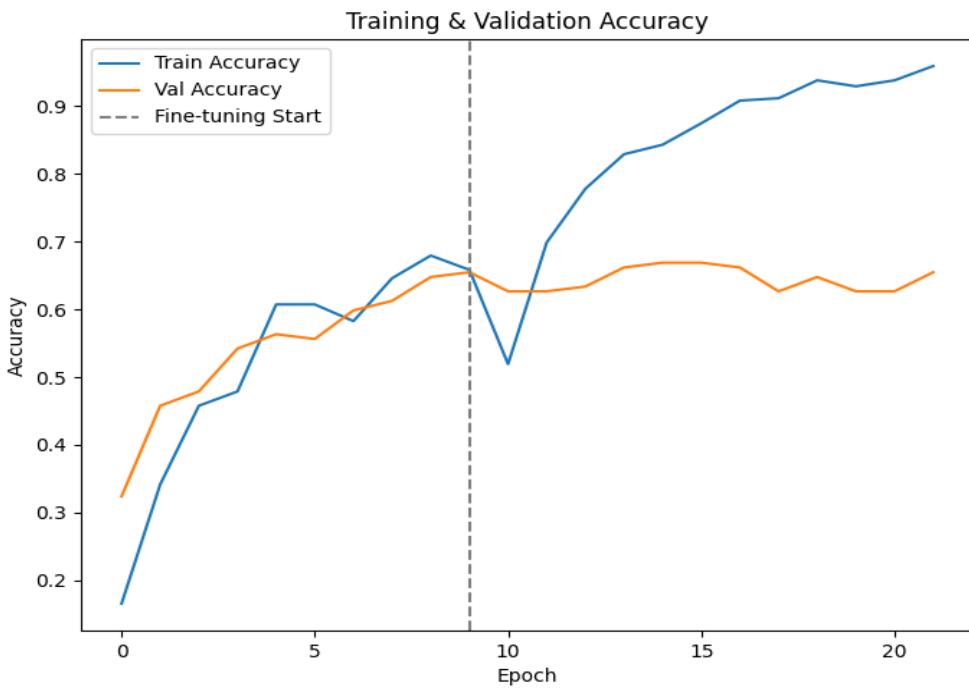
## Model Summary:

```
Model: "sequential_1"
[REDACTED]
[REDACTED]
■ Layer (type)           ■ Output Shape    ■ Param #
[REDACTED]
■ mobilenetv2_1.00_224 (Functional) ■ (None, 7, 7, 1280) ■ 2,257,984 ■
[REDACTED]
[REDACTED]
■ global_average_pooling2d   ■ (None, 1280)   ■ 0 ■
■ (GlobalAveragePooling2D)   ■                   ■
[REDACTED]
[REDACTED]
■ dropout (Dropout)        ■ (None, 1280)   ■ 0 ■
[REDACTED]
[REDACTED]
■ dense (Dense)           ■ (None, 8)      ■ 10,248 ■
[REDACTED]
[REDACTED]

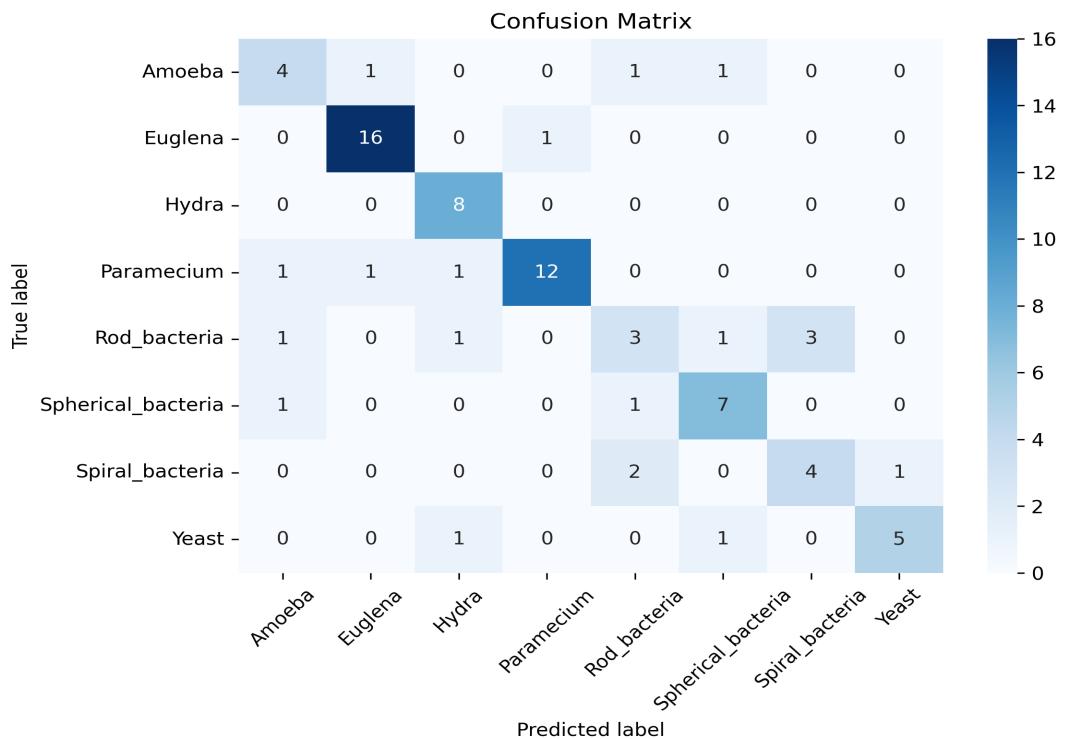
Total params: 5,998,937 (22.88 MB)
Trainable params: 1,865,352 (7.12 MB)
Non-trainable params: 402,880 (1.54 MB)
Optimizer params: 3,730,705 (14.23 MB)
```

**Test Accuracy:** 0.7468

## Training Accuracy over Epochs:



## 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

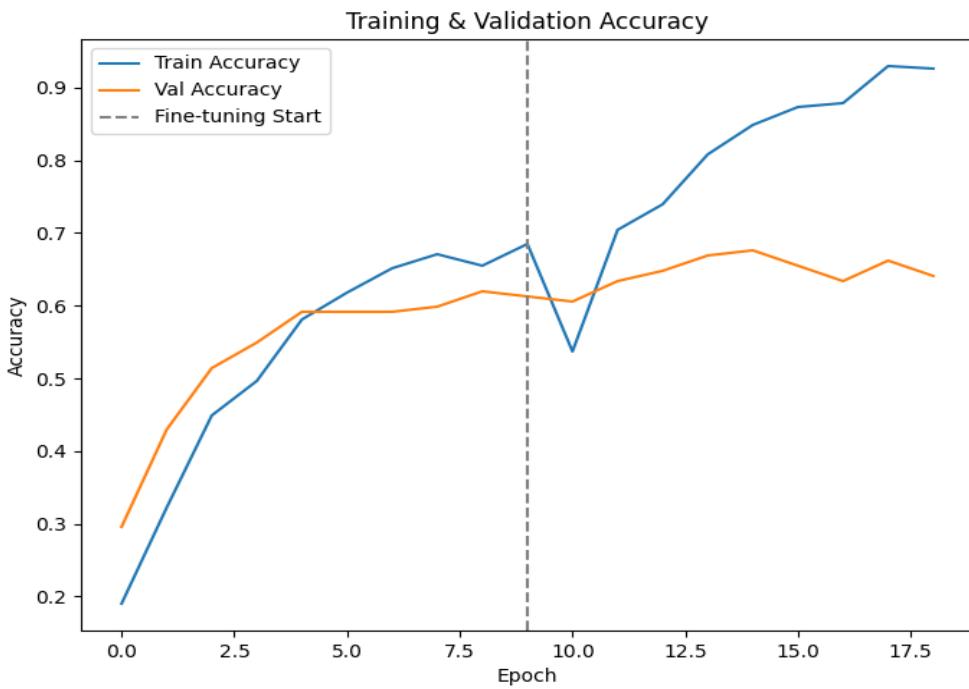
**Comments:** Using MobileNetV2, increased salt and pepper + gaussian

## Model Summary:

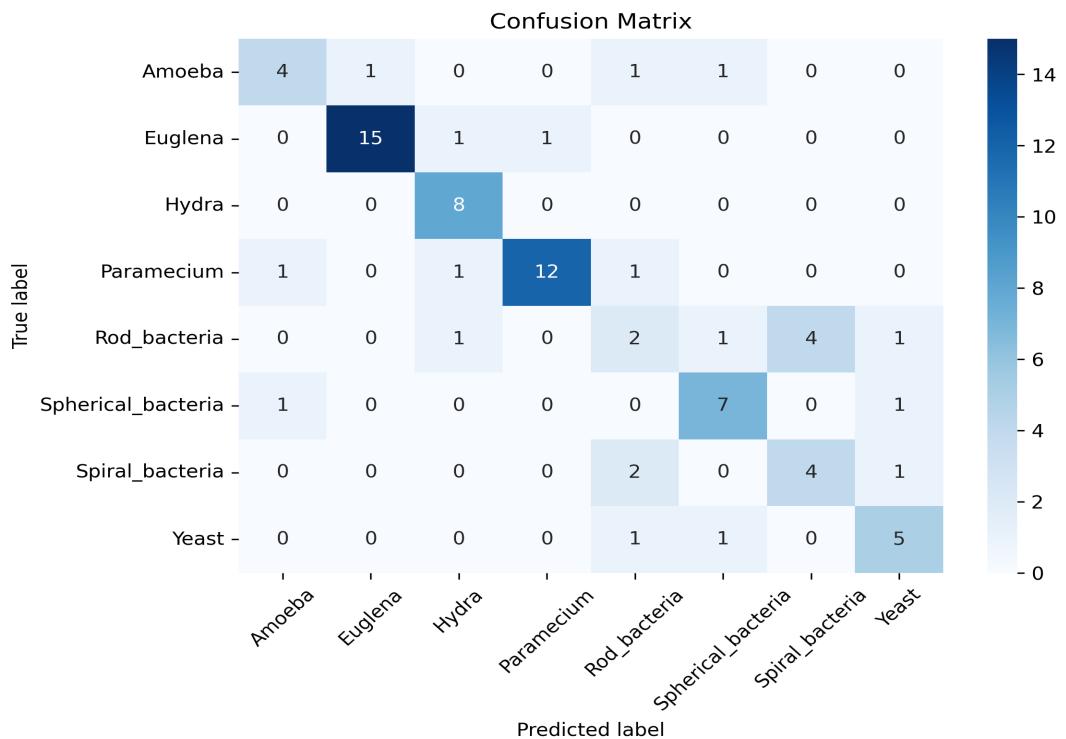
| Model: "sequential_1"                                                                                                                                            |                    |           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------|
| Layer (type)                                                                                                                                                     | Output Shape       | Param #   |
| mobilenetv2_1.00_224 (Functional)                                                                                                                                | (None, 7, 7, 1280) | 2,257,984 |
| global_average_pooling2d<br>(GlobalAveragePooling2D)                                                                                                             | (None, 1280)       | 0         |
| dropout (Dropout)                                                                                                                                                | (None, 1280)       | 0         |
| dense (Dense)                                                                                                                                                    | (None, 8)          | 10,248    |
| Total params: 5,998,937 (22.88 MB)<br>Trainable params: 1,865,352 (7.12 MB)<br>Non-trainable params: 402,880 (1.54 MB)<br>Optimizer params: 3,730,705 (14.23 MB) |                    |           |

**Test Accuracy:** 0.7215

## 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, reduced salt and pepper + gaussian, increased brightness and contrast

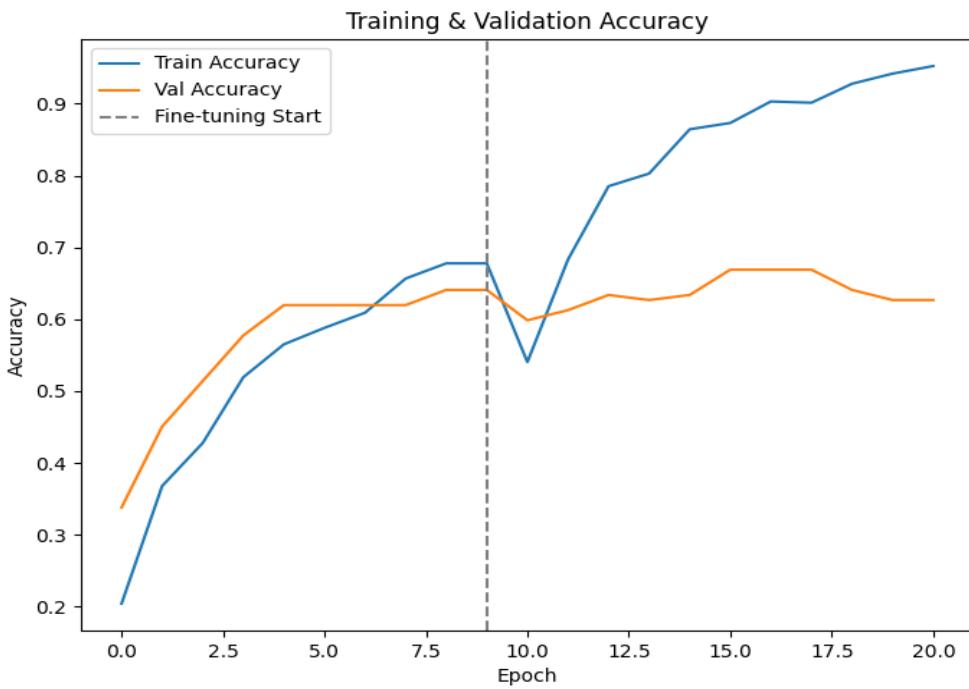
## Model Summary:

```
Model: "sequential_1"
[REDACTED]
[REDACTED]
■ Layer (type)           ■ Output Shape    ■ Param #
[REDACTED]
■ mobilenetv2_1.00_224 (Functional)   ■ (None, 7, 7, 1280)   ■ 2,257,984 ■
[REDACTED]
[REDACTED]
■ global_average_pooling2d   ■ (None, 1280)    ■ 0 ■
■ (GlobalAveragePooling2D)
[REDACTED]
[REDACTED]
■ dropout (Dropout)        ■ (None, 1280)    ■ 0 ■
[REDACTED]
[REDACTED]
■ dense (Dense)           ■ (None, 8)       ■ 10,248 ■
[REDACTED]
[REDACTED]

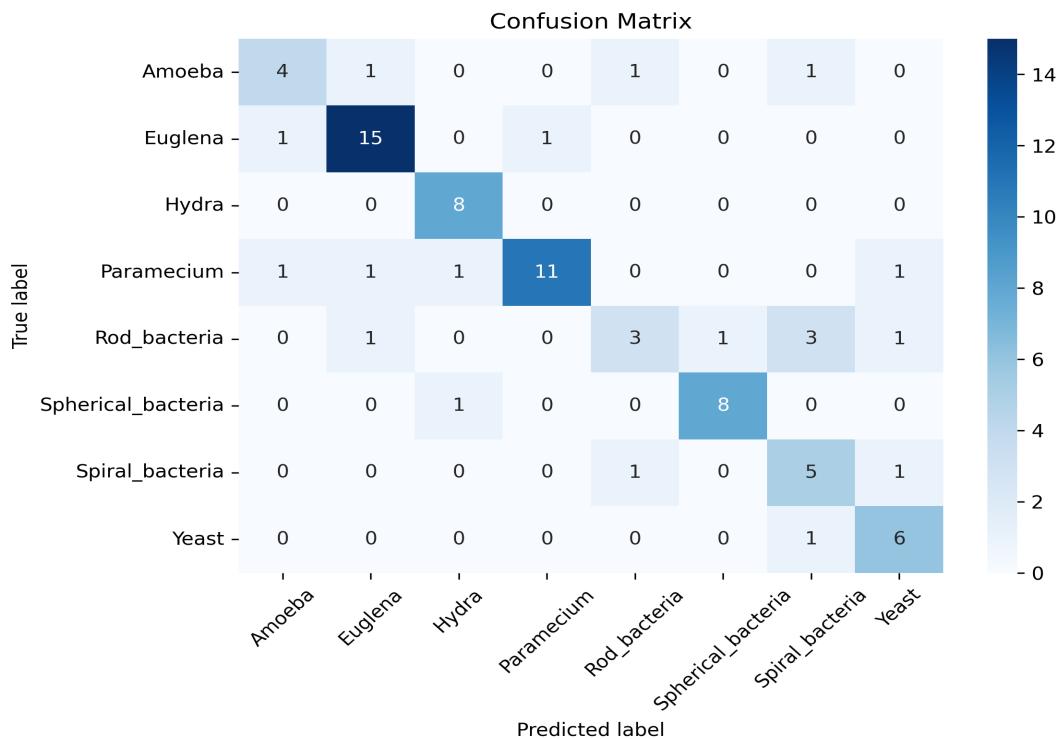
Total params: 5,998,937 (22.88 MB)
Trainable params: 1,865,352 (7.12 MB)
Non-trainable params: 402,880 (1.54 MB)
Optimizer params: 3,730,705 (14.23 MB)
```

**Test Accuracy:** 0.7595

## Training Accuracy over Epochs:



## 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

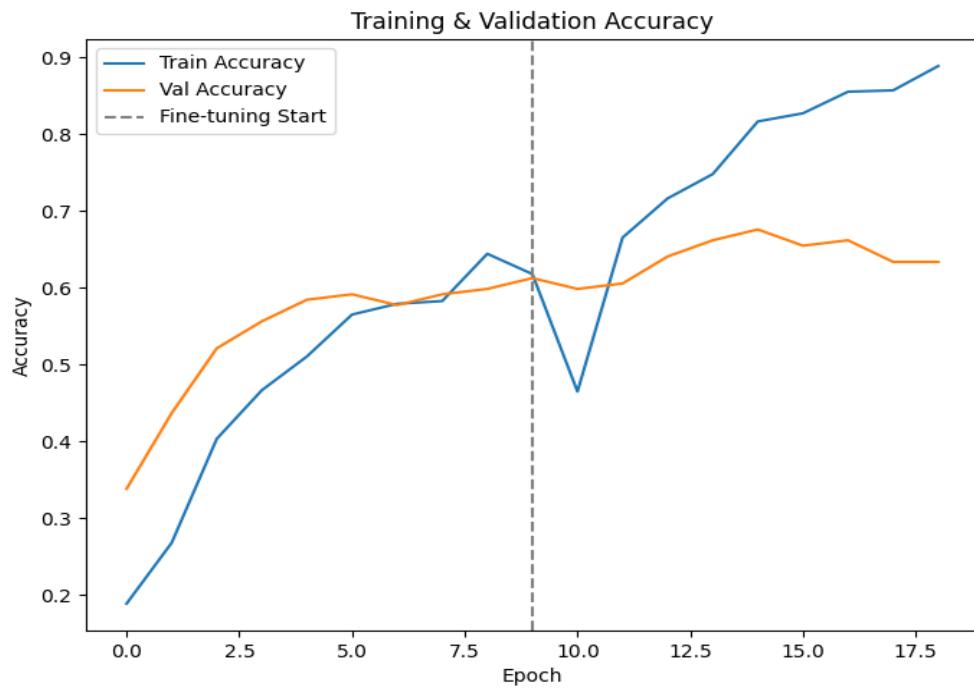
## Model Summary:

```
Model: "sequential_1"
[REDACTED]
[REDACTED]
■ Layer (type)           ■ Output Shape    ■ Param #
[REDACTED]
■ mobilenetv2_1.00_224 (Functional) ■ (None, 7, 7, 1280) ■ 2,257,984 ■
[REDACTED]
[REDACTED]
■ global_average_pooling2d   ■ (None, 1280)   ■ 0 ■
■ (GlobalAveragePooling2D)   ■                   ■
[REDACTED]
[REDACTED]
■ dropout (Dropout)        ■ (None, 1280)   ■ 0 ■
[REDACTED]
[REDACTED]
■ dense (Dense)           ■ (None, 8)      ■ 10,248 ■
[REDACTED]
[REDACTED]

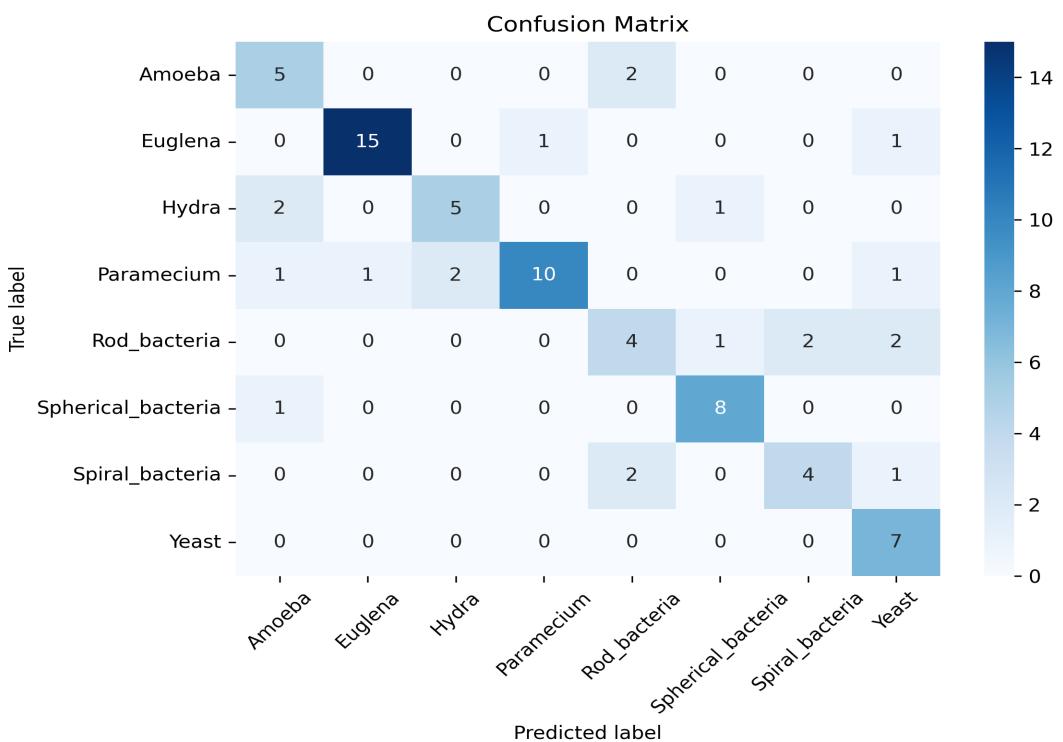
Total params: 5,998,937 (22.88 MB)
Trainable params: 1,865,352 (7.12 MB)
Non-trainable params: 402,880 (1.54 MB)
Optimizer params: 3,730,705 (14.23 MB)
```

**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

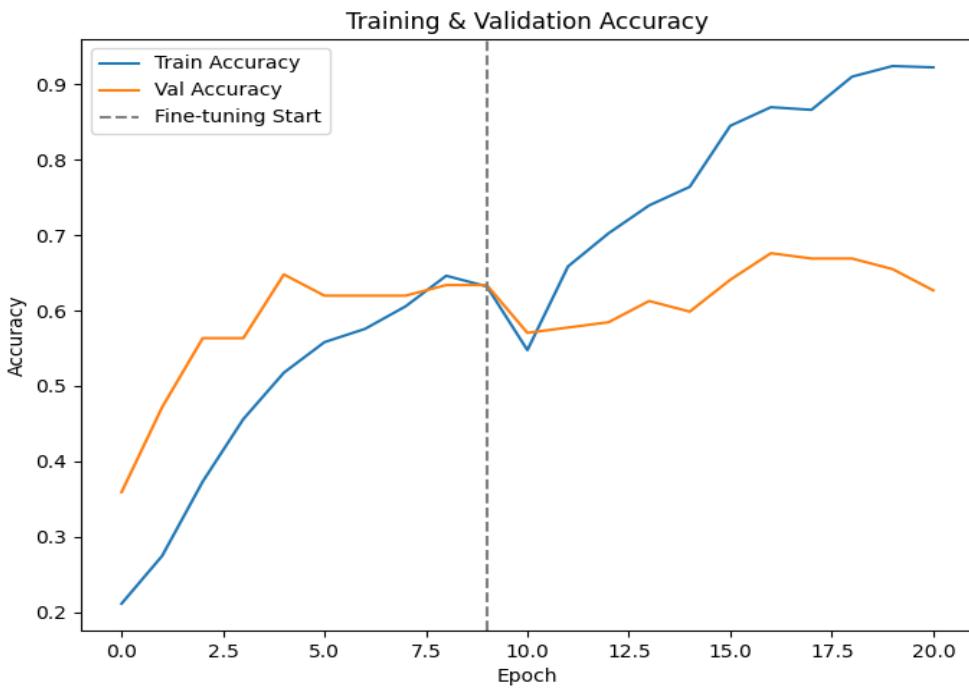
## Model Summary:

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

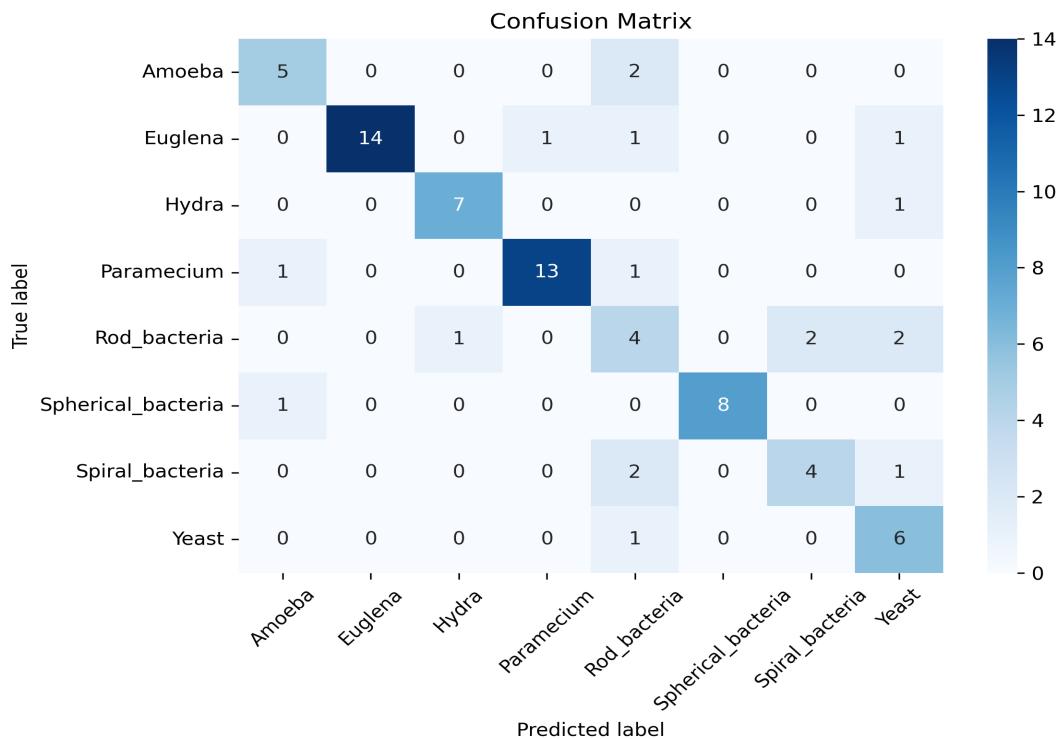
Total params: 5,998,937 (22.88 MB)  
Trainable params: 1,865,352 (7.12 MB)  
Non-trainable params: 402,880 (1.54 MB)  
Optimizer params: 3,730,705 (14.23 MB)

**Test Accuracy:** 0.7722

## Training Accuracy over Epochs:



## 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:** 0.02  
**Salt-Pepper Noise Amount:** 0.02  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Comments:** Using MobileNetV2, increased all augmentation

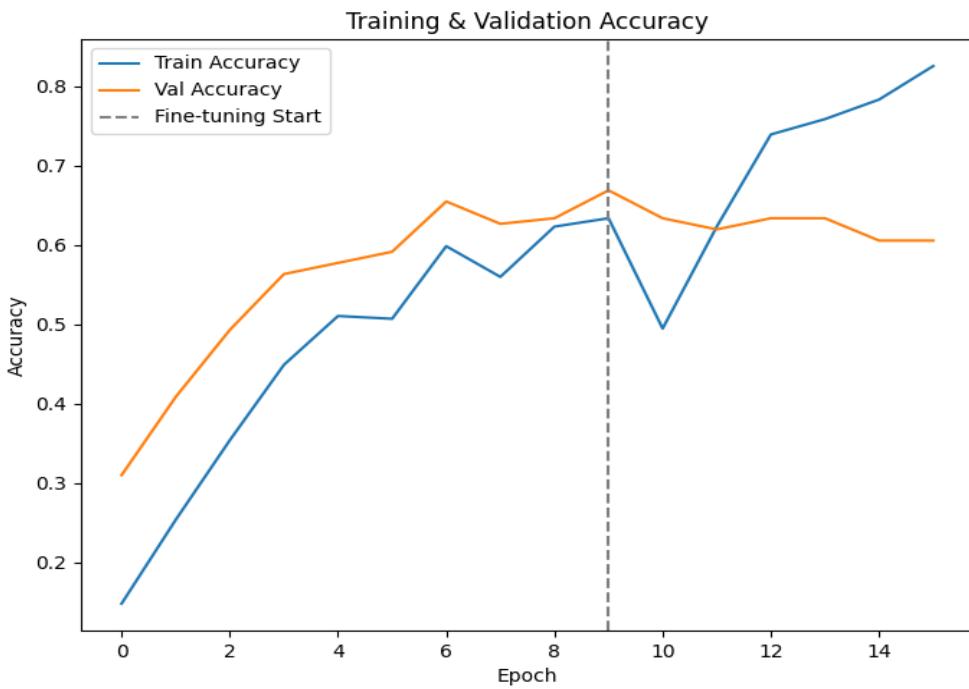
## Model Summary:

```
Model: "sequential_1"
[REDACTED]
[REDACTED]
■ Layer (type)           ■ Output Shape    ■ Param #
[REDACTED]
■ mobilenetv2_1.00_224 (Functional) ■ (None, 7, 7, 1280) ■ 2,257,984 ■
[REDACTED]
■ global_average_pooling2d   ■ (None, 1280)   ■ 0 ■
■ (GlobalAveragePooling2D)   ■                   ■
[REDACTED]
■ dropout (Dropout)        ■ (None, 1280)   ■ 0 ■
[REDACTED]
■ dense (Dense)           ■ (None, 8)      ■ 10,248 ■
[REDACTED]

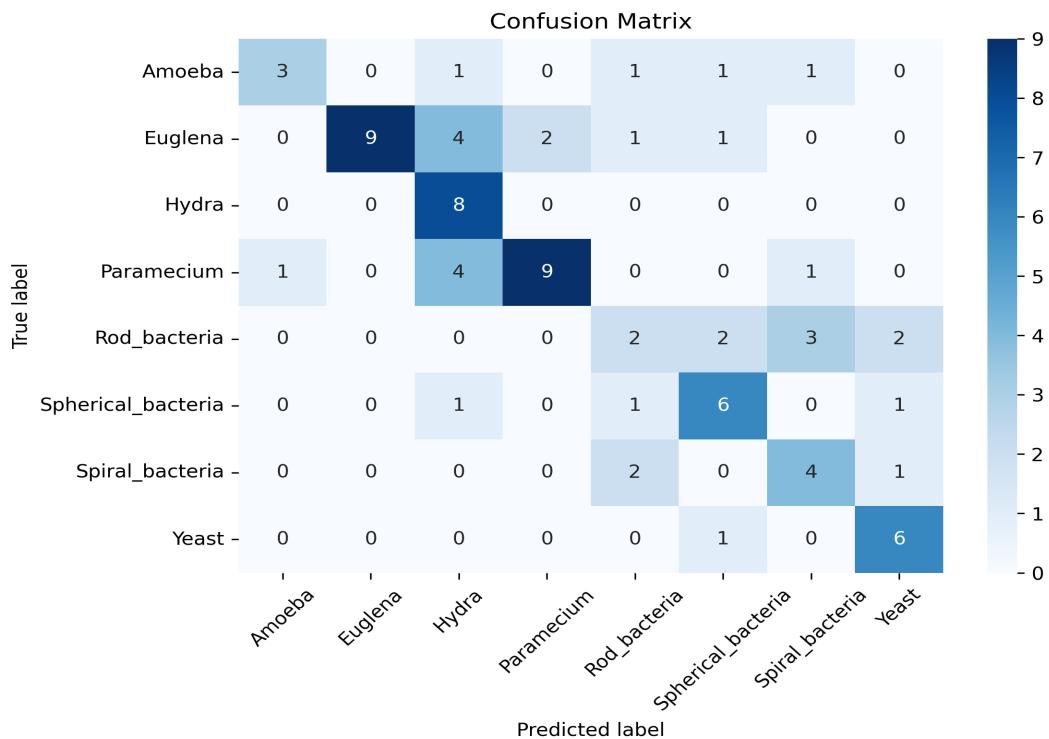
Total params: 5,998,937 (22.88 MB)
Trainable params: 1,865,352 (7.12 MB)
Non-trainable params: 402,880 (1.54 MB)
Optimizer params: 3,730,705 (14.23 MB)
```

**Test Accuracy:** 0.5949

## 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:** 0.02  
**Salt-Pepper Noise Amount:** 0.02  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Comments:** Using MobileNetV2, decreased zoom and rotation augmentation

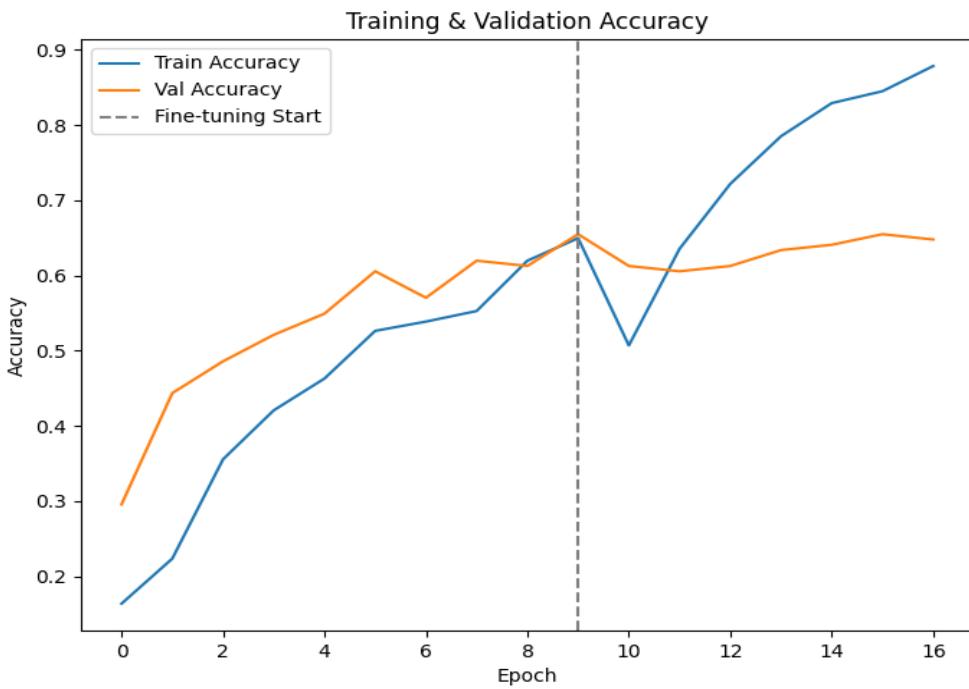
## Model Summary:

```
Model: "sequential_1"
[REDACTED]
[REDACTED]
■ Layer (type)           ■ Output Shape    ■ Param #
[REDACTED]
■ mobilenetv2_1.00_224 (Functional) ■ (None, 7, 7, 1280) ■ 2,257,984 ■
[REDACTED]
■ global_average_pooling2d   ■ (None, 1280)   ■ 0 ■
■ (GlobalAveragePooling2D)   ■                   ■
[REDACTED]
■ dropout (Dropout)        ■ (None, 1280)   ■ 0 ■
[REDACTED]
■ dense (Dense)           ■ (None, 8)      ■ 10,248 ■
[REDACTED]

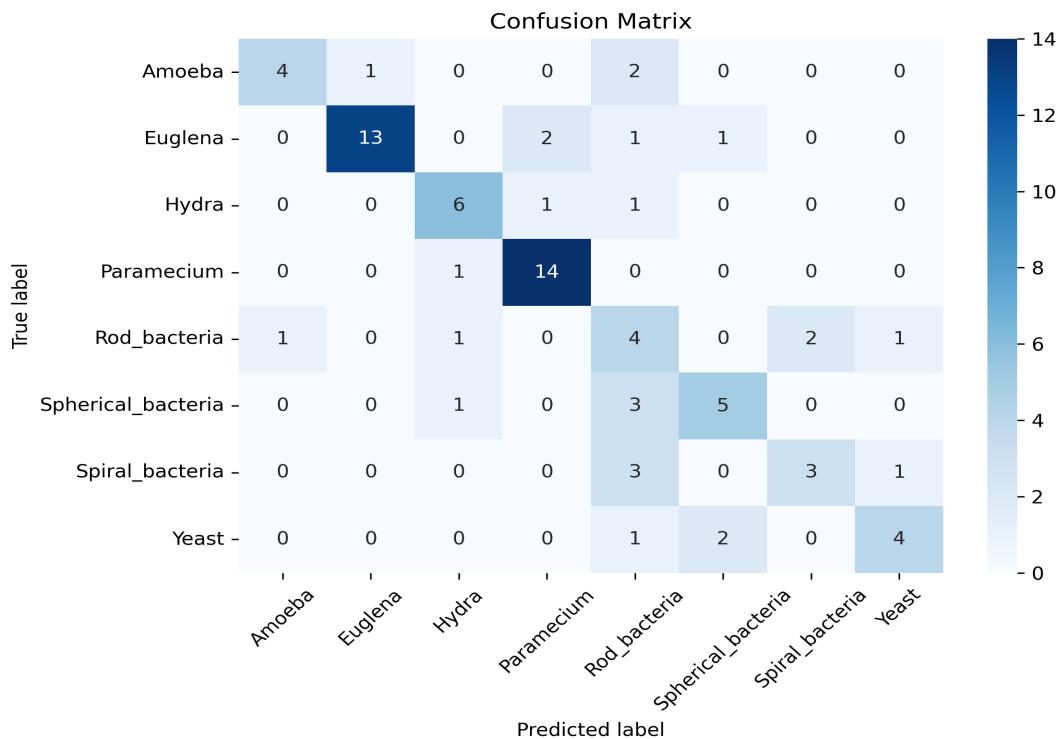
Total params: 5,998,937 (22.88 MB)
Trainable params: 1,865,352 (7.12 MB)
Non-trainable params: 402,880 (1.54 MB)
Optimizer params: 3,730,705 (14.23 MB)
```

**Test Accuracy:** 0.6709

## 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:** 0.0  
**Salt-Pepper Noise Amount:** 0.0  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Comments:** Using MobileNetV2, tweaked augmentation and removed gaussian + salt and pepper

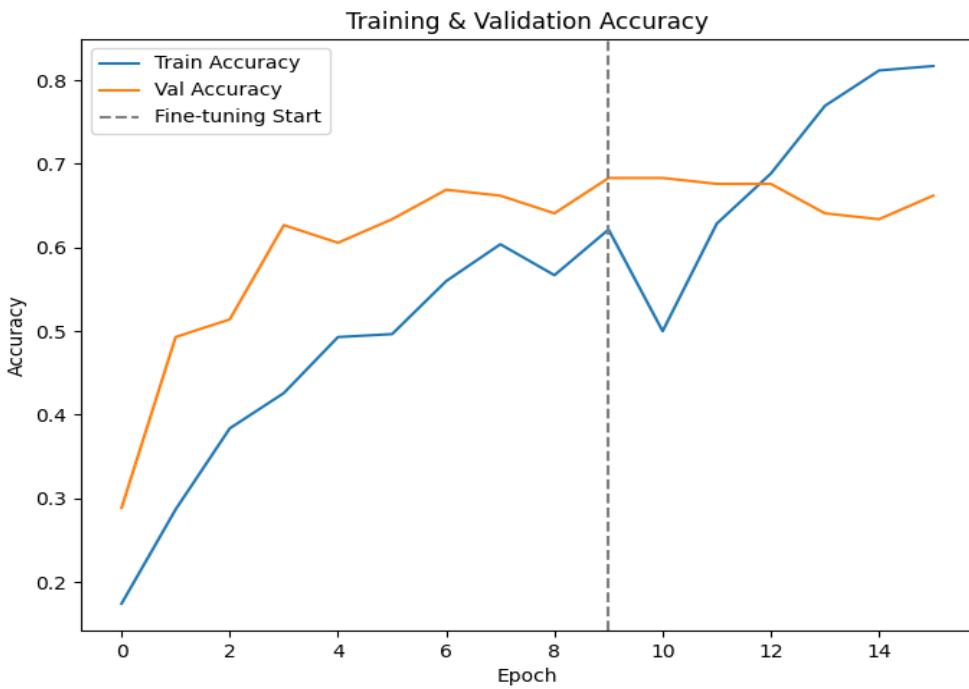
## Model Summary:

```
Model: "sequential_1"
[REDACTED]
[REDACTED]
■ Layer (type)           ■ Output Shape    ■ Param #
[REDACTED]
■ mobilenetv2_1.00_224 (Functional) ■ (None, 7, 7, 1280) ■ 2,257,984 ■
[REDACTED]
[REDACTED]
■ global_average_pooling2d   ■ (None, 1280)   ■ 0 ■
■ (GlobalAveragePooling2D)   ■                   ■
[REDACTED]
[REDACTED]
■ dropout (Dropout)        ■ (None, 1280)   ■ 0 ■
[REDACTED]
[REDACTED]
■ dense (Dense)           ■ (None, 8)      ■ 10,248 ■
[REDACTED]
[REDACTED]

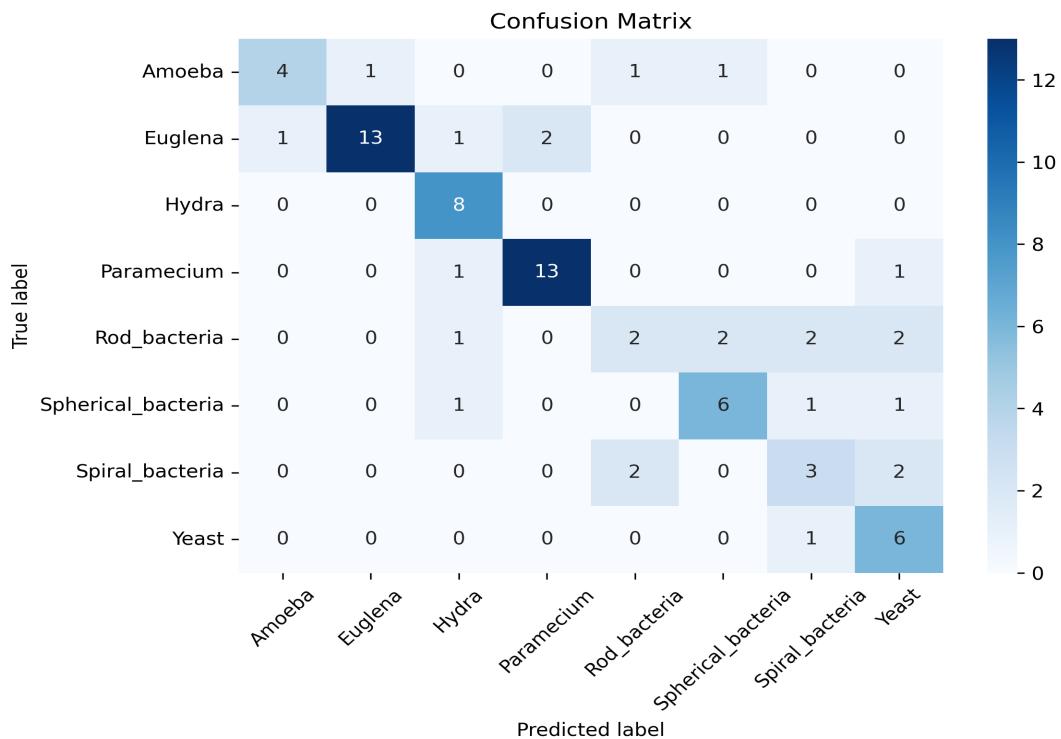
Total params: 5,998,937 (22.88 MB)
Trainable params: 1,865,352 (7.12 MB)
Non-trainable params: 402,880 (1.54 MB)
Optimizer params: 3,730,705 (14.23 MB)
```

**Test Accuracy:** 0.6962

## 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:** 0.02  
**Salt-Pepper Noise Amount:** 0.05  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Comments:** Using MobileNetV2, tweaked augmentation and increased gaussian + salt and pepper

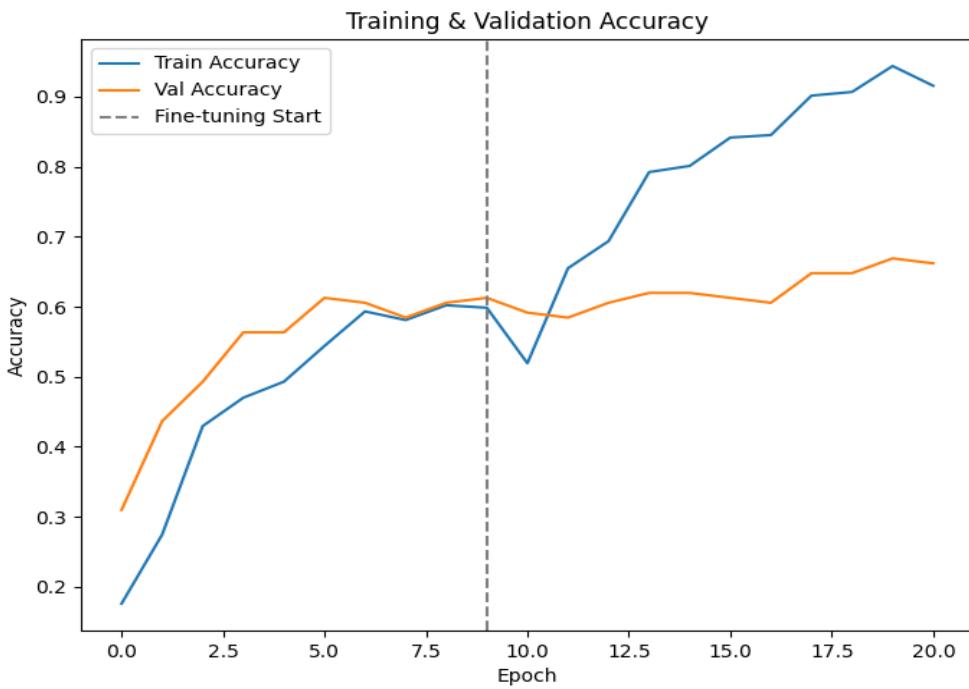
## Model Summary:

```
Model: "sequential_1"
[REDACTED]
[REDACTED]
■ Layer (type)           ■ Output Shape    ■ Param #
[REDACTED]
■ mobilenetv2_1.00_224 (Functional) ■ (None, 7, 7, 1280) ■ 2,257,984 ■
[REDACTED]
[REDACTED]
■ global_average_pooling2d   ■ (None, 1280)   ■ 0 ■
■ (GlobalAveragePooling2D)   ■                   ■
[REDACTED]
[REDACTED]
■ dropout (Dropout)        ■ (None, 1280)   ■ 0 ■
[REDACTED]
[REDACTED]
■ dense (Dense)           ■ (None, 8)      ■ 10,248 ■
[REDACTED]
[REDACTED]

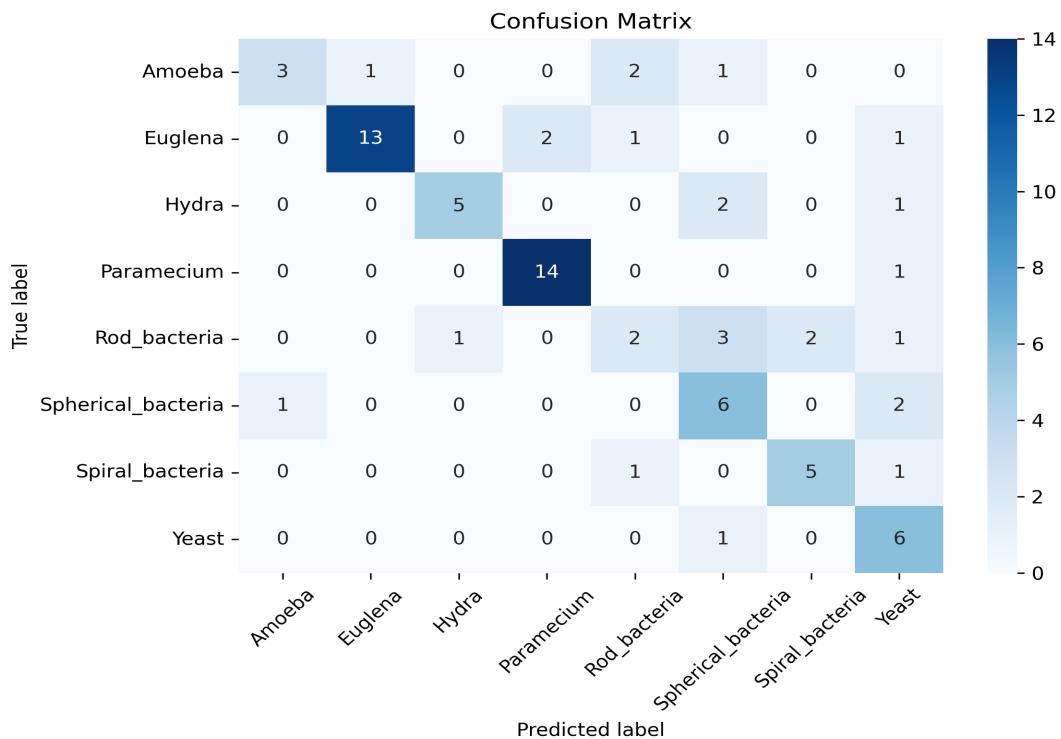
Total params: 5,998,937 (22.88 MB)
Trainable params: 1,865,352 (7.12 MB)
Non-trainable params: 402,880 (1.54 MB)
Optimizer params: 3,730,705 (14.23 MB)
```

