In [49]:

```
! unzip ~/pokemon.zip -d ~/
```

```
Archive:  /home/jovyan/pokemon.zip
  inflating: /home/jovyan/pokemon/.DS_Store
   creating: /home/jovyan/pokemon/pika_pika/
  inflating: /home/jovyan/pokemon/pika_pika/.DS_Store
   creating: /home/jovyan/pokemon/pika_pika/single_prediction/
  inflating: /home/jovyan/pokemon/pika_pika/single_prediction/check_1.jpg
  inflating: /home/jovyan/pokemon/pika_pika/single_prediction/check_2.png
  inflating: /home/jovyan/pokemon/pika_pika/single_prediction/check_3.jpg
  inflating: /home/jovyan/pokemon/pika_pika/single_prediction/check_4.jpeg
   creating: /home/jovyan/pokemon/pika_pika/test_set/
  inflating: /home/jovyan/pokemon/pika_pika/test_set/.DS_Store
   creating: /home/jovyan/pokemon/pika_pika/test_set/pokemon1/
  inflating: /home/jovyan/pokemon/pika_pika/test_set/pokemon1/rachu_29.jpeg
  inflating: /home/jovyan/pokemon/pika_pika/test_set/pokemon1/rachu_30.jpeg
  inflating: /home/jovyan/pokemon/pika_pika/test_set/pokemon1/rachu_31.jpeg
  inflating: /home/jovyan/pokemon/pika_pika/test_set/pokemon1/rachu_32.jpeg
  inflating: /home/jovyan/pokemon/pika_pika/test_set/pokemon1/rachu_33.jpeg
   creating: /home/jovyan/pokemon/pika_pika/test_set/pokemon2/
  inflating: /home/jovyan/pokemon/pika_pika/test_set/pokemon2/.DS_Store
  inflating: /home/jovyan/pokemon/pika_pika/test_set/pokemon2/Pikachu.png
  inflating: /home/jovyan/pokemon/pika_pika/test_set/pokemon2/Pikachu_12.png
  inflating: /home/jovyan/pokemon/pika_pika/test_set/pokemon2/Pikachu_28.png
 extracting: /home/jovyan/pokemon/pika_pika/test_set/pokemon2/Pikachu_30.png
  inflating: /home/jovyan/pokemon/pika_pika/test_set/pokemon2/pikachu-lets-go.jpg
   creating: /home/jovyan/pokemon/pika_pika/training_set/
  inflating: /home/jovyan/pokemon/pika_pika/training_set/.DS_Store
   creating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/.DS_Store
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_1.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_10.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_11.jpeg
 extracting: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_12.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_13.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_14.jpeg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_15.jpg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_16.jpg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_17.jpg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_2.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_20.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_22.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_23.jpg
 extracting: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_24.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_25.jpg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_26.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_28.jpeg
 extracting: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_3.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_4.jpg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_5.jpeg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_6.jpg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_7.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_8.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon1/rachu_9.png
   creating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/.DS_Store
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/60.jpeg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_1.jpeg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_10.jpg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_11.jpg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_13.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_14.png
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_15.jpeg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_16.jpeg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_17.jpeg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_18.jpeg
  inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_19.jpeg
```

```
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_2.jpg
