1. Import and Install Dependencies

```python
import cv2
import numpy as np
import os
from matplotlib import pyplot as plt
import time
import mediapipe as mp
```

2. Keypoints using MP Holistic

```python
mp_holistic = mp.solutions.holistic # Holistic model
mp_drawing = mp.solutions.drawing_utils # Drawing utilities

def mediapipe_detection(image, model):
    image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB) # COLOR CONVERSION
BGR 2 RGB
    image.flags.writeable = False                  # Image is no
longer writeable
    results = model.process(image)                 # Make prediction
    image.flags.writeable = True                   # Image is now
writeable
    image = cv2.cvtColor(image, cv2.COLOR_RGB2BGR) # COLOR COVERSION
RGB 2 BGR
    return image, results

def draw_landmarks(image, results):
    mp_drawing.draw_landmarks(image, results.face_landmarks,
mp_holistic.FACEMESH_CONTOURS) # Draw face connections
    mp_drawing.draw_landmarks(image, results.pose_landmarks,
mp_holistic.POSE_CONNECTIONS) # Draw pose connections
    mp_drawing.draw_landmarks(image, results.left_hand_landmarks,
mp_holistic.HAND_CONNECTIONS) # Draw left hand connections
    mp_drawing.draw_landmarks(image, results.right_hand_landmarks,
mp_holistic.HAND_CONNECTIONS) # Draw right hand connections

def draw_styled_landmarks(image, results):
    # Draw face connections
    mp_drawing.draw_landmarks(image, results.face_landmarks,
mp_holistic.FACEMESH_CONTOURS,
                             mp_drawing.DrawingSpec(color=(80,110,10),
thickness=1, circle_radius=1),

mp_drawing.DrawingSpec(color=(80,256,121), thickness=1,
circle_radius=1)
                             )
```

```python
    # Draw pose connections
    mp_drawing.draw_landmarks(image, results.pose_landmarks,
mp_holistic.POSE_CONNECTIONS,
                              mp_drawing.DrawingSpec(color=(80,22,10),
thickness=2, circle_radius=4),
                              mp_drawing.DrawingSpec(color=(80,44,121),
thickness=2, circle_radius=2)
                              )
    # Draw left hand connections
    mp_drawing.draw_landmarks(image, results.left_hand_landmarks,
mp_holistic.HAND_CONNECTIONS,
                              mp_drawing.DrawingSpec(color=(121,22,76),
thickness=2, circle_radius=4),

mp_drawing.DrawingSpec(color=(121,44,250), thickness=2,
circle_radius=2)
                              )
    # Draw right hand connections
    mp_drawing.draw_landmarks(image, results.right_hand_landmarks,
mp_holistic.HAND_CONNECTIONS,

mp_drawing.DrawingSpec(color=(245,117,66), thickness=2,
circle_radius=4),

mp_drawing.DrawingSpec(color=(245,66,230), thickness=2,
circle_radius=2)
                              )

cap = cv2.VideoCapture(0)
# Set mediapipe model
with mp_holistic.Holistic(min_detection_confidence=0.5,
min_tracking_confidence=0.5) as holistic:
    while cap.isOpened():

        # Read feed
        ret, frame = cap.read()

        # Make detections
        image, results = mediapipe_detection(frame, holistic)
        print(results)

        # Draw landmarks
        draw_styled_landmarks(image, results)

        # Show to screen
        cv2.imshow('OpenCV Feed', image)

        # Break gracefully
        if cv2.waitKey(10) & 0xFF == ord('q'):
            break
```
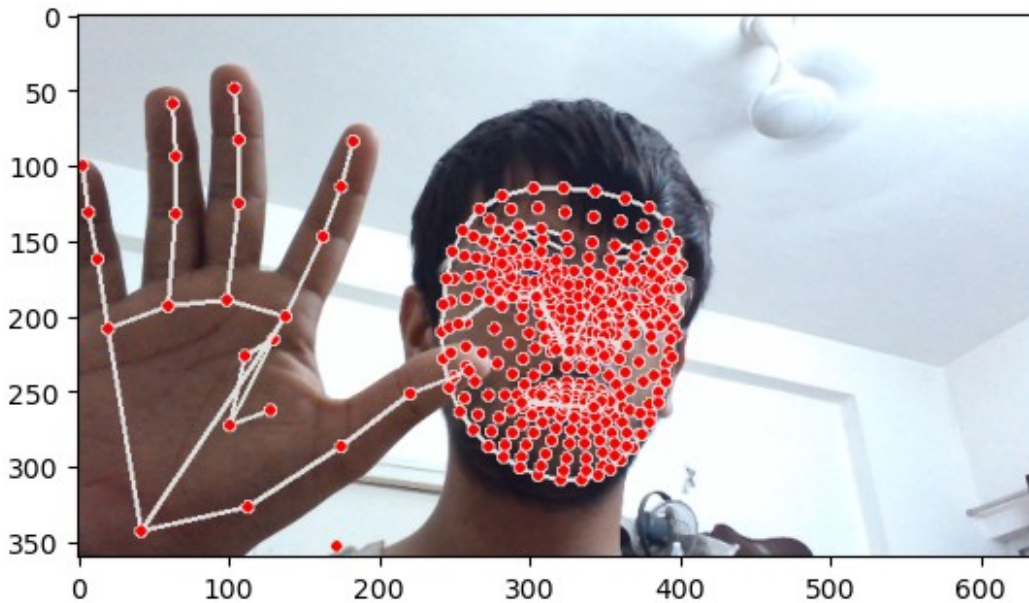
```
    cap.release()
    cv2.destroyAllWindows()
```

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draw_landmarks(frame, results)
```

```
plt.imshow(cv2.cvtColor(frame, cv2.COLOR_BGR2RGB))

<matplotlib.image.AxesImage at 0x13e81208d90>
```


3. Extract Keypoint Values

```
len(results.right_hand_landmarks.landmark)

21

pose = []
for res in results.pose_landmarks.landmark:
    test = np.array([res.x, res.y, res.z, res.visibility])
    pose.append(test)

pose = np.array([[res.x, res.y, res.z, res.visibility] for res in
results.pose_landmarks.landmark]).flatten() if results.pose_landmarks
else np.zeros(132)
face = np.array([[res.x, res.y, res.z] for res in
results.face_landmarks.landmark]).flatten() if results.face_landmarks
else np.zeros(1404)
lh = np.array([[res.x, res.y, res.z] for res in
results.left_hand_landmarks.landmark]).flatten() if
results.left_hand_landmarks else np.zeros(21*3)
rh = np.array([[res.x, res.y, res.z] for res in
results.right_hand_landmarks.landmark]).flatten() if
results.right_hand_landmarks else np.zeros(21*3)
```

```python
face = np.array([[res.x, res.y, res.z] for res in
results.face_landmarks.landmark]).flatten()
results.face_landmarks
np.zeros(1404)
```

```
array([0., 0., 0., ..., 0., 0., 0.])
```

```python
def extract_keypoints(results):
    pose = np.array([[res.x, res.y, res.z, res.visibility] for res in
results.pose_landmarks.landmark]).flatten() if results.pose_landmarks
else np.zeros(33*4)
    face = np.array([[res.x, res.y, res.z] for res in
results.face_landmarks.landmark]).flatten() if results.face_landmarks
else np.zeros(468*3)
    lh = np.array([[res.x, res.y, res.z] for res in
results.left_hand_landmarks.landmark]).flatten() if
results.left_hand_landmarks else np.zeros(21*3)
    rh = np.array([[res.x, res.y, res.z] for res in
results.right_hand_landmarks.landmark]).flatten() if
results.right_hand_landmarks else np.zeros(21*3)
    return np.concatenate([pose, face, lh, rh])
```

```python
result_test = extract_keypoints(results)
```

```python
result_test
```

```
array([ 0.51113379,  0.62420732, -1.10558796, ...,  0.00481272,
        0.28235054, -0.05226931])
```

```python
np.save('0', result_test)
```

```python
np.load('0.npy')
```

```
array([ 0.51113379,  0.62420732, -1.10558796, ...,  0.00481272,
        0.28235054, -0.05226931])
```

4. Setup Folders for Collection

```python
# Path for exported data, numpy arrays
DATA_PATH = os.path.join('C:\\Users\\ASUS\\Desktop\\ML\\Untitled
Folder')

# Actions that we try to detect
actions = np.array(['hello', 'thanks', 'iloveyou'])

# Thirty videos worth of data
no_sequences = 30

# Videos are going to be 30 frames in length
sequence_length = 30
```

```python
# Folder start
start_folder = 30

for action in actions:
    dir_path = os.path.join(DATA_PATH, action)

    # Check if directory exists
    if os.path.exists(dir_path):
        file_list = os.listdir(dir_path)

        # Check if directory contains files
        if file_list:
            dirmax = np.max(np.array(file_list).astype(int))

            for sequence in range(1, no_sequences + 1):
                try:
                    new_dir = os.path.join(dir_path, str(dirmax +
sequence))

                    # Check if directory already exists
                    if not os.path.exists(new_dir):
                        os.makedirs(new_dir)
                except Exception as e:
                    print(f"Error creating directory: {e}")
        else:
            print(f"No files found in directory '{dir_path}'.")
    else:
        print(f"Directory '{dir_path}' does not exist.")
```

```
No files found in directory 'C:\Users\ASUS\Desktop\ML\Untitled Folder\
hello'.
No files found in directory 'C:\Users\ASUS\Desktop\ML\Untitled Folder\
thanks'.
No files found in directory 'C:\Users\ASUS\Desktop\ML\Untitled Folder\
iloveyou'.
```

```python
import os

# Define the base directory path
base_dir = "C:\\Users\\ASUS\\Desktop\\ML\\Untitled Folder"  # Replace
with your desired directory path

# Create folders from 0 to 31
for i in range(30,60,1):  # Range from 0 to 31 (32 folders)
    folder_path = os.path.join(base_dir, str(i))

    # Check if folder already exists
    if not os.path.exists(folder_path):
        os.makedirs(folder_path)
```

```
        print(f"Folder '{folder_path}' created.")
    else:
        print(f"Folder '{folder_path}' already exists.")
```

```
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\30' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\31' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\32' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\33' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\34' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\35' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\36' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\37' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\38' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\39' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\40' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\41' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\42' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\43' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\44' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\45' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\46' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\47' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\48' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\49' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\50' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\51' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\52' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\53' created.
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Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\57' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\58' created.
Folder 'C:\Users\ASUS\Desktop\ML\Untitled Folder\59' created.
```

5. Collect Keypoint Values for Training and Testing

```
cap = cv2.VideoCapture(0)
# Set mediapipe model
with mp_holistic.Holistic(min_detection_confidence=0.5,
min_tracking_confidence=0.5) as holistic:

    # NEW LOOP
    # Loop through actions
    for action in actions:
        # Loop through sequences aka videos
```

```python
        for sequence in range(start_folder,
start_folder+no_sequences):
            # Loop through video length aka sequence length
            for frame_num in range(sequence_length):

                # Read feed
                ret, frame = cap.read()

                # Make detections
                image, results = mediapipe_detection(frame, holistic)

                # Draw landmarks
                draw_styled_landmarks(image, results)

                # NEW Apply wait logic
                if frame_num == 0:
                    cv2.putText(image, 'STARTING COLLECTION',
(120,200),
                               cv2.FONT_HERSHEY_SIMPLEX, 1, (0,255,
0), 4, cv2.LINE_AA)
                    cv2.putText(image, 'Collecting frames for {} Video
Number {}'.format(action, sequence), (15,12),
                               cv2.FONT_HERSHEY_SIMPLEX, 0.5, (0, 0,
255), 1, cv2.LINE_AA)
                    # Show to screen
                    cv2.imshow('OpenCV Feed', image)
                    cv2.waitKey(500)
                else:
                    cv2.putText(image, 'Collecting frames for {} Video
Number {}'.format(action, sequence), (15,12),
                               cv2.FONT_HERSHEY_SIMPLEX, 0.5, (0, 0,
255), 1, cv2.LINE_AA)
                    # Show to screen
                    cv2.imshow('OpenCV Feed', image)

                # NEW Export keypoints
                keypoints = extract_keypoints(results)
                npy_path = os.path.join(DATA_PATH, action,
str(sequence), str(frame_num))
                np.save(npy_path, keypoints)

                # Break gracefully
                if cv2.waitKey(10) & 0xFF == ord('q'):
                    break

    cap.release()
    cv2.destroyAllWindows()

cap.release()
cv2.destroyAllWindows()
```

6. Preprocess Data and Create Labels and Features

```python
from sklearn.model_selection import train_test_split
from tensorflow.keras.utils import to_categorical

label_map = {label:num for num, label in enumerate(actions)}

label_map

{'hello': 0, 'thanks': 1, 'iloveyou': 2}

sequences, labels = [], []
for action in actions:
    for sequence in np.array(os.listdir(os.path.join(DATA_PATH,
action))).astype(int):
        window = []
        for frame_num in range(sequence_length):
            res = np.load(os.path.join(DATA_PATH, action,
str(sequence), "{}.npy".format(frame_num)))
            window.append(res)
        sequences.append(window)
        labels.append(label_map[action])

np.array(sequences).shape

(90, 30, 1662)

np.array(labels).shape

(90,)

X = np.array(sequences)

X.shape

(90, 30, 1662)

y = to_categorical(labels).astype(int)

X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.05)

y_test.shape

(5, 3)
```

7. Build and Train LSTM Neural Network

```python
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import LSTM, Dense
from tensorflow.keras.callbacks import TensorBoard

log_dir = os.path.join('Logs')
tb_callback = TensorBoard(log_dir=log_dir)

model = Sequential()
model.add(LSTM(64, return_sequences=True, activation='relu',
input_shape=(30,1662)))
model.add(LSTM(128, return_sequences=True, activation='relu'))
model.add(LSTM(64, return_sequences=False, activation='relu'))
model.add(Dense(64, activation='relu'))
model.add(Dense(32, activation='relu'))
model.add(Dense(actions.shape[0], activation='softmax'))
```

```
E:\Anaconda\Lib\site-packages\keras\src\layers\rnn\rnn.py:204:
UserWarning: Do not pass an `input_shape`/`input_dim` argument to a
layer. When using Sequential models, prefer using an `Input(shape)`
object as the first layer in the model instead.
  super().__init__(**kwargs)
```

```python
model.compile(optimizer='Adam', loss='categorical_crossentropy',
metrics=['categorical_accuracy'])

model.fit(X_train, y_train, epochs=2000, callbacks=[tb_callback])
```

```
Epoch 1/2000
3/3 ─────────────────── 10s 52ms/step - categorical_accuracy: 0.3307
- loss: 2.6607
Epoch 2/2000
3/3 ─────────────────── 0s 74ms/step - categorical_accuracy: 0.3757 -
loss: 5.2641
Epoch 3/2000
3/3 ─────────────────── 0s 66ms/step - categorical_accuracy: 0.4188 -
loss: 15.9938
Epoch 4/2000
3/3 ─────────────────── 0s 77ms/step - categorical_accuracy: 0.2211 -
loss: 7.6406
Epoch 5/2000
3/3 ─────────────────── 0s 69ms/step - categorical_accuracy: 0.2975 -
loss: 7.6418
Epoch 6/2000
3/3 ─────────────────── 0s 67ms/step - categorical_accuracy: 0.1390 -
loss: 11.9807
Epoch 7/2000
3/3 ─────────────────── 0s 66ms/step - categorical_accuracy: 0.3053 -
loss: 9.5114
Epoch 8/2000
```

```
3/3 ───────────────── 0s 66ms/step - categorical_accuracy: 0.3288 -
loss: 8.6787
Epoch 9/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 0.2897 -
loss: 11.1952
Epoch 10/2000
3/3 ───────────────── 0s 88ms/step - categorical_accuracy: 0.4481 -
loss: 6.9360
Epoch 11/2000
3/3 ───────────────── 0s 80ms/step - categorical_accuracy: 0.3580 -
loss: 5.0981
Epoch 12/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.2662 -
loss: 21.4390
Epoch 13/2000
3/3 ───────────────── 0s 39ms/step - categorical_accuracy: 0.3894 -
loss: 24.8698
Epoch 14/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 0.3444 -
loss: 12.0868
Epoch 15/2000
3/3 ───────────────── 0s 76ms/step - categorical_accuracy: 0.3639 -
loss: 12.5868
Epoch 16/2000
3/3 ───────────────── 0s 61ms/step - categorical_accuracy: 0.3210 -
loss: 3.8011
Epoch 17/2000
3/3 ───────────────── 0s 65ms/step - categorical_accuracy: 0.2975 -
loss: 4.2381
Epoch 18/2000
3/3 ───────────────── 0s 67ms/step - categorical_accuracy: 0.3347 -
loss: 1.6699
Epoch 19/2000
3/3 ───────────────── 0s 69ms/step - categorical_accuracy: 0.4286 -
loss: 2.3005
Epoch 20/2000
3/3 ───────────────── 0s 81ms/step - categorical_accuracy: 0.4032 -
loss: 3.5984
Epoch 21/2000
3/3 ───────────────── 0s 81ms/step - categorical_accuracy: 0.3581 -
loss: 19.8496
Epoch 22/2000
3/3 ───────────────── 0s 51ms/step - categorical_accuracy: 0.5009 -
loss: 11.7537
Epoch 23/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 0.3854 -
loss: 46.2754
Epoch 24/2000
3/3 ───────────────── 0s 85ms/step - categorical_accuracy: 0.3503 -
```

```
loss: 16.4354
Epoch 25/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 0.4129 -
loss: 22.0100
Epoch 26/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 0.2935 -
loss: 13.4823
Epoch 27/2000
3/3 ──────────────── 0s 35ms/step - categorical_accuracy: 0.4071 -
loss: 12.3596
Epoch 28/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 0.2876 -
loss: 11.3543
Epoch 29/2000
3/3 ──────────────── 0s 50ms/step - categorical_accuracy: 0.3542 -
loss: 12.5198
Epoch 30/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.2994 -
loss: 10.6062
Epoch 31/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.3659 -
loss: 10.5937
Epoch 32/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.3718 -
loss: 15.0646
Epoch 33/2000
3/3 ──────────────── 0s 67ms/step - categorical_accuracy: 0.2036 -
loss: 36.0111
Epoch 34/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 0.3796 -
loss: 17.7161
Epoch 35/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 0.1918 -
loss: 25.1602
Epoch 36/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.2936 -
loss: 22.6905
Epoch 37/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 0.2602 -
loss: 12.2536
Epoch 38/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 0.4500 -
loss: 23.9624
Epoch 39/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 0.2838 -
loss: 2.4704
Epoch 40/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 0.3425 -
loss: 1.1418
```

```
Epoch 41/2000
3/3 ———————————— 0s 74ms/step - categorical_accuracy: 0.3425 -
loss: 1.1265
Epoch 42/2000
3/3 ———————————— 0s 36ms/step - categorical_accuracy: 0.3464 -
loss: 1.1010
Epoch 43/2000
3/3 ———————————— 0s 78ms/step - categorical_accuracy: 0.3464 -
loss: 1.1006
Epoch 44/2000
3/3 ———————————— 0s 73ms/step - categorical_accuracy: 0.3659 -
loss: 1.0987
Epoch 45/2000
3/3 ———————————— 0s 75ms/step - categorical_accuracy: 0.3503 -
loss: 1.0988
Epoch 46/2000
3/3 ———————————— 0s 69ms/step - categorical_accuracy: 0.3151 -
loss: 1.1005
Epoch 47/2000
3/3 ———————————— 0s 36ms/step - categorical_accuracy: 0.2994 -
loss: 1.0983
Epoch 48/2000
3/3 ———————————— 0s 72ms/step - categorical_accuracy: 0.3992 -
loss: 1.0973
Epoch 49/2000
3/3 ———————————— 0s 71ms/step - categorical_accuracy: 0.3855 -
loss: 1.0991
Epoch 50/2000
3/3 ———————————— 0s 83ms/step - categorical_accuracy: 0.3288 -
loss: 1.0976
Epoch 51/2000
3/3 ———————————— 0s 76ms/step - categorical_accuracy: 0.3425 -
loss: 1.0967
Epoch 52/2000
3/3 ———————————— 0s 76ms/step - categorical_accuracy: 0.4442 -
loss: 1.0979
Epoch 53/2000
3/3 ———————————— 0s 76ms/step - categorical_accuracy: 0.4325 -
loss: 1.0979
Epoch 54/2000
3/3 ———————————— 0s 73ms/step - categorical_accuracy: 0.3737 -
loss: 1.0964
Epoch 55/2000
3/3 ———————————— 0s 84ms/step - categorical_accuracy: 0.3503 -
loss: 1.0975
Epoch 56/2000
3/3 ———————————— 0s 77ms/step - categorical_accuracy: 0.3405 -
loss: 1.0963
Epoch 57/2000
```

```
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 0.3444 -
loss: 1.0963
Epoch 58/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.3796 -
loss: 1.0953
Epoch 59/2000
3/3 ──────────────── 0s 66ms/step - categorical_accuracy: 0.3835 -
loss: 1.0965
Epoch 60/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 0.3405 -
loss: 1.0975
Epoch 61/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 0.4324 -
loss: 1.0963
Epoch 62/2000

3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 0.3366 -
loss: 1.0959
Epoch 63/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.3249 -
loss: 1.0963
Epoch 64/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.3600 -
loss: 1.0964
Epoch 65/2000
3/3 ──────────────── 0s 51ms/step - categorical_accuracy: 0.3600 -
loss: 1.0933
Epoch 66/2000
3/3 ──────────────── 0s 59ms/step - categorical_accuracy: 0.3894 -
loss: 1.0934
Epoch 67/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 0.4442 -
loss: 1.0940
Epoch 68/2000
3/3 ──────────────── 0s 67ms/step - categorical_accuracy: 0.4813 -
loss: 1.0934
Epoch 69/2000
3/3 ──────────────── 0s 61ms/step - categorical_accuracy: 0.4500 -
loss: 1.0928
Epoch 70/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 0.4247 -
loss: 1.0943
Epoch 71/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.3777 -
loss: 1.0932
Epoch 72/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 0.4011 -
loss: 1.0945
Epoch 73/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.4540 -
```