**Test Accuracy:** 0.6835

## Training Accuracy over Epochs:



## Confusion Matrix:



# Model Training Report

## Configuration and Parameters:

**Image Size:** (224, 224)  
**Batch Size:** 64  
**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:** 0.02  
**Salt-Pepper Noise Amount:** 0.05  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Comments:** Using MobileNetV2, increased batch size

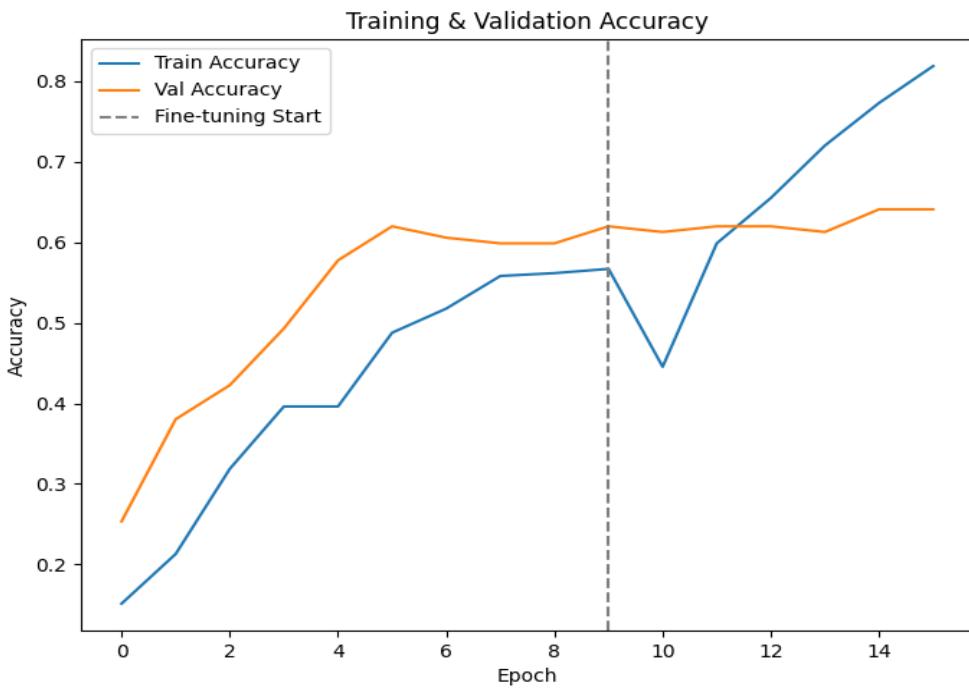
## Model Summary:

```
Model: "sequential_1"
[REDACTED]
[REDACTED]
■ Layer (type)           ■ Output Shape    ■ Param #
[REDACTED]
■ mobilenetv2_1.00_224 (Functional)   ■ (None, 7, 7, 1280)   ■ 2,257,984 ■
[REDACTED]
■ global_average_pooling2d   ■ (None, 1280)    ■ 0 ■
■ (GlobalAveragePooling2D)   ■                         ■
[REDACTED]
■ dropout (Dropout)        ■ (None, 1280)    ■ 0 ■
[REDACTED]
■ dense (Dense)           ■ (None, 8)       ■ 10,248 ■
[REDACTED]

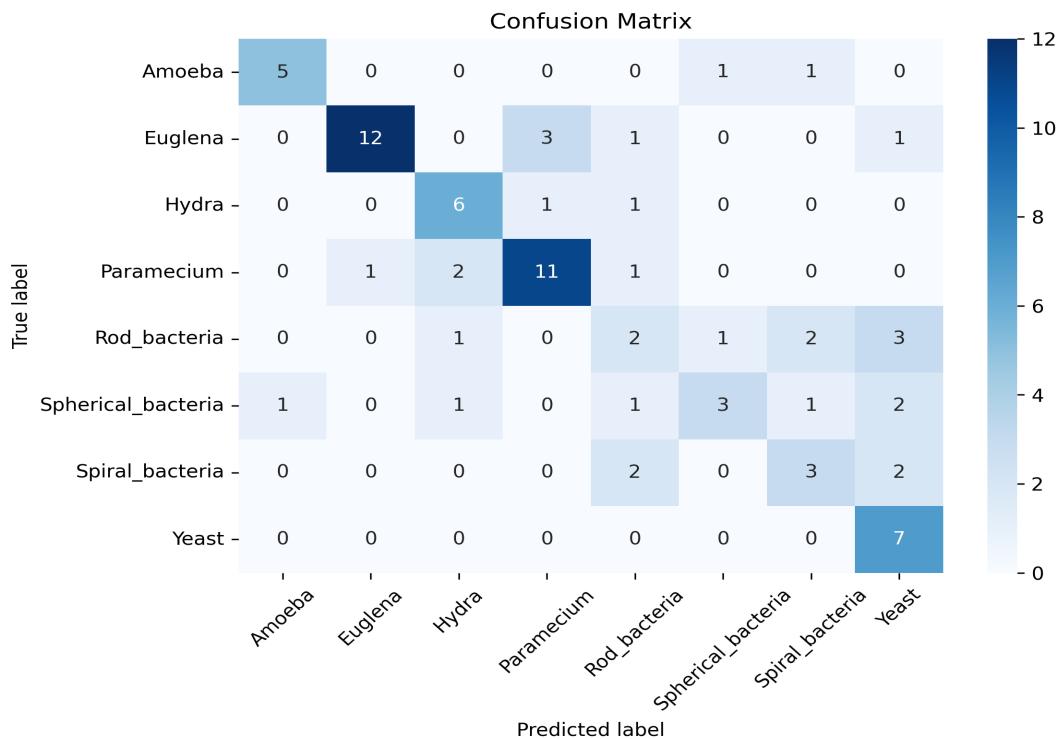
Total params: 5,998,937 (22.88 MB)
Trainable params: 1,865,352 (7.12 MB)
Non-trainable params: 402,880 (1.54 MB)
Optimizer params: 3,730,705 (14.23 MB)
```

**Test Accuracy:** 0.6203

## Training Accuracy over Epochs:



## Confusion Matrix:



# Model Training Report

## Configuration and Parameters:

**Image Size:** (224, 224)

**Batch Size:** 16

**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:** 0.02

**Salt-Pepper Noise Amount:** 0.05

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

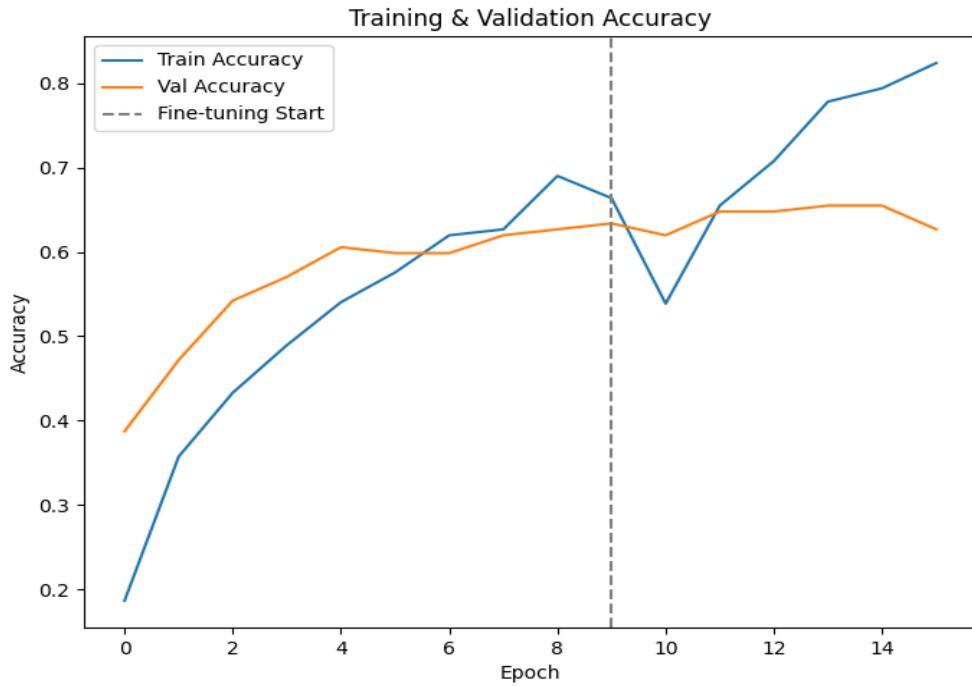
**Comments:** Using MobileNetV2, reduced batch size

## Model Summary:

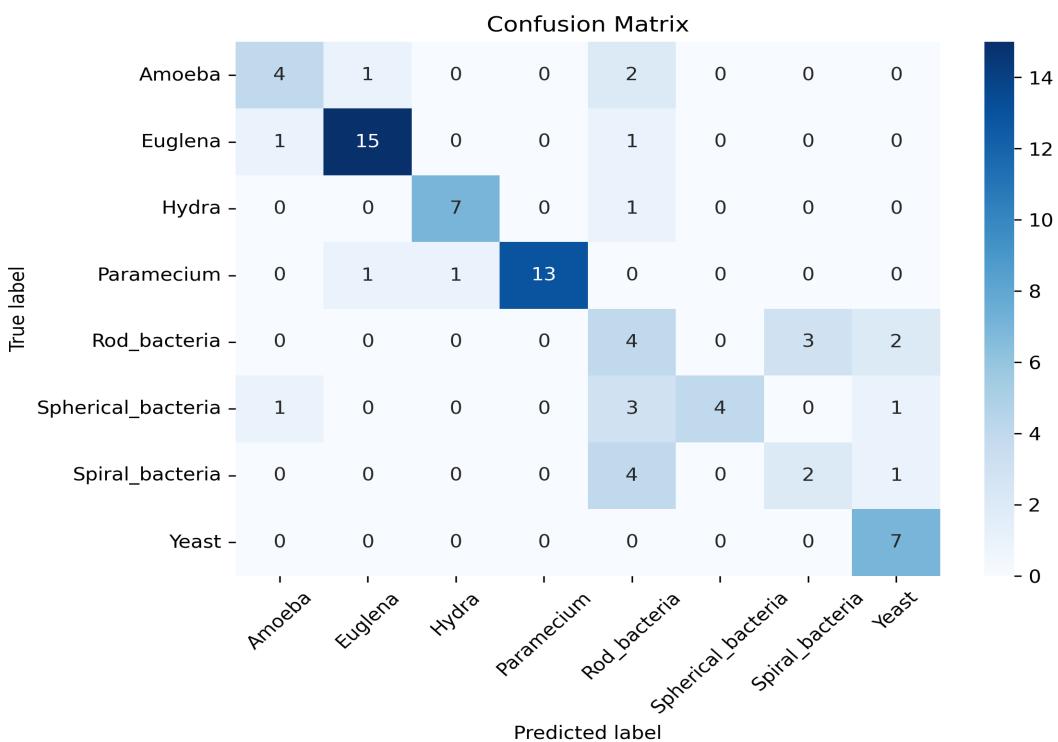
| Model: "sequential_1"                                                                                                                                            |                    |           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------|
| Layer (type)                                                                                                                                                     | Output Shape       | Param #   |
| mobilenetv2_1.00_224 (Functional)                                                                                                                                | (None, 7, 7, 1280) | 2,257,984 |
| global_average_pooling2d<br>(GlobalAveragePooling2D)                                                                                                             | (None, 1280)       | 0         |
| dropout (Dropout)                                                                                                                                                | (None, 1280)       | 0         |
| dense (Dense)                                                                                                                                                    | (None, 8)          | 10,248    |
| Total params: 5,998,937 (22.88 MB)<br>Trainable params: 1,865,352 (7.12 MB)<br>Non-trainable params: 402,880 (1.54 MB)<br>Optimizer params: 3,730,705 (14.23 MB) |                    |           |

**Test Accuracy:** 0.7089

## 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

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.02

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)

**Early Stopping Patience:** 10

**Comments:** Using MobileNetV2, improved data pipeline and added noise to preprocessing

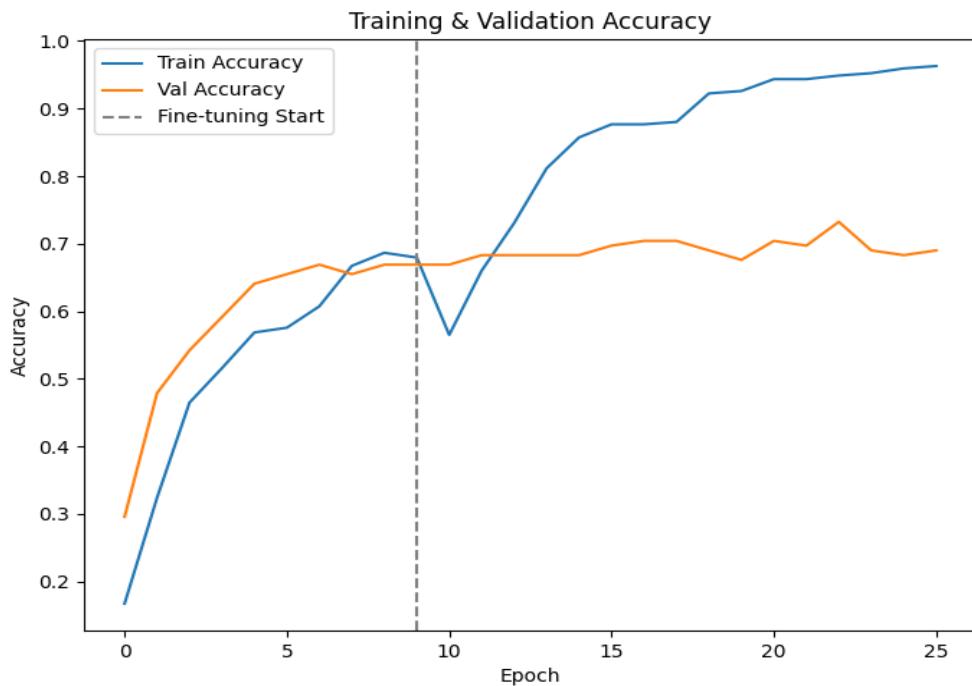
## Model Summary:

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

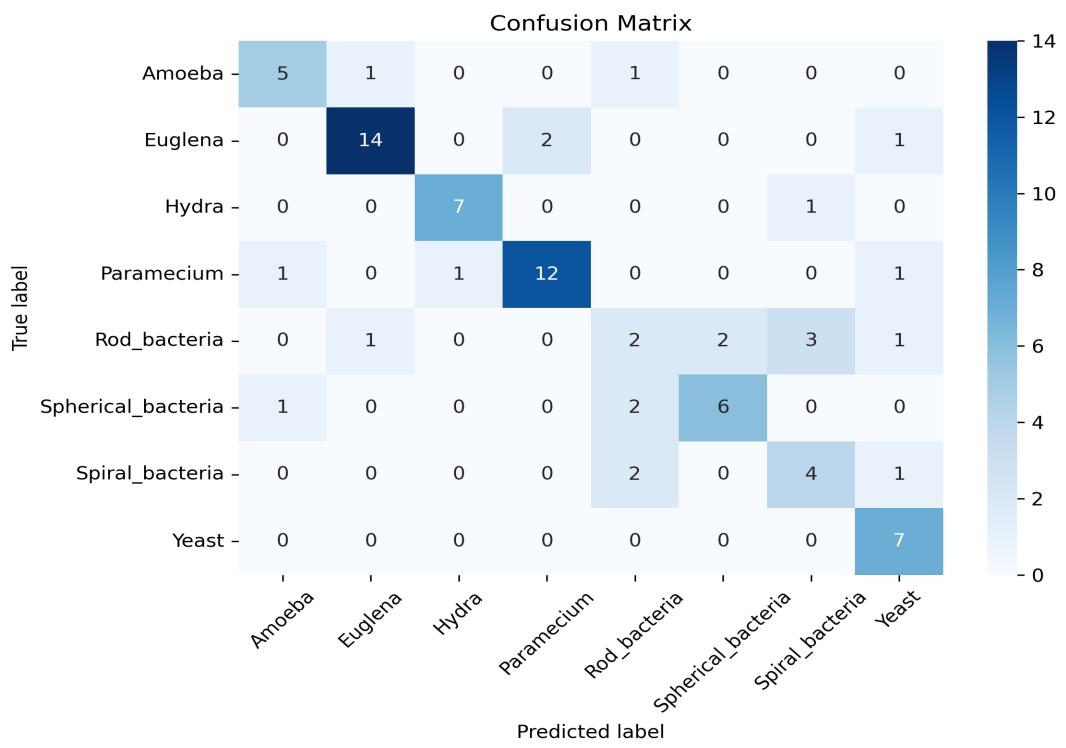
Total params: 5,998,937 (22.88 MB)  
Trainable params: 1,865,352 (7.12 MB)  
Non-trainable params: 402,880 (1.54 MB)  
Optimizer params: 3,730,705 (14.23 MB)

**Test Accuracy:** 0.7215

## 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:** 20

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.02

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)

**Early Stopping Patience:** 10

**Comments:** Using MobileNetV2, increased base epochs

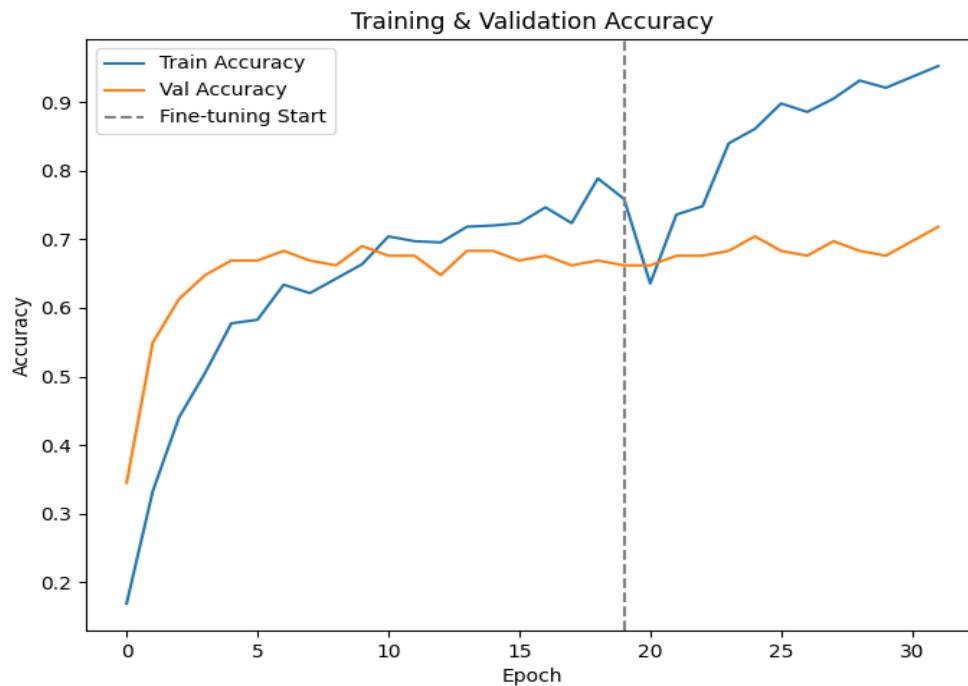
## Model Summary:

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

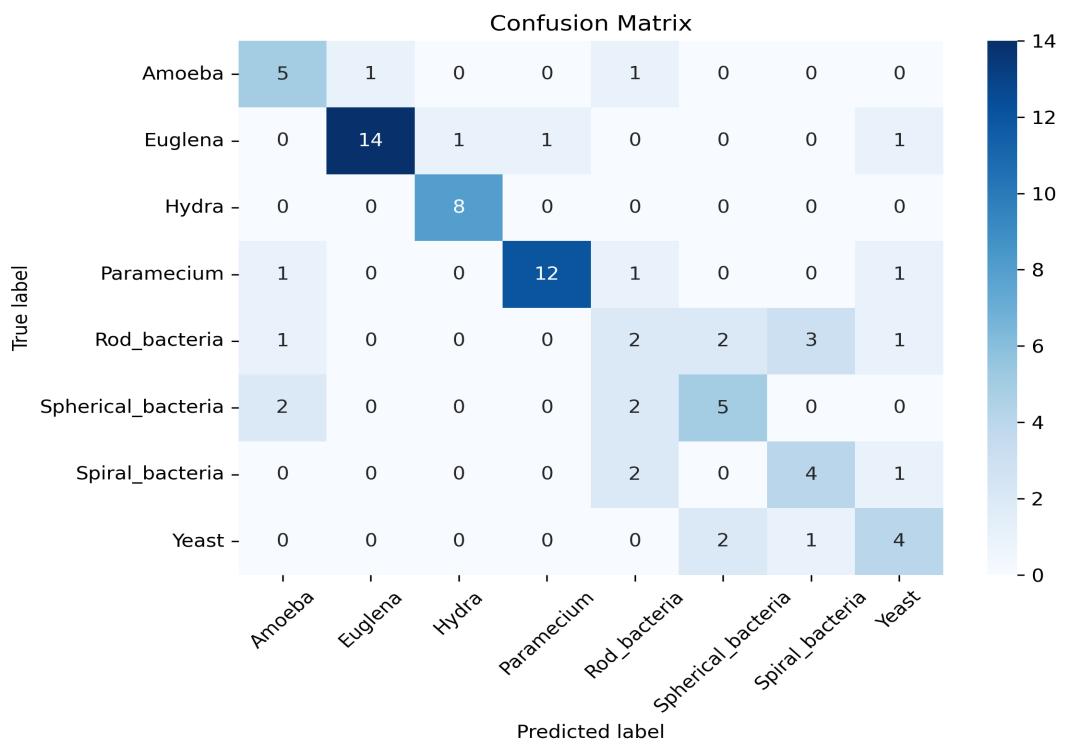
Total params: 5,998,937 (22.88 MB)  
Trainable params: 1,865,352 (7.12 MB)  
Non-trainable params: 402,880 (1.54 MB)  
Optimizer params: 3,730,705 (14.23 MB)

**Test Accuracy:** 0.6835

## 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:** 20

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.02

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)

**Early Stopping Patience:** 10

**Comments:** Using MobileNetV2, reduced dropout rate and fine tune layers

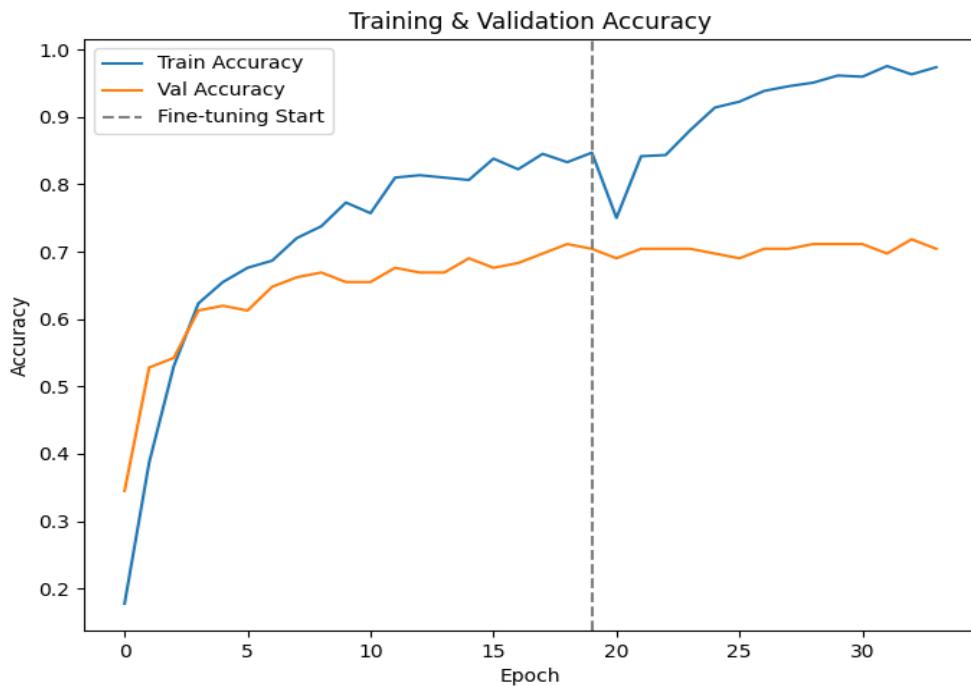
## Model Summary:

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

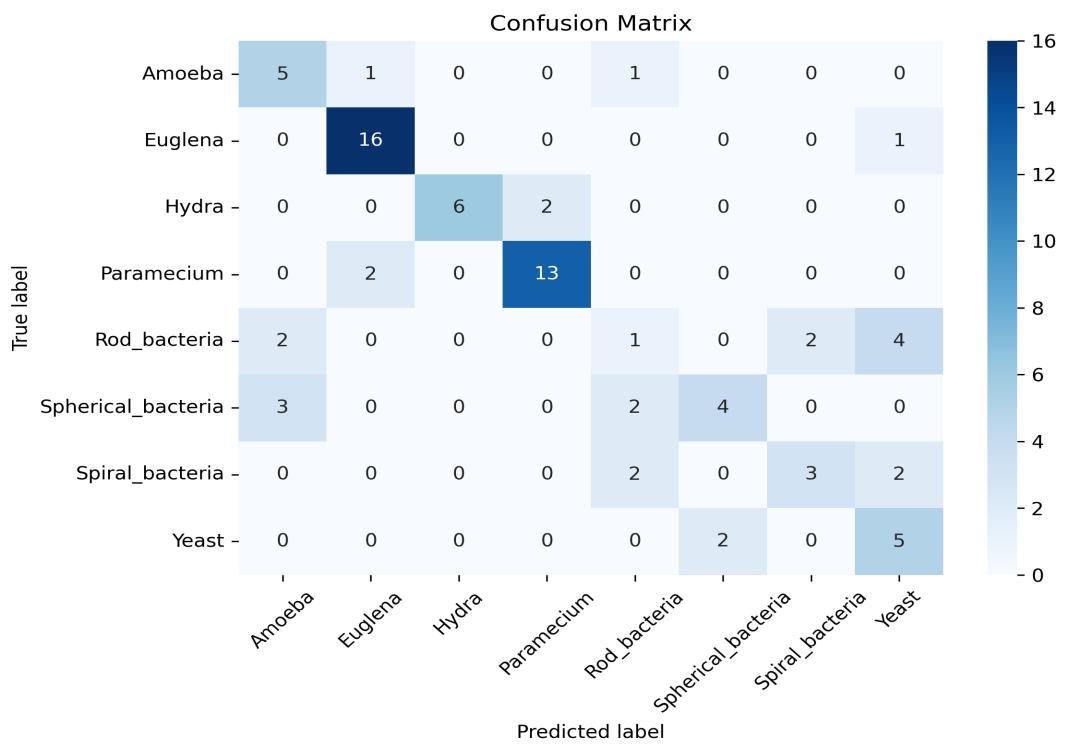
Total params: 4,700,889 (17.93 MB)  
Trainable params: 1,216,328 (4.64 MB)  
Non-trainable params: 1,051,904 (4.01 MB)  
Optimizer params: 2,432,657 (9.28 MB)

**Test Accuracy:** 0.6709

## 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:** 20

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.02

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)

**Early Stopping Patience:** 10

**Comments:** Using MobileNetV2, increased dropout rate

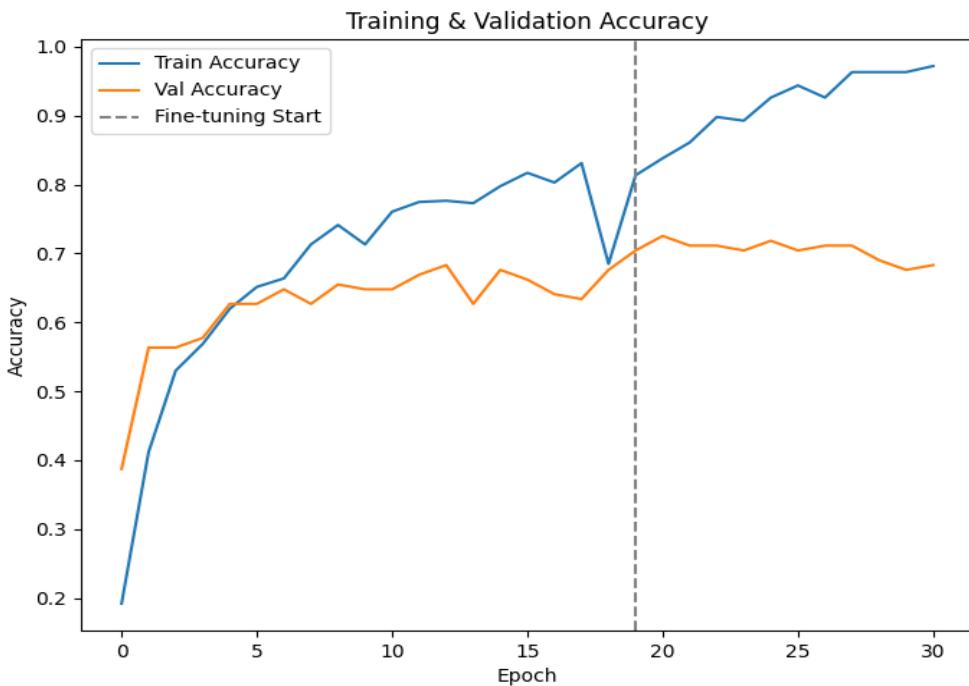
## Model Summary:

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

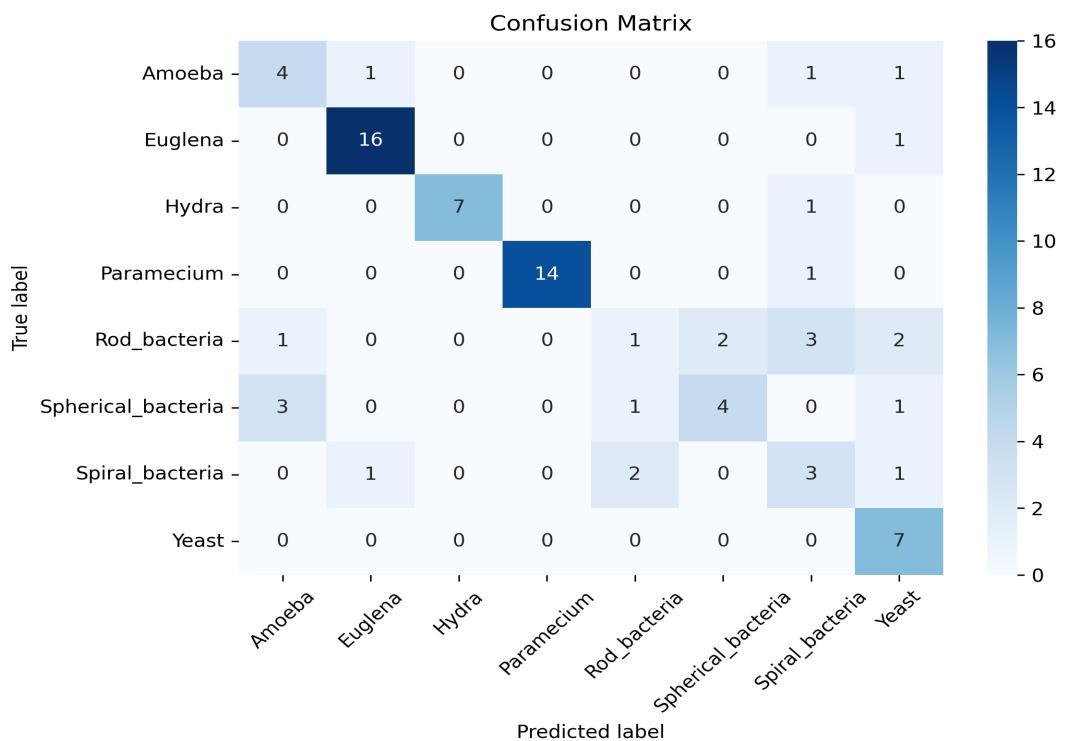
Total params: 4,700,889 (17.93 MB)  
Trainable params: 1,216,328 (4.64 MB)  
Non-trainable params: 1,051,904 (4.01 MB)  
Optimizer params: 2,432,657 (9.28 MB)

**Test Accuracy:** 0.7089

## 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:** 20

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.02

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)

**Early Stopping Patience:** 10

**Comments:** Using MobileNetV2, increased dropout rate

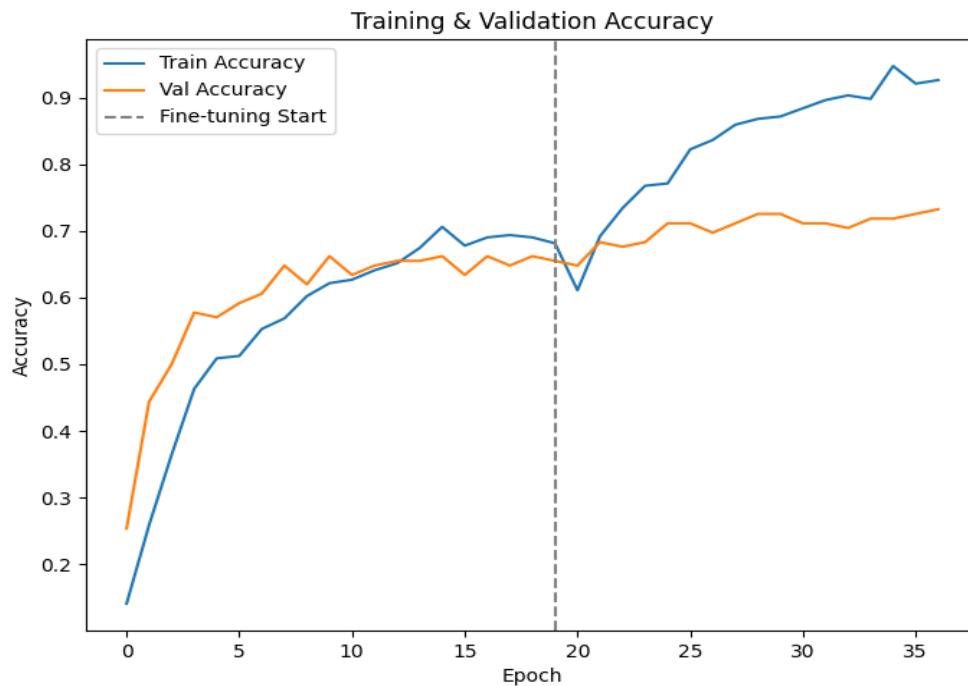
## Model Summary:

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

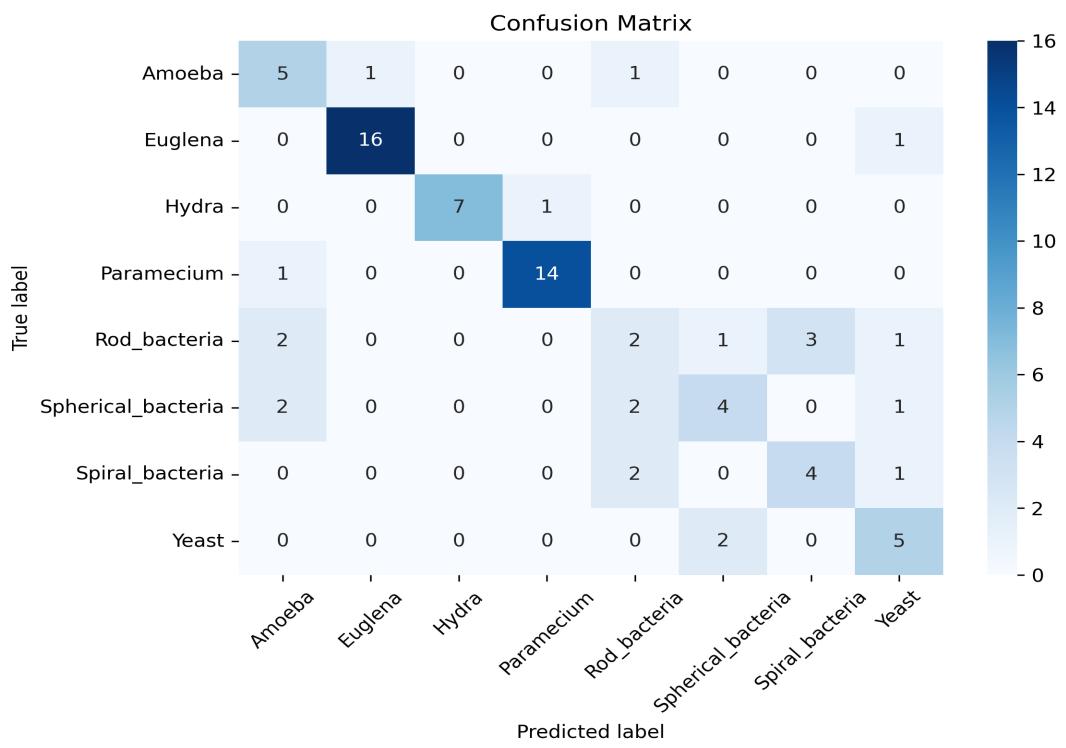
Total params: 4,700,889 (17.93 MB)  
Trainable params: 1,216,328 (4.64 MB)  
Non-trainable params: 1,051,904 (4.01 MB)  
Optimizer params: 2,432,657 (9.28 MB)

**Test Accuracy:** 0.7215

## 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:** 20

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.02

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)

**Early Stopping Patience:** 10

**Comments:** Using MobileNetV2, increased dropout rate

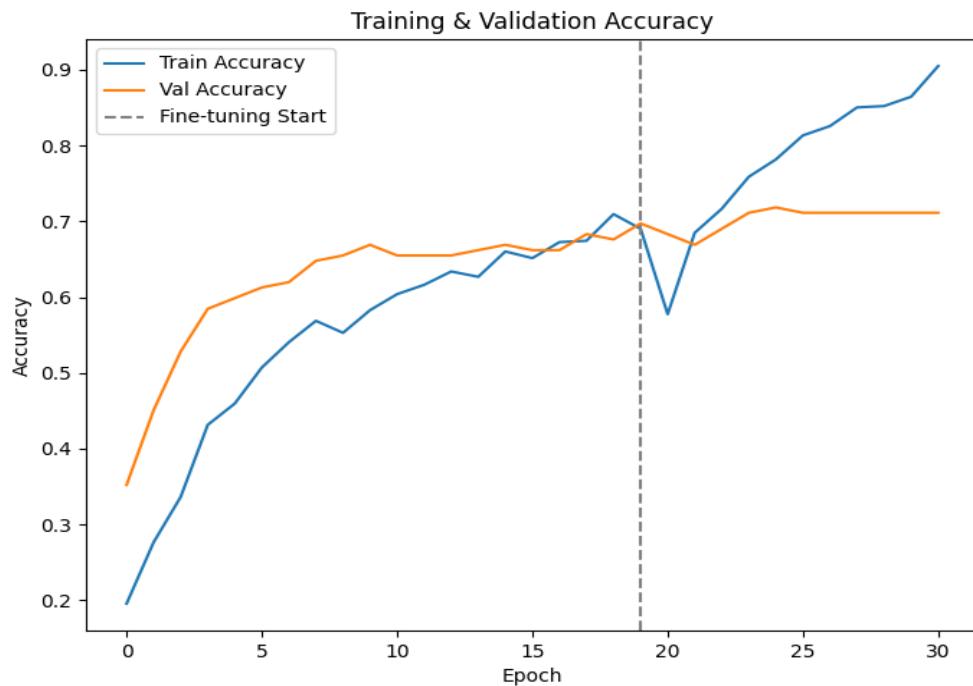
## Model Summary:

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

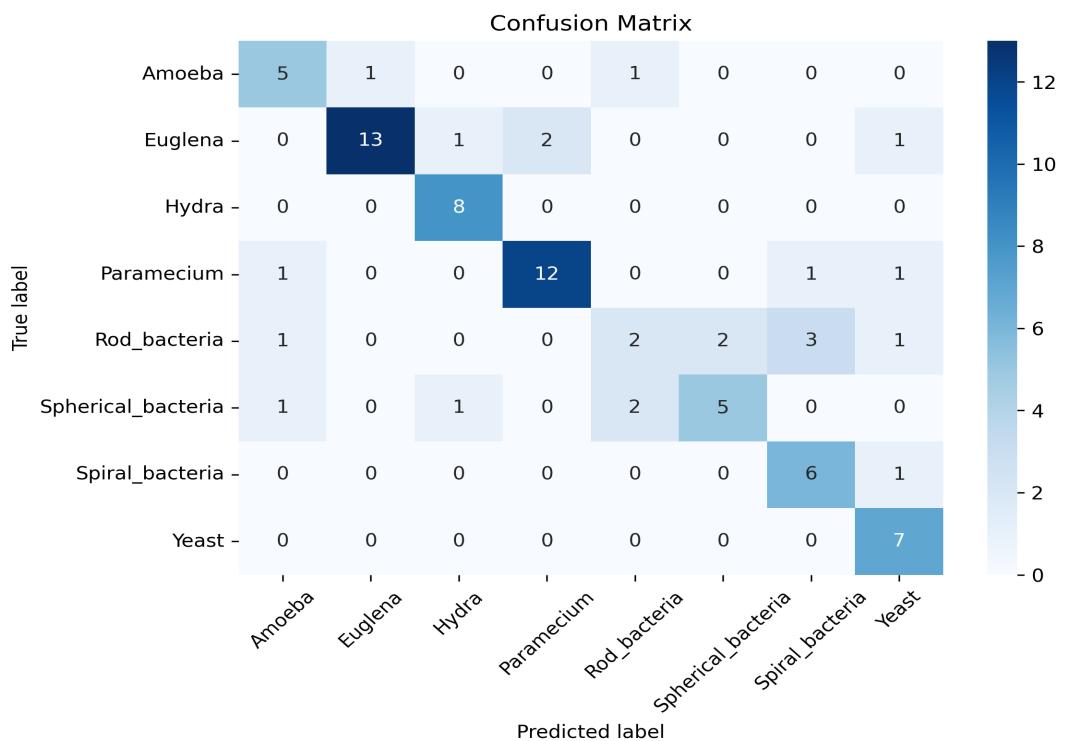
Total params: 4,700,889 (17.93 MB)  
Trainable params: 1,216,328 (4.64 MB)  
Non-trainable params: 1,051,904 (4.01 MB)  
Optimizer params: 2,432,657 (9.28 MB)

**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:** 20

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.02

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)

**Early Stopping Patience:** 10

**Comments:** Using MobileNetV2, decrease fine-tuning layers

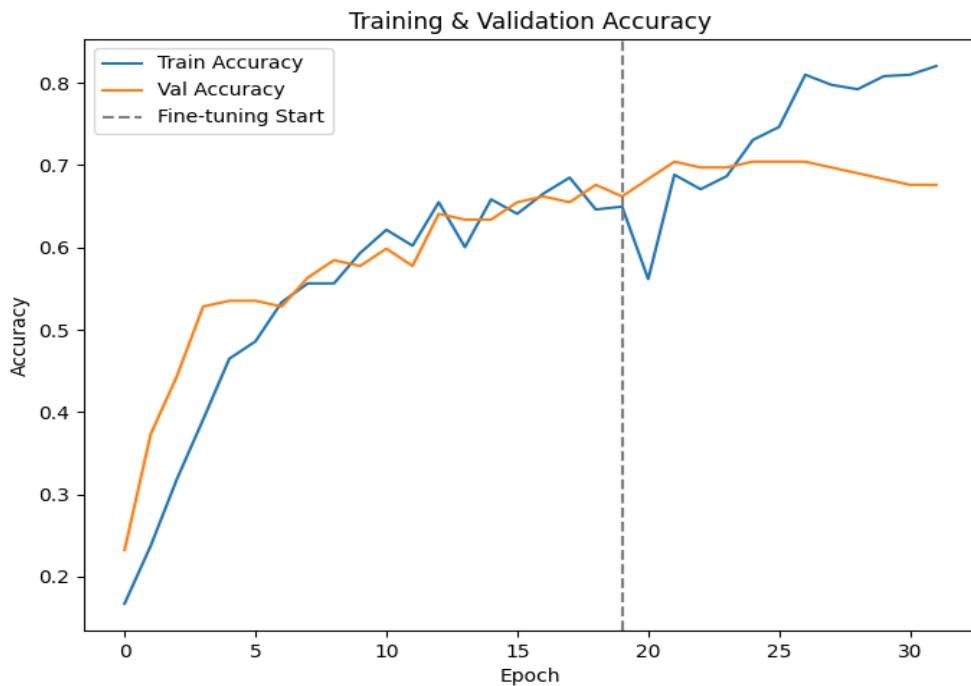
## Model Summary:

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

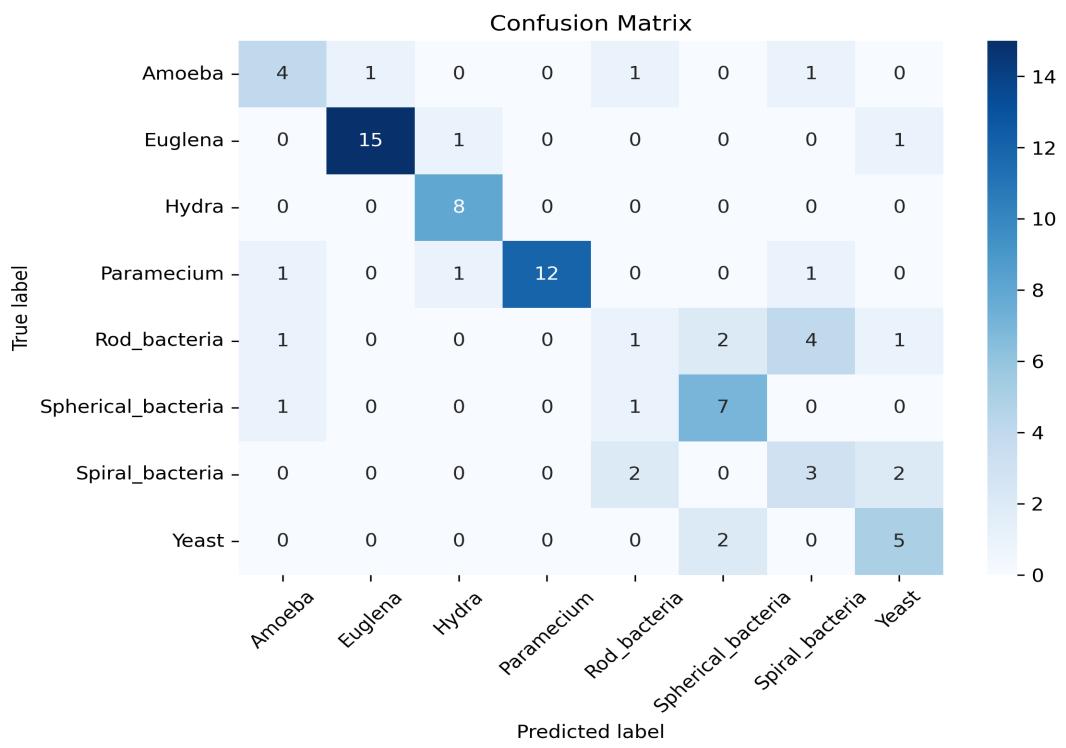
Total params: 3,753,689 (14.32 MB)  
Trainable params: 742,728 (2.83 MB)  
Non-trainable params: 1,525,504 (5.82 MB)  
Optimizer params: 1,485,457 (5.67 MB)

**Test Accuracy:** 0.6962

## 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:** 20  
**Fine-tune Epochs:** 30  
**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda  
**RandomFlip Mode:** horizontal  
**RandomRotation Factor:** 0.15  
**RandomZoom Factor:** 0.15  
**RandomContrast Factor:** 0.2  
**RandomBrightness MaxDelta:** 0.2  
**Gaussian Noise STD:** 0.02  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Optimizer (Base):** Adam  
**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)  
**Early Stopping Patience:** 10  
**Comments:** Using MobileNetV2, decrease dropout

## Model Summary:

Model: "sequential"

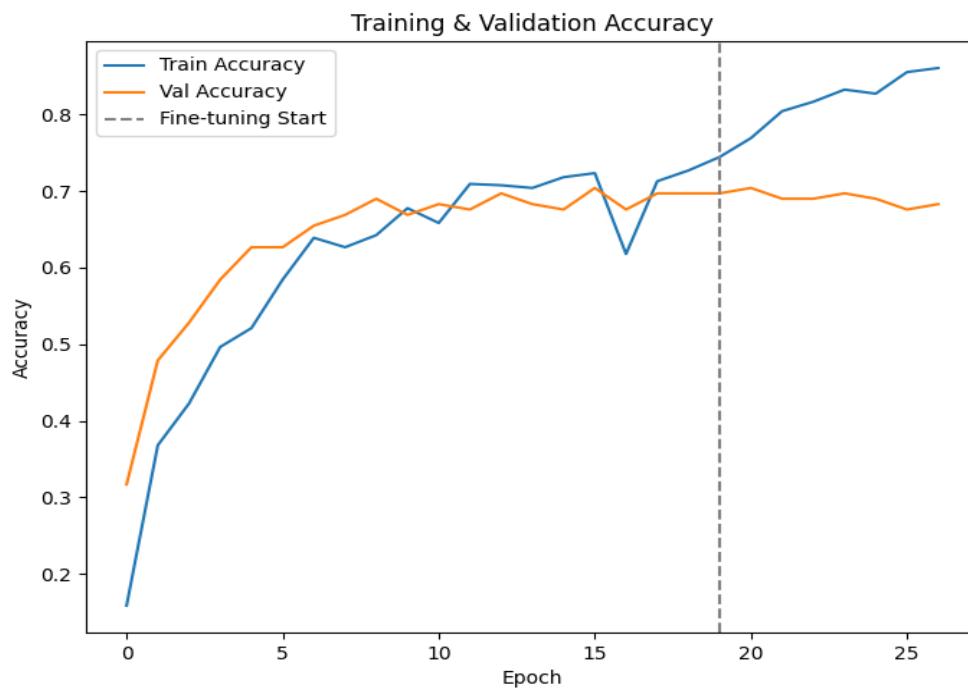
The diagram shows a Keras model summary with the following layers:

- Layer (type): mobilenetv2\_1.00\_224 (Functional) - Output Shape: (None, 7, 7, 1280) - Param #: 2,257,984
- Layer (type): global\_average\_pooling2d (GlobalAveragePooling2D) - Output Shape: (None, 1280) - Param #: 0
- Layer (type): dropout (Dropout) - Output Shape: (None, 1280) - Param #: 0
- Layer (type): dense (Dense) - Output Shape: (None, 8) - Param #: 10,248

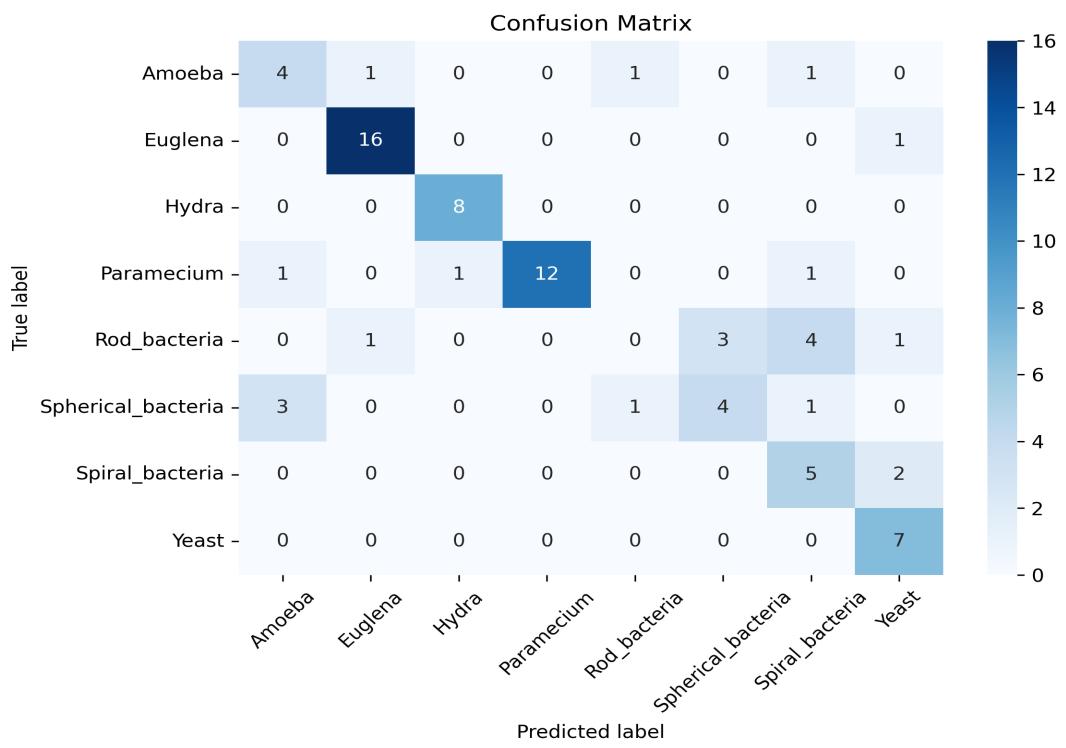
Total params: 3,753,689 (14.32 MB)  
Trainable params: 742,728 (2.83 MB)  
Non-trainable params: 1,525,504 (5.82 MB)  
Optimizer params: 1,485,457 (5.67 MB)

**Test Accuracy:** 0.7089

## 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:** 20

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.005

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)

**Early Stopping Patience:** 10

**Comments:** Using MobileNetV2, reduce gaussian std

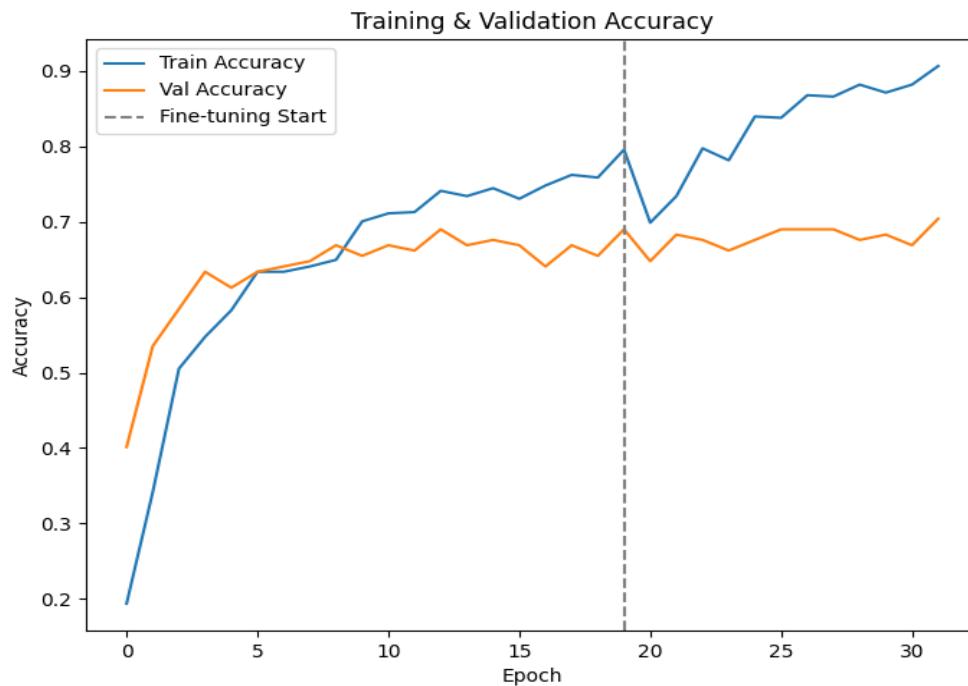
## Model Summary:

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

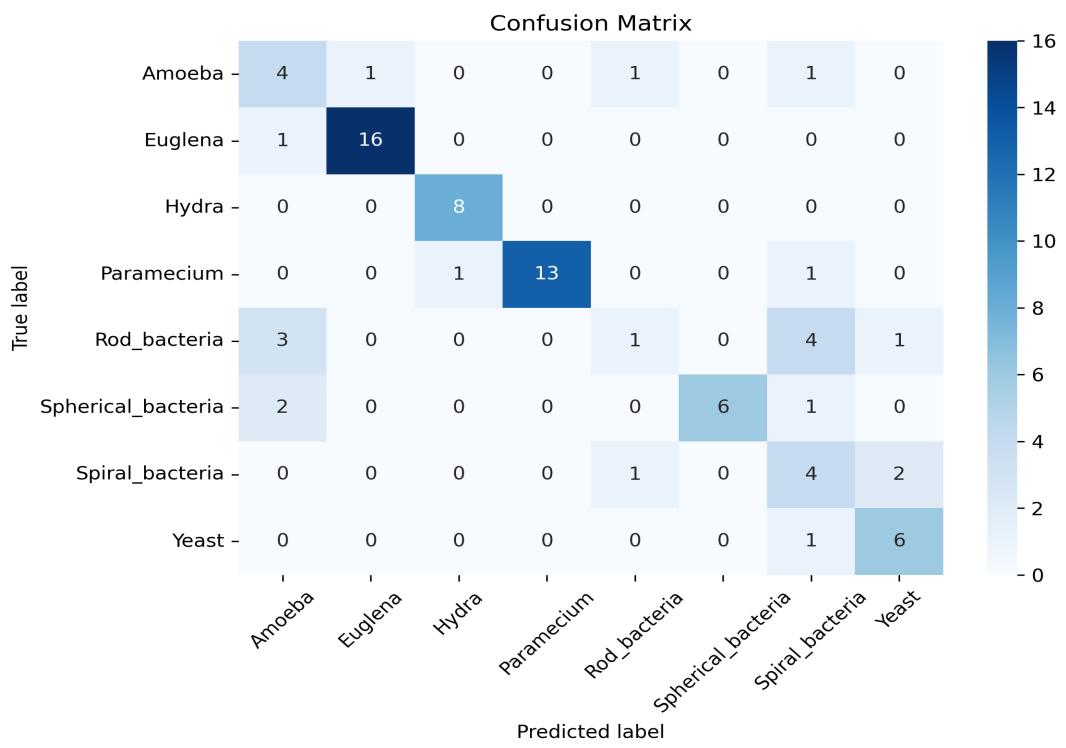
Total params: 3,753,689 (14.32 MB)  
Trainable params: 742,728 (2.83 MB)  
Non-trainable params: 1,525,504 (5.82 MB)  
Optimizer params: 1,485,457 (5.67 MB)

**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:** 20  
**Fine-tune Epochs:** 30  
**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda  
**RandomFlip Mode:** horizontal  
**RandomRotation Factor:** 0.15  
**RandomZoom Factor:** 0.15  
**RandomContrast Factor:** 0.2  
**RandomBrightness MaxDelta:** 0.2  
**Gaussian Noise STD:** 0.005  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Optimizer (Base):** Adam  
**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)  
**Early Stopping Patience:** 10  
**Comments:** Using MobileNetV2, reduce gaussian std

## Model Summary:

Model: "sequential"

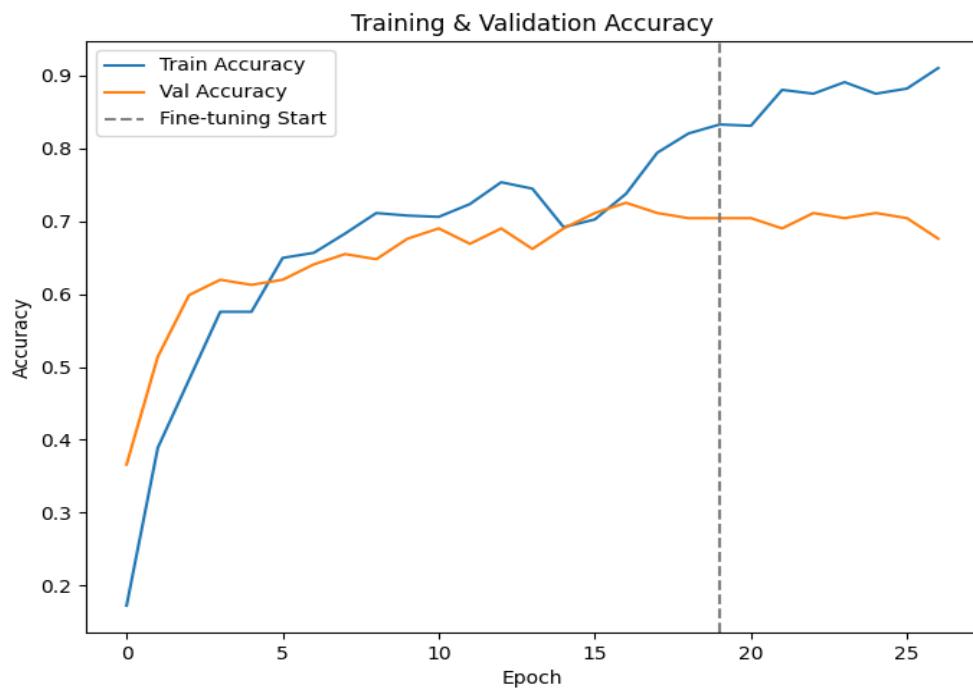
The diagram shows a Keras model summary with the following layers:

- Layer (type): mobilenetv2\_1.00\_224 (Functional) - Output Shape: (None, 7, 7, 1280) - Param #: 2,257,984
- Layer (type): global\_average\_pooling2d (GlobalAveragePooling2D) - Output Shape: (None, 1280) - Param #: 0
- Layer (type): dropout (Dropout) - Output Shape: (None, 1280) - Param #: 0
- Layer (type): dense (Dense) - Output Shape: (None, 8) - Param #: 10,248

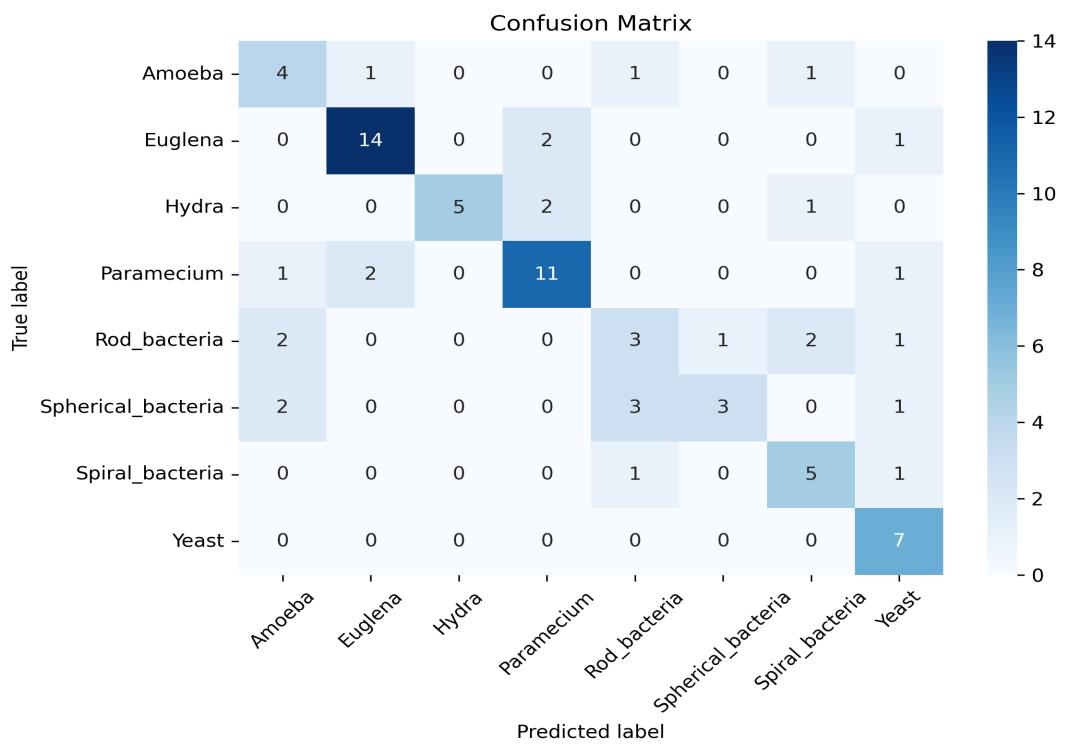
Total params: 3,753,689 (14.32 MB)  
Trainable params: 742,728 (2.83 MB)  
Non-trainable params: 1,525,504 (5.82 MB)  
Optimizer params: 1,485,457 (5.67 MB)

**Test Accuracy:** 0.6582

## 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:** 20

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.005

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)

**Early Stopping Patience:** 10

**Comments:** Using MobileNetV2, reduce gaussian std

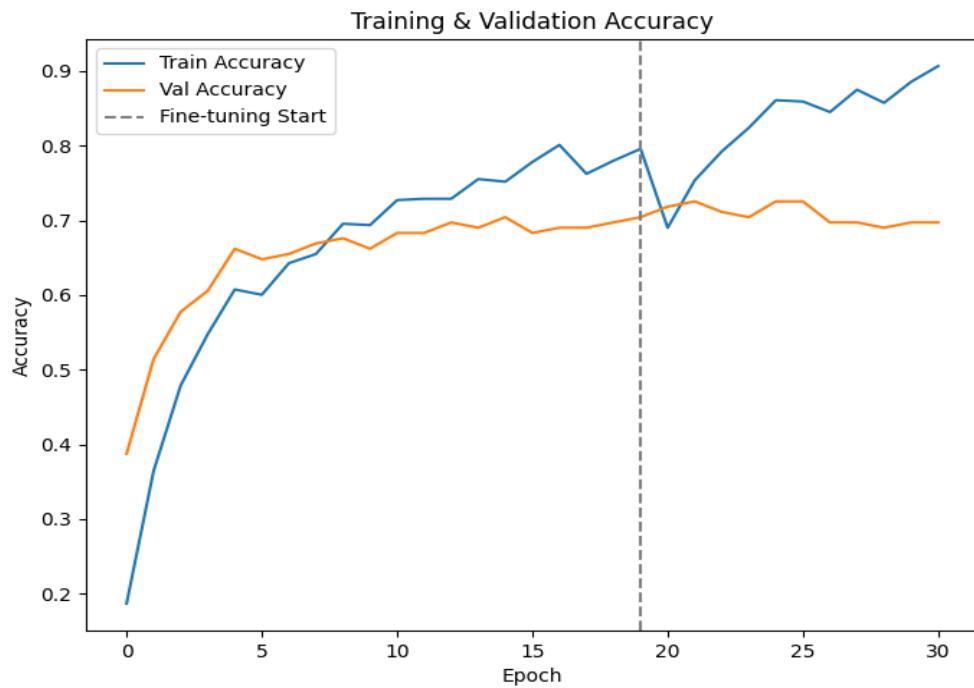
## Model Summary:

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

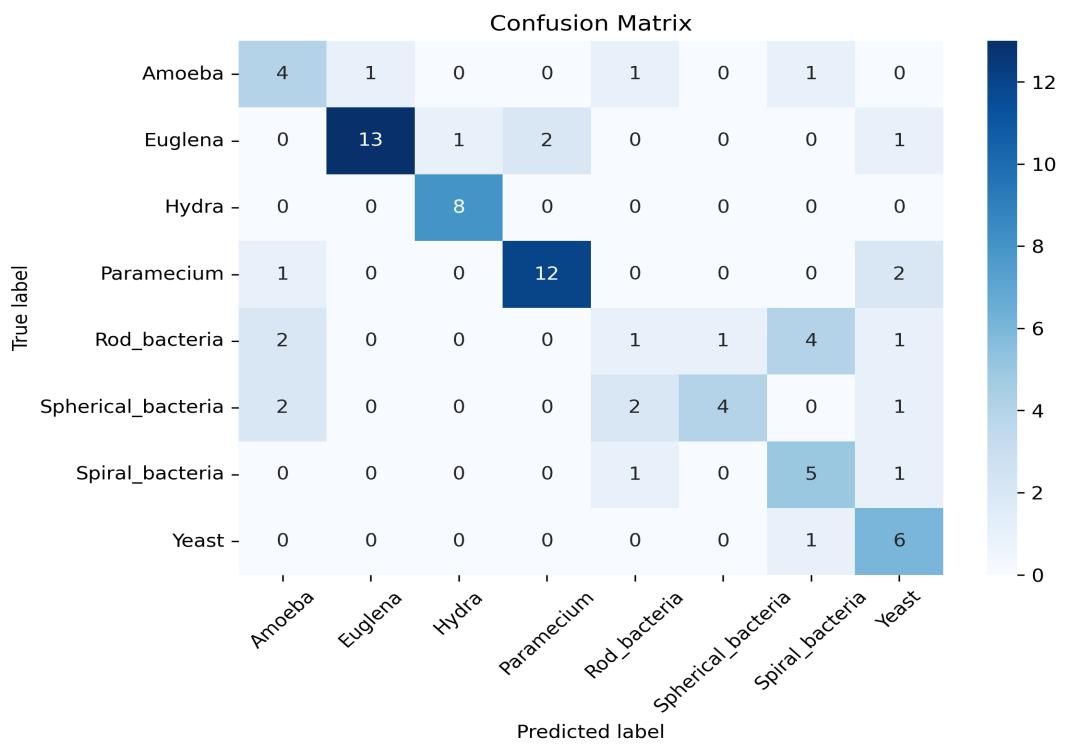
Total params: 3,753,689 (14.32 MB)  
Trainable params: 742,728 (2.83 MB)  
Non-trainable params: 1,525,504 (5.82 MB)  
Optimizer params: 1,485,457 (5.67 MB)

**Test Accuracy:** 0.6709

## 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:** 20

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.0

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)

**Early Stopping Patience:** 10

**Comments:** Using MobileNetV2, reduce gaussian std

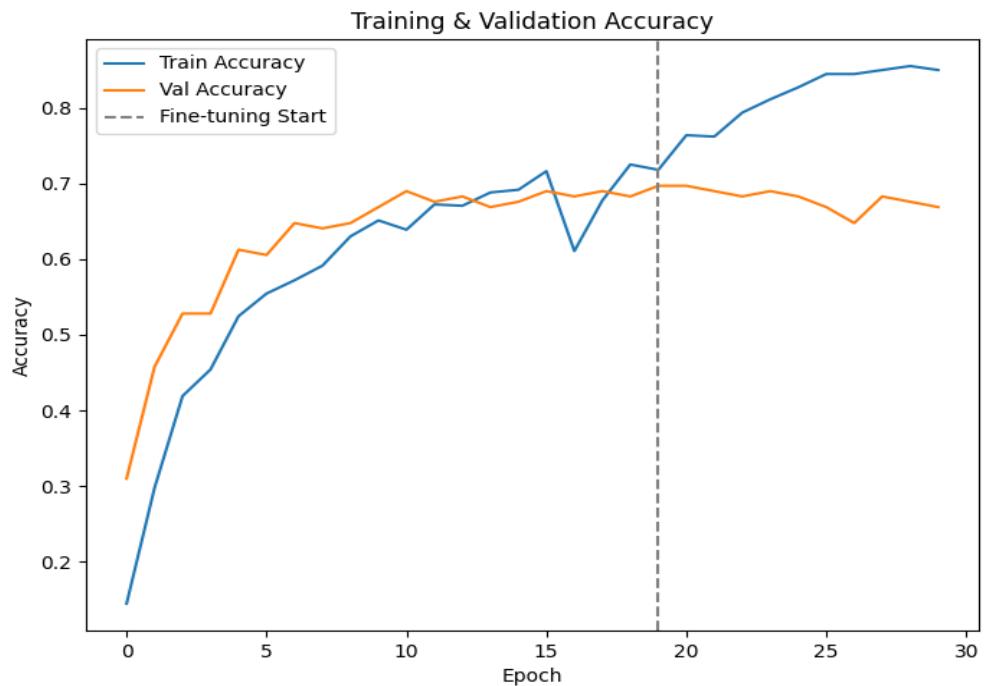
## Model Summary:

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

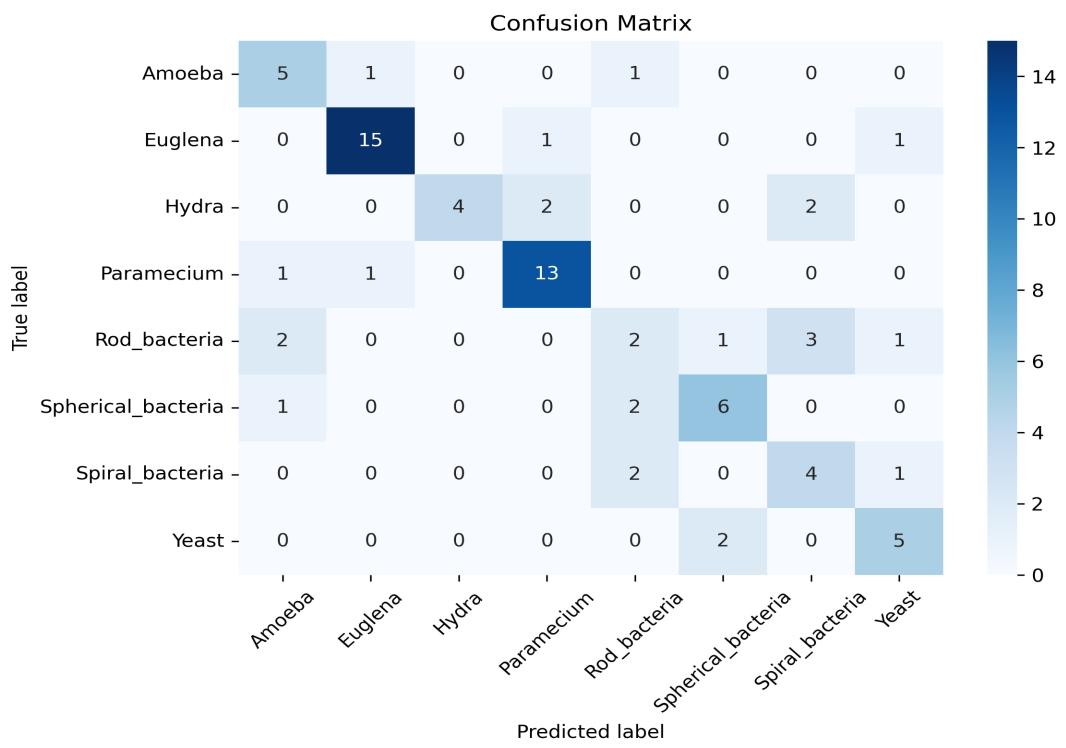
Total params: 3,753,689 (14.32 MB)  
Trainable params: 742,728 (2.83 MB)  
Non-trainable params: 1,525,504 (5.82 MB)  
Optimizer params: 1,485,457 (5.67 MB)