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_20.png
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_22.jpg
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_23.jpg
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_24.jpeg
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_25.png
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_26.jpg
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_27.jpeg
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_3.png
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_4.png
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_5.jpg
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_6.jpg
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_7.jpeg
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_8.png
inflating: /home/jovyan/pokemon/pika_pika/training_set/pokemon2/Pikachu_9.jpg
```

In [11]:

```
pip install tensorflow
```

```
Collecting tensorflow
  Downloading tensorflow-2.6.0-cp36-cp36m-manylinux2010_x86_64.whl (458.3 MB)
     |████████████████████████████████| 458.3 MB 28 kB/s s eta 0:00:01   |
| 942 kB 4.5 MB/s eta 0:01:43         |                              | 24.3 MB 4.5 MB/s et
a 0:01:38         |█|                        | 26.3 MB 4.5 MB/s eta 0:01:37
| 27.4 MB 4.5 MB/s eta 0:01:37        |█|                            | 30.5 MB 4.5 MB/s e
ta 0:01:3638.7 MB 4.8 MB/s eta 0:01:28        |████████|            | 116.9 MB 3
.6 MB/s eta 0:01:36              | 143.6 MB 3.3 MB/s eta 0:01:34        |██████████|
| 172.8 MB 3.3 MB/s eta 0:01:27██          | 207.0 MB 2.6 MB/s eta 0:01:35███
| 216.1 MB 2.6 MB/s eta 0:01:32      |███████████████████|          | 289.9 MB 2.5 MB/s
eta 0:01:08❓███████|     | 296.5 MB 2.5 MB/s eta 0:01:05❓❓██████████████████████
| 303.0 MB 4.5 MB/s eta 0:00:35❓███████████████████████|       | 314.5 MB 4.5 MB/s eta 0
:00:33      |███████████████████████|            | 326.0 MB 4.5 MB/s eta 0:00:30B/s eta 0:00:2
9████           | 340.9 MB 3.8 MB/s eta 0:00:31MB/s eta 0:00:02MB/s eta 0:00:02❓❓█████████
████████████|         | 409.0 MB 3.6 MB/s eta 0:00:14████████|      | 416.4 MB 3.6 MB/s eta 0:00:12
|██████████████████████████|        | 421.9 MB 3.6 MB/s eta 0:00:11          |█████████████████████
████████████|       | 425.4 MB 3.6 MB/s eta 0:00:10         |█████████████████████████████| | 428.6
MB 15.5 MB/s eta 0:00:02         |███████████████████████████|          | 429.7 MB 15.5 MB/s eta 0:
00:02❓██| | 442.5 MB 15.5 MB/s eta 0:00:02❓❓          | 453.0 MB 15.5 MB/s eta 0:00:01
Collecting h5py~=3.1.0
  Downloading h5py-3.1.0-cp36-cp36m-manylinux1_x86_64.whl (4.0 MB)
     |████████████████████████████████| 4.0 MB 9.1 MB/s eta 0:00:01
Collecting keras-preprocessing~=1.1.2
  Downloading Keras_Preprocessing-1.1.2-py2.py3-none-any.whl (42 kB)
     |████████████████████████████████| 42 kB 1.2 MB/s  eta 0:00:01
Requirement already satisfied: six~=1.15.0 in /srv/conda/envs/notebook/lib/python3.6/site
-packages (from tensorflow) (1.15.0)
Requirement already satisfied: typing-extensions~=3.7.4 in /srv/conda/envs/notebook/lib/p
ython3.6/site-packages (from tensorflow) (3.7.4.3)
Requirement already satisfied: numpy~=1.19.2 in /srv/conda/envs/notebook/lib/python3.6/si
te-packages (from tensorflow) (1.19.5)
Collecting protobuf>=3.9.2
  Downloading protobuf-3.17.3-cp36-cp36m-manylinux_2_5_x86_64.manylinux1_x86_64.whl (1.0
MB)
     |████████████████████████████████| 1.0 MB 49.5 MB/s eta 0:00:01
Collecting tensorboard~=2.6
  Downloading tensorboard-2.6.0-py3-none-any.whl (5.6 MB)
     |████████████████████████████████| 5.6 MB 39.3 MB/s eta 0:00:01
Collecting termcolor~=1.1.0
  Downloading termcolor-1.1.0.tar.gz (3.9 kB)
Requirement already satisfied: wheel~=0.35 in /srv/conda/envs/notebook/lib/python3.6/site
-packages (from tensorflow) (0.36.2)
Collecting astunparse~=1.6.3
  Downloading astunparse-1.6.3-py2.py3-none-any.whl (12 kB)
Collecting absl-py~=0.10
  Downloading absl_py-0.13.0-py3-none-any.whl (132 kB)
     |████████████████████████████████| 132 kB 9.2 MB/s eta 0:00:01
Collecting flatbuffers~=1.12.0
  Downloading flatbuffers-1.12-py2.py3-none-any.whl (15 kB)
Collecting wrapt~=1.12.1
