Found 4123 images belonging to 3 classes.

Found 1031 images belonging to 3 classes.

Class weights: {0: 1.528735632183908, 1: 0.6632882882882883, 2: 1.1929976851851851}

Downloading data from <https://storage.googleapis.com/tensorflow/keras-applications/inception_v3/inception_v3_weights_tf_dim_ordering_tf_kernels_notop.h5>

**87910968/87910968** ━━━━━━━━━━━━━━━━━━━━ **5s** 0us/step

**Model: "functional"**

┏━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━┓

┃ **Layer (type)** ┃ **Output Shape** ┃ **Param #** ┃ **Connected to** ┃

┡━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━┩

│ input\_layer │ (None, 299, 299, │ 0 │ - │

│ (InputLayer) │ 3) │ │ │

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│ conv2d (Conv2D) │ (None, 149, 149, │ 864 │ input\_layer[0][0] │

│ │ 32) │ │ │

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│ batch\_normalization │ (None, 149, 149, │ 96 │ conv2d[0][0] │

│ (BatchNormalizatio… │ 32) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation │ (None, 149, 149, │ 0 │ batch\_normalizat… │

│ (Activation) │ 32) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_1 (Conv2D) │ (None, 147, 147, │ 9,216 │ activation[0][0] │

│ │ 32) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 147, 147, │ 96 │ conv2d\_1[0][0] │

│ (BatchNormalizatio… │ 32) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_1 │ (None, 147, 147, │ 0 │ batch\_normalizat… │

│ (Activation) │ 32) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_2 (Conv2D) │ (None, 147, 147, │ 18,432 │ activation\_1[0][… │

│ │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 147, 147, │ 192 │ conv2d\_2[0][0] │

│ (BatchNormalizatio… │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_2 │ (None, 147, 147, │ 0 │ batch\_normalizat… │

│ (Activation) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ max\_pooling2d │ (None, 73, 73, │ 0 │ activation\_2[0][… │

│ (MaxPooling2D) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_3 (Conv2D) │ (None, 73, 73, │ 5,120 │ max\_pooling2d[0]… │

│ │ 80) │ │ │

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│ batch\_normalizatio… │ (None, 73, 73, │ 240 │ conv2d\_3[0][0] │

│ (BatchNormalizatio… │ 80) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_3 │ (None, 73, 73, │ 0 │ batch\_normalizat… │

│ (Activation) │ 80) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_4 (Conv2D) │ (None, 71, 71, │ 138,240 │ activation\_3[0][… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 71, 71, │ 576 │ conv2d\_4[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_4 │ (None, 71, 71, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ max\_pooling2d\_1 │ (None, 35, 35, │ 0 │ activation\_4[0][… │

│ (MaxPooling2D) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_8 (Conv2D) │ (None, 35, 35, │ 12,288 │ max\_pooling2d\_1[… │

│ │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 192 │ conv2d\_8[0][0] │

│ (BatchNormalizatio… │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_8 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_6 (Conv2D) │ (None, 35, 35, │ 9,216 │ max\_pooling2d\_1[… │

│ │ 48) │ │ │

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│ conv2d\_9 (Conv2D) │ (None, 35, 35, │ 55,296 │ activation\_8[0][… │

│ │ 96) │ │ │

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│ batch\_normalizatio… │ (None, 35, 35, │ 144 │ conv2d\_6[0][0] │

│ (BatchNormalizatio… │ 48) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 288 │ conv2d\_9[0][0] │

│ (BatchNormalizatio… │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_6 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 48) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_9 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ average\_pooling2d │ (None, 35, 35, │ 0 │ max\_pooling2d\_1[… │

│ (AveragePooling2D) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_5 (Conv2D) │ (None, 35, 35, │ 12,288 │ max\_pooling2d\_1[… │

│ │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_7 (Conv2D) │ (None, 35, 35, │ 76,800 │ activation\_6[0][… │

│ │ 64) │ │ │

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│ conv2d\_10 (Conv2D) │ (None, 35, 35, │ 82,944 │ activation\_9[0][… │

│ │ 96) │ │ │

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│ conv2d\_11 (Conv2D) │ (None, 35, 35, │ 6,144 │ average\_pooling2… │

│ │ 32) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 192 │ conv2d\_5[0][0] │

│ (BatchNormalizatio… │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 192 │ conv2d\_7[0][0] │

│ (BatchNormalizatio… │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 288 │ conv2d\_10[0][0] │

│ (BatchNormalizatio… │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 96 │ conv2d\_11[0][0] │

│ (BatchNormalizatio… │ 32) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_5 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_7 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_10 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_11 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 32) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ mixed0 │ (None, 35, 35, │ 0 │ activation\_5[0][… │

│ (Concatenate) │ 256) │ │ activation\_7[0][… │

│ │ │ │ activation\_10[0]… │

│ │ │ │ activation\_11[0]… │

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│ conv2d\_15 (Conv2D) │ (None, 35, 35, │ 16,384 │ mixed0[0][0] │

│ │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 192 │ conv2d\_15[0][0] │

│ (BatchNormalizatio… │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_15 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_13 (Conv2D) │ (None, 35, 35, │ 12,288 │ mixed0[0][0] │

│ │ 48) │ │ │

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│ conv2d\_16 (Conv2D) │ (None, 35, 35, │ 55,296 │ activation\_15[0]… │

│ │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 144 │ conv2d\_13[0][0] │

│ (BatchNormalizatio… │ 48) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 288 │ conv2d\_16[0][0] │

│ (BatchNormalizatio… │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_13 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 48) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_16 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ average\_pooling2d\_1 │ (None, 35, 35, │ 0 │ mixed0[0][0] │

│ (AveragePooling2D) │ 256) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_12 (Conv2D) │ (None, 35, 35, │ 16,384 │ mixed0[0][0] │

│ │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_14 (Conv2D) │ (None, 35, 35, │ 76,800 │ activation\_13[0]… │

│ │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_17 (Conv2D) │ (None, 35, 35, │ 82,944 │ activation\_16[0]… │

│ │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_18 (Conv2D) │ (None, 35, 35, │ 16,384 │ average\_pooling2… │

│ │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 192 │ conv2d\_12[0][0] │

│ (BatchNormalizatio… │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 192 │ conv2d\_14[0][0] │

│ (BatchNormalizatio… │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 288 │ conv2d\_17[0][0] │

│ (BatchNormalizatio… │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 192 │ conv2d\_18[0][0] │

│ (BatchNormalizatio… │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_12 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_14 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_17 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_18 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ mixed1 │ (None, 35, 35, │ 0 │ activation\_12[0]… │

│ (Concatenate) │ 288) │ │ activation\_14[0]… │

│ │ │ │ activation\_17[0]… │

│ │ │ │ activation\_18[0]… │

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│ conv2d\_22 (Conv2D) │ (None, 35, 35, │ 18,432 │ mixed1[0][0] │

│ │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 192 │ conv2d\_22[0][0] │

│ (BatchNormalizatio… │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_22 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_20 (Conv2D) │ (None, 35, 35, │ 13,824 │ mixed1[0][0] │