**Test Accuracy:** 0.6835

## 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:** 20

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.005

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)

**Early Stopping Patience:** 10

**Comments:** Using MobileNetV2, reduce gaussian std

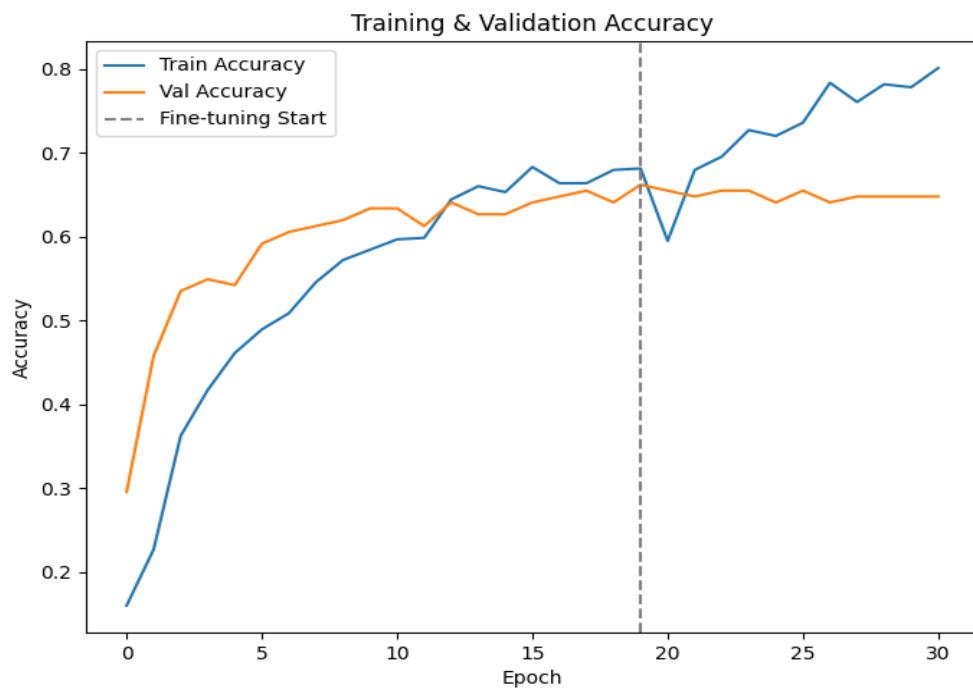
## Model Summary:

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

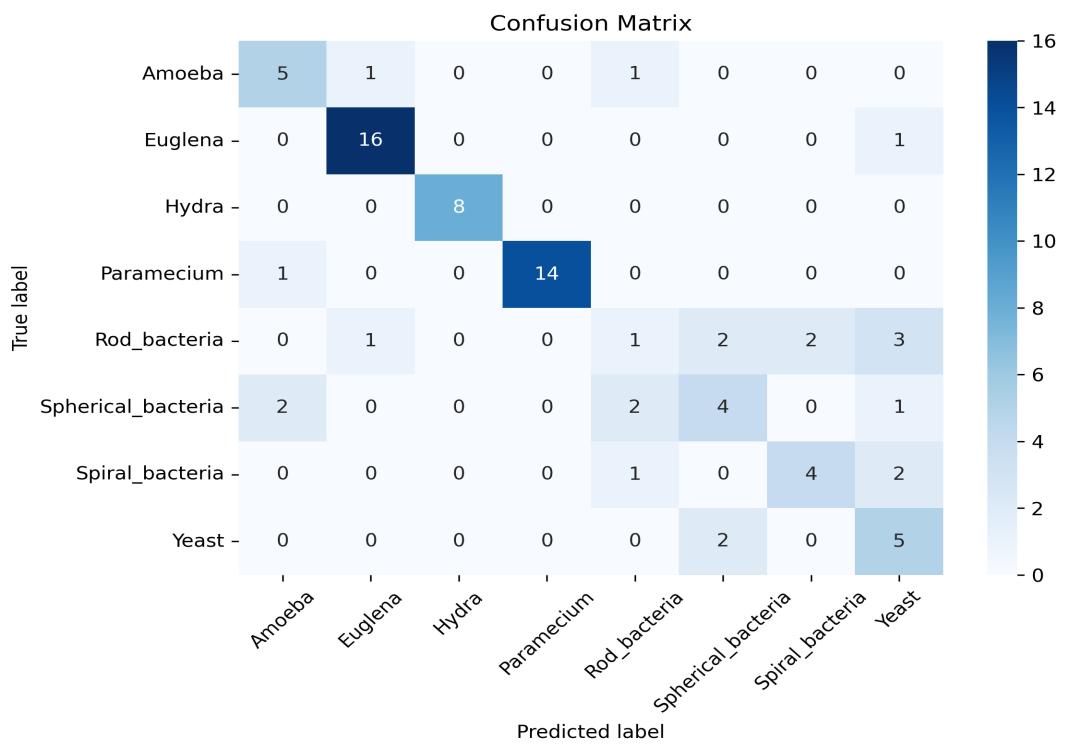
Total params: 3,753,689 (14.32 MB)  
Trainable params: 742,728 (2.83 MB)  
Non-trainable params: 1,525,504 (5.82 MB)  
Optimizer params: 1,485,457 (5.67 MB)

**Test Accuracy:** 0.7215

## Training Accuracy over Epochs:



## Confusion Matrix:



# Model Training Report

## Configuration and Parameters:

**Image Size:** (256, 256)

**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:** 20

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.005

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.96)

**Early Stopping Patience:** 10

**Comments:** Using MobileNetV2, increased image input resolution and decreased dropout

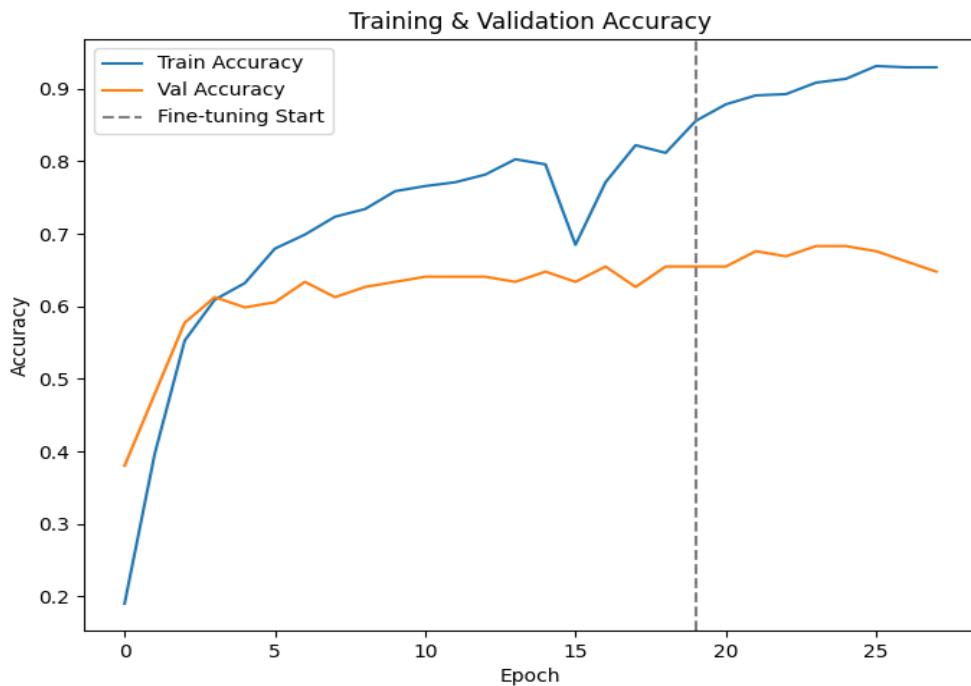
## Model Summary:

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

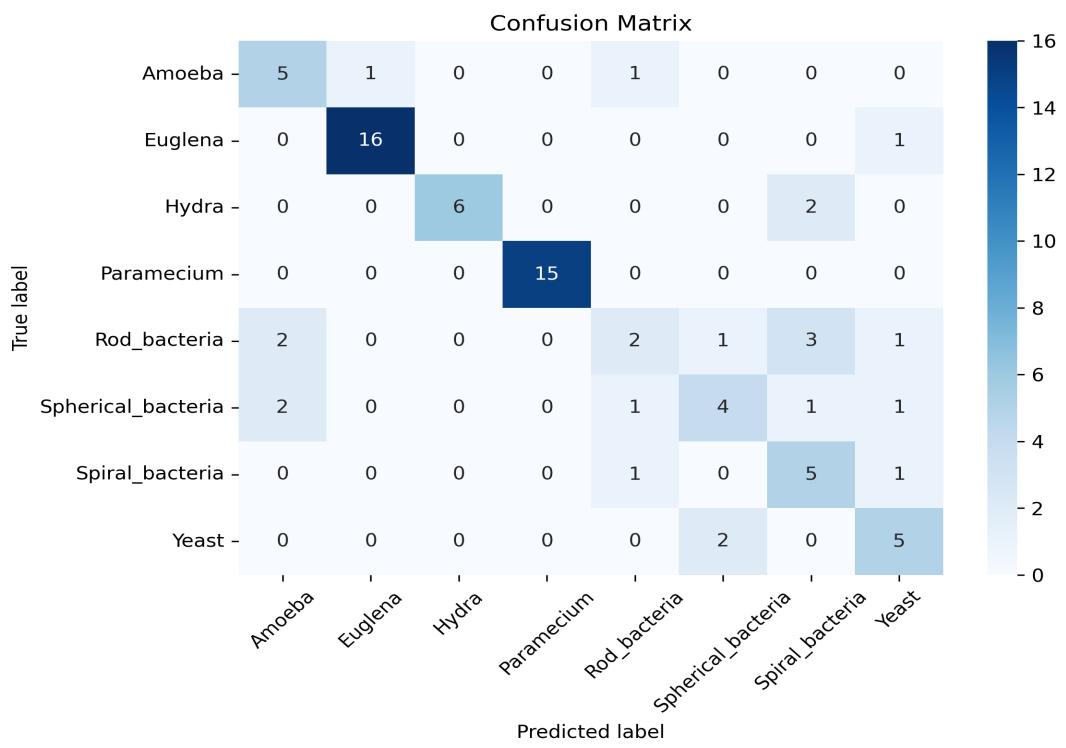
Total params: 3,753,689 (14.32 MB)  
Trainable params: 742,728 (2.83 MB)  
Non-trainable params: 1,525,504 (5.82 MB)  
Optimizer params: 1,485,457 (5.67 MB)

**Test Accuracy:** 0.7342

## Training Accuracy over Epochs:



## Confusion Matrix:



# Model Training Report

## Configuration and Parameters:

**Image Size:** (256, 256)  
**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:** 20  
**Fine-tune Epochs:** 30  
**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda  
**RandomFlip Mode:** horizontal  
**RandomRotation Factor:** 0.15  
**RandomZoom Factor:** 0.15  
**RandomContrast Factor:** 0.2  
**RandomBrightness MaxDelta:** 0.2  
**Gaussian Noise STD:** 0.005  
**Dropout:** 0.5  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Optimizer (Base):** Adam  
**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.98)  
**Early Stopping Patience:** 10  
**Comments:** Using MobileNetV2, added regularization, increased decay rate and reduced fine tuning layers

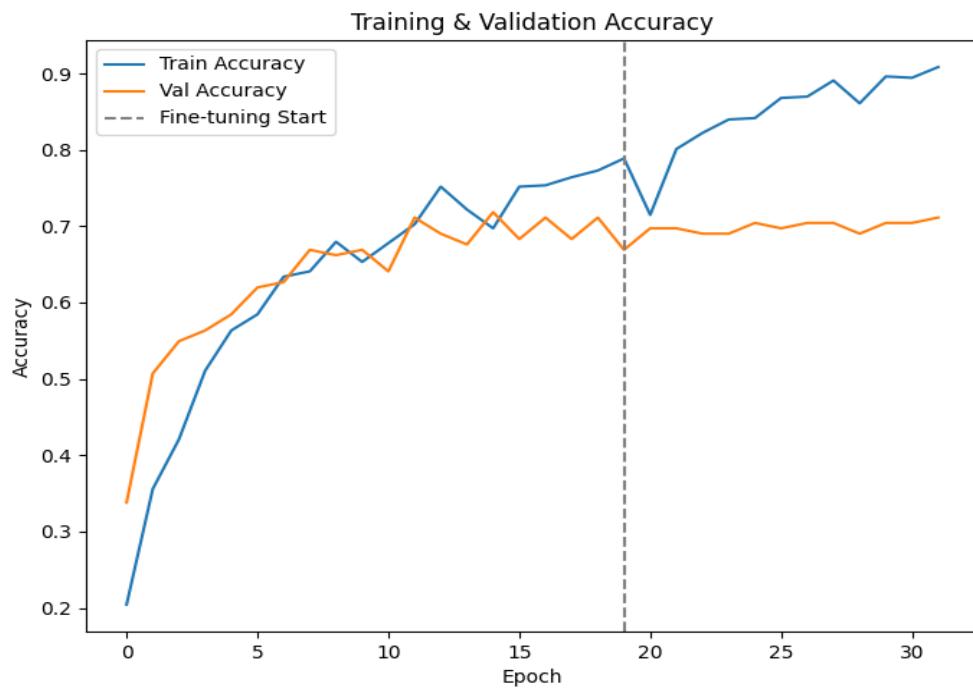
## Model Summary:

```
Model: "sequential"
[REDACTED]
[REDACTED]
■ Layer (type)           ■ Output Shape          ■ Param #
[REDACTED]
[REDACTED]
■ mobilenetv2_1.00_224 (Functional)   ■ (None, 8, 8, 1280)   ■ 2,257,984 ■
[REDACTED]
[REDACTED]
■ global_average_pooling2d      ■ (None, 1280)        ■ 0 ■
■ (GlobalAveragePooling2D)      ■                         ■
[REDACTED]
[REDACTED]
■ dropout (Dropout)           ■ (None, 1280)        ■ 0 ■
[REDACTED]
[REDACTED]
■ dense (Dense)              ■ (None, 8)           ■ 10,248 ■
[REDACTED]
[REDACTED]

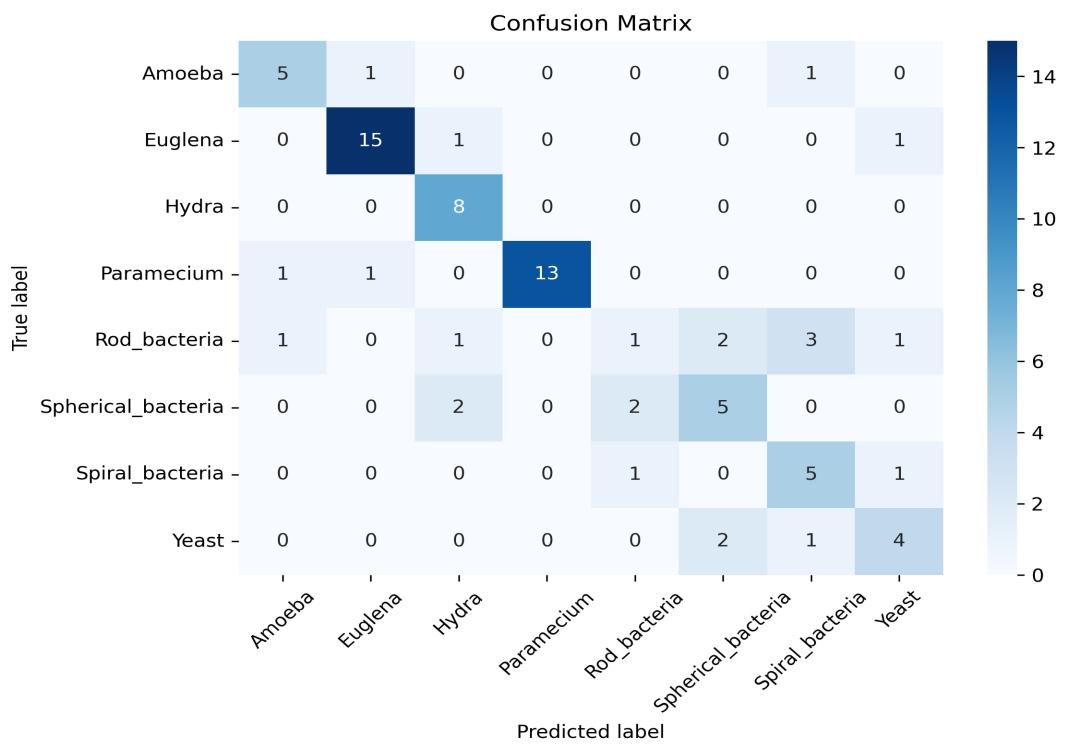
Total params: 3,728,729 (14.22 MB)
Trainable params: 730,248 (2.79 MB)
Non-trainable params: 1,537,984 (5.87 MB)
Optimizer params: 1,460,497 (5.57 MB)
```

**Test Accuracy:** 0.7089

## 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:** 20  
**Fine-tune Epochs:** 30  
**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda  
**RandomFlip Mode:** horizontal  
**RandomRotation Factor:** 0.15  
**RandomZoom Factor:** 0.15  
**RandomContrast Factor:** 0.2  
**RandomBrightness MaxDelta:** 0.2  
**Gaussian Noise STD:** 0.005  
**Dropout:** 0.5  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Optimizer (Base):** Adam  
**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.98)  
**Early Stopping Patience:** 10  
**Comments:** Using MobileNetV2, added regularization, increased decay rate and reduced fine tuning layers

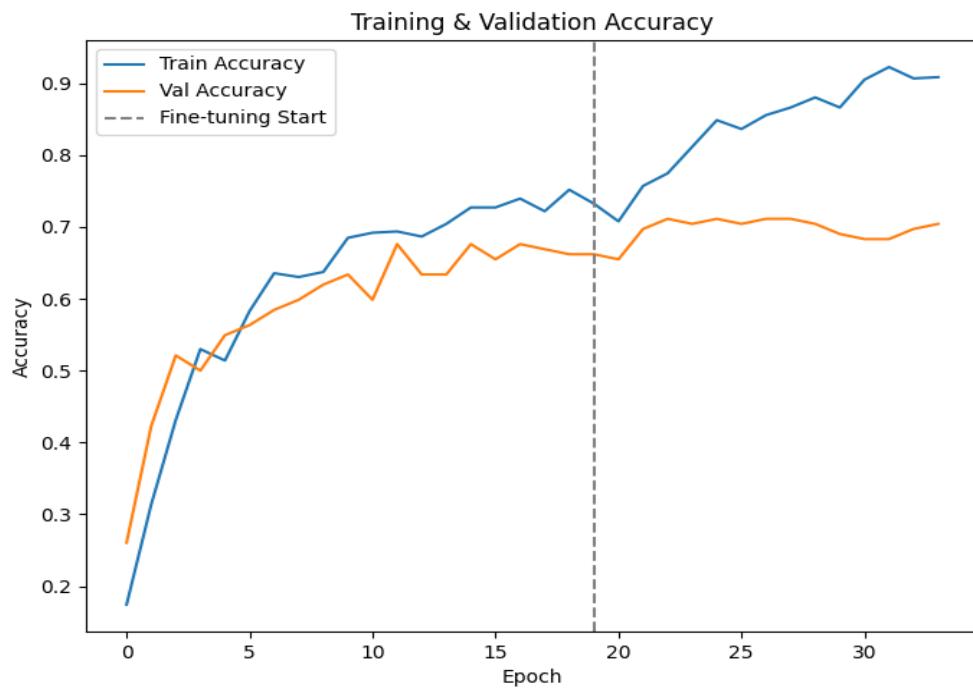
## Model Summary:

```
Model: "sequential"
[REDACTED]
[REDACTED]
■ Layer (type)           ■ Output Shape          ■ Param #
[REDACTED]
[REDACTED]
■ mobilenetv2_1.00_224 (Functional)   ■ (None, 7, 7, 1280)   ■ 2,257,984 ■
[REDACTED]
[REDACTED]
■ global_average_pooling2d      ■ (None, 1280)        ■ 0 ■
■ (GlobalAveragePooling2D)      ■                         ■
[REDACTED]
[REDACTED]
■ dropout (Dropout)           ■ (None, 1280)        ■ 0 ■
[REDACTED]
[REDACTED]
■ dense (Dense)              ■ (None, 8)           ■ 10,248 ■
[REDACTED]
[REDACTED]

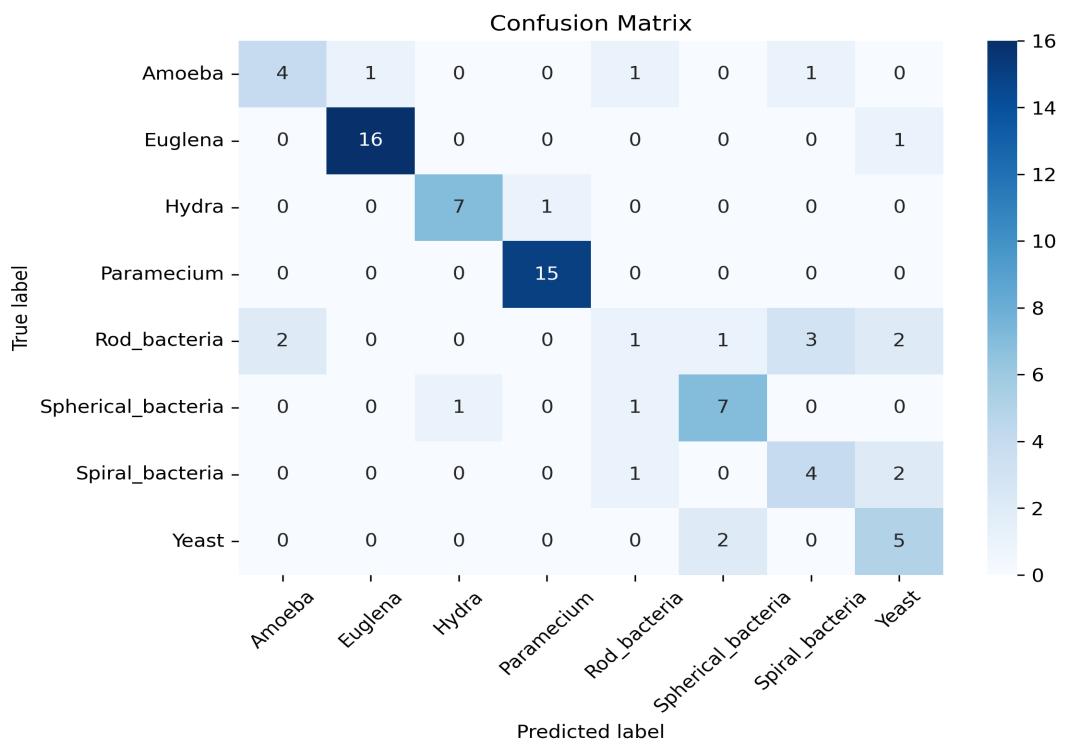
Total params: 3,728,729 (14.22 MB)
Trainable params: 730,248 (2.79 MB)
Non-trainable params: 1,537,984 (5.87 MB)
Optimizer params: 1,460,497 (5.57 MB)
```

**Test Accuracy:** 0.7468

## 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:** 20  
**Fine-tune Epochs:** 30  
**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda  
**RandomFlip Mode:** horizontal  
**RandomRotation Factor:** 0.15  
**RandomZoom Factor:** 0.15  
**RandomContrast Factor:** 0.2  
**RandomBrightness MaxDelta:** 0.2  
**Gaussian Noise STD:** 0.005  
**Dropout:** 0.5  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Optimizer (Base):** Adam  
**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.98)  
**Early Stopping Patience:** 10  
**Comments:** Using MobileNetV2, added regularization, increased decay rate and increased fine tuning layers

## Model Summary:

Model: "sequential"

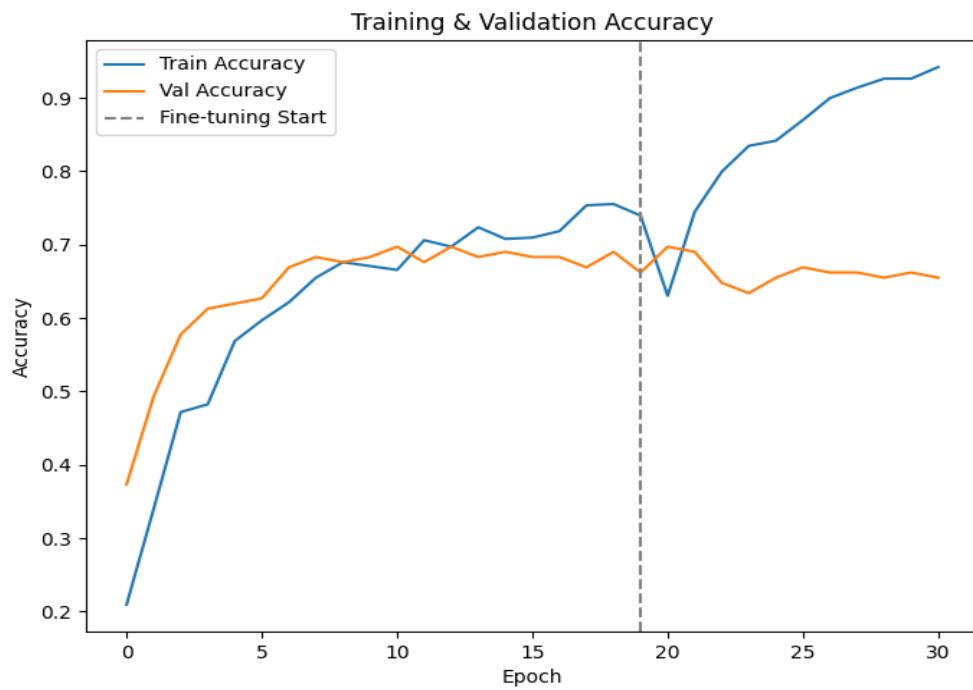
The diagram shows a Keras model structure with the following layers:

- Layer type: mobilenetv2\_1.00\_224 (Functional)
- Output Shape: (None, 7, 7, 1280)
- Param #: 2,257,984
- Layer type: global\_average\_pooling2d (GlobalAveragePooling2D)
- Output Shape: (None, 1280)
- Param #: 0
- Layer type: dropout (Dropout)
- Output Shape: (None, 1280)
- Param #: 0
- Layer type: dense (Dense)
- Output Shape: (None, 8)
- Param #: 10,248

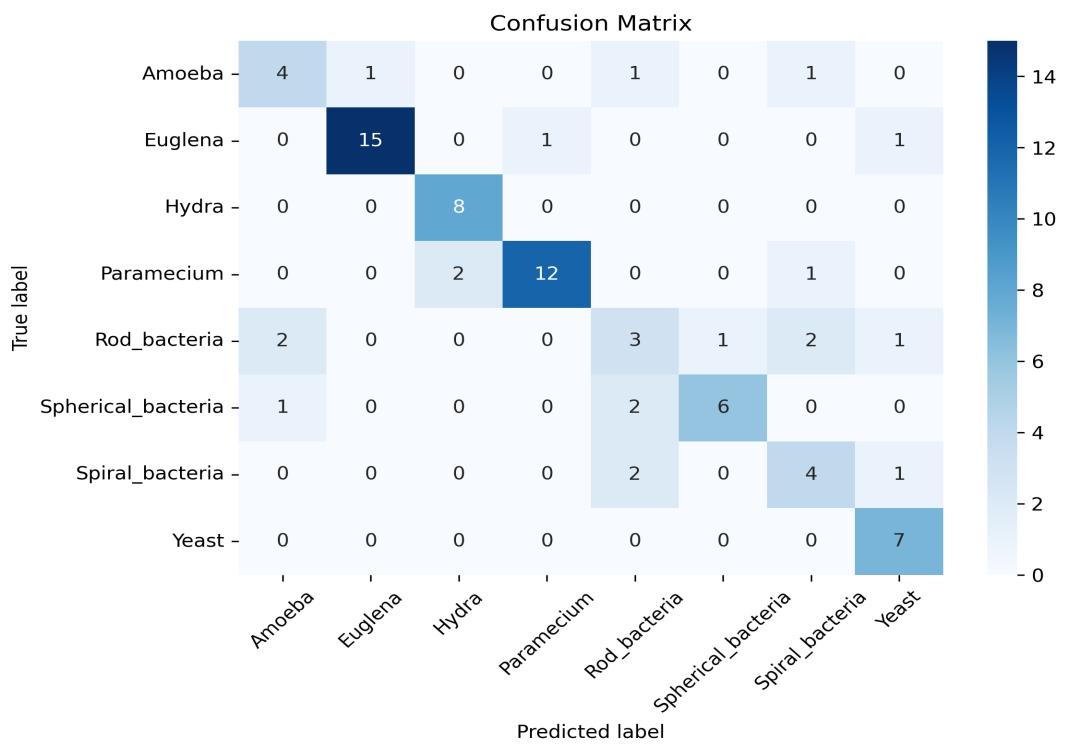
Total params: 5,998,937 (22.88 MB)  
Trainable params: 1,865,352 (7.12 MB)  
Non-trainable params: 402,880 (1.54 MB)  
Optimizer params: 3,730,705 (14.23 MB)

**Test Accuracy:** 0.7468

## Training Accuracy over Epochs:



## Confusion Matrix:



# Model Training Report

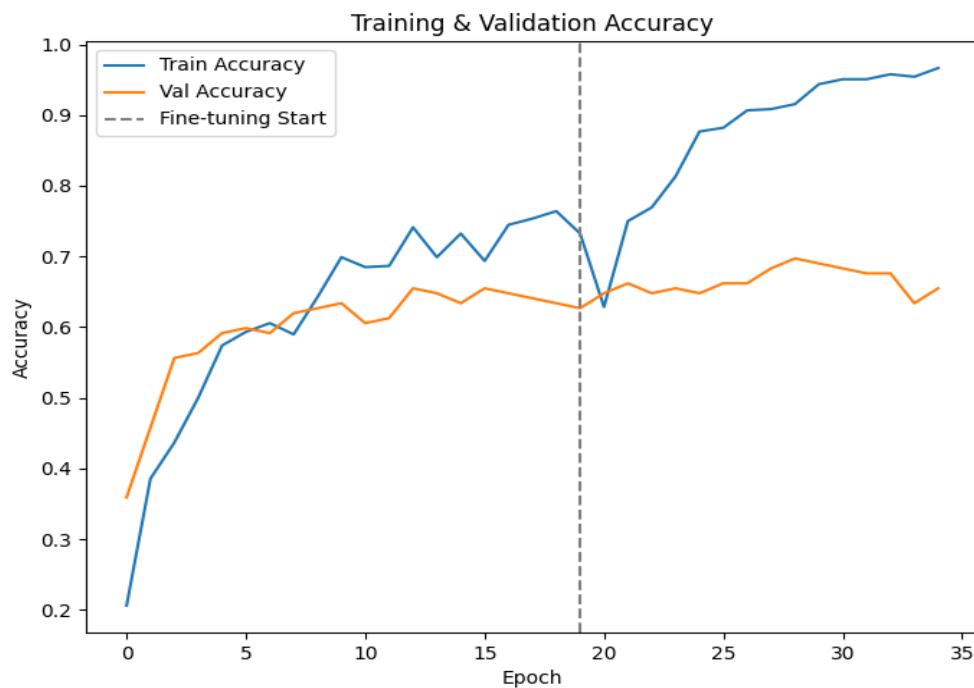
## **Configuration and Parameters:**

**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:** 20  
**Fine-tune Epochs:** 30  
**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda  
**RandomFlip Mode:** horizontal  
**RandomRotation Factor:** 0.15  
**RandomZoom Factor:** 0.15  
**RandomContrast Factor:** 0.2  
**RandomBrightness MaxDelta:** 0.2  
**Gaussian Noise STD:** 0.005  
**Dropout:** 0.5  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Optimizer (Base):** Adam  
**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.98)  
**Early Stopping Patience:** 10  
**Comments:** Using MobileNetV2

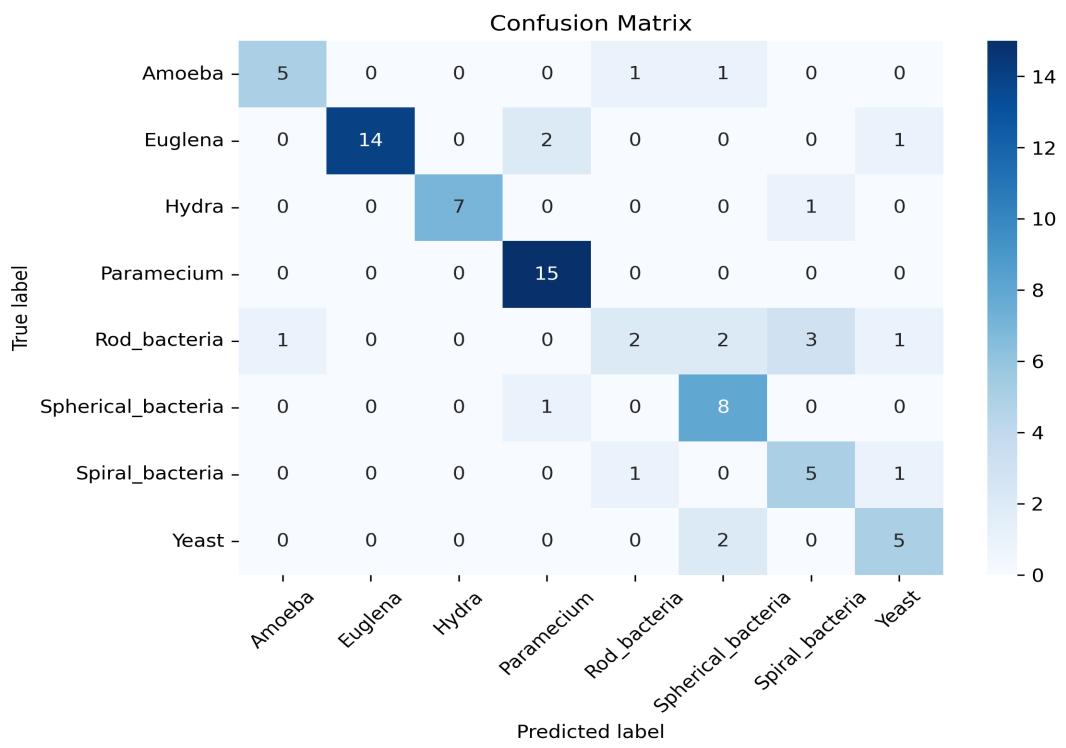
## Model Summary:

**Test Accuracy:** 0.7722

## 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:** 20  
**Fine-tune Epochs:** 30  
**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda  
**RandomFlip Mode:** horizontal  
**RandomRotation Factor:** 0.15  
**RandomZoom Factor:** 0.15  
**RandomContrast Factor:** 0.2  
**RandomBrightness MaxDelta:** 0.2  
**Gaussian Noise STD:** 0.005  
**Dropout:** 0.6  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Optimizer (Base):** Adam  
**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.98)  
**Early Stopping Patience:** 10  
**Comments:** Using MobileNetV2

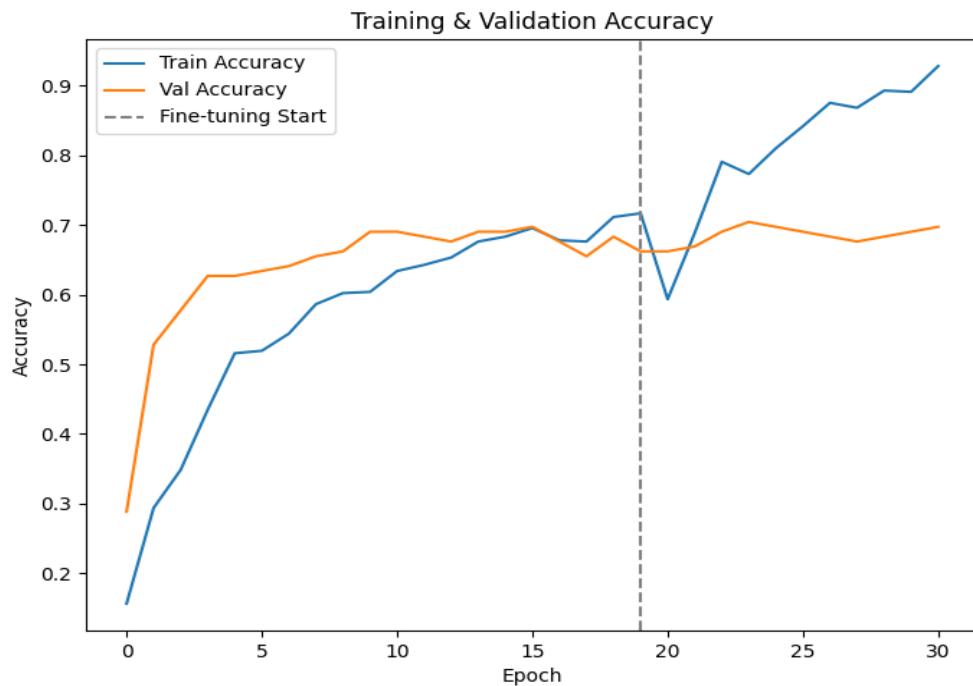
## Model Summary:

```
Model: "sequential"
[REDACTED]
    ■ Output      ■ Param ■
    ■ Layer (type) ■ Shape ■ # ■
[REDACTED]
■ mobilenetv2_1... ■ (None, 7, ■ 2,25... ■
■ (Functional) ■ 7, 1280) ■ ■
[REDACTED]
■ global_averag... ■ (None,      ■ 0 ■
■ (GlobalAverag... ■ 1280) ■ ■
[REDACTED]
■ dropout        ■ (None,      ■ 0 ■
■ (Dropout)      ■ 1280) ■ ■
[REDACTED]
■ dense (Dense) ■ (None, 8) ■ 10,2... ■
[REDACTED]

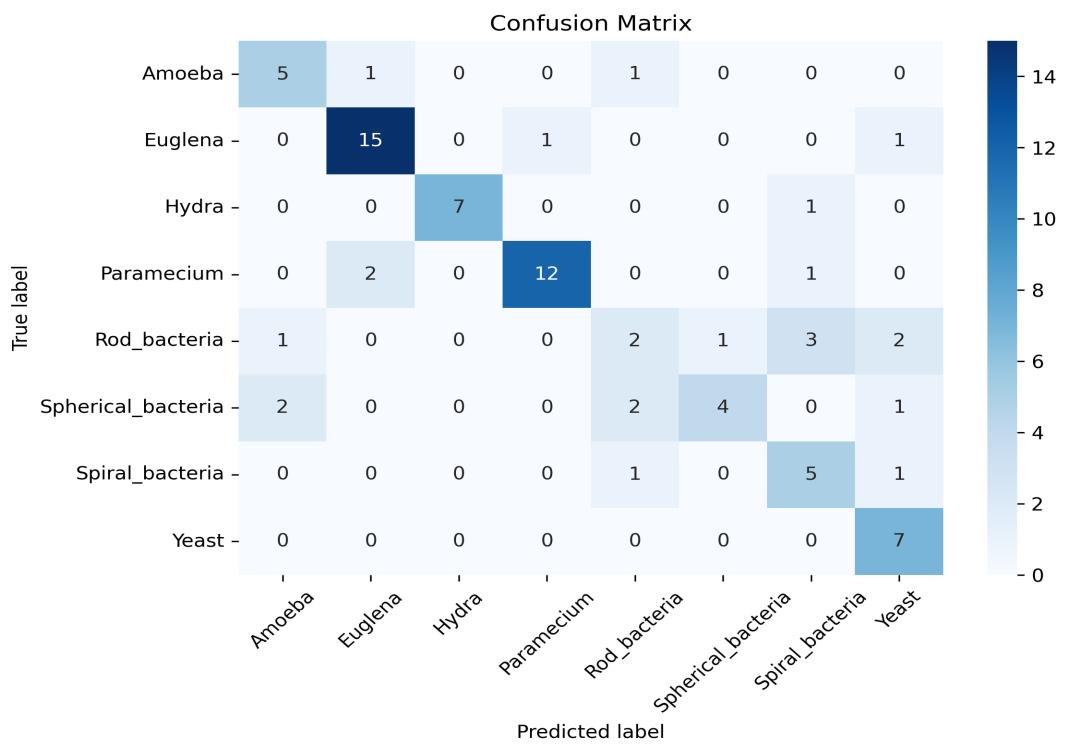
Total params: 5,998,937 (22.88 MB)
Trainable params: 1,865,352 (7.12 MB)
Non-trainable params: 402,880 (1.54 MB)
Optimizer params: 3,730,705 (14.23 MB)
```

**Test Accuracy:** 0.7215

## Training Accuracy over Epochs:



## 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:** 20

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.005

**Dropout:** 0.6

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.98)

**Early Stopping Patience:** 10

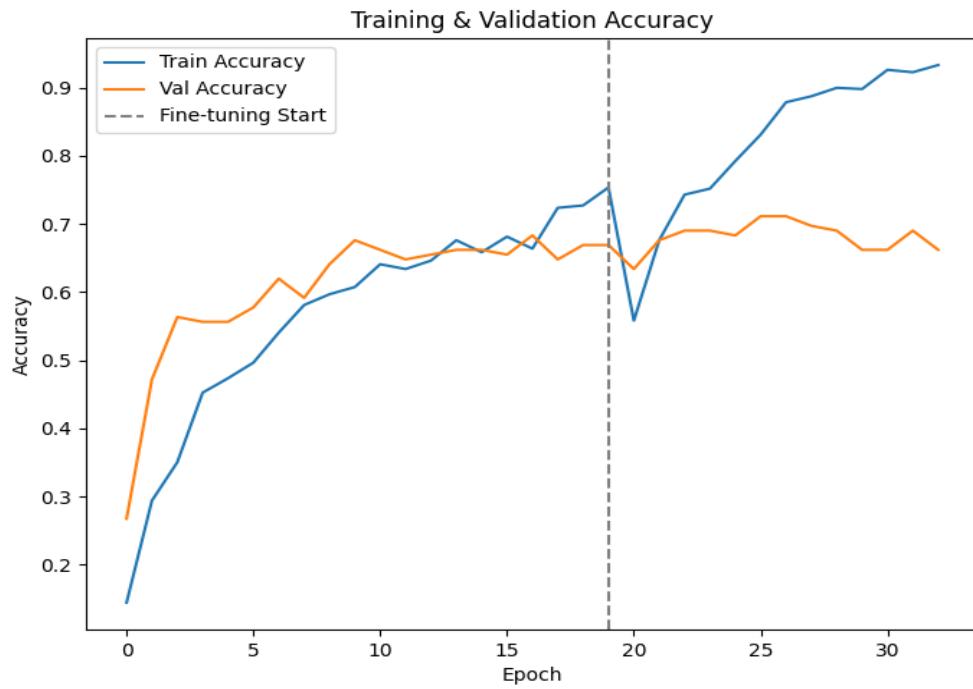
**Comments:** Using MobileNetV2, fine tune more layers with higher dropout

## Model Summary:

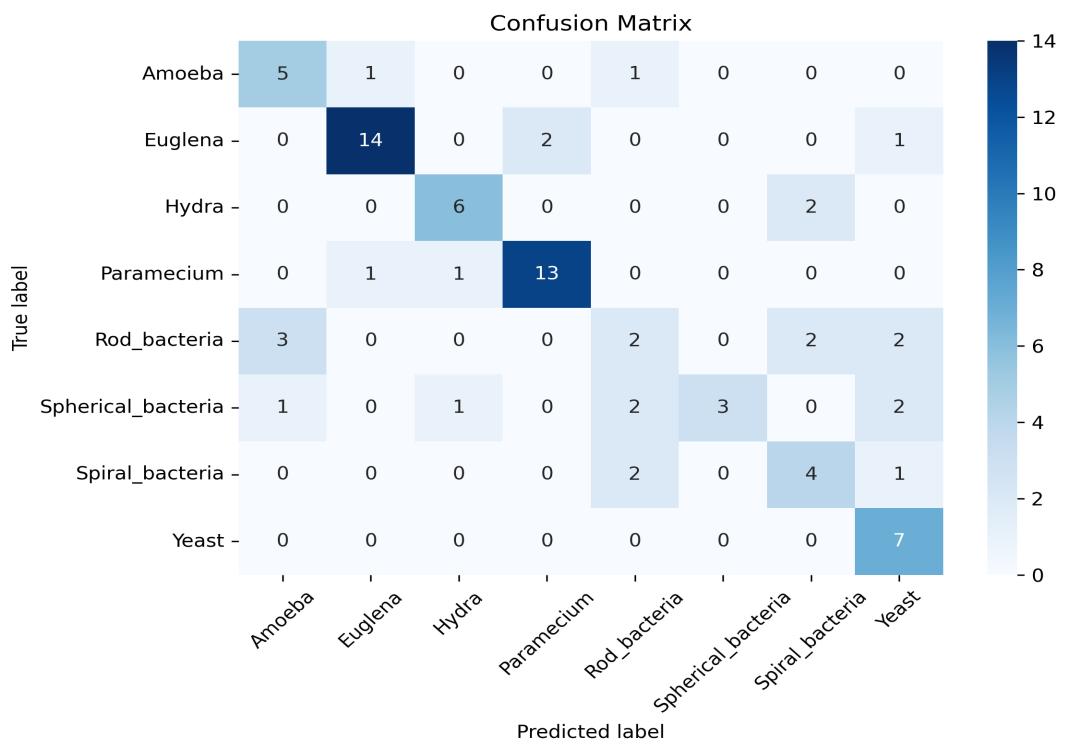
| Model: "sequential"                                  |                    |           |  |
|------------------------------------------------------|--------------------|-----------|--|
| Layer (type)                                         | Output Shape       | Param #   |  |
| mobilenetv2_1.00_224 (Functional)                    | (None, 7, 7, 1280) | 2,257,984 |  |
| global_average_pooling2d<br>(GlobalAveragePooling2D) | (None, 1280)       | 0         |  |
| dropout (Dropout)                                    | (None, 1280)       | 0         |  |
| dense (Dense)                                        | (None, 8)          | 10,248    |  |
| Total params: 6,625,497 (25.27 MB)                   |                    |           |  |
| Trainable params: 2,178,632 (8.31 MB)                |                    |           |  |
| Non-trainable params: 89,600 (350.00 KB)             |                    |           |  |
| Optimizer params: 4,357,265 (16.62 MB)               |                    |           |  |

**Test Accuracy:** 0.6835

## 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:** 20  
**Fine-tune Epochs:** 30  
**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda  
**RandomFlip Mode:** horizontal  
**RandomRotation Factor:** 0.15  
**RandomZoom Factor:** 0.15  
**RandomContrast Factor:** 0.2  
**RandomBrightness MaxDelta:** 0.2  
**Gaussian Noise STD:** 0.005  
**Dropout:** 0.6  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Optimizer (Base):** Adam  
**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.98)  
**Early Stopping Patience:** 10  
**Comments:** Using MobileNetV2, fine tune more layers with higher dropout, added a dense layer before final output

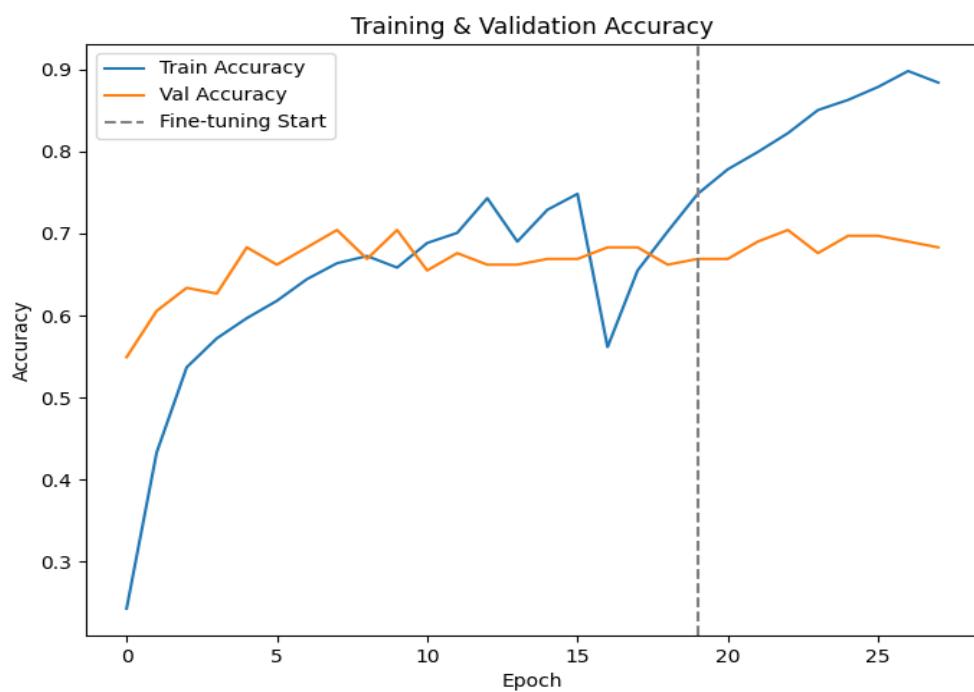
## Model Summary:

| Model: "sequential" | Layer (type)                                         | Output Shape       | Param #   |
|---------------------|------------------------------------------------------|--------------------|-----------|
|                     | mobilenetv2_1.00_224 (Functional)                    | (None, 7, 7, 1280) | 2,257,984 |
|                     | global_average_pooling2d<br>(GlobalAveragePooling2D) | (None, 1280)       | 0         |
|                     | dropout (Dropout)                                    | (None, 1280)       | 0         |
|                     | dense (Dense)                                        | (None, 256)        | 327,936   |
|                     | dropout_1 (Dropout)                                  | (None, 256)        | 0         |
|                     | dense_1 (Dense)                                      | (None, 8)          | 2,056     |