```
loss: 1.0923
Epoch 74/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 0.4560 -
loss: 1.0881
Epoch 75/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.3856 -
loss: 1.0885
Epoch 76/2000
3/3 ───────────────── 0s 80ms/step - categorical_accuracy: 0.3562 -
loss: 1.0861
Epoch 77/2000
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 0.4716 -
loss: 1.0897
Epoch 78/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 0.3796 -
loss: 1.0906
Epoch 79/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 0.4148 -
loss: 1.0905
Epoch 80/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 0.3053 -
loss: 1.1043
Epoch 81/2000
3/3 ───────────────── 0s 80ms/step - categorical_accuracy: 0.3542 -
loss: 1.0910
Epoch 82/2000
3/3 ───────────────── 0s 77ms/step - categorical_accuracy: 0.3756 -
loss: 1.0787
Epoch 83/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 0.4051 -
loss: 1.0898
Epoch 84/2000
3/3 ───────────────── 0s 69ms/step - categorical_accuracy: 0.3679 -
loss: 1.0873
Epoch 85/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 0.3659 -
loss: 1.0846
Epoch 86/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 0.4267 -
loss: 1.0792
Epoch 87/2000
3/3 ───────────────── 0s 81ms/step - categorical_accuracy: 0.3914 -
loss: 1.0913
Epoch 88/2000
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 0.3659 -
loss: 1.0797
Epoch 89/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 0.3933 -
loss: 1.0794
```

```
Epoch 90/2000
3/3 ─────────────────── 0s 70ms/step - categorical_accuracy: 0.3386 -
loss: 1.0926
Epoch 91/2000
3/3 ─────────────────── 0s 70ms/step - categorical_accuracy: 0.4618 -
loss: 1.0844
Epoch 92/2000
3/3 ─────────────────── 0s 70ms/step - categorical_accuracy: 0.4579 -
loss: 1.0689
Epoch 93/2000
3/3 ─────────────────── 0s 81ms/step - categorical_accuracy: 0.4071 -
loss: 1.0755
Epoch 94/2000
3/3 ─────────────────── 0s 73ms/step - categorical_accuracy: 0.3992 -
loss: 1.0799
Epoch 95/2000
3/3 ─────────────────── 0s 61ms/step - categorical_accuracy: 0.4461 -
loss: 1.0543
Epoch 96/2000
3/3 ─────────────────── 0s 71ms/step - categorical_accuracy: 0.4286 -
loss: 1.0793
Epoch 97/2000
3/3 ─────────────────── 0s 72ms/step - categorical_accuracy: 0.3738 -
loss: 1.0835
Epoch 98/2000
3/3 ─────────────────── 0s 86ms/step - categorical_accuracy: 0.4306 -
loss: 1.0614
Epoch 99/2000
3/3 ─────────────────── 0s 80ms/step - categorical_accuracy: 0.4266 -
loss: 1.0600
Epoch 100/2000
3/3 ─────────────────── 0s 72ms/step - categorical_accuracy: 0.3796 -
loss: 1.0737
Epoch 101/2000
3/3 ─────────────────── 0s 73ms/step - categorical_accuracy: 0.5088 -
loss: 1.0480
Epoch 102/2000
3/3 ─────────────────── 0s 82ms/step - categorical_accuracy: 0.4305 -
loss: 1.0543
Epoch 103/2000
3/3 ─────────────────── 0s 77ms/step - categorical_accuracy: 0.3601 -
loss: 1.0748
Epoch 104/2000
3/3 ─────────────────── 0s 74ms/step - categorical_accuracy: 0.3288 -
loss: 1.1076
Epoch 105/2000
3/3 ─────────────────── 0s 73ms/step - categorical_accuracy: 0.3659 -
loss: 1.0510
Epoch 106/2000
```

```
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 0.3816 -
loss: 1.0674
Epoch 107/2000
3/3 ───────────────── 0s 82ms/step - categorical_accuracy: 0.3991 -
loss: 1.1131
Epoch 108/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 0.3464 -
loss: 1.1106
Epoch 109/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 0.3699 -
loss: 1.0921
Epoch 110/2000
3/3 ───────────────── 0s 38ms/step - categorical_accuracy: 0.3894 -
loss: 1.0708
Epoch 111/2000
3/3 ───────────────── 0s 76ms/step - categorical_accuracy: 0.4578 -
loss: 1.0825
Epoch 112/2000
3/3 ───────────────── 0s 76ms/step - categorical_accuracy: 0.3093 -
loss: 1.0965
Epoch 113/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 0.3875 -
loss: 1.0807
Epoch 114/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 0.4168 -
loss: 1.0774
Epoch 115/2000
3/3 ───────────────── 0s 81ms/step - categorical_accuracy: 0.4305 -
loss: 1.0624
Epoch 116/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 0.3581 -
loss: 1.0793
Epoch 117/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 0.4638 -
loss: 1.0573
Epoch 118/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.3737 -
loss: 1.0691
Epoch 119/2000
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 0.3601 -
loss: 1.0734
Epoch 120/2000
3/3 ───────────────── 0s 35ms/step - categorical_accuracy: 0.4286 -
loss: 1.0673
Epoch 121/2000
3/3 ───────────────── 0s 68ms/step - categorical_accuracy: 0.4560 -
loss: 1.0471
Epoch 122/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 0.4774 -
```

```
loss: 1.0428
Epoch 123/2000

3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 0.4658 -
loss: 1.0488
Epoch 124/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 0.4677 -
loss: 1.0344
Epoch 125/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.3875 -
loss: 1.0470
Epoch 126/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.4167 -
loss: 1.0717
Epoch 127/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.3816 -
loss: 1.0706
Epoch 128/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 0.3581 -
loss: 1.1163
Epoch 129/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.4403 -
loss: 1.0570
Epoch 130/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 0.3405 -
loss: 1.0556
Epoch 131/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.3914 -
loss: 1.0733
Epoch 132/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 0.4305 -
loss: 1.0473
Epoch 133/2000
3/3 ──────────────── 0s 92ms/step - categorical_accuracy: 0.4697 -
loss: 1.0460
Epoch 134/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.4227 -
loss: 1.0394
Epoch 135/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.4951 -
loss: 1.0384
Epoch 136/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 0.4756 -
loss: 1.0569
Epoch 137/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 0.5401 -
loss: 1.0296
Epoch 138/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.4520 -
loss: 1.0316
```

```
Epoch 139/2000
3/3 ─────────────────── 0s 73ms/step - categorical_accuracy: 0.4189 -
loss: 1.0404
Epoch 140/2000
3/3 ─────────────────── 0s 85ms/step - categorical_accuracy: 0.4227 -
loss: 1.0474
Epoch 141/2000
3/3 ─────────────────── 0s 75ms/step - categorical_accuracy: 0.3113 -
loss: 1.0530
Epoch 142/2000
3/3 ─────────────────── 0s 70ms/step - categorical_accuracy: 0.4775 -
loss: 1.0179
Epoch 143/2000
3/3 ─────────────────── 0s 72ms/step - categorical_accuracy: 0.4267 -
loss: 1.0220
Epoch 144/2000
3/3 ─────────────────── 0s 72ms/step - categorical_accuracy: 0.4520 -
loss: 1.0626
Epoch 145/2000
3/3 ─────────────────── 0s 82ms/step - categorical_accuracy: 0.3405 -
loss: 1.1932
Epoch 146/2000
3/3 ─────────────────── 0s 76ms/step - categorical_accuracy: 0.3366 -
loss: 1.1511
Epoch 147/2000
3/3 ─────────────────── 0s 73ms/step - categorical_accuracy: 0.3914 -
loss: 1.0731
Epoch 148/2000
3/3 ─────────────────── 0s 73ms/step - categorical_accuracy: 0.4598 -
loss: 1.0368
Epoch 149/2000
3/3 ─────────────────── 0s 84ms/step - categorical_accuracy: 0.3503 -
loss: 1.0961
Epoch 150/2000
3/3 ─────────────────── 0s 76ms/step - categorical_accuracy: 0.3914 -
loss: 1.0502
Epoch 151/2000
3/3 ─────────────────── 0s 72ms/step - categorical_accuracy: 0.3895 -
loss: 1.0600
Epoch 152/2000
3/3 ─────────────────── 0s 72ms/step - categorical_accuracy: 0.4325 -
loss: 1.0368
Epoch 153/2000
3/3 ─────────────────── 0s 73ms/step - categorical_accuracy: 0.4168 -
loss: 1.0167
Epoch 154/2000
3/3 ─────────────────── 0s 79ms/step - categorical_accuracy: 0.4345 -
loss: 1.0357
Epoch 155/2000
```

```
3/3 ——————————————————— 0s 74ms/step - categorical_accuracy: 0.4423 -
loss: 1.0288
Epoch 156/2000
3/3 ——————————————————— 0s 70ms/step - categorical_accuracy: 0.4638 -
loss: 1.0346
Epoch 157/2000
3/3 ——————————————————— 0s 72ms/step - categorical_accuracy: 0.4345 -
loss: 1.0388
Epoch 158/2000
3/3 ——————————————————— 0s 78ms/step - categorical_accuracy: 0.5420 -
loss: 0.9885
Epoch 159/2000
3/3 ——————————————————— 0s 74ms/step - categorical_accuracy: 0.5518 -
loss: 0.9575
Epoch 160/2000
3/3 ——————————————————— 0s 71ms/step - categorical_accuracy: 0.5362 -
loss: 0.9641
Epoch 161/2000
3/3 ——————————————————— 0s 38ms/step - categorical_accuracy: 0.4892 -
loss: 0.9631
Epoch 162/2000
3/3 ——————————————————— 0s 62ms/step - categorical_accuracy: 0.3268 -
loss: 1.1650
Epoch 163/2000
3/3 ——————————————————— 0s 51ms/step - categorical_accuracy: 0.3405 -
loss: 1.2000
Epoch 164/2000
3/3 ——————————————————— 0s 75ms/step - categorical_accuracy: 0.3483 -
loss: 1.1240
Epoch 165/2000
3/3 ——————————————————— 0s 38ms/step - categorical_accuracy: 0.4794 -
loss: 1.0590
Epoch 166/2000
3/3 ——————————————————— 0s 72ms/step - categorical_accuracy: 0.3816 -
loss: 1.0760
Epoch 167/2000
3/3 ——————————————————— 0s 75ms/step - categorical_accuracy: 0.4403 -
loss: 1.0723
Epoch 168/2000
3/3 ——————————————————— 0s 73ms/step - categorical_accuracy: 0.4755 -
loss: 1.0365
Epoch 169/2000
3/3 ——————————————————— 0s 71ms/step - categorical_accuracy: 0.4227 -
loss: 1.0440
Epoch 170/2000
3/3 ——————————————————— 0s 75ms/step - categorical_accuracy: 0.4598 -
loss: 1.0381
Epoch 171/2000
3/3 ——————————————————— 0s 70ms/step - categorical_accuracy: 0.4481 -
```

```
loss: 1.0168
Epoch 172/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 0.4324 -
loss: 1.0361
Epoch 173/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 0.4989 -
loss: 1.0235
Epoch 174/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 0.5147 -
loss: 0.9617
Epoch 175/2000
3/3 ──────────────── 0s 67ms/step - categorical_accuracy: 0.4931 -
loss: 1.0075
Epoch 176/2000
3/3 ──────────────── 0s 45ms/step - categorical_accuracy: 0.4051 -
loss: 1.0381
Epoch 177/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 0.4403 -
loss: 1.0086
Epoch 178/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.5225 -
loss: 0.9742
Epoch 179/2000
3/3 ──────────────── 0s 36ms/step - categorical_accuracy: 0.4775 -
loss: 1.0284
Epoch 180/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.4540 -
loss: 1.0195
Epoch 181/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.4618 -
loss: 1.0191
Epoch 182/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 0.5049 -
loss: 0.9751
Epoch 183/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 0.5049 -
loss: 0.9478
Epoch 184/2000

3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.5186 -
loss: 0.9375
Epoch 185/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.4033 -
loss: 0.9769
Epoch 186/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.3797 -
loss: 1.0037
Epoch 187/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.5499 -
loss: 0.9311
```

```
Epoch 188/2000
3/3 ──────────────────── 0s 85ms/step - categorical_accuracy: 0.4912 -
loss: 0.9576
Epoch 189/2000
3/3 ──────────────────── 0s 70ms/step - categorical_accuracy: 0.5577 -
loss: 0.8948
Epoch 190/2000
3/3 ──────────────────── 0s 72ms/step - categorical_accuracy: 0.3777 -
loss: 1.1768
Epoch 191/2000
3/3 ──────────────────── 0s 74ms/step - categorical_accuracy: 0.3308 -
loss: 1.1741
Epoch 192/2000
3/3 ──────────────────── 0s 80ms/step - categorical_accuracy: 0.4619 -
loss: 1.0464
Epoch 193/2000
3/3 ──────────────────── 0s 75ms/step - categorical_accuracy: 0.4149 -
loss: 1.0361
Epoch 194/2000
3/3 ──────────────────── 0s 74ms/step - categorical_accuracy: 0.4678 -
loss: 0.9382
Epoch 195/2000
3/3 ──────────────────── 0s 72ms/step - categorical_accuracy: 0.4266 -
loss: 0.9955
Epoch 196/2000
3/3 ──────────────────── 0s 83ms/step - categorical_accuracy: 0.4989 -
loss: 1.0110
Epoch 197/2000
3/3 ──────────────────── 0s 75ms/step - categorical_accuracy: 0.3053 -
loss: 1.1090
Epoch 198/2000
3/3 ──────────────────── 0s 75ms/step - categorical_accuracy: 0.5322 -
loss: 0.9924
Epoch 199/2000
3/3 ──────────────────── 0s 72ms/step - categorical_accuracy: 0.4110 -
loss: 1.0632
Epoch 200/2000
3/3 ──────────────────── 0s 84ms/step - categorical_accuracy: 0.4344 -
loss: 1.0097
Epoch 201/2000
3/3 ──────────────────── 0s 75ms/step - categorical_accuracy: 0.4853 -
loss: 0.9814
Epoch 202/2000
3/3 ──────────────────── 0s 72ms/step - categorical_accuracy: 0.5479 -
loss: 0.9565
Epoch 203/2000
3/3 ──────────────────── 0s 77ms/step - categorical_accuracy: 0.5382 -
loss: 0.9697
Epoch 204/2000
```

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3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 0.5459 -
loss: 0.9302
Epoch 205/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 85ms/step - categorical_accuracy: 0.5831 -
loss: 0.9139
Epoch 206/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 58ms/step - categorical_accuracy: 0.5088 -
loss: 0.9234
Epoch 207/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 75ms/step - categorical_accuracy: 0.5244 -
loss: 0.8991
Epoch 208/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 72ms/step - categorical_accuracy: 0.5128 -
loss: 0.8692
Epoch 209/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 0.5871 -
loss: 0.8437
Epoch 210/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 0.5733 -
loss: 0.8578
Epoch 211/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 0.5440 -
loss: 0.9286
Epoch 212/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 72ms/step - categorical_accuracy: 0.5049 -
loss: 0.8802
Epoch 213/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 83ms/step - categorical_accuracy: 0.4148 -
loss: 1.0151
Epoch 214/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 75ms/step - categorical_accuracy: 0.4305 -
loss: 1.2416
Epoch 215/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 72ms/step - categorical_accuracy: 0.3033 -
loss: 1.3090
Epoch 216/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 72ms/step - categorical_accuracy: 0.3384 -
loss: 1.2952
Epoch 217/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 0.2916 -
loss: 1.1816
Epoch 218/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 0.3112 -
loss: 1.1496
Epoch 219/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 0.3640 -
loss: 1.0709
Epoch 220/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 0.3014 -
```

```
loss: 1.0640
Epoch 221/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 69ms/step - categorical_accuracy: 0.4500 -
loss: 1.0566
Epoch 222/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 44ms/step - categorical_accuracy: 0.4403 -
loss: 1.0346
Epoch 223/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 0.4031 -
loss: 1.0154
Epoch 224/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 72ms/step - categorical_accuracy: 0.4071 -
loss: 1.0281
Epoch 225/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 0.5049 -
loss: 0.9856
Epoch 226/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 33ms/step - categorical_accuracy: 0.5030 -
loss: 0.9471
Epoch 227/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 72ms/step - categorical_accuracy: 0.5910 -
loss: 0.9115
Epoch 228/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 82ms/step - categorical_accuracy: 0.4697 -
loss: 0.9098
Epoch 229/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 0.5362 -
loss: 0.9589
Epoch 230/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 0.4619 -
loss: 0.9438
Epoch 231/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 82ms/step - categorical_accuracy: 0.5616 -
loss: 0.8595
Epoch 232/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 0.5363 -
loss: 0.8802
Epoch 233/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 0.4795 -
loss: 0.9543
Epoch 234/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 0.4951 -
loss: 0.8900
Epoch 235/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 91ms/step - categorical_accuracy: 0.6418 -
loss: 0.8011
Epoch 236/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 85ms/step - categorical_accuracy: 0.5127 -
loss: 0.9173
```

```
Epoch 237/2000
3/3 ─────────────────── 0s 74ms/step - categorical_accuracy: 0.4814 -
loss: 0.9712
Epoch 238/2000
3/3 ─────────────────── 0s 70ms/step - categorical_accuracy: 0.5244 -
loss: 0.8992
Epoch 239/2000
3/3 ─────────────────── 0s 73ms/step - categorical_accuracy: 0.4306 -
loss: 0.9805
Epoch 240/2000
3/3 ─────────────────── 0s 79ms/step - categorical_accuracy: 0.5753 -
loss: 0.8483
Epoch 241/2000
3/3 ─────────────────── 0s 73ms/step - categorical_accuracy: 0.6105 -
loss: 0.8332
Epoch 242/2000
3/3 ─────────────────── 0s 72ms/step - categorical_accuracy: 0.5441 -
loss: 0.8544
Epoch 243/2000
3/3 ─────────────────── 0s 37ms/step - categorical_accuracy: 0.6144 -
loss: 0.8082
Epoch 244/2000
3/3 ─────────────────── 0s 75ms/step - categorical_accuracy: 0.5363 -
loss: 0.8832
Epoch 245/2000

3/3 ─────────────────── 0s 38ms/step - categorical_accuracy: 0.5617 -
loss: 0.8127
Epoch 246/2000
3/3 ─────────────────── 0s 73ms/step - categorical_accuracy: 0.6144 -
loss: 0.8322
Epoch 247/2000
3/3 ─────────────────── 0s 80ms/step - categorical_accuracy: 0.5734 -
loss: 0.7874
Epoch 248/2000
3/3 ─────────────────── 0s 77ms/step - categorical_accuracy: 0.6145 -
loss: 0.7975
Epoch 249/2000
3/3 ─────────────────── 0s 72ms/step - categorical_accuracy: 0.6144 -
loss: 0.7745
Epoch 250/2000
3/3 ─────────────────── 0s 74ms/step - categorical_accuracy: 0.4560 -
loss: 0.9833
Epoch 251/2000
3/3 ─────────────────── 0s 86ms/step - categorical_accuracy: 0.4286 -
loss: 1.0244
Epoch 252/2000
3/3 ─────────────────── 0s 77ms/step - categorical_accuracy: 0.5225 -
loss: 0.9135
Epoch 253/2000
```

```
3/3 ──────────────────── 0s 74ms/step - categorical_accuracy: 0.5773 -
loss: 0.7866
Epoch 254/2000
3/3 ──────────────────── 0s 72ms/step - categorical_accuracy: 0.6223 -
loss: 0.7814
Epoch 255/2000
3/3 ──────────────────── 0s 74ms/step - categorical_accuracy: 0.5577 -
loss: 0.7459
Epoch 256/2000
3/3 ──────────────────── 0s 83ms/step - categorical_accuracy: 0.6398 -
loss: 0.7320
Epoch 257/2000
3/3 ──────────────────── 0s 72ms/step - categorical_accuracy: 0.6399 -
loss: 0.7462
Epoch 258/2000
3/3 ──────────────────── 0s 70ms/step - categorical_accuracy: 0.5441 -
loss: 0.7874
Epoch 259/2000
3/3 ──────────────────── 0s 70ms/step - categorical_accuracy: 0.5205 -
loss: 0.7449
Epoch 260/2000
3/3 ──────────────────── 0s 78ms/step - categorical_accuracy: 0.4912 -
loss: 0.9688
Epoch 261/2000
3/3 ──────────────────── 0s 76ms/step - categorical_accuracy: 0.5930 -
loss: 0.7957
Epoch 262/2000
3/3 ──────────────────── 0s 71ms/step - categorical_accuracy: 0.5402 -
loss: 0.8292
Epoch 263/2000
3/3 ──────────────────── 0s 72ms/step - categorical_accuracy: 0.5479 -
loss: 0.8348
Epoch 264/2000
3/3 ──────────────────── 0s 70ms/step - categorical_accuracy: 0.5910 -
loss: 0.7010
Epoch 265/2000
3/3 ──────────────────── 0s 80ms/step - categorical_accuracy: 0.5735 -
loss: 0.7626
Epoch 266/2000
3/3 ──────────────────── 0s 76ms/step - categorical_accuracy: 0.6399 -
loss: 0.6655
Epoch 267/2000
3/3 ──────────────────── 0s 73ms/step - categorical_accuracy: 0.5558 -
loss: 0.6605
Epoch 268/2000
3/3 ──────────────────── 0s 73ms/step - categorical_accuracy: 0.6653 -
loss: 0.6320
Epoch 269/2000
3/3 ──────────────────── 0s 82ms/step - categorical_accuracy: 0.6360 -
```

```
loss: 0.5438
Epoch 270/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.6966 -
loss: 0.6016
Epoch 271/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.6419 -
loss: 0.6324
Epoch 272/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 0.5734 -
loss: 0.5411
Epoch 273/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 0.6321 -
loss: 0.5131
Epoch 274/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 0.7025 -
loss: 0.4654
Epoch 275/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.7006 -
loss: 0.4952
Epoch 276/2000
3/3 ──────────────── 0s 31ms/step - categorical_accuracy: 0.6673 -
loss: 0.4839
Epoch 277/2000
3/3 ──────────────── 0s 27ms/step - categorical_accuracy: 0.5440 -
loss: 0.4844
Epoch 278/2000
3/3 ──────────────── 0s 30ms/step - categorical_accuracy: 0.6556 -
loss: 0.4791
Epoch 279/2000
3/3 ──────────────── 0s 32ms/step - categorical_accuracy: 0.6517 -
loss: 0.4857
Epoch 280/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 0.6908 -
loss: 0.4479
Epoch 281/2000
3/3 ──────────────── 0s 23ms/step - categorical_accuracy: 0.6967 -
loss: 0.4706
Epoch 282/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 0.6751 -
loss: 0.4541
Epoch 283/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 0.6321 -
loss: 0.4850
Epoch 284/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 0.6790 -
loss: 0.4870
Epoch 285/2000
3/3 ──────────────── 0s 34ms/step - categorical_accuracy: 0.6067 -
loss: 0.5074
```

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Epoch 286/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 0.6496 -
loss: 0.4597
Epoch 287/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 0.7103 -
loss: 0.4486
Epoch 288/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 0.6869 -
loss: 0.4924
Epoch 289/2000
3/3 ──────────────── 0s 24ms/step - categorical_accuracy: 0.7103 -
loss: 0.4512
Epoch 290/2000
3/3 ──────────────── 0s 24ms/step - categorical_accuracy: 0.6947 -
loss: 0.4849
Epoch 291/2000
3/3 ──────────────── 0s 28ms/step - categorical_accuracy: 0.6478 -
loss: 0.4866
Epoch 292/2000
3/3 ──────────────── 0s 28ms/step - categorical_accuracy: 0.6556 -
loss: 0.4590
Epoch 293/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 0.6790 -
loss: 0.4554
Epoch 294/2000
3/3 ──────────────── 0s 24ms/step - categorical_accuracy: 0.6908 -
loss: 0.4566
Epoch 295/2000
3/3 ──────────────── 0s 36ms/step - categorical_accuracy: 0.7025 -
loss: 0.4612
Epoch 296/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.6184 -
loss: 0.4684
Epoch 297/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.6869 -
loss: 0.4603
Epoch 298/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 0.6537 -
loss: 0.4871
Epoch 299/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.6477 -
loss: 0.4759
Epoch 300/2000
3/3 ──────────────── 0s 40ms/step - categorical_accuracy: 0.6653 -
loss: 0.4706
Epoch 301/2000
3/3 ──────────────── 0s 35ms/step - categorical_accuracy: 0.6067 -
loss: 0.5127
Epoch 302/2000
```

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3/3 ───────────────── 0s 40ms/step - categorical_accuracy: 0.7612 -
loss: 0.4776
Epoch 303/2000
3/3 ───────────────── 0s 40ms/step - categorical_accuracy: 0.6888 -
loss: 0.4665
Epoch 304/2000
3/3 ───────────────── 0s 40ms/step - categorical_accuracy: 0.6869 -
loss: 0.4642
Epoch 305/2000
3/3 ───────────────── 0s 84ms/step - categorical_accuracy: 0.7377 -
loss: 0.4337
Epoch 306/2000

3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 0.7084 -
loss: 0.4710
Epoch 307/2000
3/3 ───────────────── 0s 41ms/step - categorical_accuracy: 0.6751 -
loss: 0.4487
Epoch 308/2000
3/3 ───────────────── 0s 37ms/step - categorical_accuracy: 0.6810 -
loss: 0.4505
Epoch 309/2000
3/3 ───────────────── 0s 36ms/step - categorical_accuracy: 0.5969 -
loss: 0.4816
Epoch 310/2000
3/3 ───────────────── 0s 37ms/step - categorical_accuracy: 0.6692 -
loss: 0.4244
Epoch 311/2000
3/3 ───────────────── 0s 32ms/step - categorical_accuracy: 0.6360 -
loss: 0.4676
Epoch 312/2000
3/3 ───────────────── 0s 55ms/step - categorical_accuracy: 0.6419 -
loss: 0.4673
Epoch 313/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 0.6693 -
loss: 0.4731
Epoch 314/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.7026 -
loss: 0.4692
Epoch 315/2000
3/3 ───────────────── 0s 39ms/step - categorical_accuracy: 0.6595 -
loss: 0.4750
Epoch 316/2000
3/3 ───────────────── 0s 47ms/step - categorical_accuracy: 0.7455 -
loss: 0.4293
Epoch 317/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.6830 -
loss: 0.4946
Epoch 318/2000
3/3 ───────────────── 0s 39ms/step - categorical_accuracy: 0.6908 -
```

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loss: 0.4748
Epoch 319/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 0.6849 -
loss: 0.4800
Epoch 320/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.6810 -
loss: 0.4664
Epoch 321/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.6928 -
loss: 0.4742
Epoch 322/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 0.6830 -
loss: 0.5308
Epoch 323/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 0.7162 -
loss: 0.4875
Epoch 324/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.6595 -
loss: 0.4822
Epoch 325/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 0.7279 -
loss: 0.4840
Epoch 326/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.6302 -
loss: 0.5548
Epoch 327/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 0.6535 -
loss: 0.5547
Epoch 328/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.6125 -
loss: 0.6224
Epoch 329/2000
3/3 ──────────────── 0s 39ms/step - categorical_accuracy: 0.5715 -
loss: 0.7669
Epoch 330/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.5636 -
loss: 0.8094
Epoch 331/2000
3/3 ──────────────── 0s 55ms/step - categorical_accuracy: 0.6692 -
loss: 0.9401
Epoch 332/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.6654 -
loss: 0.7011
Epoch 333/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.5538 -
loss: 0.6809
Epoch 334/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.6653 -
loss: 0.5868
```

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Epoch 335/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 0.6615 -
loss: 0.6609
Epoch 336/2000
3/3 ──────────────── 0s 31ms/step - categorical_accuracy: 0.6399 -
loss: 0.6154
Epoch 337/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.6869 -
loss: 0.5537
Epoch 338/2000
3/3 ──────────────── 0s 31ms/step - categorical_accuracy: 0.6575 -
loss: 0.5457
Epoch 339/2000
3/3 ──────────────── 0s 31ms/step - categorical_accuracy: 0.7084 -
loss: 0.4829
Epoch 340/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 0.7025 -
loss: 0.4952
Epoch 341/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.6673 -
loss: 0.4885
Epoch 342/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 0.6790 -
loss: 0.5410
Epoch 343/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 0.6751 -
loss: 0.4799
Epoch 344/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 0.6986 -
loss: 0.4851
Epoch 345/2000
3/3 ──────────────── 0s 39ms/step - categorical_accuracy: 0.6693 -
loss: 0.4906
Epoch 346/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 0.6419 -
loss: 0.5079
Epoch 347/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.6106 -
loss: 0.5212
Epoch 348/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.7181 -
loss: 0.4617
Epoch 349/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.6595 -
loss: 0.4789
Epoch 350/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 0.6517 -
loss: 0.4792
Epoch 351/2000
```

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3/3 ───────────────── 0s 63ms/step - categorical_accuracy: 0.6165 -
loss: 0.4903
Epoch 352/2000
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 0.6615 -
loss: 0.4628
Epoch 353/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.5988 -
loss: 0.4500
Epoch 354/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.6927 -
loss: 0.4733
Epoch 355/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.7025 -
loss: 0.4482
Epoch 356/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 0.6869 -
loss: 0.4532
Epoch 357/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 0.7084 -
loss: 0.4531
Epoch 358/2000
3/3 ───────────────── 0s 78ms/step - categorical_accuracy: 0.6712 -
loss: 0.4665
Epoch 359/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.7064 -
loss: 0.4613
Epoch 360/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 0.6790 -
loss: 0.4704
Epoch 361/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.6595 -
loss: 0.4663
Epoch 362/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.6712 -
loss: 0.4572
Epoch 363/2000
3/3 ───────────────── 0s 77ms/step - categorical_accuracy: 0.6888 -
loss: 0.4811
Epoch 364/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 0.7064 -
loss: 0.4779
Epoch 365/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 0.6810 -
loss: 0.4879
Epoch 366/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.6849 -
loss: 0.4990
Epoch 367/2000
```

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3/3 ────────────────── 0s 78ms/step - categorical_accuracy: 0.6634 -
loss: 0.4971
Epoch 368/2000
3/3 ────────────────── 0s 79ms/step - categorical_accuracy: 0.6966 -
loss: 0.4649
Epoch 369/2000
3/3 ────────────────── 0s 71ms/step - categorical_accuracy: 0.6517 -
loss: 0.4962
Epoch 370/2000
3/3 ────────────────── 0s 79ms/step - categorical_accuracy: 0.6869 -
loss: 0.4537
Epoch 371/2000
3/3 ────────────────── 0s 86ms/step - categorical_accuracy: 0.6341 -
loss: 0.4699
Epoch 372/2000
3/3 ────────────────── 0s 81ms/step - categorical_accuracy: 0.6419 -
loss: 0.4607
Epoch 373/2000
3/3 ────────────────── 0s 71ms/step - categorical_accuracy: 0.6947 -
loss: 0.4500
Epoch 374/2000
3/3 ────────────────── 0s 71ms/step - categorical_accuracy: 0.6517 -
loss: 0.4628
Epoch 375/2000
3/3 ────────────────── 0s 71ms/step - categorical_accuracy: 0.6869 -
loss: 0.4620
Epoch 376/2000
3/3 ────────────────── 0s 55ms/step - categorical_accuracy: 0.6185 -
loss: 0.4962
Epoch 377/2000
3/3 ────────────────── 0s 71ms/step - categorical_accuracy: 0.6790 -
loss: 0.4857
Epoch 378/2000
3/3 ────────────────── 0s 71ms/step - categorical_accuracy: 0.7652 -
loss: 0.4417
Epoch 379/2000
3/3 ────────────────── 0s 70ms/step - categorical_accuracy: 0.6986 -
loss: 0.4639
Epoch 380/2000
3/3 ────────────────── 0s 46ms/step - categorical_accuracy: 0.6830 -
loss: 0.4709
Epoch 381/2000
3/3 ────────────────── 0s 73ms/step - categorical_accuracy: 0.6673 -
loss: 0.4826
Epoch 382/2000
3/3 ────────────────── 0s 71ms/step - categorical_accuracy: 0.6614 -
loss: 0.4706
Epoch 383/2000
3/3 ────────────────── 0s 71ms/step - categorical_accuracy: 0.6145 -
loss: 0.4817
```

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Epoch 384/2000
3/3 ———————————————— 0s 86ms/step - categorical_accuracy: 0.6869 -
loss: 0.4636
Epoch 385/2000
3/3 ———————————————— 0s 70ms/step - categorical_accuracy: 0.6380 -
loss: 0.4797
Epoch 386/2000
3/3 ———————————————— 0s 71ms/step - categorical_accuracy: 0.7124 -
loss: 0.4422
Epoch 387/2000
3/3 ———————————————— 0s 71ms/step - categorical_accuracy: 0.6634 -
loss: 0.4617
Epoch 388/2000
3/3 ———————————————— 0s 70ms/step - categorical_accuracy: 0.6439 -
loss: 0.4552
Epoch 389/2000
3/3 ———————————————— 0s 70ms/step - categorical_accuracy: 0.7006 -
loss: 0.4256
Epoch 390/2000
3/3 ———————————————— 0s 77ms/step - categorical_accuracy: 0.6439 -
loss: 0.4688
Epoch 391/2000
3/3 ———————————————— 0s 50ms/step - categorical_accuracy: 0.7494 -
loss: 0.4319
Epoch 392/2000
3/3 ———————————————— 0s 71ms/step - categorical_accuracy: 0.6419 -
loss: 0.4598
Epoch 393/2000
3/3 ———————————————— 0s 70ms/step - categorical_accuracy: 0.6673 -
loss: 0.4882
Epoch 394/2000
3/3 ———————————————— 0s 76ms/step - categorical_accuracy: 0.6810 -
loss: 0.4497
Epoch 395/2000
3/3 ———————————————— 0s 70ms/step - categorical_accuracy: 0.6908 -
loss: 0.4447
Epoch 396/2000
3/3 ———————————————— 0s 71ms/step - categorical_accuracy: 0.7163 -
loss: 0.4562
Epoch 397/2000
3/3 ———————————————— 0s 73ms/step - categorical_accuracy: 0.6634 -
loss: 0.4458
Epoch 398/2000
3/3 ———————————————— 0s 71ms/step - categorical_accuracy: 0.6947 -
loss: 0.4457
Epoch 399/2000
3/3 ———————————————— 0s 79ms/step - categorical_accuracy: 0.6790 -
loss: 0.4549
Epoch 400/2000
3/3 ———————————————— 0s 79ms/step - categorical_accuracy: 0.7553 -
```

```
loss: 0.4311
Epoch 401/2000
3/3 ──────────────── 0s 33ms/step - categorical_accuracy: 0.6419 -
loss: 0.4714
Epoch 402/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.6380 -
loss: 0.4652
Epoch 403/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.6986 -
loss: 0.4630
Epoch 404/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 0.6614 -
loss: 0.4451
Epoch 405/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.6947 -
loss: 0.4738
Epoch 406/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.6693 -
loss: 0.4722
Epoch 407/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.6986 -
loss: 0.4656
Epoch 408/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.7749 -
loss: 0.4565
Epoch 409/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.7065 -
loss: 0.4710
Epoch 410/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.7123 -
loss: 0.4851
Epoch 411/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.7006 -
loss: 0.4632
Epoch 412/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 0.6634 -
loss: 0.5191
Epoch 413/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 0.6967 -
loss: 0.4643
Epoch 414/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 0.6693 -
loss: 0.4867
Epoch 415/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 0.7143 -
loss: 0.4475
Epoch 416/2000
3/3 ──────────────── 0s 67ms/step - categorical_accuracy: 0.6614 -
loss: 0.4626
Epoch 417/2000
```

```
3/3 ──────────────────── 0s 86ms/step - categorical_accuracy: 0.6263 -
loss: 0.4772
Epoch 418/2000
3/3 ──────────────────── 0s 87ms/step - categorical_accuracy: 0.6751 -
loss: 0.4620
Epoch 419/2000
3/3 ──────────────────── 0s 78ms/step - categorical_accuracy: 0.6653 -
loss: 0.4671
Epoch 420/2000
3/3 ──────────────────── 0s 71ms/step - categorical_accuracy: 0.6262 -
loss: 0.4766
Epoch 421/2000
3/3 ──────────────────── 0s 78ms/step - categorical_accuracy: 0.7338 -
loss: 0.4341
Epoch 422/2000
3/3 ──────────────────── 0s 76ms/step - categorical_accuracy: 0.7064 -
loss: 0.4530
Epoch 423/2000
3/3 ──────────────────── 0s 78ms/step - categorical_accuracy: 0.7182 -
loss: 0.4549
Epoch 424/2000
3/3 ──────────────────── 0s 71ms/step - categorical_accuracy: 0.6889 -
loss: 0.4679
Epoch 425/2000
3/3 ──────────────────── 0s 55ms/step - categorical_accuracy: 0.6693 -
loss: 0.4580
Epoch 426/2000
3/3 ──────────────────── 0s 79ms/step - categorical_accuracy: 0.6204 -
loss: 0.4705
Epoch 427/2000
3/3 ──────────────────── 0s 76ms/step - categorical_accuracy: 0.6869 -
loss: 0.4705
Epoch 428/2000

3/3 ──────────────────── 0s 70ms/step - categorical_accuracy: 0.6693 -
loss: 0.4704
Epoch 429/2000
3/3 ──────────────────── 0s 77ms/step - categorical_accuracy: 0.7085 -
loss: 0.4590
Epoch 430/2000
3/3 ──────────────────── 0s 71ms/step - categorical_accuracy: 0.6771 -
loss: 0.4755
Epoch 431/2000
3/3 ──────────────────── 0s 71ms/step - categorical_accuracy: 0.7064 -
loss: 0.4415
Epoch 432/2000
3/3 ──────────────────── 0s 51ms/step - categorical_accuracy: 0.6733 -
loss: 0.4719
Epoch 433/2000
3/3 ──────────────────── 0s 72ms/step - categorical_accuracy: 0.7182 -
```

```
loss: 0.4613
Epoch 434/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.7123 -
loss: 0.4493
Epoch 435/2000
3/3 ──────────────── 0s 66ms/step - categorical_accuracy: 0.7103 -
loss: 0.4329
Epoch 436/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 0.7064 -
loss: 0.4317
Epoch 437/2000
3/3 ──────────────── 0s 47ms/step - categorical_accuracy: 0.7377 -
loss: 0.4301
Epoch 438/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.7261 -
loss: 0.4647
Epoch 439/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 0.6830 -
loss: 0.4797
Epoch 440/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 0.6263 -
loss: 0.4748
Epoch 441/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 0.6830 -
loss: 0.4759
Epoch 442/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 0.7103 -
loss: 0.4620
Epoch 443/2000
3/3 ──────────────── 0s 39ms/step - categorical_accuracy: 0.6634 -
loss: 0.4623
Epoch 444/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.6849 -
loss: 0.4568
Epoch 445/2000
3/3 ──────────────── 0s 63ms/step - categorical_accuracy: 0.6889 -
loss: 0.4705
Epoch 446/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 0.7437 -
loss: 0.4507
Epoch 447/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.7006 -
loss: 0.4581
Epoch 448/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.7182 -
loss: 0.4743
Epoch 449/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.7006 -
loss: 0.4464
```

```
Epoch 450/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 0.7006 -
loss: 0.4820
Epoch 451/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 86ms/step - categorical_accuracy: 0.7279 -
loss: 0.4428
Epoch 452/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 0.7241 -
loss: 0.4599
Epoch 453/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 0.6830 -
loss: 0.4619
Epoch 454/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 0.7260 -
loss: 0.4929
Epoch 455/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 67ms/step - categorical_accuracy: 0.6458 -
loss: 0.4620
Epoch 456/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 0.6380 -
loss: 0.4907
Epoch 457/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 0.8140 -
loss: 0.4119
Epoch 458/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 0.7593 -
loss: 0.4575
Epoch 459/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 0.8082 -
loss: 0.4315
Epoch 460/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 0.6889 -
loss: 0.4514
Epoch 461/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 62ms/step - categorical_accuracy: 0.7534 -
loss: 0.4170
Epoch 462/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 0.7495 -
loss: 0.4272
Epoch 463/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 0.7906 -
loss: 0.4296
Epoch 464/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 0.7300 -
loss: 0.4415
Epoch 465/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 0.8199 -
loss: 0.3944
Epoch 466/2000
```

```
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 0.7691 -
loss: 0.3983
Epoch 467/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.7613 -
loss: 0.4126
Epoch 468/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.7280 -
loss: 0.4608
Epoch 469/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 0.6928 -
loss: 0.4969
Epoch 470/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.8219 -
loss: 0.4249
Epoch 471/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.8043 -
loss: 0.3876
Epoch 472/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.8845 -
loss: 0.3180
Epoch 473/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.8552 -
loss: 0.2877
Epoch 474/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 0.9138 -
loss: 0.2632
Epoch 475/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.9432 -
loss: 0.2407
Epoch 476/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.9002 -
loss: 0.2069
Epoch 477/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.9843 -
loss: 0.1261
Epoch 478/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.7983 -
loss: 0.5445
Epoch 479/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 0.8766 -
loss: 0.3943
Epoch 480/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.7964 -
loss: 0.5461
Epoch 481/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.8180 -
loss: 0.4895
Epoch 482/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.7613 -
```

```
loss: 0.3552
Epoch 483/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 0.7300 -
loss: 0.4965
Epoch 484/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.7750 -
loss: 0.4367
Epoch 485/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.9198 -
loss: 0.2965
Epoch 486/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 0.8415 -
loss: 0.3050
Epoch 487/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.8552 -
loss: 0.4699
Epoch 488/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.8513 -
loss: 0.2611
Epoch 489/2000

3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.8885 -
loss: 0.2889
Epoch 490/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.9060 -
loss: 0.1841
Epoch 491/2000
3/3 ──────────────── 0s 39ms/step - categorical_accuracy: 0.9159 -
loss: 0.2616
Epoch 492/2000
3/3 ──────────────── 0s 68ms/step - categorical_accuracy: 0.9608 -
loss: 0.1144
Epoch 493/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.9941 -
loss: 0.0795
Epoch 494/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.9902 -
loss: 0.0639
Epoch 495/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 0.9902 -
loss: 0.0758
Epoch 496/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.9902 -
loss: 0.0582
Epoch 497/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 0.0369
Epoch 498/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.9941 -
loss: 0.0415
```

```
Epoch 499/2000
3/3 ─────────────────── 0s 70ms/step - categorical_accuracy: 0.9824 -
loss: 0.0499
Epoch 500/2000
3/3 ─────────────────── 0s 72ms/step - categorical_accuracy: 0.9941 -
loss: 0.0305
Epoch 501/2000
3/3 ─────────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 0.0372
Epoch 502/2000
3/3 ─────────────────── 0s 87ms/step - categorical_accuracy: 0.9843 -
loss: 0.0407
Epoch 503/2000
3/3 ─────────────────── 0s 78ms/step - categorical_accuracy: 0.9902 -
loss: 0.0438
Epoch 504/2000
3/3 ─────────────────── 0s 71ms/step - categorical_accuracy: 0.9804 -
loss: 0.0829
Epoch 505/2000
3/3 ─────────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 0.0395
Epoch 506/2000
3/3 ─────────────────── 0s 79ms/step - categorical_accuracy: 0.9902 -
loss: 0.0539
Epoch 507/2000
3/3 ─────────────────── 0s 71ms/step - categorical_accuracy: 0.9941 -
loss: 0.0152
Epoch 508/2000
3/3 ─────────────────── 0s 71ms/step - categorical_accuracy: 0.9667 -
loss: 0.0686
Epoch 509/2000
3/3 ─────────────────── 0s 71ms/step - categorical_accuracy: 0.9648 -
loss: 0.0960
Epoch 510/2000
3/3 ─────────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 0.0164
Epoch 511/2000
3/3 ─────────────────── 0s 78ms/step - categorical_accuracy: 0.9941 -
loss: 0.0290
Epoch 512/2000
3/3 ─────────────────── 0s 71ms/step - categorical_accuracy: 0.9706 -
loss: 0.0379
Epoch 513/2000
3/3 ─────────────────── 0s 71ms/step - categorical_accuracy: 0.9941 -
loss: 0.0425
Epoch 514/2000
3/3 ─────────────────── 0s 72ms/step - categorical_accuracy: 0.9843 -
loss: 0.0300
Epoch 515/2000
```

```
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.9902 -
loss: 0.0250
Epoch 516/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.9902 -
loss: 0.0336
Epoch 517/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 0.9648 -
loss: 0.0615
Epoch 518/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 0.9354 -
loss: 0.1332
Epoch 519/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 0.9667 -
loss: 0.0915
Epoch 520/2000
3/3 ───────────────── 0s 78ms/step - categorical_accuracy: 0.9765 -
loss: 0.0311
Epoch 521/2000
3/3 ───────────────── 0s 78ms/step - categorical_accuracy: 0.9882 -
loss: 0.0581
Epoch 522/2000
3/3 ───────────────── 0s 69ms/step - categorical_accuracy: 0.9902 -
loss: 0.0341
Epoch 523/2000
3/3 ───────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 0.0132
Epoch 524/2000
3/3 ───────────────── 0s 86ms/step - categorical_accuracy: 0.9941 -
loss: 0.0123
Epoch 525/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 0.0104
Epoch 526/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 0.0111
Epoch 527/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 0.9902 -
loss: 0.0288
Epoch 528/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 0.9648 -
loss: 0.0631
Epoch 529/2000
3/3 ───────────────── 0s 83ms/step - categorical_accuracy: 0.9648 -
loss: 0.1235
Epoch 530/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 0.9843 -
loss: 0.0412
Epoch 531/2000
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 0.9824 -
```

```
loss: 0.0510
Epoch 532/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 0.0064
Epoch 533/2000
3/3 ──────────────── 0s 54ms/step - categorical_accuracy: 0.9902 -
loss: 0.0297
Epoch 534/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 0.9902 -
loss: 0.0741
Epoch 535/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.9608 -
loss: 0.0829
Epoch 536/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.9276 -
loss: 0.3038
Epoch 537/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.7125 -
loss: 0.8138
Epoch 538/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 0.6576 -
loss: 0.9306
Epoch 539/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 0.9648 -
loss: 0.0764
Epoch 540/2000
3/3 ──────────────── 0s 68ms/step - categorical_accuracy: 0.9472 -
loss: 0.2756
Epoch 541/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.9745 -
loss: 0.0972
Epoch 542/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 0.9941 -
loss: 0.0705
Epoch 543/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.9667 -
loss: 0.0809
Epoch 544/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.9824 -
loss: 0.0588
Epoch 545/2000
3/3 ──────────────── 0s 55ms/step - categorical_accuracy: 0.9824 -
loss: 0.1080
Epoch 546/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.9902 -
loss: 0.0556
Epoch 547/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.9824 -
loss: 0.0650
```

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Epoch 548/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 0.0432
Epoch 549/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 0.0370
Epoch 550/2000

3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 0.9902 -
loss: 0.0311
Epoch 551/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 0.9941 -
loss: 0.0253
Epoch 552/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 0.0239
Epoch 553/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 0.0295
Epoch 554/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.9941 -
loss: 0.0224
Epoch 555/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 0.9902 -
loss: 0.0197
Epoch 556/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 0.0289
Epoch 557/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 0.0194
Epoch 558/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 0.9902 -
loss: 0.0231
Epoch 559/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 0.0114
Epoch 560/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 0.0196
Epoch 561/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 0.9941 -
loss: 0.0126
Epoch 562/2000
3/3 ──────────────── 0s 55ms/step - categorical_accuracy: 1.0000 -
loss: 0.0180
Epoch 563/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 0.0200
Epoch 564/2000
```

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3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 0.9902 -
loss: 0.0239
Epoch 565/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 0.9902 -
loss: 0.0204
Epoch 566/2000
3/3 ───────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 0.0151
Epoch 567/2000
3/3 ───────────────── 0s 86ms/step - categorical_accuracy: 0.9941 -
loss: 0.0189
Epoch 568/2000
3/3 ───────────────── 0s 47ms/step - categorical_accuracy: 0.9824 -
loss: 0.0181
Epoch 569/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 0.0059
Epoch 570/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 0.0066
Epoch 571/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 0.0075
Epoch 572/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 0.0073
Epoch 573/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 0.0048
Epoch 574/2000
3/3 ───────────────── 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 0.0034
Epoch 575/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 0.0024
Epoch 576/2000
3/3 ───────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 0.0045
Epoch 577/2000
3/3 ───────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 0.0028
Epoch 578/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 0.0122
Epoch 579/2000
3/3 ───────────────── 0s 63ms/step - categorical_accuracy: 1.0000 -
loss: 0.0107
Epoch 580/2000
3/3 ───────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
```

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loss: 0.0058
Epoch 581/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 0.0131
Epoch 582/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 0.0043
Epoch 583/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 0.0046
Epoch 584/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 0.0040
Epoch 585/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 0.0033
Epoch 586/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 0.0025
Epoch 587/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 0.0024
Epoch 588/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 0.0019
Epoch 589/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 0.0021
Epoch 590/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 0.0016
Epoch 591/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 0.0017
Epoch 592/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 0.0014
Epoch 593/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 9.5291e-04
Epoch 594/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 0.0011
Epoch 595/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 0.0015
Epoch 596/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 9.7986e-04
```

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Epoch 597/2000
3/3 ———————————————— 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 8.4862e-04
Epoch 598/2000
3/3 ———————————————— 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 0.0012
Epoch 599/2000
3/3 ———————————————— 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 8.7774e-04
Epoch 600/2000
3/3 ———————————————— 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 7.3415e-04
Epoch 601/2000
3/3 ———————————————— 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 5.4941e-04
Epoch 602/2000
3/3 ———————————————— 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 4.8524e-04
Epoch 603/2000
3/3 ———————————————— 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 6.8215e-04
Epoch 604/2000
3/3 ———————————————— 0s 63ms/step - categorical_accuracy: 1.0000 -
loss: 4.8801e-04
Epoch 605/2000
3/3 ———————————————— 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 5.9220e-04
Epoch 606/2000
3/3 ———————————————— 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 3.7767e-04
Epoch 607/2000
3/3 ———————————————— 0s 61ms/step - categorical_accuracy: 1.0000 -
loss: 3.4297e-04
Epoch 608/2000
3/3 ———————————————— 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 5.2452e-04
Epoch 609/2000
3/3 ———————————————— 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 4.6680e-04
Epoch 610/2000
3/3 ———————————————— 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 3.0865e-04
Epoch 611/2000

3/3 ———————————————— 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 2.1272e-04
Epoch 612/2000
3/3 ———————————————— 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 2.9306e-04
Epoch 613/2000
```

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3/3 ━━━━━━━━━━━━━━━━ 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 2.4633e-04
Epoch 614/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.5130e-04
Epoch 615/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 92ms/step - categorical_accuracy: 1.0000 -
loss: 2.6440e-04
Epoch 616/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.2054e-04
Epoch 617/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.5387e-04
Epoch 618/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 2.8399e-04
Epoch 619/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 2.5243e-04
Epoch 620/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 2.0899e-04
Epoch 621/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 1.7972e-04
Epoch 622/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 2.5788e-04
Epoch 623/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 1.5218e-04
Epoch 624/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 60ms/step - categorical_accuracy: 1.0000 -
loss: 2.0863e-04
Epoch 625/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.0015e-04
Epoch 626/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.0901e-04
Epoch 627/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.7664e-04
Epoch 628/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 95ms/step - categorical_accuracy: 1.0000 -
loss: 1.5845e-04
Epoch 629/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
```

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loss: 1.7304e-04
Epoch 630/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.3332e-04
Epoch 631/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.5693e-04
Epoch 632/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.0510e-04
Epoch 633/2000
3/3 ──────────────── 0s 93ms/step - categorical_accuracy: 1.0000 -
loss: 1.0453e-04
Epoch 634/2000
3/3 ──────────────── 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 1.5956e-04
Epoch 635/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 8.5550e-05
Epoch 636/2000
3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 1.0104e-04
Epoch 637/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 6.1303e-05
Epoch 638/2000
3/3 ──────────────── 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 7.0214e-05
Epoch 639/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.1972e-04
Epoch 640/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 5.9460e-05
Epoch 641/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 9.2514e-05
Epoch 642/2000
3/3 ──────────────── 0s 90ms/step - categorical_accuracy: 1.0000 -
loss: 5.8966e-05
Epoch 643/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 8.7707e-05
Epoch 644/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 5.0438e-05
Epoch 645/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 5.5207e-05
```

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Epoch 646/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 8.3334e-05
Epoch 647/2000
3/3 ──────────────── 0s 91ms/step - categorical_accuracy: 1.0000 -
loss: 7.8926e-05
Epoch 648/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 4.8564e-05
Epoch 649/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 4.9198e-05
Epoch 650/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 4.9470e-05
Epoch 651/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 6.7898e-05
Epoch 652/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 5.9705e-05
Epoch 653/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 6.1679e-05
Epoch 654/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 3.5363e-05
Epoch 655/2000
3/3 ──────────────── 0s 54ms/step - categorical_accuracy: 1.0000 -
loss: 2.9967e-05
Epoch 656/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 3.1796e-05
Epoch 657/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.5394e-05
Epoch 658/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 5.0871e-05
Epoch 659/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 5.0331e-05
Epoch 660/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 5.0904e-05
Epoch 661/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 3.9957e-05
Epoch 662/2000
```

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3/3 ──────────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.6127e-05
Epoch 663/2000
3/3 ──────────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 4.6154e-05
Epoch 664/2000
3/3 ──────────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 4.2807e-05
Epoch 665/2000
3/3 ──────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 4.2876e-05
Epoch 666/2000
3/3 ──────────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.5132e-05
Epoch 667/2000
3/3 ──────────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.5191e-05
Epoch 668/2000
3/3 ──────────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 3.3192e-05
Epoch 669/2000
3/3 ──────────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 1.8194e-05
Epoch 670/2000

3/3 ──────────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 3.1792e-05
Epoch 671/2000
3/3 ──────────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.2064e-05
Epoch 672/2000
3/3 ──────────────────── 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 3.3942e-05
Epoch 673/2000
3/3 ──────────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 1.7342e-05
Epoch 674/2000
3/3 ──────────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.0798e-05
Epoch 675/2000
3/3 ──────────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.1175e-05
Epoch 676/2000
3/3 ──────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.9995e-05
Epoch 677/2000
3/3 ──────────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 2.9340e-05
Epoch 678/2000
3/3 ──────────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
```

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loss: 2.6954e-05
Epoch 679/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.9961e-05
Epoch 680/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.3955e-05
Epoch 681/2000
3/3 ──────────────── 0s 89ms/step - categorical_accuracy: 1.0000 -
loss: 1.7207e-05
Epoch 682/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 2.4150e-05
Epoch 683/2000
3/3 ──────────────── 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 1.6800e-05
Epoch 684/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.6771e-05
Epoch 685/2000
3/3 ──────────────── 0s 96ms/step - categorical_accuracy: 1.0000 -
loss: 1.7400e-05
Epoch 686/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 1.0701e-05
Epoch 687/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.3449e-05
Epoch 688/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 1.3945e-05
Epoch 689/2000
3/3 ──────────────── 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 2.0400e-05
Epoch 690/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 1.3873e-05
Epoch 691/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.1731e-05
Epoch 692/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.4079e-05
Epoch 693/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 1.5880e-05
Epoch 694/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 1.9283e-05
```

```
Epoch 695/2000
3/3 ──────────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 1.4000e-05
Epoch 696/2000
3/3 ──────────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.8302e-05
Epoch 697/2000
3/3 ──────────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.9852e-05
Epoch 698/2000
3/3 ──────────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 9.4416e-06
Epoch 699/2000
3/3 ──────────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 1.0688e-05
Epoch 700/2000
3/3 ──────────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 9.4776e-06
Epoch 701/2000
3/3 ──────────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.3181e-05
Epoch 702/2000
3/3 ──────────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 9.6782e-06
Epoch 703/2000
3/3 ──────────────────── 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 1.0446e-05
Epoch 704/2000
3/3 ──────────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 8.4516e-06
Epoch 705/2000
3/3 ──────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 8.5313e-06
Epoch 706/2000
3/3 ──────────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.7088e-05
Epoch 707/2000
3/3 ──────────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 8.8778e-06
Epoch 708/2000
3/3 ──────────────────── 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 8.7284e-06
Epoch 709/2000
3/3 ──────────────────── 0s 90ms/step - categorical_accuracy: 1.0000 -
loss: 1.5822e-05
Epoch 710/2000
3/3 ──────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.4778e-05
Epoch 711/2000
```

```
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 9.7914e-06
Epoch 712/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 8.1525e-06
Epoch 713/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 89ms/step - categorical_accuracy: 1.0000 -
loss: 1.5899e-05
Epoch 714/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 8.7797e-06
Epoch 715/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.0239e-05
Epoch 716/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.0530e-05
Epoch 717/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 7.3274e-06
Epoch 718/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 1.3558e-05
Epoch 719/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 8.6986e-06
Epoch 720/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 9.9855e-06
Epoch 721/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 8.9559e-06
Epoch 722/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 99ms/step - categorical_accuracy: 1.0000 -
loss: 8.6877e-06
Epoch 723/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 8.3872e-06
Epoch 724/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.3826e-05
Epoch 725/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 8.1621e-06
Epoch 726/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 9.1606e-06
Epoch 727/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 82ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 1.2794e-05
Epoch 728/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 51ms/step - categorical_accuracy: 1.0000 -
loss: 9.1176e-06
Epoch 729/2000

3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 1.1728e-05
Epoch 730/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 7.6202e-06
Epoch 731/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 6.8443e-06
Epoch 732/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.2130e-05
Epoch 733/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 9.1558e-06
Epoch 734/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 7.6739e-06
Epoch 735/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 7.5669e-06
Epoch 736/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 7.9280e-06
Epoch 737/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 8.8964e-06
Epoch 738/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 8.1596e-06
Epoch 739/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 100ms/step - categorical_accuracy: 1.0000
- loss: 7.9899e-06
Epoch 740/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 7.6238e-06
Epoch 741/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 5.8855e-06
Epoch 742/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 65ms/step - categorical_accuracy: 1.0000 -
loss: 6.8353e-06
Epoch 743/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 65ms/step - categorical_accuracy: 1.0000 -
loss: 5.4551e-06
```

```
Epoch 744/2000
3/3 ———————————————— 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 1.1205e-05
Epoch 745/2000
3/3 ———————————————— 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 6.1977e-06
Epoch 746/2000
3/3 ———————————————— 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 7.2565e-06
Epoch 747/2000
3/3 ———————————————— 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 7.5584e-06
Epoch 748/2000
3/3 ———————————————— 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 7.5999e-06
Epoch 749/2000
3/3 ———————————————— 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 7.2922e-06
Epoch 750/2000
3/3 ———————————————— 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 7.1773e-06
Epoch 751/2000
3/3 ———————————————— 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 9.4268e-06
Epoch 752/2000
3/3 ———————————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.0464e-05
Epoch 753/2000
3/3 ———————————————— 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 7.1508e-06
Epoch 754/2000
3/3 ———————————————— 0s 90ms/step - categorical_accuracy: 1.0000 -
loss: 9.6665e-06
Epoch 755/2000
3/3 ———————————————— 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 6.3839e-06
Epoch 756/2000
3/3 ———————————————— 0s 66ms/step - categorical_accuracy: 1.0000 -
loss: 6.5966e-06
Epoch 757/2000
3/3 ———————————————— 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 9.2595e-06
Epoch 758/2000
3/3 ———————————————— 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 6.4003e-06
Epoch 759/2000
3/3 ———————————————— 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 9.6260e-06
Epoch 760/2000
```

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3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 5.1700e-06
Epoch 761/2000
3/3 ──────────────── 0s 65ms/step - categorical_accuracy: 1.0000 -
loss: 4.4666e-06
Epoch 762/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 9.2211e-06
Epoch 763/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 6.0661e-06
Epoch 764/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 9.2237e-06
Epoch 765/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 5.4827e-06
Epoch 766/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 9.0879e-06
Epoch 767/2000
3/3 ──────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 6.3720e-06
Epoch 768/2000
3/3 ──────────────── 0s 42ms/step - categorical_accuracy: 1.0000 -
loss: 8.4902e-06
Epoch 769/2000
3/3 ──────────────── 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 5.4410e-06
Epoch 770/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 5.7667e-06
Epoch 771/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 5.6663e-06
Epoch 772/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 4.7707e-06
Epoch 773/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 6.1655e-06
Epoch 774/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 5.6918e-06
Epoch 775/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 8.1395e-06
Epoch 776/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 8.1363e-06
Epoch 777/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 4.1013e-06
Epoch 778/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 67ms/step - categorical_accuracy: 1.0000 -
loss: 4.1121e-06
Epoch 779/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 8.0515e-06
Epoch 780/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 4.8687e-06
Epoch 781/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 5.6311e-06
Epoch 782/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 7.4149e-06
Epoch 783/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 7.9707e-06
Epoch 784/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 7.0106e-06
Epoch 785/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 4.0685e-06
Epoch 786/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 7.3538e-06
Epoch 787/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 6.7240e-06
Epoch 788/2000

3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 4.5080e-06
Epoch 789/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 4.2994e-06
Epoch 790/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 4.8651e-06
Epoch 791/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.6607e-06
Epoch 792/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 66ms/step - categorical_accuracy: 1.0000 -
loss: 3.5132e-06
```

```
Epoch 793/2000
3/3 ———————————————— 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 5.1552e-06
Epoch 794/2000
3/3 ———————————————— 0s 90ms/step - categorical_accuracy: 1.0000 -
loss: 5.0496e-06
Epoch 795/2000
3/3 ———————————————— 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 4.1322e-06
Epoch 796/2000
3/3 ———————————————— 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 4.5512e-06
Epoch 797/2000
3/3 ———————————————— 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 6.9265e-06
Epoch 798/2000
3/3 ———————————————— 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 5.1504e-06
Epoch 799/2000
3/3 ———————————————— 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 3.3119e-06
Epoch 800/2000
3/3 ———————————————— 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 3.8791e-06
Epoch 801/2000
3/3 ———————————————— 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 6.3391e-06
Epoch 802/2000
3/3 ———————————————— 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 3.2976e-06
Epoch 803/2000
3/3 ———————————————— 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 6.2909e-06
Epoch 804/2000
3/3 ———————————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 4.9881e-06
Epoch 805/2000
3/3 ———————————————— 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 4.8039e-06
Epoch 806/2000
3/3 ———————————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 4.9100e-06
Epoch 807/2000
3/3 ———————————————— 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 3.9103e-06
Epoch 808/2000
3/3 ———————————————— 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 6.8379e-06
Epoch 809/2000
```

```
3/3 ——————————————— 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 4.4793e-06
Epoch 810/2000
3/3 ——————————————— 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 3.5401e-06
Epoch 811/2000
3/3 ——————————————— 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 4.3762e-06
Epoch 812/2000
3/3 ——————————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 6.2312e-06
Epoch 813/2000
3/3 ——————————————— 0s 63ms/step - categorical_accuracy: 1.0000 -
loss: 4.0150e-06
Epoch 814/2000
3/3 ——————————————— 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 6.3263e-06
Epoch 815/2000
3/3 ——————————————— 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 5.9692e-06
Epoch 816/2000
3/3 ——————————————— 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 3.4492e-06
Epoch 817/2000
3/3 ——————————————— 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 2.9338e-06
Epoch 818/2000
3/3 ——————————————— 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 5.9413e-06
Epoch 819/2000
3/3 ——————————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 5.2670e-06
Epoch 820/2000
3/3 ——————————————— 0s 67ms/step - categorical_accuracy: 1.0000 -
loss: 5.6571e-06
Epoch 821/2000
3/3 ——————————————— 0s 56ms/step - categorical_accuracy: 1.0000 -
loss: 5.8078e-06
Epoch 822/2000
3/3 ——————————————— 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 6.0080e-06
Epoch 823/2000
3/3 ——————————————— 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 3.3374e-06
Epoch 824/2000
3/3 ——————————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.9139e-06
Epoch 825/2000
3/3 ——————————————— 0s 74ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 5.5321e-06
Epoch 826/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 3.9371e-06
Epoch 827/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 5.4787e-06
Epoch 828/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 3.2950e-06
Epoch 829/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 2.7118e-06
Epoch 830/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 3.8714e-06
Epoch 831/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 5.5628e-06
Epoch 832/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 5.0861e-06
Epoch 833/2000
3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 5.1603e-06
Epoch 834/2000
3/3 ──────────────── 0s 91ms/step - categorical_accuracy: 1.0000 -
loss: 3.0197e-06
Epoch 835/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 3.8579e-06
Epoch 836/2000
3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 4.9733e-06
Epoch 837/2000
3/3 ──────────────── 0s 41ms/step - categorical_accuracy: 1.0000 -
loss: 5.0163e-06
Epoch 838/2000
3/3 ──────────────── 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 3.4564e-06
Epoch 839/2000
3/3 ──────────────── 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 3.7998e-06
Epoch 840/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 3.7870e-06
Epoch 841/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 5.3421e-06
```

```
Epoch 842/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 4.6166e-06
Epoch 843/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 2.7795e-06
Epoch 844/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 5.1899e-06
Epoch 845/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 2.9698e-06
Epoch 846/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 4.8595e-06
Epoch 847/2000

3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 4.9224e-06
Epoch 848/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 3.3550e-06
Epoch 849/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 4.9297e-06
Epoch 850/2000
3/3 ──────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 3.3491e-06
Epoch 851/2000
3/3 ──────────────── 0s 90ms/step - categorical_accuracy: 1.0000 -
loss: 3.5556e-06
Epoch 852/2000
3/3 ──────────────── 0s 42ms/step - categorical_accuracy: 1.0000 -
loss: 4.5741e-06
Epoch 853/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.9202e-06
Epoch 854/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 3.1406e-06
Epoch 855/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.8004e-06
Epoch 856/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.8742e-06
Epoch 857/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 3.6955e-06
Epoch 858/2000
```

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3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 4.5648e-06
Epoch 859/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 4.3547e-06
Epoch 860/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.6122e-06
Epoch 861/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.2353e-06
Epoch 862/2000
3/3 ──────────────── 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 2.9018e-06
Epoch 863/2000
3/3 ──────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 4.9282e-06
Epoch 864/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 2.4916e-06
Epoch 865/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 3.2686e-06
Epoch 866/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 4.5414e-06
Epoch 867/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 2.6211e-06
Epoch 868/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 4.5341e-06
Epoch 869/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.8997e-06
Epoch 870/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 2.6847e-06
Epoch 871/2000
3/3 ──────────────── 0s 89ms/step - categorical_accuracy: 1.0000 -
loss: 4.1848e-06
Epoch 872/2000
3/3 ──────────────── 0s 90ms/step - categorical_accuracy: 1.0000 -
loss: 4.3324e-06
Epoch 873/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 4.2641e-06
Epoch 874/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 3.9772e-06
Epoch 875/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 4.3697e-06
Epoch 876/2000
3/3 ──────────────── 0s 93ms/step - categorical_accuracy: 1.0000 -
loss: 2.3450e-06
Epoch 877/2000
3/3 ──────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 2.9563e-06
Epoch 878/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.7853e-06
Epoch 879/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.6359e-06
Epoch 880/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.8393e-06
Epoch 881/2000
3/3 ──────────────── 0s 93ms/step - categorical_accuracy: 1.0000 -
loss: 3.9824e-06
Epoch 882/2000
3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 2.7389e-06
Epoch 883/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.9938e-06
Epoch 884/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.4607e-06
Epoch 885/2000
3/3 ──────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 3.0531e-06
Epoch 886/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 2.6989e-06
Epoch 887/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 2.8784e-06
Epoch 888/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.9878e-06
Epoch 889/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 3.7947e-06
Epoch 890/2000
3/3 ──────────────── 0s 91ms/step - categorical_accuracy: 1.0000 -
loss: 4.0761e-06
```

```
Epoch 891/2000
3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 2.6534e-06
Epoch 892/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.4837e-06
Epoch 893/2000
3/3 ──────────────── 0s 41ms/step - categorical_accuracy: 1.0000 -
loss: 2.1328e-06
Epoch 894/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 3.6166e-06
Epoch 895/2000
3/3 ──────────────── 0s 90ms/step - categorical_accuracy: 1.0000 -
loss: 2.8686e-06
Epoch 896/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 2.0445e-06
Epoch 897/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 4.0737e-06
Epoch 898/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.1166e-06
Epoch 899/2000
3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 2.3221e-06
Epoch 900/2000
3/3 ──────────────── 0s 58ms/step - categorical_accuracy: 1.0000 -
loss: 2.7644e-06
Epoch 901/2000
3/3 ──────────────── 0s 90ms/step - categorical_accuracy: 1.0000 -
loss: 3.7786e-06
Epoch 902/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 2.3843e-06
Epoch 903/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 1.8521e-06
Epoch 904/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.3724e-06
Epoch 905/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 2.7070e-06
Epoch 906/2000

3/3 ──────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 2.4918e-06
Epoch 907/2000
```

```
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.4396e-06
Epoch 908/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.5898e-06
Epoch 909/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.8373e-06
Epoch 910/2000
3/3 ──────────────── 0s 66ms/step - categorical_accuracy: 1.0000 -
loss: 1.8590e-06
Epoch 911/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.8754e-06
Epoch 912/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.7615e-06
Epoch 913/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.6081e-06
Epoch 914/2000
3/3 ──────────────── 0s 62ms/step - categorical_accuracy: 1.0000 -
loss: 2.9583e-06
Epoch 915/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 2.2022e-06
Epoch 916/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 2.2309e-06
Epoch 917/2000
3/3 ──────────────── 0s 61ms/step - categorical_accuracy: 1.0000 -
loss: 2.5139e-06
Epoch 918/2000
3/3 ──────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 3.4962e-06
Epoch 919/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.3725e-06
Epoch 920/2000
3/3 ──────────────── 0s 92ms/step - categorical_accuracy: 1.0000 -
loss: 2.1101e-06
Epoch 921/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 3.3100e-06
Epoch 922/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 3.2609e-06
Epoch 923/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 2.2609e-06
Epoch 924/2000
3/3 ——————————— 0s 92ms/step - categorical_accuracy: 1.0000 -
loss: 3.3140e-06
Epoch 925/2000
3/3 ——————————— 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 3.2504e-06
Epoch 926/2000
3/3 ——————————— 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.6113e-06
Epoch 927/2000
3/3 ——————————— 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.3072e-06
Epoch 928/2000
3/3 ——————————— 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.4042e-06
Epoch 929/2000
3/3 ——————————— 0s 89ms/step - categorical_accuracy: 1.0000 -
loss: 2.2431e-06
Epoch 930/2000
3/3 ——————————— 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.1858e-06
Epoch 931/2000
3/3 ——————————— 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.5178e-06
Epoch 932/2000
3/3 ——————————— 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 3.4530e-06
Epoch 933/2000
3/3 ——————————— 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 2.3923e-06
Epoch 934/2000
3/3 ——————————— 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 1.8060e-06
Epoch 935/2000
3/3 ——————————— 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 3.1505e-06
Epoch 936/2000
3/3 ——————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.2846e-06
Epoch 937/2000
3/3 ——————————— 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 3.0427e-06
Epoch 938/2000
3/3 ——————————— 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 3.1046e-06
Epoch 939/2000
3/3 ——————————— 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.2797e-06
```

```
Epoch 940/2000
3/3 ──────────────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 3.1476e-06
Epoch 941/2000
3/3 ──────────────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.7947e-06
Epoch 942/2000
3/3 ──────────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 3.2067e-06
Epoch 943/2000
3/3 ──────────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.3169e-06
Epoch 944/2000
3/3 ──────────────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 2.3087e-06
Epoch 945/2000
3/3 ──────────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.3480e-06
Epoch 946/2000
3/3 ──────────────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 3.1056e-06
Epoch 947/2000
3/3 ──────────────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 1.7261e-06
Epoch 948/2000
3/3 ──────────────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 1.5731e-06
Epoch 949/2000
3/3 ──────────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 3.1272e-06
Epoch 950/2000
3/3 ──────────────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.9710e-06
Epoch 951/2000
3/3 ──────────────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 2.6448e-06
Epoch 952/2000
3/3 ──────────────────────── 0s 49ms/step - categorical_accuracy: 1.0000 -
loss: 2.2524e-06
Epoch 953/2000
3/3 ──────────────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 1.6015e-06
Epoch 954/2000
3/3 ──────────────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.0237e-06
Epoch 955/2000
3/3 ──────────────────────── 0s 90ms/step - categorical_accuracy: 1.0000 -
loss: 2.8127e-06
Epoch 956/2000
```

```
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 1.9189e-06
Epoch 957/2000
3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 2.7985e-06
Epoch 958/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.4309e-06
Epoch 959/2000
3/3 ──────────────── 0s 92ms/step - categorical_accuracy: 1.0000 -
loss: 1.3904e-06
Epoch 960/2000
3/3 ──────────────── 0s 96ms/step - categorical_accuracy: 1.0000 -
loss: 1.9272e-06
Epoch 961/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.7244e-06
Epoch 962/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.9370e-06
Epoch 963/2000
3/3 ──────────────── 0s 46ms/step - categorical_accuracy: 1.0000 -
loss: 1.8956e-06
Epoch 964/2000
3/3 ──────────────── 0s 48ms/step - categorical_accuracy: 1.0000 -
loss: 2.6652e-06
Epoch 965/2000

3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.7451e-06
Epoch 966/2000
3/3 ──────────────── 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 2.0000e-06
Epoch 967/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.9294e-06
Epoch 968/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.8411e-06
Epoch 969/2000
3/3 ──────────────── 0s 66ms/step - categorical_accuracy: 1.0000 -
loss: 2.5776e-06
Epoch 970/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 2.7009e-06
Epoch 971/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 1.5697e-06
Epoch 972/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 2.1803e-06
Epoch 973/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 2.6976e-06
Epoch 974/2000
3/3 ──────────────── 0s 90ms/step - categorical_accuracy: 1.0000 -
loss: 1.8785e-06
Epoch 975/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.5626e-06
Epoch 976/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.5330e-06
Epoch 977/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 2.7192e-06
Epoch 978/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 1.7749e-06
Epoch 979/2000
3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 1.7721e-06
Epoch 980/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 1.9774e-06
Epoch 981/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.6061e-06
Epoch 982/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 1.4065e-06
Epoch 983/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 2.7189e-06
Epoch 984/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.4002e-06
Epoch 985/2000
3/3 ──────────────── 0s 67ms/step - categorical_accuracy: 1.0000 -
loss: 1.5161e-06
Epoch 986/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 2.6245e-06
Epoch 987/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 1.8271e-06
Epoch 988/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.4406e-06
```

```
Epoch 989/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 2.4468e-06
Epoch 990/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.6645e-06
Epoch 991/2000
3/3 ──────────────── 0s 92ms/step - categorical_accuracy: 1.0000 -
loss: 1.7982e-06
Epoch 992/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 2.2941e-06
Epoch 993/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.9071e-06
Epoch 994/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.4608e-06
Epoch 995/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.8163e-06
Epoch 996/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.3921e-06
Epoch 997/2000
3/3 ──────────────── 0s 65ms/step - categorical_accuracy: 1.0000 -
loss: 2.3744e-06
Epoch 998/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 2.4132e-06
Epoch 999/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.3359e-06
Epoch 1000/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 1.5810e-06
Epoch 1001/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.7065e-06
Epoch 1002/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.7484e-06
Epoch 1003/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.8339e-06
Epoch 1004/2000
3/3 ──────────────── 0s 40ms/step - categorical_accuracy: 1.0000 -
loss: 1.7461e-06
Epoch 1005/2000
```

```
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.8203e-06
Epoch 1006/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.5539e-06
Epoch 1007/2000
3/3 ───────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 1.5539e-06
Epoch 1008/2000
3/3 ───────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 1.6377e-06
Epoch 1009/2000
3/3 ───────────────── 0s 52ms/step - categorical_accuracy: 1.0000 -
loss: 2.2836e-06
Epoch 1010/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.6065e-06
Epoch 1011/2000
3/3 ───────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 1.5076e-06
Epoch 1012/2000
3/3 ───────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 2.3778e-06
Epoch 1013/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.1492e-06
Epoch 1014/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.3920e-06
Epoch 1015/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.2013e-06
Epoch 1016/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.6409e-06
Epoch 1017/2000
3/3 ───────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 1.7149e-06
Epoch 1018/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.4697e-06
Epoch 1019/2000
3/3 ───────────────── 0s 66ms/step - categorical_accuracy: 1.0000 -
loss: 2.3128e-06
Epoch 1020/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.5065e-06
Epoch 1021/2000
3/3 ───────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 1.3135e-06
Epoch 1022/2000
3/3 ───────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 2.0553e-06
Epoch 1023/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.6562e-06
Epoch 1024/2000

3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.2417e-06
Epoch 1025/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.0606e-06
Epoch 1026/2000
3/3 ───────────────── 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 1.3670e-06
Epoch 1027/2000
3/3 ───────────────── 0s 59ms/step - categorical_accuracy: 1.0000 -
loss: 2.2386e-06
Epoch 1028/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.5003e-06
Epoch 1029/2000
3/3 ───────────────── 0s 63ms/step - categorical_accuracy: 1.0000 -
loss: 1.4989e-06
Epoch 1030/2000
3/3 ───────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 1.1232e-06
Epoch 1031/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.4447e-06
Epoch 1032/2000
3/3 ───────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 1.5483e-06
Epoch 1033/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.9950e-06
Epoch 1034/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.9415e-06
Epoch 1035/2000
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.0062e-06
Epoch 1036/2000
3/3 ───────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.2796e-06
Epoch 1037/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.2258e-06
```

```
Epoch 1038/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.4278e-06
Epoch 1039/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.4897e-06
Epoch 1040/2000
3/3 ──────────────── 0s 52ms/step - categorical_accuracy: 1.0000 -
loss: 1.9524e-06
Epoch 1041/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.3067e-06
Epoch 1042/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.3079e-06
Epoch 1043/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.0457e-06
Epoch 1044/2000
3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 2.0180e-06
Epoch 1045/2000
3/3 ──────────────── 0s 67ms/step - categorical_accuracy: 1.0000 -
loss: 1.9844e-06
Epoch 1046/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.3143e-06
Epoch 1047/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.0105e-06
Epoch 1048/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 2.0293e-06
Epoch 1049/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.2261e-06
Epoch 1050/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.4628e-06
Epoch 1051/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.4158e-06
Epoch 1052/2000
3/3 ──────────────── 0s 35ms/step - categorical_accuracy: 1.0000 -
loss: 1.3613e-06
Epoch 1053/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.2672e-06
Epoch 1054/2000
```

```
3/3 ───────────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 2.1114e-06
Epoch 1055/2000
3/3 ───────────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.9231e-06
Epoch 1056/2000
3/3 ───────────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 1.1918e-06
Epoch 1057/2000
3/3 ───────────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.4509e-06
Epoch 1058/2000
3/3 ───────────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.2790e-06
Epoch 1059/2000
3/3 ───────────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.7733e-06
Epoch 1060/2000
3/3 ───────────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.3710e-06
Epoch 1061/2000
3/3 ───────────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.2236e-06
Epoch 1062/2000
3/3 ───────────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.4071e-06
Epoch 1063/2000
3/3 ───────────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 9.7493e-07
Epoch 1064/2000
3/3 ───────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 9.7072e-07
Epoch 1065/2000
3/3 ───────────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.0643e-06
Epoch 1066/2000
3/3 ───────────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.4419e-06
Epoch 1067/2000
3/3 ───────────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 1.3006e-06
Epoch 1068/2000
3/3 ───────────────────── 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 1.2373e-06
Epoch 1069/2000
3/3 ───────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.3346e-06
Epoch 1070/2000
3/3 ───────────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 9.4762e-07
Epoch 1071/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.8852e-06
Epoch 1072/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.8924e-06
Epoch 1073/2000
3/3 ───────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 1.0689e-06
Epoch 1074/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.2470e-06
Epoch 1075/2000
3/3 ───────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.8910e-06
Epoch 1076/2000
3/3 ───────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 1.7771e-06
Epoch 1077/2000
3/3 ───────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 1.2621e-06
Epoch 1078/2000
3/3 ───────────────── 0s 39ms/step - categorical_accuracy: 1.0000 -
loss: 1.8195e-06
Epoch 1079/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 9.5895e-07
Epoch 1080/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.7782e-06
Epoch 1081/2000
3/3 ───────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 9.6148e-07
Epoch 1082/2000
3/3 ───────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 9.2653e-07
Epoch 1083/2000

3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 9.0743e-07
Epoch 1084/2000
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.8283e-06
Epoch 1085/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.0937e-06
Epoch 1086/2000
3/3 ───────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.2450e-06
```

```
Epoch 1087/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 67ms/step - categorical_accuracy: 1.0000 -
loss: 1.6590e-06
Epoch 1088/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 1.2536e-06
Epoch 1089/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.1726e-06
Epoch 1090/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.2974e-06
Epoch 1091/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.2142e-06
Epoch 1092/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.2326e-06
Epoch 1093/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.0415e-06
Epoch 1094/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.1851e-06
Epoch 1095/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 9.0594e-07
Epoch 1096/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 35ms/step - categorical_accuracy: 1.0000 -
loss: 9.8253e-07
Epoch 1097/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 9.0381e-07
Epoch 1098/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.1248e-06
Epoch 1099/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.1294e-06
Epoch 1100/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 47ms/step - categorical_accuracy: 1.0000 -
loss: 1.0640e-06
Epoch 1101/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.2002e-06
Epoch 1102/2000
3/3 ━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.6462e-06
Epoch 1103/2000
```

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3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.5999e-06
Epoch 1104/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 9.2403e-07
Epoch 1105/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 9.7479e-07
Epoch 1106/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.5415e-06
Epoch 1107/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.1289e-06
Epoch 1108/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.1419e-06
Epoch 1109/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 8.5206e-07
Epoch 1110/2000
3/3 ──────────────── 0s 91ms/step - categorical_accuracy: 1.0000 -
loss: 1.3496e-06
Epoch 1111/2000
3/3 ──────────────── 0s 55ms/step - categorical_accuracy: 1.0000 -
loss: 1.5319e-06
Epoch 1112/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.2928e-06
Epoch 1113/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.5938e-06
Epoch 1114/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.6785e-06
Epoch 1115/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.2005e-06
Epoch 1116/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 9.3697e-07
Epoch 1117/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 8.6897e-07
Epoch 1118/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 9.5951e-07
Epoch 1119/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
```

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loss: 1.5204e-06
Epoch 1120/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.1388e-06
Epoch 1121/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 1.4676e-06
Epoch 1122/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 39ms/step - categorical_accuracy: 1.0000 -
loss: 9.1086e-07
Epoch 1123/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.4345e-06
Epoch 1124/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.0647e-06
Epoch 1125/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.1183e-06
Epoch 1126/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.5855e-06
Epoch 1127/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.4863e-06
Epoch 1128/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 8.7355e-07
Epoch 1129/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 8.8609e-07
Epoch 1130/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.1683e-06
Epoch 1131/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 94ms/step - categorical_accuracy: 1.0000 -
loss: 1.4766e-06
Epoch 1132/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 7.7155e-07
Epoch 1133/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.4635e-06
Epoch 1134/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.0069e-06
Epoch 1135/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 36ms/step - categorical_accuracy: 1.0000 -
loss: 1.2220e-06
```

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Epoch 1136/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 9.5146e-07
Epoch 1137/2000
3/3 ──────────────── 0s 31ms/step - categorical_accuracy: 1.0000 -
loss: 9.0911e-07
Epoch 1138/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 9.3516e-07
Epoch 1139/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.4651e-06
Epoch 1140/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.0900e-06
Epoch 1141/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 9.1116e-07
Epoch 1142/2000

3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 9.1277e-07
Epoch 1143/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.5072e-06
Epoch 1144/2000
3/3 ──────────────── 0s 52ms/step - categorical_accuracy: 1.0000 -
loss: 1.5104e-06
Epoch 1145/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 8.4711e-07
Epoch 1146/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.4164e-06
Epoch 1147/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 8.8133e-07
Epoch 1148/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 9.4557e-07
Epoch 1149/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.3663e-06
Epoch 1150/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 9.5486e-07
Epoch 1151/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.3812e-06
Epoch 1152/2000
```

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3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 9.9187e-07
Epoch 1153/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 8.0747e-07
Epoch 1154/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.4990e-06
Epoch 1155/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 1.3935e-06
Epoch 1156/2000
3/3 ──────────────── 0s 39ms/step - categorical_accuracy: 1.0000 -
loss: 7.8510e-07
Epoch 1157/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 7.7949e-07
Epoch 1158/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 9.4805e-07
Epoch 1159/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 8.2349e-07
Epoch 1160/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.3641e-06
Epoch 1161/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.3236e-06
Epoch 1162/2000
3/3 ──────────────── 0s 39ms/step - categorical_accuracy: 1.0000 -
loss: 1.3089e-06
Epoch 1163/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.2274e-06
Epoch 1164/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 7.9856e-07
Epoch 1165/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.4355e-06
Epoch 1166/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 6.9772e-07
Epoch 1167/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 8.8025e-07
Epoch 1168/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
```

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loss: 1.3156e-06
Epoch 1169/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.3459e-06
Epoch 1170/2000
3/3 ──────────────── 0s 60ms/step - categorical_accuracy: 1.0000 -
loss: 9.3284e-07
Epoch 1171/2000
3/3 ──────────────── 0s 39ms/step - categorical_accuracy: 1.0000 -
loss: 9.9314e-07
Epoch 1172/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.2781e-06
Epoch 1173/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 9.4749e-07
Epoch 1174/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 8.4998e-07
Epoch 1175/2000
3/3 ──────────────── 0s 52ms/step - categorical_accuracy: 1.0000 -
loss: 8.7880e-07
Epoch 1176/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 1.2979e-06
Epoch 1177/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.2320e-06
Epoch 1178/2000
3/3 ──────────────── 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 7.2632e-07
Epoch 1179/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.1435e-06
Epoch 1180/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 1.2958e-06
Epoch 1181/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.2569e-06
Epoch 1182/2000
3/3 ──────────────── 0s 67ms/step - categorical_accuracy: 1.0000 -
loss: 1.2073e-06
Epoch 1183/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.3120e-06
Epoch 1184/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 1.2271e-06
```

```
Epoch 1185/2000
3/3 ——————————————— 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 9.0808e-07
Epoch 1186/2000
3/3 ——————————————— 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 8.6454e-07
Epoch 1187/2000
3/3 ——————————————— 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.2040e-06
Epoch 1188/2000
3/3 ——————————————— 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 7.3532e-07
Epoch 1189/2000
3/3 ——————————————— 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 9.2645e-07
Epoch 1190/2000
3/3 ——————————————— 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 9.6952e-07
Epoch 1191/2000
3/3 ——————————————— 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 6.6055e-07
Epoch 1192/2000
3/3 ——————————————— 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 8.1188e-07
Epoch 1193/2000
3/3 ——————————————— 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.2699e-06
Epoch 1194/2000
3/3 ——————————————— 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 9.0571e-07
Epoch 1195/2000
3/3 ——————————————— 0s 65ms/step - categorical_accuracy: 1.0000 -
loss: 1.1914e-06
Epoch 1196/2000
3/3 ——————————————— 0s 67ms/step - categorical_accuracy: 1.0000 -
loss: 1.1308e-06
Epoch 1197/2000
3/3 ——————————————— 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 7.3993e-07
Epoch 1198/2000
3/3 ——————————————— 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 5.7436e-07
Epoch 1199/2000
3/3 ——————————————— 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 8.8775e-07
Epoch 1200/2000
3/3 ——————————————— 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 8.2467e-07
Epoch 1201/2000
```

```
3/3 ─────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.1751e-06
Epoch 1202/2000
3/3 ─────────────── 0s 91ms/step - categorical_accuracy: 1.0000 -
loss: 8.1767e-07
Epoch 1203/2000
3/3 ─────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 1.1986e-06
Epoch 1204/2000
3/3 ─────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.0328e-06
Epoch 1205/2000
3/3 ─────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 8.4651e-07
Epoch 1206/2000
3/3 ─────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 9.1659e-07
Epoch 1207/2000
3/3 ─────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 9.5503e-07
Epoch 1208/2000
3/3 ─────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 8.3044e-07
Epoch 1209/2000
3/3 ─────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.0248e-06
Epoch 1210/2000
3/3 ─────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 1.2032e-06
Epoch 1211/2000
3/3 ─────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 7.4846e-07
Epoch 1212/2000
3/3 ─────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 8.2645e-07
Epoch 1213/2000
3/3 ─────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 8.6557e-07
Epoch 1214/2000
3/3 ─────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 8.2132e-07
Epoch 1215/2000
3/3 ─────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 6.9630e-07
Epoch 1216/2000
3/3 ─────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 1.0846e-06
Epoch 1217/2000
3/3 ─────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 1.1445e-06
```

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Epoch 1218/2000
3/3 ──────────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 6.1688e-07
Epoch 1219/2000
3/3 ──────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 7.0745e-07
Epoch 1220/2000
3/3 ──────────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 1.1885e-06
Epoch 1221/2000
3/3 ──────────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 1.1463e-06
Epoch 1222/2000
3/3 ──────────────────── 0s 56ms/step - categorical_accuracy: 1.0000 -
loss: 1.1102e-06
Epoch 1223/2000
3/3 ──────────────────── 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 1.1156e-06
Epoch 1224/2000
3/3 ──────────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 5.5748e-07
Epoch 1225/2000
3/3 ──────────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 6.2872e-07
Epoch 1226/2000
3/3 ──────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.0623e-06
Epoch 1227/2000
3/3 ──────────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 1.0874e-06
Epoch 1228/2000
3/3 ──────────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 8.4897e-07
Epoch 1229/2000
3/3 ──────────────────── 0s 66ms/step - categorical_accuracy: 1.0000 -
loss: 6.7343e-07
Epoch 1230/2000
3/3 ──────────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 7.6770e-07
Epoch 1231/2000
3/3 ──────────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 6.6782e-07
Epoch 1232/2000
3/3 ──────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.0254e-06
Epoch 1233/2000
3/3 ──────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 7.6605e-07
Epoch 1234/2000
3/3 ──────────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
```

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loss: 8.3613e-07
Epoch 1235/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 89ms/step - categorical_accuracy: 1.0000 -
loss: 8.4894e-07
Epoch 1236/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 5.8281e-07
Epoch 1237/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.0608e-06
Epoch 1238/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 5.4066e-07
Epoch 1239/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 7.6627e-07
Epoch 1240/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 9.1599e-07
Epoch 1241/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 6.6893e-07
Epoch 1242/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 7.2853e-07
Epoch 1243/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 6.0746e-07
Epoch 1244/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 7.7391e-07
Epoch 1245/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.0622e-06
Epoch 1246/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.0328e-06
Epoch 1247/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 6.3655e-07
Epoch 1248/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 7.1826e-07
Epoch 1249/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 5.1616e-07
Epoch 1250/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.0312e-06
Epoch 1251/2000
```

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3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 9.8669e-07
Epoch 1252/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 9.9809e-07
Epoch 1253/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 7.0892e-07
Epoch 1254/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.1310e-06
Epoch 1255/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 9.9879e-07
Epoch 1256/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 9.9110e-07
Epoch 1257/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 6.6887e-07
Epoch 1258/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.0125e-06
Epoch 1259/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 9.8363e-07
Epoch 1260/2000

3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.0910e-06
Epoch 1261/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 8.1624e-07
Epoch 1262/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 9.2984e-07
Epoch 1263/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 6.6534e-07
Epoch 1264/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 6.7069e-07
Epoch 1265/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 7.2354e-07
Epoch 1266/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 6.8861e-07
Epoch 1267/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
```

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loss: 6.8046e-07
Epoch 1268/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 9.7289e-07
Epoch 1269/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.0558e-06
Epoch 1270/2000
3/3 ──────────────── 0s 66ms/step - categorical_accuracy: 1.0000 -
loss: 6.4831e-07
Epoch 1271/2000
3/3 ──────────────── 0s 39ms/step - categorical_accuracy: 1.0000 -
loss: 9.3144e-07
Epoch 1272/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.0329e-06
Epoch 1273/2000
3/3 ──────────────── 0s 64ms/step - categorical_accuracy: 1.0000 -
loss: 6.5157e-07
Epoch 1274/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 7.0652e-07
Epoch 1275/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 7.1978e-07
Epoch 1276/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 9.5819e-07
Epoch 1277/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 6.9067e-07
Epoch 1278/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 6.3969e-07
Epoch 1279/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 9.3723e-07
Epoch 1280/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 9.5911e-07
Epoch 1281/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 9.9752e-07
Epoch 1282/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 6.4039e-07
Epoch 1283/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 5.6468e-07
```

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Epoch 1284/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.0283e-06
Epoch 1285/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 9.8450e-07
Epoch 1286/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 9.1767e-07
Epoch 1287/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 6.9251e-07
Epoch 1288/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 9.5605e-07
Epoch 1289/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 9.7072e-07
Epoch 1290/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 5.3931e-07
Epoch 1291/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 6.8806e-07
Epoch 1292/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 7.3555e-07
Epoch 1293/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 9.1041e-07
Epoch 1294/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 5.3788e-07
Epoch 1295/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 9.9632e-07
Epoch 1296/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 39ms/step - categorical_accuracy: 1.0000 -
loss: 7.3252e-07
Epoch 1297/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 8.9270e-07
Epoch 1298/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 97ms/step - categorical_accuracy: 1.0000 -
loss: 9.5369e-07
Epoch 1299/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 9.2528e-07
Epoch 1300/2000
```

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3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 6.1352e-07
Epoch 1301/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 6.3028e-07
Epoch 1302/2000
3/3 ──────────────── 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 8.1747e-07
Epoch 1303/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 9.3947e-07
Epoch 1304/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 5.5229e-07
Epoch 1305/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 5.2269e-07
Epoch 1306/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 5.9418e-07
Epoch 1307/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 8.7522e-07
Epoch 1308/2000
3/3 ──────────────── 0s 46ms/step - categorical_accuracy: 1.0000 -
loss: 6.0583e-07
Epoch 1309/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 9.1268e-07
Epoch 1310/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 5.1572e-07
Epoch 1311/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 9.2524e-07
Epoch 1312/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 4.9917e-07
Epoch 1313/2000
3/3 ──────────────── 0s 65ms/step - categorical_accuracy: 1.0000 -
loss: 8.9756e-07
Epoch 1314/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 7.2060e-07
Epoch 1315/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 8.0651e-07
Epoch 1316/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 5.6180e-07
Epoch 1317/2000
3/3 ──────────────── 0s 89ms/step - categorical_accuracy: 1.0000 -
loss: 6.1557e-07
Epoch 1318/2000
3/3 ──────────────── 0s 39ms/step - categorical_accuracy: 1.0000 -
loss: 6.5841e-07
Epoch 1319/2000

3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 5.0311e-07
Epoch 1320/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 9.0007e-07
Epoch 1321/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 5.5851e-07
Epoch 1322/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 7.0332e-07
Epoch 1323/2000
3/3 ──────────────── 0s 67ms/step - categorical_accuracy: 1.0000 -
loss: 8.1579e-07
Epoch 1324/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 6.1810e-07
Epoch 1325/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 5.2778e-07
Epoch 1326/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 5.9947e-07
Epoch 1327/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 6.3764e-07
Epoch 1328/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 6.3415e-07
Epoch 1329/2000
3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 4.4325e-07
Epoch 1330/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 6.4834e-07
Epoch 1331/2000
3/3 ──────────────── 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 7.5734e-07
Epoch 1332/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 5.7361e-07
```

```
Epoch 1333/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 4.8957e-07
Epoch 1334/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 6.5323e-07
Epoch 1335/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 5.2726e-07
Epoch 1336/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 8.5765e-07
Epoch 1337/2000
3/3 ──────────────── 0s 66ms/step - categorical_accuracy: 1.0000 -
loss: 5.2261e-07
Epoch 1338/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 5.3307e-07
Epoch 1339/2000
3/3 ──────────────── 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 7.7825e-07
Epoch 1340/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 5.0304e-07
Epoch 1341/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 6.6461e-07
Epoch 1342/2000
3/3 ──────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 5.8730e-07
Epoch 1343/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 7.0209e-07
Epoch 1344/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 8.0918e-07
Epoch 1345/2000
3/3 ──────────────── 0s 48ms/step - categorical_accuracy: 1.0000 -
loss: 4.8998e-07
Epoch 1346/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 5.3374e-07
Epoch 1347/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 6.6552e-07
Epoch 1348/2000
3/3 ──────────────── 0s 67ms/step - categorical_accuracy: 1.0000 -
loss: 8.5783e-07
Epoch 1349/2000
```

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3/3 ───────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 6.6831e-07
Epoch 1350/2000
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 8.5643e-07
Epoch 1351/2000
3/3 ───────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 6.0055e-07
Epoch 1352/2000
3/3 ───────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 7.6912e-07
Epoch 1353/2000
3/3 ───────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 4.7389e-07
Epoch 1354/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 7.6330e-07
Epoch 1355/2000
3/3 ───────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 6.2173e-07
Epoch 1356/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 8.0193e-07
Epoch 1357/2000
3/3 ───────────────── 0s 59ms/step - categorical_accuracy: 1.0000 -
loss: 5.4861e-07
Epoch 1358/2000
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 4.8202e-07
Epoch 1359/2000
3/3 ───────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 7.7211e-07
Epoch 1360/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 5.4137e-07
Epoch 1361/2000
3/3 ───────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 5.6652e-07
Epoch 1362/2000
3/3 ───────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 5.7979e-07
Epoch 1363/2000
3/3 ───────────────── 0s 55ms/step - categorical_accuracy: 1.0000 -
loss: 4.0120e-07
Epoch 1364/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 7.5045e-07
Epoch 1365/2000
3/3 ───────────────── 0s 68ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 5.4672e-07
Epoch 1366/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 4.8805e-07
Epoch 1367/2000
3/3 ──────────────── 0s 90ms/step - categorical_accuracy: 1.0000 -
loss: 4.9363e-07
Epoch 1368/2000
3/3 ──────────────── 0s 97ms/step - categorical_accuracy: 1.0000 -
loss: 7.9002e-07
Epoch 1369/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 5.6650e-07
Epoch 1370/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 5.3343e-07
Epoch 1371/2000
3/3 ──────────────── 0s 89ms/step - categorical_accuracy: 1.0000 -
loss: 5.2830e-07
Epoch 1372/2000
3/3 ──────────────── 0s 89ms/step - categorical_accuracy: 1.0000 -
loss: 4.7057e-07
Epoch 1373/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 7.5392e-07
Epoch 1374/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 6.4543e-07
Epoch 1375/2000
3/3 ──────────────── 0s 66ms/step - categorical_accuracy: 1.0000 -
loss: 4.8290e-07
Epoch 1376/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 5.1758e-07
Epoch 1377/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 4.1444e-07
Epoch 1378/2000

3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 5.1291e-07
Epoch 1379/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 5.2595e-07
Epoch 1380/2000
3/3 ──────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 7.0150e-07
Epoch 1381/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 6.7472e-07
```

```
Epoch 1382/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 5.3781e-07
Epoch 1383/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 4.9777e-07
Epoch 1384/2000
3/3 ──────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 5.1406e-07
Epoch 1385/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 7.2873e-07
Epoch 1386/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 6.9335e-07
Epoch 1387/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 4.0767e-07
Epoch 1388/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 6.1673e-07
Epoch 1389/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 4.9308e-07
Epoch 1390/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 7.5082e-07
Epoch 1391/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 4.0321e-07
Epoch 1392/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 5.0962e-07
Epoch 1393/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 7.1825e-07
Epoch 1394/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 5.2569e-07
Epoch 1395/2000
3/3 ──────────────── 0s 65ms/step - categorical_accuracy: 1.0000 -
loss: 7.1823e-07
Epoch 1396/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 7.2706e-07
Epoch 1397/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 3.7969e-07
Epoch 1398/2000
```

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3/3 ──────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 4.8515e-07
Epoch 1399/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 5.4382e-07
Epoch 1400/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 6.6746e-07
Epoch 1401/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 6.5325e-07
Epoch 1402/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 7.0353e-07
Epoch 1403/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 4.7233e-07
Epoch 1404/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 6.4973e-07
Epoch 1405/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 7.2703e-07
Epoch 1406/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 5.0167e-07
Epoch 1407/2000
3/3 ──────────────── 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 6.9840e-07
Epoch 1408/2000
3/3 ──────────────── 0s 49ms/step - categorical_accuracy: 1.0000 -
loss: 4.9561e-07
Epoch 1409/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 5.5894e-07
Epoch 1410/2000
3/3 ──────────────── 0s 67ms/step - categorical_accuracy: 1.0000 -
loss: 6.9653e-07
Epoch 1411/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 6.4017e-07
Epoch 1412/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 6.3411e-07
Epoch 1413/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 6.6717e-07
Epoch 1414/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 4.5136e-07
Epoch 1415/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 6.4368e-07
Epoch 1416/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 5.0955e-07
Epoch 1417/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 6.3574e-07
Epoch 1418/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 6.9208e-07
Epoch 1419/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 5.4750e-07
Epoch 1420/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 6.1268e-07
Epoch 1421/2000
3/3 ──────────────── 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 4.6251e-07
Epoch 1422/2000
3/3 ──────────────── 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 6.7368e-07
Epoch 1423/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 5.3258e-07
Epoch 1424/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 6.4225e-07
Epoch 1425/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 4.4177e-07
Epoch 1426/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 4.3524e-07
Epoch 1427/2000
3/3 ──────────────── 0s 98ms/step - categorical_accuracy: 1.0000 -
loss: 4.4410e-07
Epoch 1428/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 4.3712e-07
Epoch 1429/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 6.4735e-07
Epoch 1430/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 3.9939e-07
```

```
Epoch 1431/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 3.6330e-07
Epoch 1432/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 6.2685e-07
Epoch 1433/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 4.7877e-07
Epoch 1434/2000
3/3 ──────────────── 0s 67ms/step - categorical_accuracy: 1.0000 -
loss: 5.7819e-07
Epoch 1435/2000
3/3 ──────────────── 0s 66ms/step - categorical_accuracy: 1.0000 -
loss: 4.1965e-07
Epoch 1436/2000
3/3 ──────────────── 0s 66ms/step - categorical_accuracy: 1.0000 -
loss: 3.9541e-07
Epoch 1437/2000

3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 4.3081e-07
Epoch 1438/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 6.1499e-07
Epoch 1439/2000
3/3 ──────────────── 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 4.8831e-07
Epoch 1440/2000
3/3 ──────────────── 0s 42ms/step - categorical_accuracy: 1.0000 -
loss: 5.0344e-07
Epoch 1441/2000
3/3 ──────────────── 0s 43ms/step - categorical_accuracy: 1.0000 -
loss: 4.5639e-07
Epoch 1442/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 5.9075e-07
Epoch 1443/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 3.8679e-07
Epoch 1444/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 6.1193e-07
Epoch 1445/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 3.5371e-07
Epoch 1446/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 4.3730e-07
Epoch 1447/2000
```

```
3/3 ———————————— 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 5.9725e-07
Epoch 1448/2000
3/3 ———————————— 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 5.3066e-07
Epoch 1449/2000
3/3 ———————————— 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 4.1007e-07
Epoch 1450/2000
3/3 ———————————— 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 4.6476e-07
Epoch 1451/2000
3/3 ———————————— 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 3.6255e-07
Epoch 1452/2000
3/3 ———————————— 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 6.3311e-07
Epoch 1453/2000
3/3 ———————————— 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 6.4265e-07
Epoch 1454/2000
3/3 ———————————— 0s 40ms/step - categorical_accuracy: 1.0000 -
loss: 3.6767e-07
Epoch 1455/2000
3/3 ———————————— 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 4.4938e-07
Epoch 1456/2000
3/3 ———————————— 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 4.0235e-07
Epoch 1457/2000
3/3 ———————————— 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 3.5508e-07
Epoch 1458/2000
3/3 ———————————— 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 6.1795e-07
Epoch 1459/2000
3/3 ———————————— 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 4.2143e-07
Epoch 1460/2000
3/3 ———————————— 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 5.5228e-07
Epoch 1461/2000
3/3 ———————————— 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 5.7672e-07
Epoch 1462/2000
3/3 ———————————— 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 5.7509e-07
Epoch 1463/2000
3/3 ———————————— 0s 78ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 4.0093e-07
Epoch 1464/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 4.1164e-07
Epoch 1465/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 4.1724e-07
Epoch 1466/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 4.5657e-07
Epoch 1467/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 6.0419e-07
Epoch 1468/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 3.8976e-07
Epoch 1469/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 3.8183e-07
Epoch 1470/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 3.0313e-07
Epoch 1471/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 5.7298e-07
Epoch 1472/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 5.9136e-07
Epoch 1473/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 4.0231e-07
Epoch 1474/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 6.0883e-07
Epoch 1475/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 3.5714e-07
Epoch 1476/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 4.1465e-07
Epoch 1477/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.2361e-07
Epoch 1478/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 3.6902e-07
Epoch 1479/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 4.3932e-07
```

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Epoch 1480/2000
3/3 ──────────────── 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 3.8949e-07
Epoch 1481/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 4.3629e-07
Epoch 1482/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 5.8926e-07
Epoch 1483/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.8553e-07
Epoch 1484/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 5.7296e-07
Epoch 1485/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 4.6633e-07
Epoch 1486/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 5.5434e-07
Epoch 1487/2000
3/3 ──────────────── 0s 51ms/step - categorical_accuracy: 1.0000 -
loss: 5.4291e-07
Epoch 1488/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 6.0252e-07
Epoch 1489/2000
3/3 ──────────────── 0s 95ms/step - categorical_accuracy: 1.0000 -
loss: 5.5805e-07
Epoch 1490/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 5.9971e-07
Epoch 1491/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 5.9437e-07
Epoch 1492/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 5.8737e-07
Epoch 1493/2000
3/3 ──────────────── 0s 112ms/step - categorical_accuracy: 1.0000
- loss: 3.0006e-07
Epoch 1494/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 2.9331e-07
Epoch 1495/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 4.1135e-07
Epoch 1496/2000
```

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3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 5.5663e-07
Epoch 1497/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 5.7292e-07
Epoch 1498/2000
3/3 ──────────────── 0s 62ms/step - categorical_accuracy: 1.0000 -
loss: 3.0587e-07
Epoch 1499/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 5.6268e-07
Epoch 1500/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 3.5430e-07
Epoch 1501/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 3.5872e-07
Epoch 1502/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.7350e-07
Epoch 1503/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.3077e-07
Epoch 1504/2000
3/3 ──────────────── 0s 31ms/step - categorical_accuracy: 1.0000 -
loss: 2.8024e-07
Epoch 1505/2000
3/3 ──────────────── 0s 31ms/step - categorical_accuracy: 1.0000 -
loss: 3.0003e-07
Epoch 1506/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 5.4963e-07
Epoch 1507/2000
3/3 ──────────────── 0s 86ms/step - categorical_accuracy: 1.0000 -
loss: 5.6033e-07
Epoch 1508/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 4.5858e-07
Epoch 1509/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 4.2669e-07
Epoch 1510/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 5.5264e-07
Epoch 1511/2000
3/3 ──────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 3.2144e-07
Epoch 1512/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 5.0304e-07
```

```
Epoch 1513/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 3.8689e-07
Epoch 1514/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.9128e-07
Epoch 1515/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 3.5591e-07
Epoch 1516/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 3.3752e-07
Epoch 1517/2000
3/3 ──────────────── 0s 36ms/step - categorical_accuracy: 1.0000 -
loss: 5.1539e-07
Epoch 1518/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 4.3668e-07
Epoch 1519/2000
3/3 ──────────────── 0s 66ms/step - categorical_accuracy: 1.0000 -
loss: 3.8197e-07
Epoch 1520/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 3.5286e-07
Epoch 1521/2000
3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 3.6869e-07
Epoch 1522/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 4.0570e-07
Epoch 1523/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 3.1653e-07
Epoch 1524/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.0534e-07
Epoch 1525/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 4.2759e-07
Epoch 1526/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 3.1676e-07
Epoch 1527/2000
3/3 ──────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 3.6728e-07
Epoch 1528/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 4.9581e-07
Epoch 1529/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 2.6599e-07
Epoch 1530/2000
3/3 ──────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 3.7403e-07
Epoch 1531/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 3.0114e-07
Epoch 1532/2000
3/3 ──────────────── 0s 65ms/step - categorical_accuracy: 1.0000 -
loss: 3.8356e-07
Epoch 1533/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 3.5191e-07
Epoch 1534/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 3.6471e-07
Epoch 1535/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 3.3026e-07
Epoch 1536/2000
3/3 ──────────────── 0s 42ms/step - categorical_accuracy: 1.0000 -
loss: 5.1441e-07
Epoch 1537/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 4.1453e-07
Epoch 1538/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 4.4316e-07
Epoch 1539/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 3.8192e-07
Epoch 1540/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 3.8587e-07
Epoch 1541/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 5.0462e-07
Epoch 1542/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 5.1532e-07
Epoch 1543/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 4.8854e-07
Epoch 1544/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 2.6131e-07
Epoch 1545/2000
3/3 ──────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 5.0881e-07
Epoch 1546/2000
```

```
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.0695e-07
Epoch 1547/2000
3/3 ──────────────── 0s 51ms/step - categorical_accuracy: 1.0000 -
loss: 4.1335e-07
Epoch 1548/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 3.2884e-07
Epoch 1549/2000
3/3 ──────────────── 0s 41ms/step - categorical_accuracy: 1.0000 -
loss: 4.9017e-07
Epoch 1550/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 4.5826e-07
Epoch 1551/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 5.0436e-07
Epoch 1552/2000
3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 2.9370e-07
Epoch 1553/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.3418e-07
Epoch 1554/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 4.9856e-07
Epoch 1555/2000

3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.8285e-07
Epoch 1556/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 5.2139e-07
Epoch 1557/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 3.5885e-07
Epoch 1558/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 2.7923e-07
Epoch 1559/2000
3/3 ──────────────── 0s 65ms/step - categorical_accuracy: 1.0000 -
loss: 4.9714e-07
Epoch 1560/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 3.2974e-07
Epoch 1561/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 3.2206e-07
Epoch 1562/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 3.0412e-07
Epoch 1563/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 3.4859e-07
Epoch 1564/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.9468e-07
Epoch 1565/2000
3/3 ──────────────── 0s 41ms/step - categorical_accuracy: 1.0000 -
loss: 3.2599e-07
Epoch 1566/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 4.3938e-07
Epoch 1567/2000
3/3 ──────────────── 0s 43ms/step - categorical_accuracy: 1.0000 -
loss: 3.3624e-07
Epoch 1568/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.5299e-07
Epoch 1569/2000
3/3 ──────────────── 0s 89ms/step - categorical_accuracy: 1.0000 -
loss: 5.1319e-07
Epoch 1570/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 3.4137e-07
Epoch 1571/2000
3/3 ──────────────── 0s 45ms/step - categorical_accuracy: 1.0000 -
loss: 4.5126e-07
Epoch 1572/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.5742e-07
Epoch 1573/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 4.8780e-07
Epoch 1574/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.9850e-07
Epoch 1575/2000
3/3 ──────────────── 0s 35ms/step - categorical_accuracy: 1.0000 -
loss: 4.3331e-07
Epoch 1576/2000
3/3 ──────────────── 0s 29ms/step - categorical_accuracy: 1.0000 -
loss: 3.1293e-07
Epoch 1577/2000
3/3 ──────────────── 0s 29ms/step - categorical_accuracy: 1.0000 -
loss: 4.2679e-07
Epoch 1578/2000
3/3 ──────────────── 0s 26ms/step - categorical_accuracy: 1.0000 -
loss: 3.9606e-07
```

```
Epoch 1579/2000
3/3 ──────────────── 0s 22ms/step - categorical_accuracy: 1.0000 -
loss: 3.6253e-07
Epoch 1580/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 1.0000 -
loss: 2.8431e-07
Epoch 1581/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 1.0000 -
loss: 3.4948e-07
Epoch 1582/2000
3/3 ──────────────── 0s 24ms/step - categorical_accuracy: 1.0000 -
loss: 4.7544e-07
Epoch 1583/2000
3/3 ──────────────── 0s 24ms/step - categorical_accuracy: 1.0000 -
loss: 3.1316e-07
Epoch 1584/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 1.0000 -
loss: 3.8418e-07
Epoch 1585/2000
3/3 ──────────────── 0s 24ms/step - categorical_accuracy: 1.0000 -
loss: 4.2375e-07
Epoch 1586/2000
3/3 ──────────────── 0s 24ms/step - categorical_accuracy: 1.0000 -
loss: 4.1188e-07
Epoch 1587/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 1.0000 -
loss: 4.2236e-07
Epoch 1588/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 1.0000 -
loss: 3.1245e-07
Epoch 1589/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 1.0000 -
loss: 2.8336e-07
Epoch 1590/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 1.0000 -
loss: 3.1292e-07
Epoch 1591/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 1.0000 -
loss: 3.3829e-07
Epoch 1592/2000
3/3 ──────────────── 0s 25ms/step - categorical_accuracy: 1.0000 -
loss: 3.1105e-07
Epoch 1593/2000
3/3 ──────────────── 0s 28ms/step - categorical_accuracy: 1.0000 -
loss: 2.7567e-07
Epoch 1594/2000
3/3 ──────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 4.4237e-07
Epoch 1595/2000
```

```
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 3.1920e-07
Epoch 1596/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.4435e-07
Epoch 1597/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 3.0220e-07
Epoch 1598/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.8543e-07
Epoch 1599/2000
3/3 ──────────────── 0s 62ms/step - categorical_accuracy: 1.0000 -
loss: 4.4143e-07
Epoch 1600/2000
3/3 ──────────────── 0s 85ms/step - categorical_accuracy: 1.0000 -
loss: 4.4446e-07
Epoch 1601/2000
3/3 ──────────────── 0s 61ms/step - categorical_accuracy: 1.0000 -
loss: 3.1338e-07
Epoch 1602/2000
3/3 ──────────────── 0s 59ms/step - categorical_accuracy: 1.0000 -
loss: 4.2932e-07
Epoch 1603/2000
3/3 ──────────────── 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 3.0406e-07
Epoch 1604/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 2.9660e-07
Epoch 1605/2000
3/3 ──────────────── 0s 93ms/step - categorical_accuracy: 1.0000 -
loss: 3.1966e-07
Epoch 1606/2000
3/3 ──────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 4.4864e-07
Epoch 1607/2000
3/3 ──────────────── 0s 46ms/step - categorical_accuracy: 1.0000 -
loss: 4.3769e-07
Epoch 1608/2000
3/3 ──────────────── 0s 43ms/step - categorical_accuracy: 1.0000 -
loss: 4.0370e-07
Epoch 1609/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 4.2465e-07
Epoch 1610/2000
3/3 ──────────────── 0s 45ms/step - categorical_accuracy: 1.0000 -
loss: 2.7287e-07
Epoch 1611/2000
3/3 ──────────────── 0s 40ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 4.1861e-07
Epoch 1612/2000
3/3 ──────────────── 0s 42ms/step - categorical_accuracy: 1.0000 -
loss: 3.2499e-07
Epoch 1613/2000
3/3 ──────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 2.8006e-07
Epoch 1614/2000

3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.9123e-07
Epoch 1615/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 3.1312e-07
Epoch 1616/2000
3/3 ──────────────── 0s 55ms/step - categorical_accuracy: 1.0000 -
loss: 4.3348e-07
Epoch 1617/2000
3/3 ──────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 2.9566e-07
Epoch 1618/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 4.1325e-07
Epoch 1619/2000
3/3 ──────────────── 0s 65ms/step - categorical_accuracy: 1.0000 -
loss: 2.7330e-07
Epoch 1620/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.9776e-07
Epoch 1621/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.3511e-07
Epoch 1622/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.4255e-07
Epoch 1623/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 3.1288e-07
Epoch 1624/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 3.7970e-07
Epoch 1625/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 3.0985e-07
Epoch 1626/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 3.0845e-07
Epoch 1627/2000
3/3 ──────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 3.2032e-07
```

```
Epoch 1628/2000
3/3 ───────────────── 0s 63ms/step - categorical_accuracy: 1.0000 -
loss: 3.7946e-07
Epoch 1629/2000
3/3 ───────────────── 0s 36ms/step - categorical_accuracy: 1.0000 -
loss: 3.9156e-07
Epoch 1630/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.1065e-07
Epoch 1631/2000
3/3 ───────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 2.7421e-07
Epoch 1632/2000
3/3 ───────────────── 0s 35ms/step - categorical_accuracy: 1.0000 -
loss: 4.0622e-07
Epoch 1633/2000
3/3 ───────────────── 0s 45ms/step - categorical_accuracy: 1.0000 -
loss: 4.1553e-07
Epoch 1634/2000
3/3 ───────────────── 0s 41ms/step - categorical_accuracy: 1.0000 -
loss: 4.1809e-07
Epoch 1635/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.9192e-07
Epoch 1636/2000
3/3 ───────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 2.5697e-07
Epoch 1637/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.7187e-07
Epoch 1638/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 4.0228e-07
Epoch 1639/2000
3/3 ───────────────── 0s 56ms/step - categorical_accuracy: 1.0000 -
loss: 3.9110e-07
Epoch 1640/2000
3/3 ───────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 3.5780e-07
Epoch 1641/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 3.5754e-07
Epoch 1642/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 4.0643e-07
Epoch 1643/2000
3/3 ───────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 2.5979e-07
Epoch 1644/2000
```

```
3/3 ─────────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 2.8349e-07
Epoch 1645/2000
3/3 ─────────────────── 0s 59ms/step - categorical_accuracy: 1.0000 -
loss: 4.1855e-07
Epoch 1646/2000
3/3 ─────────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.7643e-07
Epoch 1647/2000
3/3 ─────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 3.7573e-07
Epoch 1648/2000
3/3 ─────────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 4.2809e-07
Epoch 1649/2000
3/3 ─────────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.3159e-07
Epoch 1650/2000
3/3 ─────────────────── 0s 39ms/step - categorical_accuracy: 1.0000 -
loss: 3.9013e-07
Epoch 1651/2000
3/3 ─────────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.7069e-07
Epoch 1652/2000
3/3 ─────────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 2.0480e-07
Epoch 1653/2000
3/3 ─────────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 2.3156e-07
Epoch 1654/2000
3/3 ─────────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.0176e-07
Epoch 1655/2000
3/3 ─────────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 3.6777e-07
Epoch 1656/2000
3/3 ─────────────────── 0s 42ms/step - categorical_accuracy: 1.0000 -
loss: 2.2365e-07
Epoch 1657/2000
3/3 ─────────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 3.6265e-07
Epoch 1658/2000
3/3 ─────────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 3.6358e-07
Epoch 1659/2000
3/3 ─────────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.8256e-07
Epoch 1660/2000
3/3 ─────────────────── 0s 48ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 2.8395e-07
Epoch 1661/2000
3/3 ———————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.6183e-07
Epoch 1662/2000
3/3 ———————————— 0s 54ms/step - categorical_accuracy: 1.0000 -
loss: 2.2015e-07
Epoch 1663/2000
3/3 ———————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.5297e-07
Epoch 1664/2000
3/3 ———————————— 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 2.5437e-07
Epoch 1665/2000
3/3 ———————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.6718e-07
Epoch 1666/2000
3/3 ———————————— 0s 59ms/step - categorical_accuracy: 1.0000 -
loss: 3.1445e-07
Epoch 1667/2000
3/3 ———————————— 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 2.5484e-07
Epoch 1668/2000
3/3 ———————————— 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 3.7172e-07
Epoch 1669/2000
3/3 ———————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.4519e-07
Epoch 1670/2000
3/3 ———————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.0373e-07
Epoch 1671/2000
3/3 ———————————— 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.4575e-07
Epoch 1672/2000
3/3 ———————————— 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 3.5191e-07
Epoch 1673/2000

3/3 ———————————— 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 2.6671e-07
Epoch 1674/2000
3/3 ———————————— 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 3.7078e-07
Epoch 1675/2000
3/3 ———————————— 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.6996e-07
Epoch 1676/2000
3/3 ———————————— 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 2.3085e-07
```

```
Epoch 1677/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 56ms/step - categorical_accuracy: 1.0000 -
loss: 3.5797e-07
Epoch 1678/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 3.4074e-07
Epoch 1679/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 2.0011e-07
Epoch 1680/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 3.5937e-07
Epoch 1681/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.9790e-07
Epoch 1682/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 46ms/step - categorical_accuracy: 1.0000 -
loss: 2.2712e-07
Epoch 1683/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.6727e-07
Epoch 1684/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 40ms/step - categorical_accuracy: 1.0000 -
loss: 1.7053e-07
Epoch 1685/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.1593e-07
Epoch 1686/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 2.6156e-07
Epoch 1687/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.3118e-07
Epoch 1688/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 60ms/step - categorical_accuracy: 1.0000 -
loss: 3.6448e-07
Epoch 1689/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 2.5598e-07
Epoch 1690/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.3316e-07
Epoch 1691/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.4153e-07
Epoch 1692/2000
3/3 ━━━━━━━━━━━━━━━━━━━━ 0s 60ms/step - categorical_accuracy: 1.0000 -
loss: 2.3642e-07
Epoch 1693/2000
```

```
3/3 ───────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 2.8344e-07
Epoch 1694/2000
3/3 ───────────────── 0s 59ms/step - categorical_accuracy: 1.0000 -
loss: 3.6982e-07
Epoch 1695/2000
3/3 ───────────────── 0s 58ms/step - categorical_accuracy: 1.0000 -
loss: 1.9683e-07
Epoch 1696/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 3.6051e-07
Epoch 1697/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.3222e-07
Epoch 1698/2000
3/3 ───────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.2523e-07
Epoch 1699/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.3443e-07
Epoch 1700/2000
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.0521e-07
Epoch 1701/2000
3/3 ───────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 3.5003e-07
Epoch 1702/2000
3/3 ───────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.4665e-07
Epoch 1703/2000
3/3 ───────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.2990e-07
Epoch 1704/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.9682e-07
Epoch 1705/2000
3/3 ───────────────── 0s 62ms/step - categorical_accuracy: 1.0000 -
loss: 3.6959e-07
Epoch 1706/2000
3/3 ───────────────── 0s 61ms/step - categorical_accuracy: 1.0000 -
loss: 3.6213e-07
Epoch 1707/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 2.7157e-07
Epoch 1708/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.9601e-07
Epoch 1709/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 2.8739e-07
Epoch 1710/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 2.2661e-07
Epoch 1711/2000
3/3 ──────────────── 0s 41ms/step - categorical_accuracy: 1.0000 -
loss: 1.8938e-07
Epoch 1712/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 3.1953e-07
Epoch 1713/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.8866e-07
Epoch 1714/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 2.0613e-07
Epoch 1715/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.5083e-07
Epoch 1716/2000
3/3 ──────────────── 0s 35ms/step - categorical_accuracy: 1.0000 -
loss: 1.8424e-07
Epoch 1717/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.5151e-07
Epoch 1718/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.7597e-07
Epoch 1719/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.2113e-07
Epoch 1720/2000
3/3 ──────────────── 0s 66ms/step - categorical_accuracy: 1.0000 -
loss: 3.0692e-07
Epoch 1721/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 2.7130e-07
Epoch 1722/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 3.3463e-07
Epoch 1723/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.8457e-07
Epoch 1724/2000
3/3 ──────────────── 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 3.0016e-07
Epoch 1725/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 3.2694e-07
```

```
Epoch 1726/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.1869e-07
Epoch 1727/2000
3/3 ──────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 1.7676e-07
Epoch 1728/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 3.3508e-07
Epoch 1729/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.2706e-07
Epoch 1730/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 1.8514e-07
Epoch 1731/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.4347e-07
Epoch 1732/2000

3/3 ──────────────── 0s 40ms/step - categorical_accuracy: 1.0000 -
loss: 2.9807e-07
Epoch 1733/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.4160e-07
Epoch 1734/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 3.2414e-07
Epoch 1735/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.3124e-07
Epoch 1736/2000
3/3 ──────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 2.3543e-07
Epoch 1737/2000
3/3 ──────────────── 0s 39ms/step - categorical_accuracy: 1.0000 -
loss: 1.9445e-07
Epoch 1738/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.9177e-07
Epoch 1739/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.9410e-07
Epoch 1740/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.0562e-07
Epoch 1741/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 3.2855e-07
Epoch 1742/2000
```

```
3/3 ───────────────── 0s 57ms/step - categorical_accuracy: 1.0000 -
loss: 2.3706e-07
Epoch 1743/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.6744e-07
Epoch 1744/2000
3/3 ───────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 2.1050e-07
Epoch 1745/2000
3/3 ───────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 1.8535e-07
Epoch 1746/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.8688e-07
Epoch 1747/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 3.2390e-07
Epoch 1748/2000
3/3 ───────────────── 0s 35ms/step - categorical_accuracy: 1.0000 -
loss: 2.1820e-07
Epoch 1749/2000
3/3 ───────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.9211e-07
Epoch 1750/2000
3/3 ───────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 3.1527e-07
Epoch 1751/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.9630e-07
Epoch 1752/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.1283e-07
Epoch 1753/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.9292e-07
Epoch 1754/2000
3/3 ───────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 2.3378e-07
Epoch 1755/2000
3/3 ───────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 2.2913e-07
Epoch 1756/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.2913e-07
Epoch 1757/2000
3/3 ───────────────── 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 3.0782e-07
Epoch 1758/2000
3/3 ───────────────── 0s 45ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 2.9710e-07
Epoch 1759/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.3377e-07
Epoch 1760/2000
3/3 ──────────────── 0s 39ms/step - categorical_accuracy: 1.0000 -
loss: 3.0060e-07
Epoch 1761/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.0468e-07
Epoch 1762/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.6182e-07
Epoch 1763/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 2.1677e-07
Epoch 1764/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.8732e-07
Epoch 1765/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.7090e-07
Epoch 1766/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.3284e-07
Epoch 1767/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.7859e-07
Epoch 1768/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 3.1992e-07
Epoch 1769/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.7579e-07
Epoch 1770/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.2491e-07
Epoch 1771/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 2.4005e-07
Epoch 1772/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 2.6659e-07
Epoch 1773/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.5880e-07
Epoch 1774/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.5903e-07
```

```
Epoch 1775/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 3.1199e-07
Epoch 1776/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.0605e-07
Epoch 1777/2000
3/3 ───────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 1.7928e-07
Epoch 1778/2000
3/3 ───────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 2.4797e-07
Epoch 1779/2000
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.3935e-07
Epoch 1780/2000
3/3 ───────────────── 0s 42ms/step - categorical_accuracy: 1.0000 -
loss: 1.9977e-07
Epoch 1781/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.8870e-07
Epoch 1782/2000
3/3 ───────────────── 0s 35ms/step - categorical_accuracy: 1.0000 -
loss: 2.8195e-07
Epoch 1783/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.9638e-07
Epoch 1784/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.9358e-07
Epoch 1785/2000
3/3 ───────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.6879e-07
Epoch 1786/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.0558e-07
Epoch 1787/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.8648e-07
Epoch 1788/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.2071e-07
Epoch 1789/2000
3/3 ───────────────── 0s 88ms/step - categorical_accuracy: 1.0000 -
loss: 2.0348e-07
Epoch 1790/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.9032e-07
Epoch 1791/2000
```

```
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.8883e-07
Epoch 1792/2000
3/3 ──────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.0767e-07
Epoch 1793/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 2.9824e-07
Epoch 1794/2000
3/3 ──────────────── 0s 84ms/step - categorical_accuracy: 1.0000 -
loss: 2.5936e-07
Epoch 1795/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 1.9789e-07
Epoch 1796/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.8881e-07
Epoch 1797/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.9916e-07
Epoch 1798/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.5388e-07
Epoch 1799/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 2.8658e-07
Epoch 1800/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.4782e-07
Epoch 1801/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.7762e-07
Epoch 1802/2000
3/3 ──────────────── 0s 91ms/step - categorical_accuracy: 1.0000 -
loss: 1.9555e-07
Epoch 1803/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.9439e-07
Epoch 1804/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.7949e-07
Epoch 1805/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.8228e-07
Epoch 1806/2000
3/3 ──────────────── 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 2.5329e-07
Epoch 1807/2000
3/3 ──────────────── 0s 41ms/step - categorical_accuracy: 1.0000 -
loss: 2.1021e-07
```

```
Epoch 1808/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.0998e-07
Epoch 1809/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 2.2931e-07
Epoch 1810/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.7366e-07
Epoch 1811/2000
3/3 ───────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 1.8879e-07
Epoch 1812/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.1184e-07
Epoch 1813/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.5981e-07
Epoch 1814/2000
3/3 ───────────────── 0s 60ms/step - categorical_accuracy: 1.0000 -
loss: 2.0974e-07
Epoch 1815/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.5676e-07
Epoch 1816/2000
3/3 ───────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 1.6039e-07
Epoch 1817/2000
3/3 ───────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.8565e-07
Epoch 1818/2000
3/3 ───────────────── 0s 59ms/step - categorical_accuracy: 1.0000 -
loss: 2.0113e-07
Epoch 1819/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.5678e-07
Epoch 1820/2000
3/3 ───────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 2.5514e-07
Epoch 1821/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.3721e-07
Epoch 1822/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.9995e-07
Epoch 1823/2000
3/3 ───────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 2.8842e-07
Epoch 1824/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 2.1975e-07
Epoch 1825/2000
3/3 ———————————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.8121e-07
Epoch 1826/2000
3/3 ———————————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.8970e-07
Epoch 1827/2000
3/3 ———————————————— 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 1.5525e-07
Epoch 1828/2000
3/3 ———————————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.5187e-07
Epoch 1829/2000
3/3 ———————————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.7574e-07
Epoch 1830/2000
3/3 ———————————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.9529e-07
Epoch 1831/2000
3/3 ———————————————— 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.7003e-07
Epoch 1832/2000
3/3 ———————————————— 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 1.9995e-07
Epoch 1833/2000
3/3 ———————————————— 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.7911e-07
Epoch 1834/2000
3/3 ———————————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.5245e-07
Epoch 1835/2000
3/3 ———————————————— 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.6677e-07
Epoch 1836/2000
3/3 ———————————————— 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.2369e-07
Epoch 1837/2000
3/3 ———————————————— 0s 41ms/step - categorical_accuracy: 1.0000 -
loss: 1.9133e-07
Epoch 1838/2000
3/3 ———————————————— 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.4395e-07
Epoch 1839/2000
3/3 ———————————————— 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.9179e-07
Epoch 1840/2000
3/3 ———————————————— 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.8899e-07
Epoch 1841/2000
```

```
3/3 ───────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 2.6978e-07
Epoch 1842/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.6140e-07
Epoch 1843/2000
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.7281e-07
Epoch 1844/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.3241e-07
Epoch 1845/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.4767e-07
Epoch 1846/2000
3/3 ───────────────── 0s 87ms/step - categorical_accuracy: 1.0000 -
loss: 2.4743e-07
Epoch 1847/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.5697e-07
Epoch 1848/2000
3/3 ───────────────── 0s 61ms/step - categorical_accuracy: 1.0000 -
loss: 2.6115e-07
Epoch 1849/2000
3/3 ───────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.3904e-07
Epoch 1850/2000

3/3 ───────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.3741e-07
Epoch 1851/2000
3/3 ───────────────── 0s 44ms/step - categorical_accuracy: 1.0000 -
loss: 1.9014e-07
Epoch 1852/2000
3/3 ───────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 2.4742e-07
Epoch 1853/2000
3/3 ───────────────── 0s 34ms/step - categorical_accuracy: 1.0000 -
loss: 2.5883e-07
Epoch 1854/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.0435e-07
Epoch 1855/2000
3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.3753e-07
Epoch 1856/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.3589e-07
Epoch 1857/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 1.7711e-07
Epoch 1858/2000
3/3 ──────────────── 0s 94ms/step - categorical_accuracy: 1.0000 -
loss: 1.5895e-07
Epoch 1859/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 2.5255e-07
Epoch 1860/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.4719e-07
Epoch 1861/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.9550e-07
Epoch 1862/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 1.9643e-07
Epoch 1863/2000
3/3 ──────────────── 0s 68ms/step - categorical_accuracy: 1.0000 -
loss: 1.9527e-07
Epoch 1864/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.2763e-07
Epoch 1865/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.6872e-07
Epoch 1866/2000
3/3 ──────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 1.9013e-07
Epoch 1867/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.1853e-07
Epoch 1868/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 2.4461e-07
Epoch 1869/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.3600e-07
Epoch 1870/2000
3/3 ──────────────── 0s 35ms/step - categorical_accuracy: 1.0000 -
loss: 1.4031e-07
Epoch 1871/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 2.4439e-07
Epoch 1872/2000
3/3 ──────────────── 0s 41ms/step - categorical_accuracy: 1.0000 -
loss: 1.5428e-07
Epoch 1873/2000
3/3 ──────────────── 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 1.6126e-07
```

```
Epoch 1874/2000
3/3 ─────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.0806e-07
Epoch 1875/2000
3/3 ─────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.2552e-07
Epoch 1876/2000
3/3 ─────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 2.3203e-07
Epoch 1877/2000
3/3 ─────────────── 0s 83ms/step - categorical_accuracy: 1.0000 -
loss: 1.8477e-07
Epoch 1878/2000
3/3 ─────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.4857e-07
Epoch 1879/2000
3/3 ─────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 1.6614e-07
Epoch 1880/2000
3/3 ─────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 2.3087e-07
Epoch 1881/2000
3/3 ─────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.4309e-07
Epoch 1882/2000
3/3 ─────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.3715e-07
Epoch 1883/2000
3/3 ─────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 1.6754e-07
Epoch 1884/2000
3/3 ─────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.5135e-07
Epoch 1885/2000
3/3 ─────────────── 0s 46ms/step - categorical_accuracy: 1.0000 -
loss: 1.9152e-07
Epoch 1886/2000
3/3 ─────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.6137e-07
Epoch 1887/2000
3/3 ─────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.5566e-07
Epoch 1888/2000
3/3 ─────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.3156e-07
Epoch 1889/2000
3/3 ─────────────── 0s 69ms/step - categorical_accuracy: 1.0000 -
loss: 1.8057e-07
Epoch 1890/2000
```

```
3/3 ──────────────── 0s 50ms/step - categorical_accuracy: 1.0000 -
loss: 2.3831e-07
Epoch 1891/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 1.9477e-07
Epoch 1892/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.1782e-07
Epoch 1893/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.4285e-07
Epoch 1894/2000
3/3 ──────────────── 0s 52ms/step - categorical_accuracy: 1.0000 -
loss: 1.6357e-07
Epoch 1895/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 2.3086e-07
Epoch 1896/2000
3/3 ──────────────── 0s 36ms/step - categorical_accuracy: 1.0000 -
loss: 1.7731e-07
Epoch 1897/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.8243e-07
Epoch 1898/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 2.3877e-07
Epoch 1899/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.2690e-07
Epoch 1900/2000
3/3 ──────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.5332e-07
Epoch 1901/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.6519e-07
Epoch 1902/2000
3/3 ──────────────── 0s 51ms/step - categorical_accuracy: 1.0000 -
loss: 1.0931e-07
Epoch 1903/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.0058e-07
Epoch 1904/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.2689e-07
Epoch 1905/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 1.3330e-07
Epoch 1906/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 2.3086e-07
Epoch 1907/2000
3/3 ──────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 2.1991e-07
Epoch 1908/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.1583e-07
Epoch 1909/2000

3/3 ──────────────── 0s 35ms/step - categorical_accuracy: 1.0000 -
loss: 2.1408e-07
Epoch 1910/2000
3/3 ──────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 2.3108e-07
Epoch 1911/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.2293e-07
Epoch 1912/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.3480e-07
Epoch 1913/2000
3/3 ──────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.1676e-07
Epoch 1914/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.3818e-07
Epoch 1915/2000
3/3 ──────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 1.3957e-07
Epoch 1916/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.5005e-07
Epoch 1917/2000
3/3 ──────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.3981e-07
Epoch 1918/2000
3/3 ──────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.7985e-07
Epoch 1919/2000
3/3 ──────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 1.5727e-07
Epoch 1920/2000
3/3 ──────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.1978e-07
Epoch 1921/2000
3/3 ──────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 2.1664e-07
Epoch 1922/2000
3/3 ──────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.1920e-07
```

```
Epoch 1923/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 44ms/step - categorical_accuracy: 1.0000 -
loss: 1.5098e-07
Epoch 1924/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 1.6983e-07
Epoch 1925/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 1.3817e-07
Epoch 1926/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.4119e-07
Epoch 1927/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.0917e-07
Epoch 1928/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 59ms/step - categorical_accuracy: 1.0000 -
loss: 2.0033e-07
Epoch 1929/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 2.0429e-07
Epoch 1930/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.1035e-07
Epoch 1931/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 39ms/step - categorical_accuracy: 1.0000 -
loss: 2.1384e-07
Epoch 1932/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 1.9731e-07
Epoch 1933/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.2327e-07
Epoch 1934/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 41ms/step - categorical_accuracy: 1.0000 -
loss: 1.4561e-07
Epoch 1935/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 42ms/step - categorical_accuracy: 1.0000 -
loss: 1.3444e-07
Epoch 1936/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 91ms/step - categorical_accuracy: 1.0000 -
loss: 2.2198e-07
Epoch 1937/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 64ms/step - categorical_accuracy: 1.0000 -
loss: 1.4981e-07
Epoch 1938/2000
3/3 ━━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 2.0405e-07
Epoch 1939/2000
```

```
3/3 ─────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.2931e-07
Epoch 1940/2000
3/3 ─────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.6773e-07
Epoch 1941/2000
3/3 ─────────────── 0s 61ms/step - categorical_accuracy: 1.0000 -
loss: 1.9125e-07
Epoch 1942/2000
3/3 ─────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.5912e-07
Epoch 1943/2000
3/3 ─────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.1860e-07
Epoch 1944/2000
3/3 ─────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.9218e-07
Epoch 1945/2000
3/3 ─────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.9567e-07
Epoch 1946/2000
3/3 ─────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.5981e-07
Epoch 1947/2000
3/3 ─────────────── 0s 38ms/step - categorical_accuracy: 1.0000 -
loss: 1.3630e-07
Epoch 1948/2000
3/3 ─────────────── 0s 35ms/step - categorical_accuracy: 1.0000 -
loss: 1.5468e-07
Epoch 1949/2000
3/3 ─────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.6423e-07
Epoch 1950/2000
3/3 ─────────────── 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.2139e-07
Epoch 1951/2000
3/3 ─────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 2.0427e-07
Epoch 1952/2000
3/3 ─────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.3163e-07
Epoch 1953/2000
3/3 ─────────────── 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 1.3839e-07
Epoch 1954/2000
3/3 ─────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.0905e-07
Epoch 1955/2000
3/3 ─────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
```

```
loss: 1.4700e-07
Epoch 1956/2000
3/3 ───────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.5002e-07
Epoch 1957/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 2.0590e-07
Epoch 1958/2000
3/3 ───────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.4094e-07
Epoch 1959/2000
3/3 ───────────────── 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.4443e-07
Epoch 1960/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.1521e-07
Epoch 1961/2000
3/3 ───────────────── 0s 37ms/step - categorical_accuracy: 1.0000 -
loss: 1.9402e-07
Epoch 1962/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.3512e-07
Epoch 1963/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.9961e-07
Epoch 1964/2000
3/3 ───────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 1.1044e-07
Epoch 1965/2000
3/3 ───────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.5584e-07
Epoch 1966/2000
3/3 ───────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.4815e-07
Epoch 1967/2000
3/3 ───────────────── 0s 36ms/step - categorical_accuracy: 1.0000 -
loss: 1.1486e-07
Epoch 1968/2000

3/3 ───────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.8797e-07
Epoch 1969/2000
3/3 ───────────────── 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 2.0101e-07
Epoch 1970/2000
3/3 ───────────────── 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.7726e-07
Epoch 1971/2000
3/3 ───────────────── 0s 35ms/step - categorical_accuracy: 1.0000 -
loss: 1.9495e-07
```

```
Epoch 1972/2000
3/3 ━━━━━━━━━━━━━━━ 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.3720e-07
Epoch 1973/2000
3/3 ━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 1.4955e-07
Epoch 1974/2000
3/3 ━━━━━━━━━━━━━━━ 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.3860e-07
Epoch 1975/2000
3/3 ━━━━━━━━━━━━━━━ 0s 76ms/step - categorical_accuracy: 1.0000 -
loss: 1.8959e-07
Epoch 1976/2000
3/3 ━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 1.5653e-07
Epoch 1977/2000
3/3 ━━━━━━━━━━━━━━━ 0s 81ms/step - categorical_accuracy: 1.0000 -
loss: 1.1648e-07
Epoch 1978/2000
3/3 ━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.3721e-07
Epoch 1979/2000
3/3 ━━━━━━━━━━━━━━━ 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.8446e-07
Epoch 1980/2000
3/3 ━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.3487e-07
Epoch 1981/2000
3/3 ━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.7934e-07
Epoch 1982/2000
3/3 ━━━━━━━━━━━━━━━ 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 2.0123e-07
Epoch 1983/2000
3/3 ━━━━━━━━━━━━━━━ 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.9680e-07
Epoch 1984/2000
3/3 ━━━━━━━━━━━━━━━ 0s 80ms/step - categorical_accuracy: 1.0000 -
loss: 1.1415e-07
Epoch 1985/2000
3/3 ━━━━━━━━━━━━━━━ 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 1.9866e-07
Epoch 1986/2000
3/3 ━━━━━━━━━━━━━━━ 0s 75ms/step - categorical_accuracy: 1.0000 -
loss: 1.8004e-07
Epoch 1987/2000
3/3 ━━━━━━━━━━━━━━━ 0s 74ms/step - categorical_accuracy: 1.0000 -
loss: 1.1787e-07
Epoch 1988/2000
```

```
3/3 ──────────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.7607e-07
Epoch 1989/2000
3/3 ──────────────────── 0s 82ms/step - categorical_accuracy: 1.0000 -
loss: 1.9051e-07
Epoch 1990/2000
3/3 ──────────────────── 0s 77ms/step - categorical_accuracy: 1.0000 -
loss: 1.3860e-07
Epoch 1991/2000
3/3 ──────────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.9633e-07
Epoch 1992/2000
3/3 ──────────────────── 0s 34ms/step - categorical_accuracy: 1.0000 -
loss: 1.9749e-07
Epoch 1993/2000
3/3 ──────────────────── 0s 71ms/step - categorical_accuracy: 1.0000 -
loss: 1.8911e-07
Epoch 1994/2000
3/3 ──────────────────── 0s 42ms/step - categorical_accuracy: 1.0000 -
loss: 1.0297e-07
Epoch 1995/2000
3/3 ──────────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.1670e-07
Epoch 1996/2000
3/3 ──────────────────── 0s 70ms/step - categorical_accuracy: 1.0000 -
loss: 1.2927e-07
Epoch 1997/2000
3/3 ──────────────────── 0s 73ms/step - categorical_accuracy: 1.0000 -
loss: 1.3812e-07
Epoch 1998/2000
3/3 ──────────────────── 0s 79ms/step - categorical_accuracy: 1.0000 -
loss: 1.7281e-07
Epoch 1999/2000
3/3 ──────────────────── 0s 78ms/step - categorical_accuracy: 1.0000 -
loss: 1.7817e-07
Epoch 2000/2000
3/3 ──────────────────── 0s 72ms/step - categorical_accuracy: 1.0000 -
loss: 1.3440e-07

<keras.src.callbacks.history.History at 0x13e5157c1d0>

model.summary()

Model: "sequential"
```

Layer (type)	Output Shape	Param #

```
┌───────────────┐
│ lstm (LSTM)                      │ (None, 30, 64)        │
442,112 │
├───────────────┼───────────────────┼───────────────┤
│ lstm_1 (LSTM)                    │ (None, 30, 128)       │
98,816 │
├───────────────┼───────────────────┼───────────────┤
│ lstm_2 (LSTM)                    │ (None, 64)            │
49,408 │
├───────────────┼───────────────────┼───────────────┤
│ dense (Dense)                    │ (None, 64)            │
4,160 │
├───────────────┼───────────────────┼───────────────┤
│ dense_1 (Dense)                  │ (None, 32)            │
2,080 │
├───────────────┼───────────────────┼───────────────┤
│ dense_2 (Dense)                  │ (None, 3)             │
99 │
└───────────────┴───────────────────┴───────────────┘

 Total params: 1,790,027 (6.83 MB)

 Trainable params: 596,675 (2.28 MB)

 Non-trainable params: 0 (0.00 B)

 Optimizer params: 1,193,352 (4.55 MB)
```

8. Make Predictions

```
res = model.predict(X_test)

1/1 ──────────────── 0s 31ms/step

actions[np.argmax(res[4])]

'hello'

actions[np.argmax(y_test[4])]

'hello'
```

9. Save Weights

```
model.save('action.h5')

WARNING:absl:You are saving your model as an HDF5 file via
`model.save()` or `keras.saving.save_model(model)`. This file format
is considered legacy. We recommend using instead the native Keras
format, e.g. `model.save('my_model.keras')` or
`keras.saving.save_model(model, 'my_model.keras')`.

model.load_weights('action.h5')
```

10. Evaluation using Confusion Matrix and Accuracy

```
from sklearn.metrics import multilabel_confusion_matrix,
accuracy_score

yhat = model.predict(X_test)

1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 32ms/step

ytrue = np.argmax(y_test, axis=1).tolist()
yhat = np.argmax(yhat, axis=1).tolist()

multilabel_confusion_matrix(ytrue, yhat)

array([[[3, 0],
        [0, 2]],

       [[3, 0],
        [0, 2]],

       [[4, 0],
        [0, 1]]], dtype=int64)

accuracy_score(ytrue, yhat)

1.0
```

11. Test in Real Time

```
from scipy import stats

def prob_viz(res, actions, input_frame, colors):
    output_frame = input_frame.copy()
    for num, prob in enumerate(res):
```
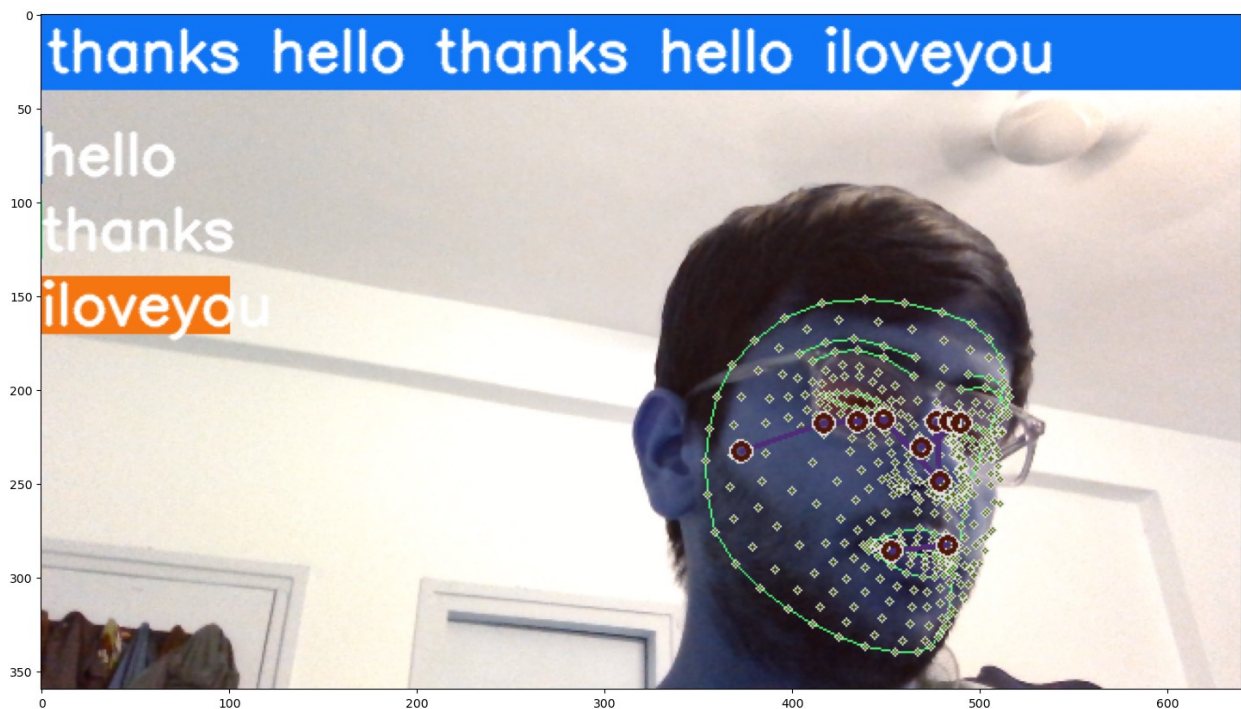
```
        cv2.rectangle(output_frame, (0, 60 + num * 40), (int(prob *
100), 90 + num * 40), colors[num], -1)
        cv2.putText(output_frame, actions[num], (0, 85 + num * 40),
cv2.FONT_HERSHEY_SIMPLEX, 1, (255, 255, 255), 2, cv2.LINE_AA)

    return cv2.cvtColor(output_frame, cv2.COLOR_BGR2RGB)

plt.figure(figsize=(18,18))
plt.imshow(prob_viz(res, actions, image, colors))

<matplotlib.image.AxesImage at 0x13ea1e3be90>
```



```
# 1. New detection variables
sequence = []
sentence = []
predictions = []
threshold = 0.5

cap = cv2.VideoCapture(0)
# Set mediapipe model
with mp_holistic.Holistic(min_detection_confidence=0.5,
min_tracking_confidence=0.5) as holistic:
    while cap.isOpened():

        # Read feed
        ret, frame = cap.read()

        # Make detections
```

```
        image, results = mediapipe_detection(frame, holistic)
        print(results)

        # Draw landmarks
        draw_styled_landmarks(image, results)

        # 2. Prediction logic
        keypoints = extract_keypoints(results)
        sequence.append(keypoints)
        sequence = sequence[-30:]

        if len(sequence) == 30:
            res = model.predict(np.expand_dims(sequence, axis=0))[0]
            print(actions[np.argmax(res)])
            predictions.append(np.argmax(res))


        #3. Viz logic
            if np.unique(predictions[-10:])[0]==np.argmax(res):
                if res[np.argmax(res)] > threshold:

                    if len(sentence) > 0:
                        if actions[np.argmax(res)] != sentence[-1]:
                            sentence.append(actions[np.argmax(res)])
                    else:
                        sentence.append(actions[np.argmax(res)])

            if len(sentence) > 5:
                sentence = sentence[-5:]

            # Viz probabilities
            image = prob_viz(res, actions, image, colors)

        cv2.rectangle(image, (0,0), (640, 40), (245, 117, 16), -1)
        cv2.putText(image, ' '.join(sentence), (3,30),
                        cv2.FONT_HERSHEY_SIMPLEX, 1, (255, 255, 255),
2, cv2.LINE_AA)

        # Show to screen
        cv2.imshow('OpenCV Feed', image)

        # Break gracefully
        if cv2.waitKey(10) & 0xFF == ord('q'):
            break
    cap.release()
    cv2.destroyAllWindows()

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