│ │ 48) │ │ │

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│ conv2d\_23 (Conv2D) │ (None, 35, 35, │ 55,296 │ activation\_22[0]… │

│ │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 144 │ conv2d\_20[0][0] │

│ (BatchNormalizatio… │ 48) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 288 │ conv2d\_23[0][0] │

│ (BatchNormalizatio… │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_20 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 48) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_23 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ average\_pooling2d\_2 │ (None, 35, 35, │ 0 │ mixed1[0][0] │

│ (AveragePooling2D) │ 288) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_19 (Conv2D) │ (None, 35, 35, │ 18,432 │ mixed1[0][0] │

│ │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_21 (Conv2D) │ (None, 35, 35, │ 76,800 │ activation\_20[0]… │

│ │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_24 (Conv2D) │ (None, 35, 35, │ 82,944 │ activation\_23[0]… │

│ │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_25 (Conv2D) │ (None, 35, 35, │ 18,432 │ average\_pooling2… │

│ │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 192 │ conv2d\_19[0][0] │

│ (BatchNormalizatio… │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 192 │ conv2d\_21[0][0] │

│ (BatchNormalizatio… │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 288 │ conv2d\_24[0][0] │

│ (BatchNormalizatio… │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 192 │ conv2d\_25[0][0] │

│ (BatchNormalizatio… │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_19 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_21 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_24 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_25 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ mixed2 │ (None, 35, 35, │ 0 │ activation\_19[0]… │

│ (Concatenate) │ 288) │ │ activation\_21[0]… │

│ │ │ │ activation\_24[0]… │

│ │ │ │ activation\_25[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_27 (Conv2D) │ (None, 35, 35, │ 18,432 │ mixed2[0][0] │

│ │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 192 │ conv2d\_27[0][0] │

│ (BatchNormalizatio… │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_27 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 64) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_28 (Conv2D) │ (None, 35, 35, │ 55,296 │ activation\_27[0]… │

│ │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 35, 35, │ 288 │ conv2d\_28[0][0] │

│ (BatchNormalizatio… │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_28 │ (None, 35, 35, │ 0 │ batch\_normalizat… │

│ (Activation) │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_26 (Conv2D) │ (None, 17, 17, │ 995,328 │ mixed2[0][0] │

│ │ 384) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_29 (Conv2D) │ (None, 17, 17, │ 82,944 │ activation\_28[0]… │

│ │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 1,152 │ conv2d\_26[0][0] │

│ (BatchNormalizatio… │ 384) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 288 │ conv2d\_29[0][0] │

│ (BatchNormalizatio… │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_26 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 384) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_29 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 96) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ max\_pooling2d\_2 │ (None, 17, 17, │ 0 │ mixed2[0][0] │

│ (MaxPooling2D) │ 288) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ mixed3 │ (None, 17, 17, │ 0 │ activation\_26[0]… │

│ (Concatenate) │ 768) │ │ activation\_29[0]… │

│ │ │ │ max\_pooling2d\_2[… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_34 (Conv2D) │ (None, 17, 17, │ 98,304 │ mixed3[0][0] │

│ │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 384 │ conv2d\_34[0][0] │

│ (BatchNormalizatio… │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_34 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_35 (Conv2D) │ (None, 17, 17, │ 114,688 │ activation\_34[0]… │

│ │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 384 │ conv2d\_35[0][0] │

│ (BatchNormalizatio… │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_35 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_31 (Conv2D) │ (None, 17, 17, │ 98,304 │ mixed3[0][0] │

│ │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_36 (Conv2D) │ (None, 17, 17, │ 114,688 │ activation\_35[0]… │

│ │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 384 │ conv2d\_31[0][0] │

│ (BatchNormalizatio… │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 384 │ conv2d\_36[0][0] │

│ (BatchNormalizatio… │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_31 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_36 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_32 (Conv2D) │ (None, 17, 17, │ 114,688 │ activation\_31[0]… │

│ │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_37 (Conv2D) │ (None, 17, 17, │ 114,688 │ activation\_36[0]… │

│ │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 384 │ conv2d\_32[0][0] │

│ (BatchNormalizatio… │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 384 │ conv2d\_37[0][0] │

│ (BatchNormalizatio… │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_32 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_37 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 128) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ average\_pooling2d\_3 │ (None, 17, 17, │ 0 │ mixed3[0][0] │

│ (AveragePooling2D) │ 768) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_30 (Conv2D) │ (None, 17, 17, │ 147,456 │ mixed3[0][0] │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_33 (Conv2D) │ (None, 17, 17, │ 172,032 │ activation\_32[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_38 (Conv2D) │ (None, 17, 17, │ 172,032 │ activation\_37[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_39 (Conv2D) │ (None, 17, 17, │ 147,456 │ average\_pooling2… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_30[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_33[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_38[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_39[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_30 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_33 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_38 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_39 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ mixed4 │ (None, 17, 17, │ 0 │ activation\_30[0]… │

│ (Concatenate) │ 768) │ │ activation\_33[0]… │

│ │ │ │ activation\_38[0]… │

│ │ │ │ activation\_39[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_44 (Conv2D) │ (None, 17, 17, │ 122,880 │ mixed4[0][0] │

│ │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 480 │ conv2d\_44[0][0] │

│ (BatchNormalizatio… │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_44 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_45 (Conv2D) │ (None, 17, 17, │ 179,200 │ activation\_44[0]… │

│ │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 480 │ conv2d\_45[0][0] │

│ (BatchNormalizatio… │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_45 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_41 (Conv2D) │ (None, 17, 17, │ 122,880 │ mixed4[0][0] │

│ │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_46 (Conv2D) │ (None, 17, 17, │ 179,200 │ activation\_45[0]… │

│ │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 480 │ conv2d\_41[0][0] │

│ (BatchNormalizatio… │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 480 │ conv2d\_46[0][0] │

│ (BatchNormalizatio… │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_41 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_46 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_42 (Conv2D) │ (None, 17, 17, │ 179,200 │ activation\_41[0]… │

│ │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_47 (Conv2D) │ (None, 17, 17, │ 179,200 │ activation\_46[0]… │

│ │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 480 │ conv2d\_42[0][0] │

│ (BatchNormalizatio… │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 480 │ conv2d\_47[0][0] │

│ (BatchNormalizatio… │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_42 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_47 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ average\_pooling2d\_4 │ (None, 17, 17, │ 0 │ mixed4[0][0] │

│ (AveragePooling2D) │ 768) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_40 (Conv2D) │ (None, 17, 17, │ 147,456 │ mixed4[0][0] │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_43 (Conv2D) │ (None, 17, 17, │ 215,040 │ activation\_42[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_48 (Conv2D) │ (None, 17, 17, │ 215,040 │ activation\_47[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_49 (Conv2D) │ (None, 17, 17, │ 147,456 │ average\_pooling2… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_40[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_43[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_48[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_49[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_40 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_43 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_48 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_49 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ mixed5 │ (None, 17, 17, │ 0 │ activation\_40[0]… │

│ (Concatenate) │ 768) │ │ activation\_43[0]… │

│ │ │ │ activation\_48[0]… │

│ │ │ │ activation\_49[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_54 (Conv2D) │ (None, 17, 17, │ 122,880 │ mixed5[0][0] │

│ │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 480 │ conv2d\_54[0][0] │

│ (BatchNormalizatio… │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_54 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_55 (Conv2D) │ (None, 17, 17, │ 179,200 │ activation\_54[0]… │

│ │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 480 │ conv2d\_55[0][0] │

│ (BatchNormalizatio… │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_55 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_51 (Conv2D) │ (None, 17, 17, │ 122,880 │ mixed5[0][0] │

│ │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_56 (Conv2D) │ (None, 17, 17, │ 179,200 │ activation\_55[0]… │

│ │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 480 │ conv2d\_51[0][0] │

│ (BatchNormalizatio… │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 480 │ conv2d\_56[0][0] │

│ (BatchNormalizatio… │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_51 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_56 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_52 (Conv2D) │ (None, 17, 17, │ 179,200 │ activation\_51[0]… │

│ │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_57 (Conv2D) │ (None, 17, 17, │ 179,200 │ activation\_56[0]… │

│ │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 480 │ conv2d\_52[0][0] │

│ (BatchNormalizatio… │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 480 │ conv2d\_57[0][0] │

│ (BatchNormalizatio… │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_52 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_57 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 160) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ average\_pooling2d\_5 │ (None, 17, 17, │ 0 │ mixed5[0][0] │

│ (AveragePooling2D) │ 768) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_50 (Conv2D) │ (None, 17, 17, │ 147,456 │ mixed5[0][0] │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_53 (Conv2D) │ (None, 17, 17, │ 215,040 │ activation\_52[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_58 (Conv2D) │ (None, 17, 17, │ 215,040 │ activation\_57[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_59 (Conv2D) │ (None, 17, 17, │ 147,456 │ average\_pooling2… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_50[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_53[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_58[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_59[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_50 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_53 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_58 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_59 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ mixed6 │ (None, 17, 17, │ 0 │ activation\_50[0]… │

│ (Concatenate) │ 768) │ │ activation\_53[0]… │

│ │ │ │ activation\_58[0]… │

│ │ │ │ activation\_59[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_64 (Conv2D) │ (None, 17, 17, │ 147,456 │ mixed6[0][0] │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_64[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_64 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_65 (Conv2D) │ (None, 17, 17, │ 258,048 │ activation\_64[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_65[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_65 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_61 (Conv2D) │ (None, 17, 17, │ 147,456 │ mixed6[0][0] │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_66 (Conv2D) │ (None, 17, 17, │ 258,048 │ activation\_65[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_61[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_66[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_61 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_66 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_62 (Conv2D) │ (None, 17, 17, │ 258,048 │ activation\_61[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_67 (Conv2D) │ (None, 17, 17, │ 258,048 │ activation\_66[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_62[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_67[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_62 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_67 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ average\_pooling2d\_6 │ (None, 17, 17, │ 0 │ mixed6[0][0] │

│ (AveragePooling2D) │ 768) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_60 (Conv2D) │ (None, 17, 17, │ 147,456 │ mixed6[0][0] │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_63 (Conv2D) │ (None, 17, 17, │ 258,048 │ activation\_62[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_68 (Conv2D) │ (None, 17, 17, │ 258,048 │ activation\_67[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_69 (Conv2D) │ (None, 17, 17, │ 147,456 │ average\_pooling2… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_60[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_63[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_68[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_69[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_60 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_63 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_68 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_69 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ mixed7 │ (None, 17, 17, │ 0 │ activation\_60[0]… │

│ (Concatenate) │ 768) │ │ activation\_63[0]… │

│ │ │ │ activation\_68[0]… │

│ │ │ │ activation\_69[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_72 (Conv2D) │ (None, 17, 17, │ 147,456 │ mixed7[0][0] │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_72[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_72 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_73 (Conv2D) │ (None, 17, 17, │ 258,048 │ activation\_72[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_73[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_73 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_70 (Conv2D) │ (None, 17, 17, │ 147,456 │ mixed7[0][0] │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_74 (Conv2D) │ (None, 17, 17, │ 258,048 │ activation\_73[0]… │

│ │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_70[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 17, 17, │ 576 │ conv2d\_74[0][0] │

│ (BatchNormalizatio… │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_70 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_74 │ (None, 17, 17, │ 0 │ batch\_normalizat… │

│ (Activation) │ 192) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_71 (Conv2D) │ (None, 8, 8, 320) │ 552,960 │ activation\_70[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_75 (Conv2D) │ (None, 8, 8, 192) │ 331,776 │ activation\_74[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 320) │ 960 │ conv2d\_71[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 192) │ 576 │ conv2d\_75[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_71 │ (None, 8, 8, 320) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_75 │ (None, 8, 8, 192) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ max\_pooling2d\_3 │ (None, 8, 8, 768) │ 0 │ mixed7[0][0] │

│ (MaxPooling2D) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ mixed8 │ (None, 8, 8, │ 0 │ activation\_71[0]… │

│ (Concatenate) │ 1280) │ │ activation\_75[0]… │

│ │ │ │ max\_pooling2d\_3[… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_80 (Conv2D) │ (None, 8, 8, 448) │ 573,440 │ mixed8[0][0] │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 448) │ 1,344 │ conv2d\_80[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_80 │ (None, 8, 8, 448) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_77 (Conv2D) │ (None, 8, 8, 384) │ 491,520 │ mixed8[0][0] │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_81 (Conv2D) │ (None, 8, 8, 384) │ 1,548,288 │ activation\_80[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 384) │ 1,152 │ conv2d\_77[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 384) │ 1,152 │ conv2d\_81[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_77 │ (None, 8, 8, 384) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_81 │ (None, 8, 8, 384) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_78 (Conv2D) │ (None, 8, 8, 384) │ 442,368 │ activation\_77[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_79 (Conv2D) │ (None, 8, 8, 384) │ 442,368 │ activation\_77[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_82 (Conv2D) │ (None, 8, 8, 384) │ 442,368 │ activation\_81[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_83 (Conv2D) │ (None, 8, 8, 384) │ 442,368 │ activation\_81[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ average\_pooling2d\_7 │ (None, 8, 8, │ 0 │ mixed8[0][0] │

│ (AveragePooling2D) │ 1280) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_76 (Conv2D) │ (None, 8, 8, 320) │ 409,600 │ mixed8[0][0] │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 384) │ 1,152 │ conv2d\_78[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 384) │ 1,152 │ conv2d\_79[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 384) │ 1,152 │ conv2d\_82[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 384) │ 1,152 │ conv2d\_83[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_84 (Conv2D) │ (None, 8, 8, 192) │ 245,760 │ average\_pooling2… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 320) │ 960 │ conv2d\_76[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_78 │ (None, 8, 8, 384) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_79 │ (None, 8, 8, 384) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_82 │ (None, 8, 8, 384) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_83 │ (None, 8, 8, 384) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 192) │ 576 │ conv2d\_84[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_76 │ (None, 8, 8, 320) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ mixed9\_0 │ (None, 8, 8, 768) │ 0 │ activation\_78[0]… │