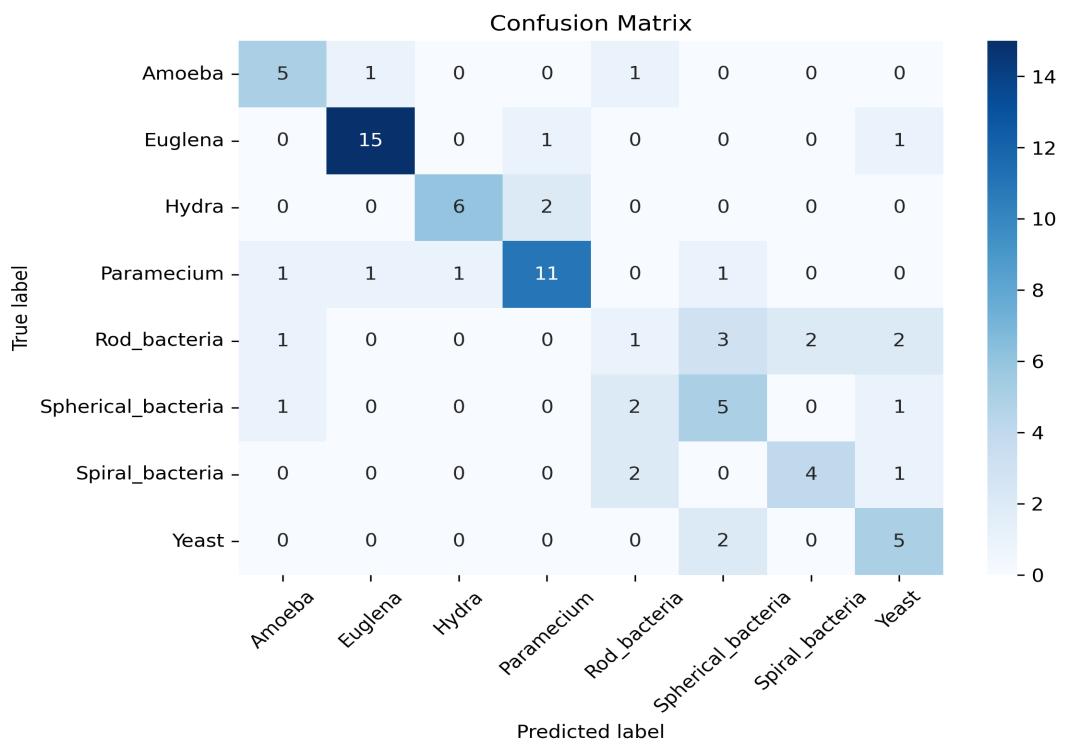
```
[  
Total params: 7,584,729 (28.93 MB)  
Trainable params: 2,498,376 (9.53 MB)  
Non-trainable params: 89,600 (350.00 KB)  
Optimizer params: 4,996,753 (19.06 MB)
```

**Test Accuracy:** 0.6582

## 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:** 20

**Fine-tune Epochs:** 30

**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda

**RandomFlip Mode:** horizontal

**RandomRotation Factor:** 0.15

**RandomZoom Factor:** 0.15

**RandomContrast Factor:** 0.2

**RandomBrightness MaxDelta:** 0.2

**Gaussian Noise STD:** 0.005

**Dropout:** 0.6

**Train Size:** 568

**Validation Size:** 142

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.98)

**Early Stopping Patience:** 10

**Comments:** Using MobileNetV2, fine tune more layers

## Model Summary:

Model: "sequential"

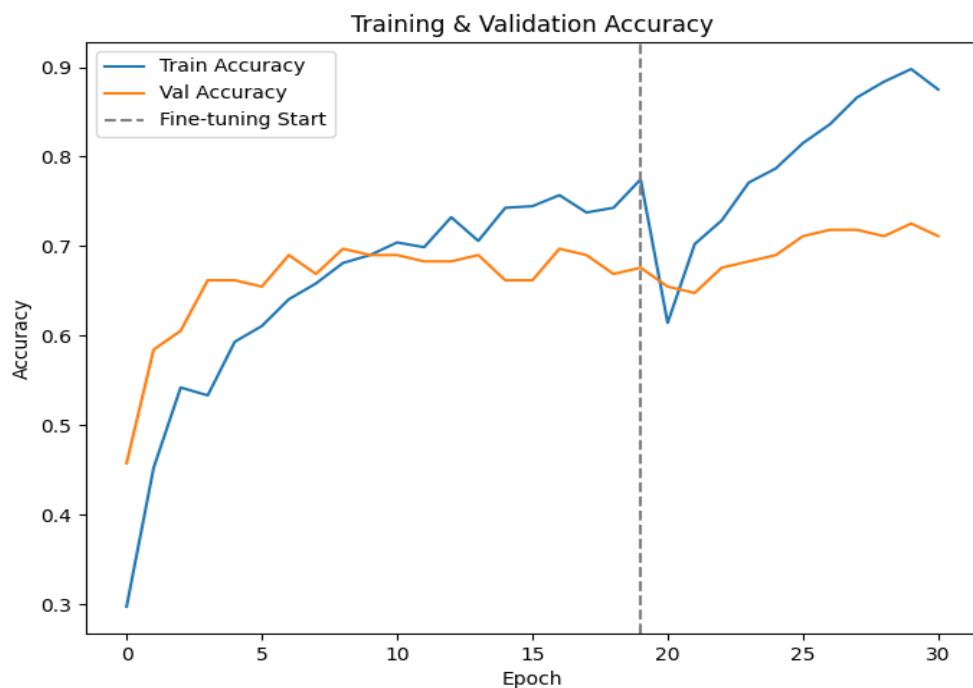
| Layer (type)                                         | Output Shape       | Param #   |
|------------------------------------------------------|--------------------|-----------|
| mobilenetv2_1.00_224 (Functional)                    | (None, 7, 7, 1280) | 2,257,984 |
| global_average_pooling2d<br>(GlobalAveragePooling2D) | (None, 1280)       | 0         |
| dropout (Dropout)                                    | (None, 1280)       | 0         |
| dense (Dense)                                        | (None, 256)        | 327,936   |
| dropout_1 (Dropout)                                  | (None, 256)        | 0         |
| dense_1 (Dense)                                      | (None, 8)          | 2,056     |

Total params: 6,970,841 (26.59 MB)

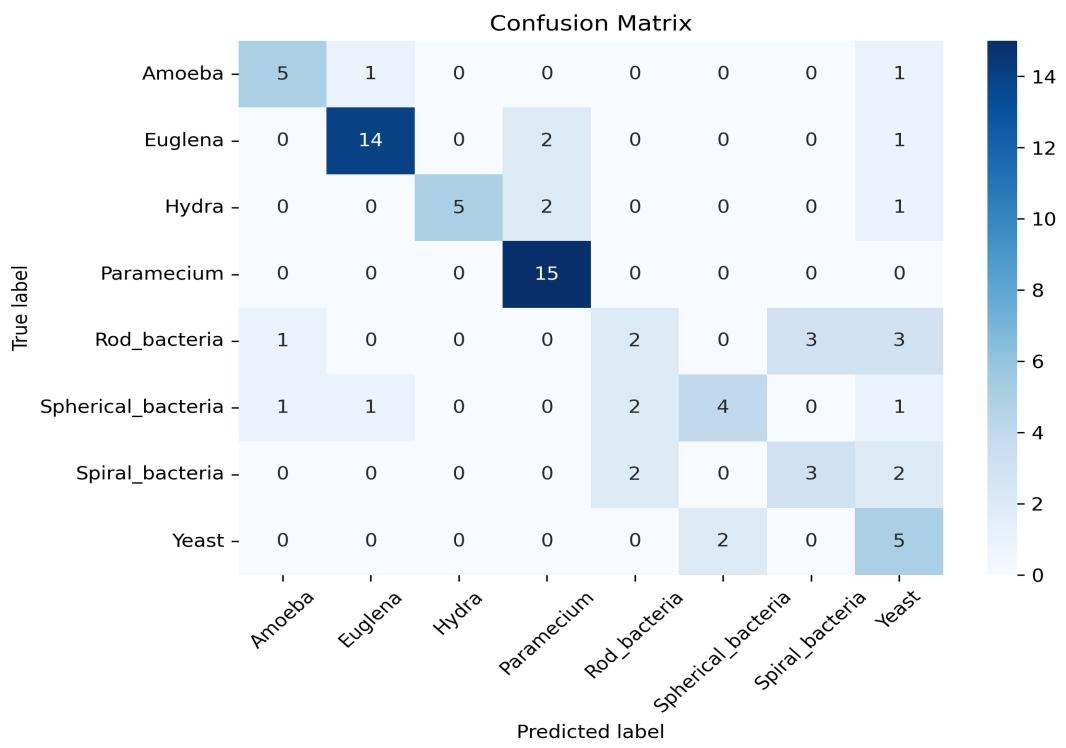
Trainable params: 2,191,432 (8.36 MB)  
Non-trainable params: 396,544 (1.51 MB)  
Optimizer params: 4,382,865 (16.72 MB)

**Test Accuracy:** 0.6709

## 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:** 20  
**Fine-tune Epochs:** 30  
**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda  
**RandomFlip Mode:** horizontal  
**RandomRotation Factor:** 0.2  
**RandomZoom Factor:** 0.2  
**RandomContrast Factor:** 0.2  
**RandomBrightness MaxDelta:** 0.2  
**Gaussian Noise STD:** 0.01  
**Dropout:** 0.6  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Optimizer (Base):** Adam  
**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.98)  
**Early Stopping Patience:** 10  
**Comments:** Using MobileNetV2, fine tune more layers, increase augmentation

## Model Summary:

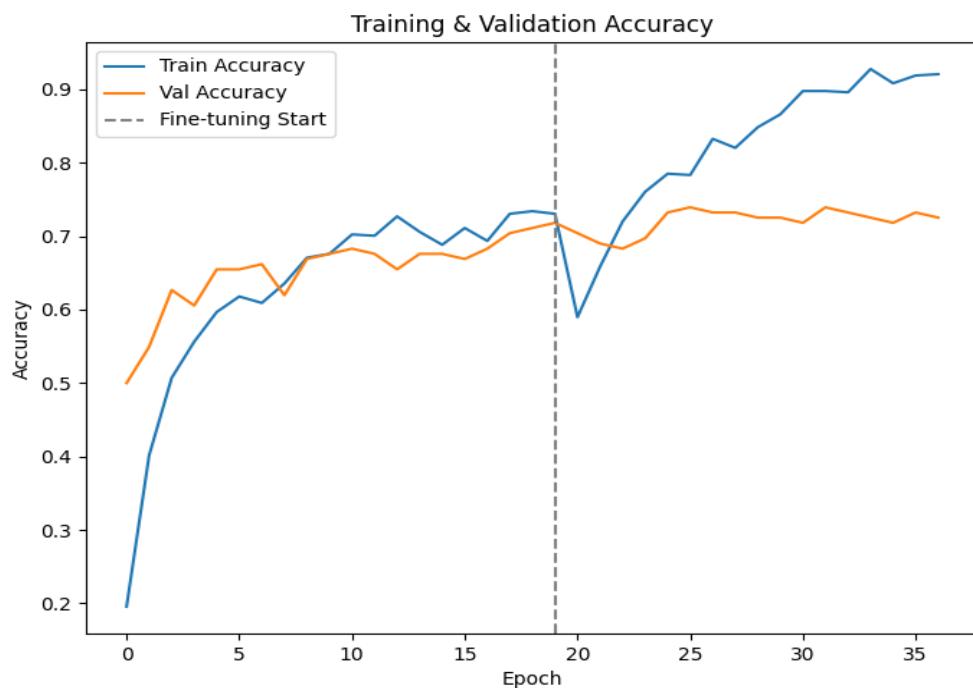
| Model: "sequential"                                  |                    |           |  |
|------------------------------------------------------|--------------------|-----------|--|
| Layer (type)                                         | Output Shape       | Param #   |  |
| mobilenetv2_1.00_224 (Functional)                    | (None, 7, 7, 1280) | 2,257,984 |  |
| global_average_pooling2d<br>(GlobalAveragePooling2D) | (None, 1280)       | 0         |  |
| dropout (Dropout)                                    | (None, 1280)       | 0         |  |
| dense (Dense)                                        | (None, 256)        | 327,936   |  |
| dropout_1 (Dropout)                                  | (None, 256)        | 0         |  |
| dense_1 (Dense)                                      | (None, 8)          | 2,056     |  |

Total params: 6,970,841 (26.59 MB)

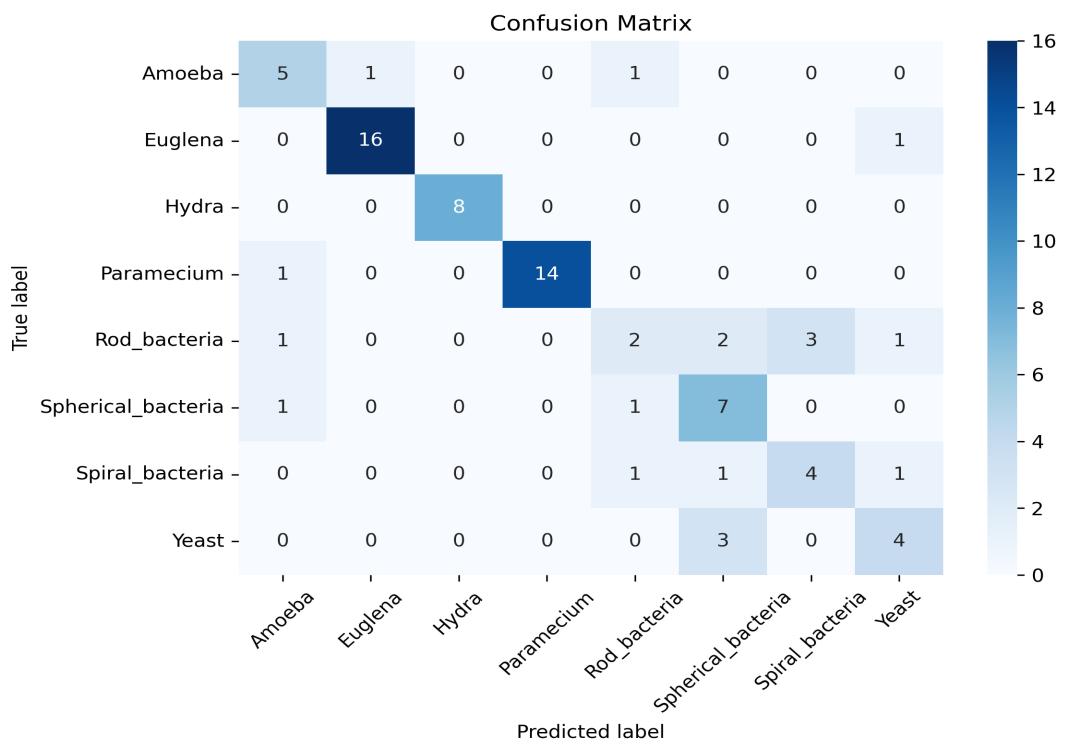
```
Trainable params: 2,191,432 (8.36 MB)
Non-trainable params: 396,544 (1.51 MB)
Optimizer params: 4,382,865 (16.72 MB)
```

**Test Accuracy:** 0.7595

## Training Accuracy over Epochs:



## Confusion Matrix:



# Model Training Report

### **Configuration and Parameters:**

**Image Size:** (224, 224)

**Image 3.26. (E)**

**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: 20

**Base Epochs: 20**  
**Fine-tune Epochs: 30**

**Data Augmentation:** random flip, random rotation, random zoom, random contrast, lambda

**RandomFlip Mode:** horizontal

**RandomFlip Mode:** horizontal  
**RandomRotation Factor:** 0.2

RandomZoom Factor: 0.2

**RandomZoom Factor:** 0.2  
**RandomContrast Factor:** 0.3

**RandomContrast Factor:** 0.2  
**RandomBrightness MaxDelta:** 0.3

## RandomBrightness MaxDef Gaussian Noise STD: 0.05

## Gaussian Naive Bayes

**Dropout: 0.6**

**Train Size: 568**

## Validation Six

**Test Size:** 79

**Optimizer (Base):** Adam

**Optimizer (Fine-tune):** Adam

**Early Stopping Patience:** 10

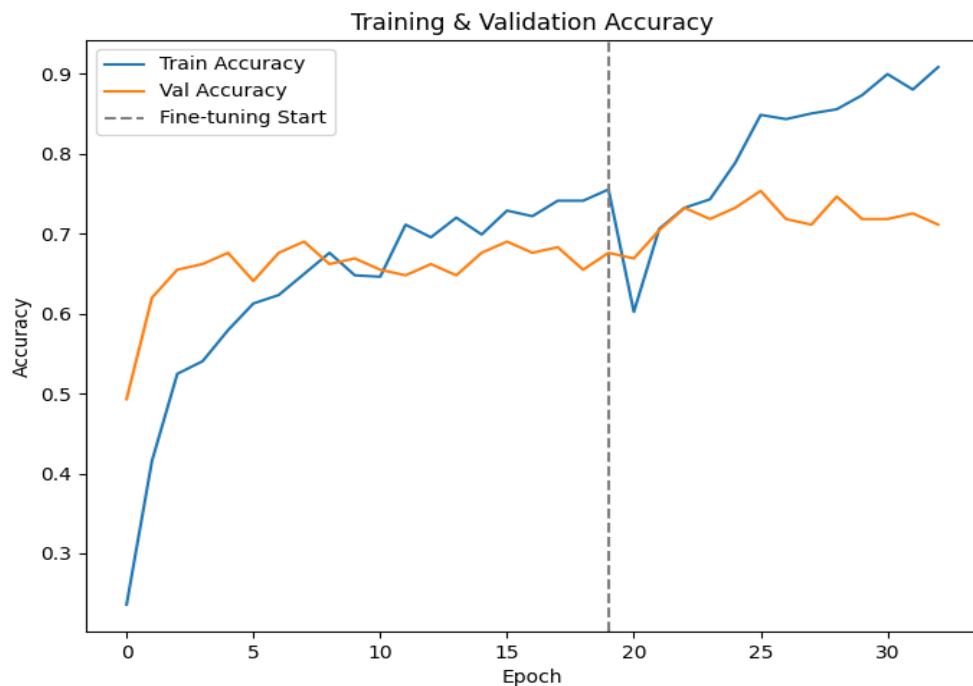
## Model Summary:



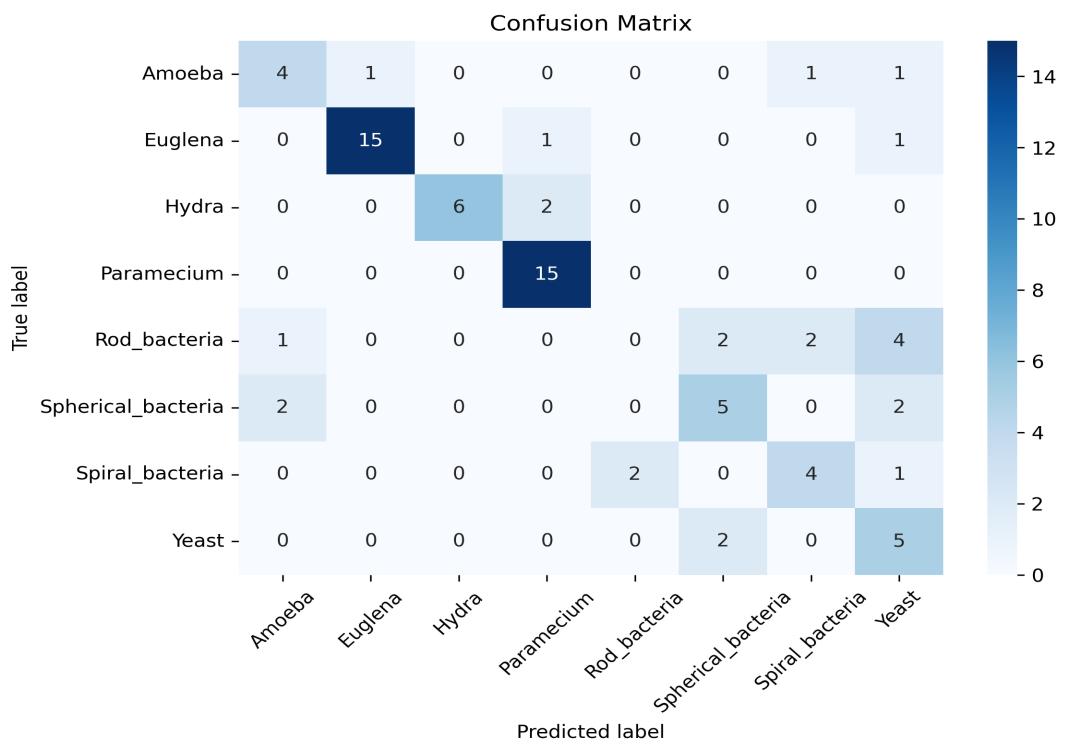
Trainable params: 2,191,432 (8.36 MB)  
Non-trainable params: 396,544 (1.51 MB)  
Optimizer params: 4,382,865 (16.72 MB)

**Test Accuracy:** 0.6835

## 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:** 20  
**Fine-tune Epochs:** 30  
**Data Augmentation:** random\_flip, random\_rotation, random\_zoom, random\_contrast, lambda  
**RandomFlip Mode:** horizontal  
**RandomRotation Factor:** 0.2  
**RandomZoom Factor:** 0.2  
**RandomContrast Factor:** 0.2  
**RandomBrightness MaxDelta:** 0.2  
**Gaussian Noise STD:** 0.01  
**Dropout:** 0.6  
**Train Size:** 568  
**Validation Size:** 142  
**Test Size:** 79  
**Optimizer (Base):** Adam  
**Optimizer (Fine-tune):** Adam with ExponentialDecay(initial\_lr=0.0001, decay\_rate=0.98)  
**Early Stopping Patience:** 10  
**Comments:** Using MobileNetV2, fine tune more layers

## Model Summary:

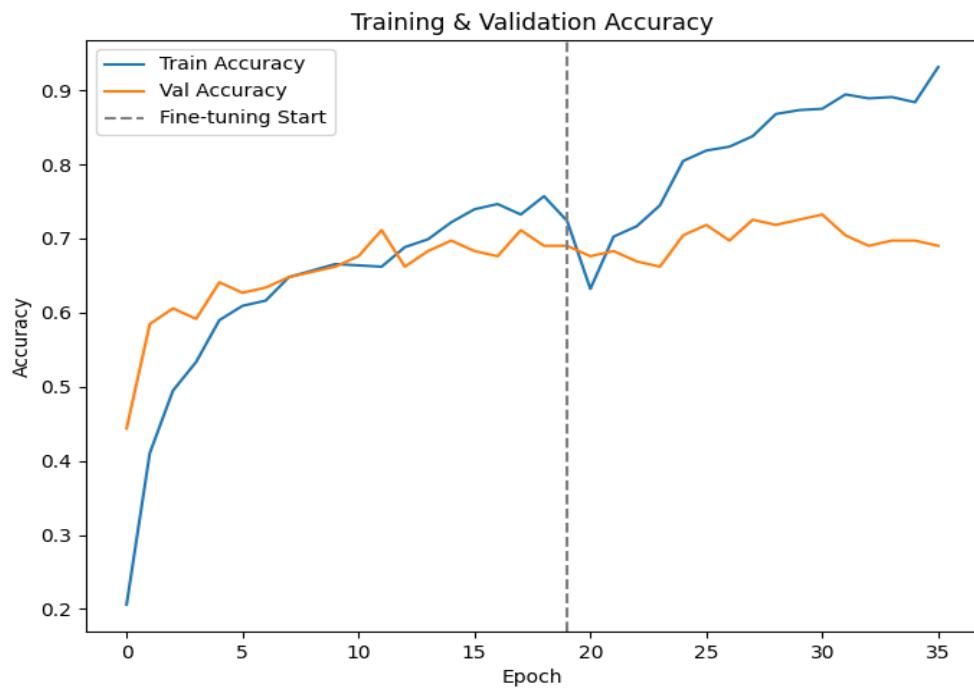
| Model: "sequential"                                  |                    |           |  |
|------------------------------------------------------|--------------------|-----------|--|
| Layer (type)                                         | Output Shape       | Param #   |  |
| mobilenetv2_1.00_224 (Functional)                    | (None, 7, 7, 1280) | 2,257,984 |  |
| global_average_pooling2d<br>(GlobalAveragePooling2D) | (None, 1280)       | 0         |  |
| dropout (Dropout)                                    | (None, 1280)       | 0         |  |
| dense (Dense)                                        | (None, 256)        | 327,936   |  |
| dropout_1 (Dropout)                                  | (None, 256)        | 0         |  |
| dense_1 (Dense)                                      | (None, 8)          | 2,056     |  |

Total params: 6,970,841 (26.59 MB)

Trainable params: 2,191,432 (8.36 MB)  
Non-trainable params: 396,544 (1.51 MB)  
Optimizer params: 4,382,865 (16.72 MB)

**Test Accuracy:** 0.7722

## Training Accuracy over Epochs:



## Confusion Matrix:

