```
from google.colab import files


uploaded = files.upload()
```

```
Choose Files No file chosen  Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.
Saving archive.zip to archive.zip
```

```
import zipfile
import os


with zipfile.ZipFile("archive.zip", 'r') as zip_ref:
    zip_ref.extractall("archive")


os.listdir("archive")
```

```
['name of the animals.txt', 'animals']
```

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator


train_path = "animals_data/animals"
```

+ Code + Text

```
datagen = ImageDataGenerator(
    rescale=1./255,
    validation_split=0.2
)



train_datagen = ImageDataGenerator(
    rescale=1./255,
    rotation_range=20,
    zoom_range=0.2,
    width_shift_range=0.2,
    height_shift_range=0.2,
    horizontal_flip=True,
    validation_split=0.2  # Split into train and validation sets
)


os.makedirs("'name of the animals.txt', 'animals'", exist_ok=True)


os.listdir("'name of the animals.txt', 'animals'")
```

```
[]
```

```
train_path = "'name of the animals.txt', 'animals'"



os.makedirs(" Images('name of the animals.txt', 'animals')", exist_ok=True)


train_generator = datagen.flow_from_directory(
    train_path,
    target_size=(128, 128),
    batch_size=32,
    class_mode='categorical',
    subset='training'
)
```

```
Found 0 images belonging to 0 classes.
```

```
import os
import numpy as np
import tensorflow as tf
from tensorflow.keras import layers, models
from tensorflow.keras.utils import to_categorical
from tensorflow.keras.applications import VGG16
```

```
from tensorflow.keras.preprocessing import image
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.optimizers import Adam
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.metrics import classification_report
import matplotlib.pyplot as plt
import pandas as pd
from PIL import Image
import random
from tensorflow.keras.callbacks import EarlyStopping
import warnings
warnings.filterwarnings("ignore", category=UserWarning, module='keras')
```

```
import kagglehub

# Download latest version
test_path = kagglehub.dataset_download("naykrit/animal-classification")
train_path = path = kagglehub.dataset_download("iamsouravbanerjee/animal-image-dataset-90-different-animals")

print("Path to test files:", test_path)
print("Path to train files:", train_path)
```

```
Downloading from https://www.kaggle.com/api/v1/datasets/download/naykrit/animal-classification?dataset_version_number=1...
100%|██████████| 7.72M/7.72M [00:01<00:00, 7.40MB/s]Extracting files...

Path to test files: /root/.cache/kagglehub/datasets/naykrit/animal-classification/versions/1
Path to train files: /kaggle/input/animal-image-dataset-90-different-animals
```

```
def load_images_from_directory(directory, sel, image_size=(150, 150)):
    images = []
    labels = []
    class_names = os.listdir(directory)

    for class_name in sel:
        class_path = os.path.join(directory, class_name)

        if os.path.isdir(class_path):
            # Get all image files in the directory
            for img_name in os.listdir(class_path):
                img_path = os.path.join(class_path, img_name)
                if img_path.lower().endswith(('.png', '.jpg', '.jpeg')):
                    img = image.load_img(img_path, target_size=image_size)
                    img_array = image.img_to_array(img) / 255.0  # Normalize the image
                    images.append(img_array)
                    labels.append(sel.index(class_name))  # Index of class_name as label

    images = np.array(images)
    labels = np.array(labels)
    return images, labels
```

```
train_dir = train_path + '/animals/animals'
test_dir = test_path + '/test_set'
class_names = ["dog", "cat", "elephant", "lion", "tiger"]
num_classes = len(class_names)
```

```
print("Loading training data...")
train_images, train_labels = load_images_from_directory(train_dir, sel = class_names)
print("Loading test data...")
test_images, test_labels = load_images_from_directory(test_dir, sel = class_names)
train_images, e_images, train_labels, e_labels = train_test_split(train_images, train_labels, stratify=train_labels, test_size=0.2, random_s
```

```
Loading training data...
Loading test data...
```

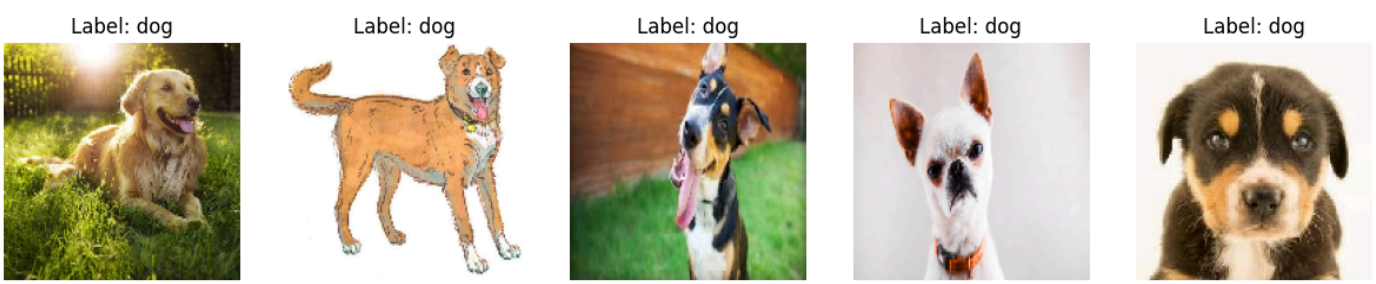
```
for class_name in class_names:
    class_path = os.path.join(train_dir, class_name)
    if os.path.isdir(class_path):
        num_images = len([f for f in os.listdir(class_path) if f.lower().endswith(('.png', '.jpg', '.jpeg'))])
        print(f"Class {class_name}: {num_images} images")
```

```
Class dog: 60 images
Class cat: 60 images
Class elephant: 60 images
Class lion: 60 images
```

```
Class tiger: 60 images
```

```
def show_example_images(images, labels, class_names, target_class, num_images=5):
    class_index = class_names.index(target_class)  # Get the index for the target class
    class_images = [images[i] for i in range(len(images)) if labels[i] == class_index]

    # Randomly select a number of images from the filtered class
    selected_images = random.sample(class_images, min(num_images, len(class_images)))

    # Plot the selected images
    plt.figure(figsize=(15, 10))
    for i, img in enumerate(selected_images):
        plt.subplot(1, num_images, i+1)

        # Reverse normalization
        img = img * 255.0  # Reverse normalization to show the actual image
        img = img.astype(np.uint8)

        # Plot each image
        plt.imshow(img)
        plt.title(f"Label: {target_class}")
        plt.axis('off')

    plt.show()
```

```
show_example_images(train_images, train_labels, class_names, target_class="dog", num_images=5)
```




```
show_example_images(train_images, train_labels, class_names, target_class="cat", num_images=5)
```


```
show_example_images(train_images, train_labels, class_names, target_class="elephant", num_images=5)
```


```
cnn_model = models.Sequential([
    layers.Conv2D(32, (3,3), activation='relu', input_shape=(150,150,3)),
```

```
    layers.MaxPooling2D(2,2),
    layers.Conv2D(64, (3,3), activation='relu'),
    layers.MaxPooling2D(2,2),
    layers.Conv2D(128, (3,3), activation='relu'),
    layers.MaxPooling2D(2,2),
    layers.Flatten(),
    layers.Dense(128, activation='relu'),
    layers.Dropout(0.5),
    layers.Dense(num_classes, activation='softmax')
])
cnn_model.compile(optimizer='adam', loss='sparse_categorical_crossentropy', metrics=['accuracy'])


cnn_history = cnn_model.fit(
    train_images, train_labels,
    validation_data=(e_images, e_labels),
    epochs=30,
    callbacks=[tf.keras.callbacks.EarlyStopping(monitor='val_loss', patience=5, restore_best_weights=True)],
)
```

```
Epoch 1/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 12s 766ms/step - accuracy: 0.2147 - loss: 1.7576 - val_accuracy: 0.2833 - val_loss: 1.5956
Epoch 2/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 35ms/step - accuracy: 0.2340 - loss: 1.5910 - val_accuracy: 0.4333 - val_loss: 1.5543
Epoch 3/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 30ms/step - accuracy: 0.3281 - loss: 1.5383 - val_accuracy: 0.5333 - val_loss: 1.4077
Epoch 4/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 31ms/step - accuracy: 0.4097 - loss: 1.3966 - val_accuracy: 0.4833 - val_loss: 1.3874
Epoch 5/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 31ms/step - accuracy: 0.4553 - loss: 1.3631 - val_accuracy: 0.4667 - val_loss: 1.2310
Epoch 6/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 31ms/step - accuracy: 0.4814 - loss: 1.1951 - val_accuracy: 0.6167 - val_loss: 1.1053
Epoch 7/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 33ms/step - accuracy: 0.6108 - loss: 1.0029 - val_accuracy: 0.6167 - val_loss: 1.0617
Epoch 8/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 30ms/step - accuracy: 0.6405 - loss: 0.9672 - val_accuracy: 0.6167 - val_loss: 1.0717
Epoch 9/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 31ms/step - accuracy: 0.6860 - loss: 0.7899 - val_accuracy: 0.6333 - val_loss: 1.0506
Epoch 10/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 31ms/step - accuracy: 0.7379 - loss: 0.7783 - val_accuracy: 0.6833 - val_loss: 0.9511
Epoch 11/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 34ms/step - accuracy: 0.7856 - loss: 0.5935 - val_accuracy: 0.7000 - val_loss: 0.9879
Epoch 12/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 31ms/step - accuracy: 0.7910 - loss: 0.5254 - val_accuracy: 0.7333 - val_loss: 0.8736
Epoch 13/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 29ms/step - accuracy: 0.9091 - loss: 0.3013 - val_accuracy: 0.7667 - val_loss: 0.8742
Epoch 14/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 34ms/step - accuracy: 0.8999 - loss: 0.2379 - val_accuracy: 0.7000 - val_loss: 0.9761
Epoch 15/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 30ms/step - accuracy: 0.8675 - loss: 0.3656 - val_accuracy: 0.7000 - val_loss: 1.0584
Epoch 16/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 34ms/step - accuracy: 0.9520 - loss: 0.1949 - val_accuracy: 0.7500 - val_loss: 0.8830
Epoch 17/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 0s 29ms/step - accuracy: 0.9279 - loss: 0.2060 - val_accuracy: 0.7833 - val_loss: 0.9344
```

```
test_loss, test_acc = cnn_model.evaluate(test_images, test_labels)
print(f"Test Accuracy (CNN): {test_acc}")

test_predictions = np.argmax(cnn_model.predict(test_images), axis=1)
print(classification_report(test_labels, test_predictions, target_names=class_names))
(test_images, test_labels, test_predictions, class_names)
```

```
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 13ms/step - accuracy: 0.5092 - loss: 1.2680
Test Accuracy (CNN): 0.5699999928474426
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step
              precision    recall  f1-score   support

         dog       0.47      0.35      0.40        20
         cat       0.26      0.30      0.28        20
    elephant       0.58      0.90      0.71        20
        lion       0.73      0.40      0.52        20
       tiger       0.90      0.90      0.90        20

    accuracy                           0.57       100
   macro avg       0.59      0.57      0.56       100
weighted avg       0.59      0.57      0.56       100

(array([[[[0.85882354, 0.88235295, 0.84313726],
          [0.88235295, 0.9019608 , 0.8862745 ],
          [0.8901961 , 0.90588236, 0.9019608 ],
```

```
                ...,
                [0.5921569 , 0.6       , 0.5137255 ],
                [0.5921569 , 0.6       , 0.5137255 ],
                [0.60784316, 0.6       , 0.5019608 ]],

               [[0.8666667 , 0.8901961 , 0.8509804 ],
                [0.8862745 , 0.90588236, 0.8901961 ],
                [0.90588236, 0.92156863, 0.91764706],
                ...,
                [0.6431373 , 0.6509804 , 0.5686275 ],
                [0.67058825, 0.6784314 , 0.59607846],
                [0.7019608 , 0.69803923, 0.6156863 ]],

               [[0.8745098 , 0.8980392 , 0.85882354],
                [0.89411765, 0.9137255 , 0.8980392 ],
                [0.9137255 , 0.92941177, 0.9254902 ],
                ...,
                [0.78431374, 0.7882353 , 0.7176471 ],
                [0.8039216 , 0.80784315, 0.7372549 ],
                [0.8235294 , 0.827451  , 0.7647059 ]],

               ...,

               [[0.87058824, 0.8352941 , 0.7058824 ],
                [0.8980392 , 0.8627451 , 0.73333335],
                [0.8901961 , 0.85490197, 0.7254902 ],
                ...,
                [0.92156863, 0.8862745 , 0.77254903],
                [0.92941177, 0.89411765, 0.78039217],
                [0.9254902 , 0.8901961 , 0.7764706 ]],

               [[0.8784314 , 0.84313726, 0.7137255 ],
                [0.8784314 , 0.84313726, 0.7137255 ],
                [0.8784314 , 0.84313726, 0.7137255 ],
                ...,
                [0.9254902 , 0.8901961 , 0.7764706 ],
                [0.9254902 , 0.8901961 , 0.7764706 ],
                [0.91764706, 0.88235295, 0.76862746]],

               [[0.87058824, 0.8352941 , 0.7058824 ],
```

```
datagen = ImageDataGenerator(
    rotation_range=20,
    width_shift_range=0.2,
    height_shift_range=0.2,
    shear_range=0.2,
    zoom_range=0.2,
    horizontal_flip=True,
    fill_mode='nearest'
)


cnn_aug_model = models.Sequential([
    layers.Conv2D(32, (3,3), activation='relu', input_shape=(150,150,3)),
    layers.MaxPooling2D(2,2),
    layers.Conv2D(64, (3,3), activation='relu'),
    layers.MaxPooling2D(2,2),
    layers.Conv2D(128, (3,3), activation='relu'),
    layers.MaxPooling2D(2,2),
    layers.Flatten(),
    layers.Dense(128, activation='relu'),
    layers.Dropout(0.5),
    layers.Dense(num_classes, activation='softmax')
])


cnn_aug_model.compile(optimizer='adam', loss='sparse_categorical_crossentropy', metrics=['accuracy'])


cnn_aug_history = cnn_aug_model.fit(
    datagen.flow(train_images, train_labels, batch_size=32),
    validation_data=(e_images, e_labels),
    epochs=30,
    callbacks=[tf.keras.callbacks.EarlyStopping(monitor='val_loss', patience=5, restore_best_weights=True)]
)
```

```
Epoch 1/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 7s 559ms/step - accuracy: 0.1928 - loss: 2.3104 - val_accuracy: 0.2167 - val_loss: 1.6147
Epoch 2/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 155ms/step - accuracy: 0.1414 - loss: 1.6269 - val_accuracy: 0.2333 - val_loss: 1.6055
Epoch 3/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 153ms/step - accuracy: 0.2573 - loss: 1.6041 - val_accuracy: 0.2000 - val_loss: 1.5987
```

```
Epoch 4/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 150ms/step - accuracy: 0.2566 - loss: 1.6045 - val_accuracy: 0.2000 - val_loss: 1.5854
Epoch 5/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 152ms/step - accuracy: 0.2332 - loss: 1.5872 - val_accuracy: 0.3333 - val_loss: 1.5670
Epoch 6/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 154ms/step - accuracy: 0.2298 - loss: 1.5669 - val_accuracy: 0.3167 - val_loss: 1.4920
Epoch 7/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 156ms/step - accuracy: 0.3026 - loss: 1.5254 - val_accuracy: 0.3167 - val_loss: 1.4811
Epoch 8/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 2s 191ms/step - accuracy: 0.3535 - loss: 1.4868 - val_accuracy: 0.4167 - val_loss: 1.5013
Epoch 9/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 2s 151ms/step - accuracy: 0.2752 - loss: 1.5653 - val_accuracy: 0.2667 - val_loss: 1.5105
Epoch 10/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 150ms/step - accuracy: 0.3402 - loss: 1.5030 - val_accuracy: 0.3167 - val_loss: 1.4142
Epoch 11/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 156ms/step - accuracy: 0.4058 - loss: 1.4397 - val_accuracy: 0.4000 - val_loss: 1.3942
Epoch 12/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 153ms/step - accuracy: 0.4681 - loss: 1.3453 - val_accuracy: 0.5167 - val_loss: 1.2511
Epoch 13/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 152ms/step - accuracy: 0.4484 - loss: 1.2907 - val_accuracy: 0.6000 - val_loss: 1.2235
Epoch 14/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 156ms/step - accuracy: 0.4146 - loss: 1.3388 - val_accuracy: 0.5167 - val_loss: 1.2330
Epoch 15/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 150ms/step - accuracy: 0.5311 - loss: 1.2541 - val_accuracy: 0.4333 - val_loss: 1.3997
Epoch 16/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 161ms/step - accuracy: 0.4032 - loss: 1.3385 - val_accuracy: 0.4167 - val_loss: 1.2803
Epoch 17/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 2s 151ms/step - accuracy: 0.4623 - loss: 1.2048 - val_accuracy: 0.5500 - val_loss: 1.1735
Epoch 18/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 154ms/step - accuracy: 0.5314 - loss: 1.1694 - val_accuracy: 0.6500 - val_loss: 1.0299
Epoch 19/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 152ms/step - accuracy: 0.5255 - loss: 1.1842 - val_accuracy: 0.5167 - val_loss: 1.1317
Epoch 20/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 149ms/step - accuracy: 0.5056 - loss: 1.1140 - val_accuracy: 0.4167 - val_loss: 1.6472
Epoch 21/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 152ms/step - accuracy: 0.5478 - loss: 1.1320 - val_accuracy: 0.5000 - val_loss: 1.2485
Epoch 22/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 149ms/step - accuracy: 0.6005 - loss: 1.0655 - val_accuracy: 0.6667 - val_loss: 0.9770
Epoch 23/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 151ms/step - accuracy: 0.5916 - loss: 0.9975 - val_accuracy: 0.5833 - val_loss: 1.0650
Epoch 24/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 147ms/step - accuracy: 0.5546 - loss: 1.0632 - val_accuracy: 0.6333 - val_loss: 1.0143
Epoch 25/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 2s 248ms/step - accuracy: 0.5438 - loss: 1.0139 - val_accuracy: 0.6167 - val_loss: 1.0099
Epoch 26/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 2s 147ms/step - accuracy: 0.6408 - loss: 0.8986 - val_accuracy: 0.5667 - val_loss: 1.2421
Epoch 27/30
8/8 ━━━━━━━━━━━━━━━━━━━━ 1s 156ms/step - accuracy: 0.5844 - loss: 1.0689 - val_accuracy: 0.6333 - val_loss: 0.9835
```

```
test_loss_aug, test_acc_aug = cnn_aug_model.evaluate(test_images, test_labels)
print(f"Test Accuracy (CNN with Augmentation): {test_acc_aug}")
```

```
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 89ms/step - accuracy: 0.5287 - loss: 1.2679
Test Accuracy (CNN with Augmentation): 0.5899999737739563
```

```
cnn_aug_predictions = np.argmax(cnn_aug_model.predict(test_images), axis=1)
print(classification_report(test_labels, cnn_aug_predictions, target_names=class_names))
```

```
(test_images, test_labels, cnn_aug_predictions, class_names)
(cnn_aug_history)
```

```
4/4 ━━━━━━━━━━━━━━━━━━━━ 0s 12ms/step
              precision    recall  f1-score   support

         dog       0.50      0.45      0.47        20
         cat       0.31      0.25      0.28        20
    elephant       0.53      0.90      0.67        20
        lion       0.89      0.40      0.55        20
       tiger       0.83      0.95      0.88        20

    accuracy                           0.59       100
   macro avg       0.61      0.59      0.57       100
weighted avg       0.61      0.59      0.57       100

<keras.src.callbacks.history.History at 0x79aa10558d50>
```