│ (Concatenate) │ │ │ activation\_79[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ concatenate │ (None, 8, 8, 768) │ 0 │ activation\_82[0]… │

│ (Concatenate) │ │ │ activation\_83[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_84 │ (None, 8, 8, 192) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ mixed9 │ (None, 8, 8, │ 0 │ activation\_76[0]… │

│ (Concatenate) │ 2048) │ │ mixed9\_0[0][0], │

│ │ │ │ concatenate[0][0… │

│ │ │ │ activation\_84[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_89 (Conv2D) │ (None, 8, 8, 448) │ 917,504 │ mixed9[0][0] │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 448) │ 1,344 │ conv2d\_89[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_89 │ (None, 8, 8, 448) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_86 (Conv2D) │ (None, 8, 8, 384) │ 786,432 │ mixed9[0][0] │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_90 (Conv2D) │ (None, 8, 8, 384) │ 1,548,288 │ activation\_89[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 384) │ 1,152 │ conv2d\_86[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 384) │ 1,152 │ conv2d\_90[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_86 │ (None, 8, 8, 384) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_90 │ (None, 8, 8, 384) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_87 (Conv2D) │ (None, 8, 8, 384) │ 442,368 │ activation\_86[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_88 (Conv2D) │ (None, 8, 8, 384) │ 442,368 │ activation\_86[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_91 (Conv2D) │ (None, 8, 8, 384) │ 442,368 │ activation\_90[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_92 (Conv2D) │ (None, 8, 8, 384) │ 442,368 │ activation\_90[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ average\_pooling2d\_8 │ (None, 8, 8, │ 0 │ mixed9[0][0] │

│ (AveragePooling2D) │ 2048) │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_85 (Conv2D) │ (None, 8, 8, 320) │ 655,360 │ mixed9[0][0] │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 384) │ 1,152 │ conv2d\_87[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 384) │ 1,152 │ conv2d\_88[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 384) │ 1,152 │ conv2d\_91[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 384) │ 1,152 │ conv2d\_92[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ conv2d\_93 (Conv2D) │ (None, 8, 8, 192) │ 393,216 │ average\_pooling2… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 320) │ 960 │ conv2d\_85[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_87 │ (None, 8, 8, 384) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_88 │ (None, 8, 8, 384) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_91 │ (None, 8, 8, 384) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_92 │ (None, 8, 8, 384) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 8, 8, 192) │ 576 │ conv2d\_93[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_85 │ (None, 8, 8, 320) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ mixed9\_1 │ (None, 8, 8, 768) │ 0 │ activation\_87[0]… │

│ (Concatenate) │ │ │ activation\_88[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ concatenate\_1 │ (None, 8, 8, 768) │ 0 │ activation\_91[0]… │

│ (Concatenate) │ │ │ activation\_92[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ activation\_93 │ (None, 8, 8, 192) │ 0 │ batch\_normalizat… │

│ (Activation) │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ mixed10 │ (None, 8, 8, │ 0 │ activation\_85[0]… │

│ (Concatenate) │ 2048) │ │ mixed9\_1[0][0], │

│ │ │ │ concatenate\_1[0]… │

│ │ │ │ activation\_93[0]… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ global\_average\_poo… │ (None, 2048) │ 0 │ mixed10[0][0] │

│ (GlobalAveragePool… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 2048) │ 8,192 │ global\_average\_p… │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ dense (Dense) │ (None, 1024) │ 2,098,176 │ batch\_normalizat… │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ dropout (Dropout) │ (None, 1024) │ 0 │ dense[0][0] │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ dense\_1 (Dense) │ (None, 512) │ 524,800 │ dropout[0][0] │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ batch\_normalizatio… │ (None, 512) │ 2,048 │ dense\_1[0][0] │

│ (BatchNormalizatio… │ │ │ │

├─────────────────────┼───────────────────┼────────────┼───────────────────┤

│ dense\_2 (Dense) │ (None, 3) │ 1,539 │ batch\_normalizat… │

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**Total params:** 24,437,539 (93.22 MB)

**Trainable params:** 13,744,515 (52.43 MB)

**Non-trainable params:** 10,693,024 (40.79 MB)

/usr/local/lib/python3.11/dist-packages/keras/src/trainers/data\_adapters/py\_dataset\_adapter.py:121: UserWarning: Your `PyDataset` class should call `super().\_\_init\_\_(\*\*kwargs)` in its constructor. `\*\*kwargs` can include `workers`, `use\_multiprocessing`, `max\_queue\_size`. Do not pass these arguments to `fit()`, as they will be ignored.

self.\_warn\_if\_super\_not\_called()

Epoch 1/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 879ms/step - accuracy: 0.3331 - loss: 1.5442

Epoch 1: val\_accuracy improved from -inf to 0.36178, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **177s** 1s/step - accuracy: 0.3332 - loss: 1.5439 - val\_accuracy: 0.3618 - val\_loss: 1.0906 - learning\_rate: 1.0000e-05

Epoch 2/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 719ms/step - accuracy: 0.4186 - loss: 1.3667

Epoch 2: val\_accuracy improved from 0.36178 to 0.45393, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **147s** 831ms/step - accuracy: 0.4185 - loss: 1.3665 - val\_accuracy: 0.4539 - val\_loss: 1.0430 - learning\_rate: 1.0000e-05

Epoch 3/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 719ms/step - accuracy: 0.4130 - loss: 1.3246

Epoch 3: val\_accuracy improved from 0.45393 to 0.50145, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **141s** 825ms/step - accuracy: 0.4131 - loss: 1.3244 - val\_accuracy: 0.5015 - val\_loss: 1.0195 - learning\_rate: 1.0000e-05

Epoch 4/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 725ms/step - accuracy: 0.4436 - loss: 1.2069

Epoch 4: val\_accuracy improved from 0.50145 to 0.50630, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **144s** 838ms/step - accuracy: 0.4436 - loss: 1.2069 - val\_accuracy: 0.5063 - val\_loss: 1.0346 - learning\_rate: 1.0000e-05

Epoch 5/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 724ms/step - accuracy: 0.4613 - loss: 1.1880

Epoch 5: val\_accuracy improved from 0.50630 to 0.52376, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **141s** 830ms/step - accuracy: 0.4614 - loss: 1.1879 - val\_accuracy: 0.5238 - val\_loss: 0.9902 - learning\_rate: 1.0000e-05

Epoch 6/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 714ms/step - accuracy: 0.4894 - loss: 1.1087

Epoch 6: val\_accuracy improved from 0.52376 to 0.53443, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **105s** 817ms/step - accuracy: 0.4894 - loss: 1.1089 - val\_accuracy: 0.5344 - val\_loss: 0.9681 - learning\_rate: 1.0000e-05

Epoch 7/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 721ms/step - accuracy: 0.4971 - loss: 1.0944

Epoch 7: val\_accuracy improved from 0.53443 to 0.54607, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **107s** 829ms/step - accuracy: 0.4971 - loss: 1.0944 - val\_accuracy: 0.5461 - val\_loss: 0.9483 - learning\_rate: 1.0000e-05

Epoch 8/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 721ms/step - accuracy: 0.5064 - loss: 1.0426

Epoch 8: val\_accuracy improved from 0.54607 to 0.55674, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **142s** 831ms/step - accuracy: 0.5064 - loss: 1.0427 - val\_accuracy: 0.5567 - val\_loss: 0.9629 - learning\_rate: 1.0000e-05

Epoch 9/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 713ms/step - accuracy: 0.5379 - loss: 1.0275

Epoch 9: val\_accuracy improved from 0.55674 to 0.58196, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **106s** 823ms/step - accuracy: 0.5379 - loss: 1.0274 - val\_accuracy: 0.5820 - val\_loss: 0.9398 - learning\_rate: 1.0000e-05

Epoch 10/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 706ms/step - accuracy: 0.5279 - loss: 1.0207

Epoch 10: val\_accuracy improved from 0.58196 to 0.59651, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **141s** 817ms/step - accuracy: 0.5279 - loss: 1.0207 - val\_accuracy: 0.5965 - val\_loss: 0.9102 - learning\_rate: 1.0000e-05

Epoch 11/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 710ms/step - accuracy: 0.5378 - loss: 0.9859

Epoch 11: val\_accuracy improved from 0.59651 to 0.60233, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **106s** 818ms/step - accuracy: 0.5379 - loss: 0.9858 - val\_accuracy: 0.6023 - val\_loss: 0.8999 - learning\_rate: 1.0000e-05

Epoch 12/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 698ms/step - accuracy: 0.5489 - loss: 0.9476

Epoch 12: val\_accuracy improved from 0.60233 to 0.61300, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **141s** 808ms/step - accuracy: 0.5490 - loss: 0.9476 - val\_accuracy: 0.6130 - val\_loss: 0.8760 - learning\_rate: 1.0000e-05

Epoch 13/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 702ms/step - accuracy: 0.5685 - loss: 0.9178

Epoch 13: val\_accuracy did not improve from 0.61300

**129/129** ━━━━━━━━━━━━━━━━━━━━ **141s** 798ms/step - accuracy: 0.5685 - loss: 0.9179 - val\_accuracy: 0.6033 - val\_loss: 0.9012 - learning\_rate: 1.0000e-05

Epoch 14/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 714ms/step - accuracy: 0.5776 - loss: 0.9132

Epoch 14: val\_accuracy did not improve from 0.61300

**129/129** ━━━━━━━━━━━━━━━━━━━━ **105s** 811ms/step - accuracy: 0.5776 - loss: 0.9133 - val\_accuracy: 0.6043 - val\_loss: 0.8913 - learning\_rate: 1.0000e-05

Epoch 15/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 707ms/step - accuracy: 0.5915 - loss: 0.8865

Epoch 15: val\_accuracy improved from 0.61300 to 0.63046, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **105s** 813ms/step - accuracy: 0.5915 - loss: 0.8863 - val\_accuracy: 0.6305 - val\_loss: 0.8450 - learning\_rate: 1.0000e-05

Epoch 16/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 704ms/step - accuracy: 0.6072 - loss: 0.8769

Epoch 16: val\_accuracy did not improve from 0.63046

**129/129** ━━━━━━━━━━━━━━━━━━━━ **104s** 803ms/step - accuracy: 0.6071 - loss: 0.8768 - val\_accuracy: 0.6295 - val\_loss: 0.8400 - learning\_rate: 1.0000e-05

Epoch 17/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 715ms/step - accuracy: 0.6177 - loss: 0.8251

Epoch 17: val\_accuracy improved from 0.63046 to 0.64694, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **144s** 819ms/step - accuracy: 0.6176 - loss: 0.8251 - val\_accuracy: 0.6469 - val\_loss: 0.8290 - learning\_rate: 1.0000e-05

Epoch 18/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 722ms/step - accuracy: 0.6283 - loss: 0.8054

Epoch 18: val\_accuracy did not improve from 0.64694

**129/129** ━━━━━━━━━━━━━━━━━━━━ **105s** 810ms/step - accuracy: 0.6283 - loss: 0.8055 - val\_accuracy: 0.6469 - val\_loss: 0.8288 - learning\_rate: 1.0000e-05

Epoch 19/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 716ms/step - accuracy: 0.6213 - loss: 0.8361

Epoch 19: val\_accuracy improved from 0.64694 to 0.67507, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **106s** 825ms/step - accuracy: 0.6213 - loss: 0.8359 - val\_accuracy: 0.6751 - val\_loss: 0.7741 - learning\_rate: 1.0000e-05

Epoch 20/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 694ms/step - accuracy: 0.6535 - loss: 0.7698

Epoch 20: val\_accuracy did not improve from 0.67507

**129/129** ━━━━━━━━━━━━━━━━━━━━ **103s** 791ms/step - accuracy: 0.6535 - loss: 0.7699 - val\_accuracy: 0.6702 - val\_loss: 0.7728 - learning\_rate: 1.0000e-05

Epoch 21/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 709ms/step - accuracy: 0.6619 - loss: 0.7400

Epoch 21: val\_accuracy did not improve from 0.67507

**129/129** ━━━━━━━━━━━━━━━━━━━━ **104s** 804ms/step - accuracy: 0.6618 - loss: 0.7401 - val\_accuracy: 0.6673 - val\_loss: 0.7881 - learning\_rate: 1.0000e-05

Epoch 22/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 707ms/step - accuracy: 0.6814 - loss: 0.7205

Epoch 22: val\_accuracy improved from 0.67507 to 0.68283, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **144s** 820ms/step - accuracy: 0.6812 - loss: 0.7207 - val\_accuracy: 0.6828 - val\_loss: 0.7574 - learning\_rate: 1.0000e-05

Epoch 23/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 708ms/step - accuracy: 0.6665 - loss: 0.7245

Epoch 23: val\_accuracy improved from 0.68283 to 0.68477, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **105s** 812ms/step - accuracy: 0.6664 - loss: 0.7246 - val\_accuracy: 0.6848 - val\_loss: 0.7261 - learning\_rate: 1.0000e-05

Epoch 24/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 700ms/step - accuracy: 0.6852 - loss: 0.6870

Epoch 24: val\_accuracy improved from 0.68477 to 0.69738, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **142s** 810ms/step - accuracy: 0.6852 - loss: 0.6871 - val\_accuracy: 0.6974 - val\_loss: 0.7071 - learning\_rate: 1.0000e-05

Epoch 25/25

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 708ms/step - accuracy: 0.6855 - loss: 0.6900

Epoch 25: val\_accuracy improved from 0.69738 to 0.69835, saving model to Alzheimer\_Detection/models/vgg16\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **143s** 814ms/step - accuracy: 0.6854 - loss: 0.6901 - val\_accuracy: 0.6984 - val\_loss: 0.7285 - learning\_rate: 1.0000e-05

Restoring model weights from the end of the best epoch: 24.

Starting fine-tuning phase...

Epoch 26/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 1s/step - accuracy: 0.4254 - auc: 0.6092 - loss: 1.3924 - precision: 0.4439 - recall: 0.3727

Epoch 26: val\_accuracy improved from -inf to 0.57420, saving model to Alzheimer\_Detection/models/vgg16\_ft\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **237s** 1s/step - accuracy: 0.4255 - auc: 0.6092 - loss: 1.3923 - precision: 0.4439 - recall: 0.3726 - val\_accuracy: 0.5742 - val\_auc: 0.7502 - val\_loss: 1.0150 - val\_precision: 0.6030 - val\_recall: 0.5024 - learning\_rate: 5.0000e-06

Epoch 27/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 780ms/step - accuracy: 0.4427 - auc: 0.6343 - loss: 1.2913 - precision: 0.4682 - recall: 0.3796

Epoch 27: val\_accuracy did not improve from 0.57420

**129/129** ━━━━━━━━━━━━━━━━━━━━ **115s** 874ms/step - accuracy: 0.4428 - auc: 0.6344 - loss: 1.2911 - precision: 0.4683 - recall: 0.3797 - val\_accuracy: 0.4918 - val\_auc: 0.6852 - val\_loss: 1.0987 - val\_precision: 0.5244 - val\_recall: 0.4064 - learning\_rate: 5.0000e-06

Epoch 28/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 794ms/step - accuracy: 0.4993 - auc: 0.6732 - loss: 1.2034 - precision: 0.5189 - recall: 0.4275

Epoch 28: val\_accuracy did not improve from 0.57420

**129/129** ━━━━━━━━━━━━━━━━━━━━ **143s** 886ms/step - accuracy: 0.4992 - auc: 0.6731 - loss: 1.2033 - precision: 0.5188 - recall: 0.4275 - val\_accuracy: 0.4646 - val\_auc: 0.6625 - val\_loss: 1.1491 - val\_precision: 0.4919 - val\_recall: 0.3841 - learning\_rate: 5.0000e-06

Epoch 29/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 798ms/step - accuracy: 0.5083 - auc: 0.6856 - loss: 1.1794 - precision: 0.5169 - recall: 0.4283

Epoch 29: val\_accuracy did not improve from 0.57420

**129/129** ━━━━━━━━━━━━━━━━━━━━ **116s** 897ms/step - accuracy: 0.5082 - auc: 0.6855 - loss: 1.1794 - precision: 0.5169 - recall: 0.4283 - val\_accuracy: 0.5082 - val\_auc: 0.7019 - val\_loss: 1.0707 - val\_precision: 0.5313 - val\_recall: 0.4200 - learning\_rate: 5.0000e-06

Epoch 30/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 822ms/step - accuracy: 0.5115 - auc: 0.6934 - loss: 1.1403 - precision: 0.5343 - recall: 0.4452

Epoch 30: val\_accuracy did not improve from 0.57420

**129/129** ━━━━━━━━━━━━━━━━━━━━ **143s** 912ms/step - accuracy: 0.5115 - auc: 0.6934 - loss: 1.1402 - precision: 0.5344 - recall: 0.4452 - val\_accuracy: 0.5412 - val\_auc: 0.7322 - val\_loss: 1.0163 - val\_precision: 0.5653 - val\_recall: 0.4491 - learning\_rate: 5.0000e-06

Epoch 31/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 799ms/step - accuracy: 0.5220 - auc: 0.7025 - loss: 1.1041 - precision: 0.5458 - recall: 0.4505

Epoch 31: val\_accuracy did not improve from 0.57420

**129/129** ━━━━━━━━━━━━━━━━━━━━ **115s** 893ms/step - accuracy: 0.5220 - auc: 0.7025 - loss: 1.1041 - precision: 0.5458 - recall: 0.4505 - val\_accuracy: 0.5344 - val\_auc: 0.7355 - val\_loss: 1.0066 - val\_precision: 0.5740 - val\_recall: 0.4627 - learning\_rate: 5.0000e-06

Epoch 32/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 785ms/step - accuracy: 0.5293 - auc: 0.7163 - loss: 1.0778 - precision: 0.5578 - recall: 0.4632

Epoch 32: val\_accuracy did not improve from 0.57420

**129/129** ━━━━━━━━━━━━━━━━━━━━ **113s** 876ms/step - accuracy: 0.5294 - auc: 0.7164 - loss: 1.0778 - precision: 0.5578 - recall: 0.4632 - val\_accuracy: 0.5587 - val\_auc: 0.7487 - val\_loss: 0.9860 - val\_precision: 0.5824 - val\_recall: 0.4762 - learning\_rate: 5.0000e-06

Epoch 33/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 814ms/step - accuracy: 0.5322 - auc: 0.7301 - loss: 1.0289 - precision: 0.5644 - recall: 0.4702

Epoch 33: ReduceLROnPlateau reducing learning rate to 2.499999936844688e-06.

Epoch 33: val\_accuracy did not improve from 0.57420

**129/129** ━━━━━━━━━━━━━━━━━━━━ **146s** 909ms/step - accuracy: 0.5322 - auc: 0.7301 - loss: 1.0292 - precision: 0.5643 - recall: 0.4702 - val\_accuracy: 0.5567 - val\_auc: 0.7507 - val\_loss: 0.9867 - val\_precision: 0.5830 - val\_recall: 0.4801 - learning\_rate: 5.0000e-06

Epoch 34/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 788ms/step - accuracy: 0.5477 - auc: 0.7282 - loss: 1.0506 - precision: 0.5731 - recall: 0.4784

Epoch 34: val\_accuracy did not improve from 0.57420

**129/129** ━━━━━━━━━━━━━━━━━━━━ **113s** 877ms/step - accuracy: 0.5477 - auc: 0.7282 - loss: 1.0507 - precision: 0.5730 - recall: 0.4784 - val\_accuracy: 0.5645 - val\_auc: 0.7565 - val\_loss: 0.9738 - val\_precision: 0.5960 - val\_recall: 0.4908 - learning\_rate: 2.5000e-06

Epoch 35/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 804ms/step - accuracy: 0.5209 - auc: 0.7185 - loss: 1.0659 - precision: 0.5531 - recall: 0.4584

Epoch 35: val\_accuracy did not improve from 0.57420

**129/129** ━━━━━━━━━━━━━━━━━━━━ **145s** 898ms/step - accuracy: 0.5210 - auc: 0.7185 - loss: 1.0658 - precision: 0.5533 - recall: 0.4585 - val\_accuracy: 0.5606 - val\_auc: 0.7541 - val\_loss: 0.9800 - val\_precision: 0.6031 - val\_recall: 0.4937 - learning\_rate: 2.5000e-06

Epoch 36/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 787ms/step - accuracy: 0.5434 - auc: 0.7355 - loss: 1.0310 - precision: 0.5761 - recall: 0.4787

Epoch 36: val\_accuracy did not improve from 0.57420

**129/129** ━━━━━━━━━━━━━━━━━━━━ **115s** 886ms/step - accuracy: 0.5434 - auc: 0.7355 - loss: 1.0310 - precision: 0.5761 - recall: 0.4787 - val\_accuracy: 0.5694 - val\_auc: 0.7663 - val\_loss: 0.9536 - val\_precision: 0.6031 - val\_recall: 0.4908 - learning\_rate: 2.5000e-06

Epoch 37/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 810ms/step - accuracy: 0.5645 - auc: 0.7538 - loss: 0.9941 - precision: 0.5973 - recall: 0.5097

Epoch 37: val\_accuracy did not improve from 0.57420

**129/129** ━━━━━━━━━━━━━━━━━━━━ **117s** 907ms/step - accuracy: 0.5646 - auc: 0.7538 - loss: 0.9941 - precision: 0.5973 - recall: 0.5097 - val\_accuracy: 0.5713 - val\_auc: 0.7696 - val\_loss: 0.9478 - val\_precision: 0.6033 - val\_recall: 0.4956 - learning\_rate: 2.5000e-06

Epoch 38/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 797ms/step - accuracy: 0.5612 - auc: 0.7454 - loss: 0.9947 - precision: 0.5876 - recall: 0.4998

Epoch 38: val\_accuracy improved from 0.57420 to 0.58099, saving model to Alzheimer\_Detection/models/vgg16\_ft\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **121s** 937ms/step - accuracy: 0.5612 - auc: 0.7454 - loss: 0.9948 - precision: 0.5875 - recall: 0.4998 - val\_accuracy: 0.5810 - val\_auc: 0.7775 - val\_loss: 0.9346 - val\_precision: 0.6106 - val\_recall: 0.5034 - learning\_rate: 2.5000e-06

Epoch 39/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 789ms/step - accuracy: 0.5689 - auc: 0.7516 - loss: 1.0136 - precision: 0.5946 - recall: 0.4997

Epoch 39: val\_accuracy improved from 0.58099 to 0.59069, saving model to Alzheimer\_Detection/models/vgg16\_ft\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **116s** 903ms/step - accuracy: 0.5689 - auc: 0.7516 - loss: 1.0135 - precision: 0.5946 - recall: 0.4997 - val\_accuracy: 0.5907 - val\_auc: 0.7839 - val\_loss: 0.9207 - val\_precision: 0.6295 - val\_recall: 0.5209 - learning\_rate: 2.5000e-06

Epoch 40/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 792ms/step - accuracy: 0.5832 - auc: 0.7698 - loss: 0.9370 - precision: 0.6141 - recall: 0.5205

Epoch 40: val\_accuracy did not improve from 0.59069

**129/129** ━━━━━━━━━━━━━━━━━━━━ **140s** 890ms/step - accuracy: 0.5832 - auc: 0.7697 - loss: 0.9372 - precision: 0.6141 - recall: 0.5204 - val\_accuracy: 0.5868 - val\_auc: 0.7824 - val\_loss: 0.9239 - val\_precision: 0.6253 - val\_recall: 0.5179 - learning\_rate: 2.5000e-06

Epoch 41/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 801ms/step - accuracy: 0.5644 - auc: 0.7538 - loss: 0.9881 - precision: 0.5947 - recall: 0.5059

Epoch 41: val\_accuracy did not improve from 0.59069

**129/129** ━━━━━━━━━━━━━━━━━━━━ **143s** 897ms/step - accuracy: 0.5645 - auc: 0.7538 - loss: 0.9879 - precision: 0.5948 - recall: 0.5059 - val\_accuracy: 0.5858 - val\_auc: 0.7847 - val\_loss: 0.9224 - val\_precision: 0.6275 - val\_recall: 0.5179 - learning\_rate: 2.5000e-06

Epoch 42/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 803ms/step - accuracy: 0.5837 - auc: 0.7716 - loss: 0.9493 - precision: 0.6193 - recall: 0.5275

Epoch 42: val\_accuracy improved from 0.59069 to 0.60330, saving model to Alzheimer\_Detection/models/vgg16\_ft\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **145s** 918ms/step - accuracy: 0.5836 - auc: 0.7715 - loss: 0.9493 - precision: 0.6193 - recall: 0.5274 - val\_accuracy: 0.6033 - val\_auc: 0.7930 - val\_loss: 0.9054 - val\_precision: 0.6487 - val\_recall: 0.5267 - learning\_rate: 2.5000e-06

Epoch 43/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 781ms/step - accuracy: 0.5960 - auc: 0.7833 - loss: 0.9072 - precision: 0.6226 - recall: 0.5315

Epoch 43: val\_accuracy improved from 0.60330 to 0.60524, saving model to Alzheimer\_Detection/models/vgg16\_ft\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **139s** 892ms/step - accuracy: 0.5959 - auc: 0.7832 - loss: 0.9075 - precision: 0.6226 - recall: 0.5315 - val\_accuracy: 0.6052 - val\_auc: 0.7942 - val\_loss: 0.9060 - val\_precision: 0.6461 - val\_recall: 0.5383 - learning\_rate: 2.5000e-06

Epoch 44/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 800ms/step - accuracy: 0.5963 - auc: 0.7754 - loss: 0.9393 - precision: 0.6233 - recall: 0.5268

Epoch 44: val\_accuracy improved from 0.60524 to 0.61688, saving model to Alzheimer\_Detection/models/vgg16\_ft\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **123s** 951ms/step - accuracy: 0.5963 - auc: 0.7755 - loss: 0.9392 - precision: 0.6234 - recall: 0.5269 - val\_accuracy: 0.6169 - val\_auc: 0.8005 - val\_loss: 0.8933 - val\_precision: 0.6531 - val\_recall: 0.5441 - learning\_rate: 2.5000e-06

Epoch 45/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 797ms/step - accuracy: 0.5983 - auc: 0.7860 - loss: 0.9017 - precision: 0.6346 - recall: 0.5391

Epoch 45: val\_accuracy did not improve from 0.61688

**129/129** ━━━━━━━━━━━━━━━━━━━━ **133s** 887ms/step - accuracy: 0.5984 - auc: 0.7860 - loss: 0.9018 - precision: 0.6347 - recall: 0.5391 - val\_accuracy: 0.6091 - val\_auc: 0.7988 - val\_loss: 0.9005 - val\_precision: 0.6445 - val\_recall: 0.5364 - learning\_rate: 2.5000e-06

Epoch 46/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 802ms/step - accuracy: 0.5841 - auc: 0.7734 - loss: 0.9388 - precision: 0.6148 - recall: 0.5255

Epoch 46: val\_accuracy did not improve from 0.61688

**129/129** ━━━━━━━━━━━━━━━━━━━━ **144s** 900ms/step - accuracy: 0.5842 - auc: 0.7735 - loss: 0.9387 - precision: 0.6149 - recall: 0.5256 - val\_accuracy: 0.6140 - val\_auc: 0.8040 - val\_loss: 0.8890 - val\_precision: 0.6472 - val\_recall: 0.5480 - learning\_rate: 2.5000e-06

Epoch 47/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 793ms/step - accuracy: 0.6131 - auc: 0.7950 - loss: 0.8899 - precision: 0.6424 - recall: 0.5530

Epoch 47: val\_accuracy did not improve from 0.61688

**129/129** ━━━━━━━━━━━━━━━━━━━━ **116s** 895ms/step - accuracy: 0.6131 - auc: 0.7950 - loss: 0.8901 - precision: 0.6424 - recall: 0.5530 - val\_accuracy: 0.6081 - val\_auc: 0.8042 - val\_loss: 0.8890 - val\_precision: 0.6570 - val\_recall: 0.5500 - learning\_rate: 2.5000e-06

Epoch 48/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 808ms/step - accuracy: 0.5952 - auc: 0.7935 - loss: 0.8704 - precision: 0.6328 - recall: 0.5403

Epoch 48: val\_accuracy improved from 0.61688 to 0.62464, saving model to Alzheimer\_Detection/models/vgg16\_ft\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **148s** 943ms/step - accuracy: 0.5953 - auc: 0.7935 - loss: 0.8704 - precision: 0.6329 - recall: 0.5404 - val\_accuracy: 0.6246 - val\_auc: 0.8080 - val\_loss: 0.8829 - val\_precision: 0.6644 - val\_recall: 0.5567 - learning\_rate: 2.5000e-06

Epoch 49/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 801ms/step - accuracy: 0.6155 - auc: 0.7960 - loss: 0.8853 - precision: 0.6504 - recall: 0.5548

Epoch 49: val\_accuracy improved from 0.62464 to 0.63725, saving model to Alzheimer\_Detection/models/vgg16\_ft\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **120s** 930ms/step - accuracy: 0.6156 - auc: 0.7960 - loss: 0.8852 - precision: 0.6505 - recall: 0.5549 - val\_accuracy: 0.6372 - val\_auc: 0.8155 - val\_loss: 0.8679 - val\_precision: 0.6766 - val\_recall: 0.5723 - learning\_rate: 2.5000e-06

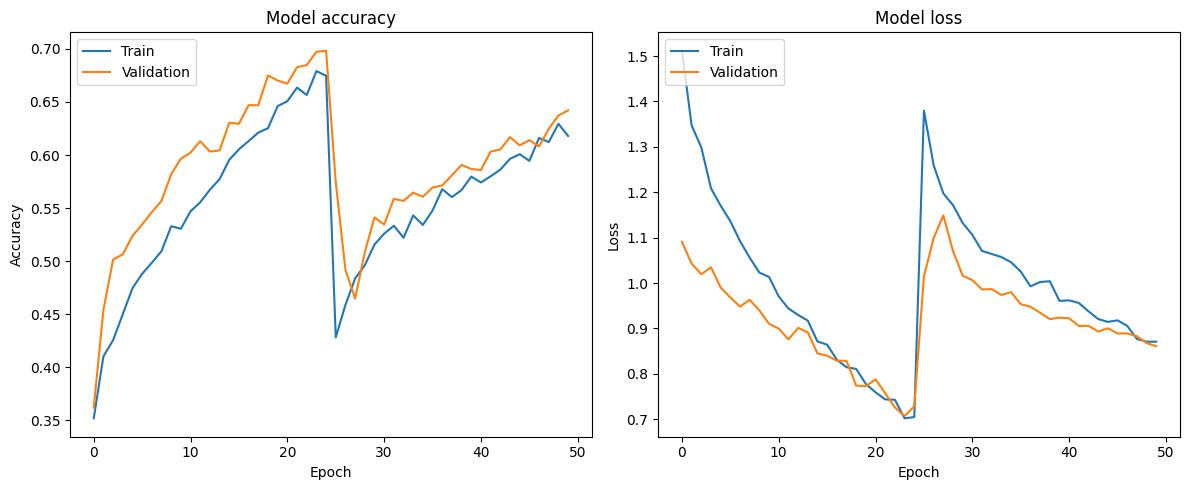
Epoch 50/50

**129/129** ━━━━━━━━━━━━━━━━━━━━ **0s** 805ms/step - accuracy: 0.6255 - auc: 0.8091 - loss: 0.8651 - precision: 0.6660 - recall: 0.5734

Epoch 50: val\_accuracy improved from 0.63725 to 0.64210, saving model to Alzheimer\_Detection/models/vgg16\_ft\_best.keras

**129/129** ━━━━━━━━━━━━━━━━━━━━ **123s** 956ms/step - accuracy: 0.6255 - auc: 0.8090 - loss: 0.8651 - precision: 0.6659 - recall: 0.5733 - val\_accuracy: 0.6421 - val\_auc: 0.8192 - val\_loss: 0.8610 - val\_precision: 0.6871 - val\_recall: 0.5771 - learning\_rate: 2.5000e-06

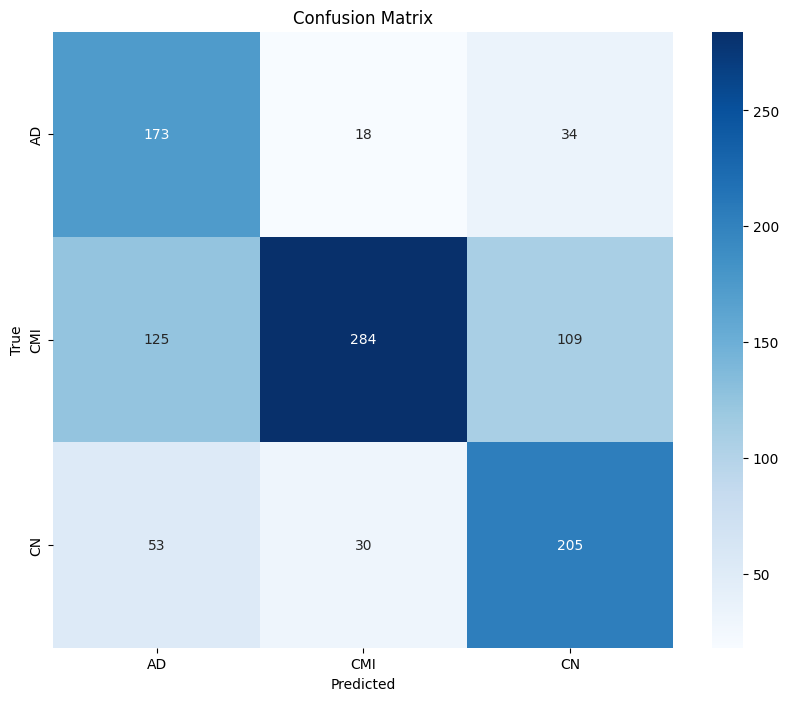
Restoring model weights from the end of the best epoch: 50.



**33/33** ━━━━━━━━━━━━━━━━━━━━ **5s** 144ms/step - accuracy: 0.6679 - auc: 0.8470 - loss: 0.7984 - precision: 0.7239 - recall: 0.6192

Final validation results: {'loss': 0.8610430359840393, 'compile\_metrics': 0.6420950293540955}

**33/33** ━━━━━━━━━━━━━━━━━━━━ **16s** 324ms/step



Classification Report:

precision recall f1-score support

AD 0.49 0.77 0.60 225

CMI 0.86 0.55 0.67 518

CN 0.59 0.71 0.64 288

accuracy 0.64 1031

macro avg 0.65 0.68 0.64 1031

weighted avg 0.70 0.64 0.65 1031