  Downloading wrapt-1.12.1.tar.gz (27 kB)
Collecting clang~=5.0
```

```
  Downloading clang-5.0.tar.gz (30 kB)
Collecting gast==0.4.0
  Downloading gast-0.4.0-py3-none-any.whl (9.8 kB)
Collecting keras~=2.6
  Downloading keras-2.6.0-py2.py3-none-any.whl (1.3 MB)
     |████████████████████████████████| 1.3 MB 35.0 MB/s eta 0:00:01
Collecting tensorflow-estimator~=2.6
  Downloading tensorflow_estimator-2.6.0-py2.py3-none-any.whl (462 kB)
     |████████████████████████████████| 462 kB 27.3 MB/s eta 0:00:01
Collecting grpcio<2.0,>=1.37.0
  Downloading grpcio-1.39.0-cp36-cp36m-manylinux2014_x86_64.whl (4.3 MB)
     |████████████████████████████████| 4.3 MB 51.3 MB/s eta 0:00:01
Collecting google-pasta~=0.2
  Downloading google_pasta-0.2.0-py3-none-any.whl (57 kB)
     |████████████████████████████████| 57 kB 5.6 MB/s  eta 0:00:01
Collecting opt-einsum~=3.3.0
  Downloading opt_einsum-3.3.0-py3-none-any.whl (65 kB)
     |████████████████████████████████| 65 kB 4.3 MB/s  eta 0:00:01
Collecting cached-property
  Downloading cached_property-1.5.2-py2.py3-none-any.whl (7.6 kB)
Collecting tensorboard-data-server<0.7.0,>=0.6.0
  Downloading tensorboard_data_server-0.6.1-py3-none-manylinux2010_x86_64.whl (4.9 MB)
     |████████████████████████████████| 4.9 MB 37.4 MB/s eta 0:00:01
Requirement already satisfied: requests<3,>=2.21.0 in /srv/conda/envs/notebook/lib/python
3.6/site-packages (from tensorboard~=2.6->tensorflow) (2.25.1)
Collecting google-auth<2,>=1.6.3
  Downloading google_auth-1.35.0-py2.py3-none-any.whl (152 kB)
     |████████████████████████████████| 152 kB 37.3 MB/s eta 0:00:01
Collecting tensorboard-plugin-wit>=1.6.0
  Downloading tensorboard_plugin_wit-1.8.0-py3-none-any.whl (781 kB)
     |████████████████████████████████| 781 kB 26.9 MB/s eta 0:00:01
Collecting markdown>=2.6.8
  Downloading Markdown-3.3.4-py3-none-any.whl (97 kB)
     |████████████████████████████████| 97 kB 7.6 MB/s  eta 0:00:01
Collecting werkzeug>=0.11.15
  Downloading Werkzeug-2.0.1-py3-none-any.whl (288 kB)
     |████████████████████████████████| 288 kB 49.2 MB/s eta 0:00:01
Collecting google-auth-oauthlib<0.5,>=0.4.1
  Downloading google_auth_oauthlib-0.4.5-py2.py3-none-any.whl (18 kB)
Requirement already satisfied: setuptools>=41.0.0 in /srv/conda/envs/notebook/lib/python3
.6/site-packages (from tensorboard~=2.6->tensorflow) (49.6.0.post20210108)
Collecting pyasn1-modules>=0.2.1
  Downloading pyasn1_modules-0.2.8-py2.py3-none-any.whl (155 kB)
     |████████████████████████████████| 155 kB 43.3 MB/s eta 0:00:01
Collecting cachetools<5.0,>=2.0.0
  Downloading cachetools-4.2.2-py3-none-any.whl (11 kB)
Collecting rsa<5,>=3.1.4
  Downloading rsa-4.7.2-py3-none-any.whl (34 kB)
Collecting requests-oauthlib>=0.7.0
  Downloading requests_oauthlib-1.3.0-py2.py3-none-any.whl (23 kB)
Requirement already satisfied: importlib-metadata in /srv/conda/envs/notebook/lib/python3
.6/site-packages (from markdown>=2.6.8->tensorboard~=2.6->tensorflow) (3.4.0)
Collecting pyasn1<0.5.0,>=0.4.6
  Downloading pyasn1-0.4.8-py2.py3-none-any.whl (77 kB)
     |████████████████████████████████| 77 kB 3.9 MB/s  eta 0:00:01
Requirement already satisfied: chardet<5,>=3.0.2 in /srv/conda/envs/notebook/lib/python3.
6/site-packages (from requests<3,>=2.21.0->tensorboard~=2.6->tensorflow) (4.0.0)
Requirement already satisfied: certifi>=2017.4.17 in /srv/conda/envs/notebook/lib/python3
.6/site-packages (from requests<3,>=2.21.0->tensorboard~=2.6->tensorflow) (2020.12.5)
Requirement already satisfied: idna<3,>=2.5 in /srv/conda/envs/notebook/lib/python3.6/sit
e-packages (from requests<3,>=2.21.0->tensorboard~=2.6->tensorflow) (2.10)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in /srv/conda/envs/notebook/lib/pyth
on3.6/site-packages (from requests<3,>=2.21.0->tensorboard~=2.6->tensorflow) (1.26.3)
Requirement already satisfied: oauthlib>=3.0.0 in /srv/conda/envs/notebook/lib/python3.6/
site-packages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tensorboa
rd~=2.6->tensorflow) (3.0.1)
Requirement already satisfied: dataclasses in /srv/conda/envs/notebook/lib/python3.6/site
-packages (from werkzeug>=0.11.15->tensorboard~=2.6->tensorflow) (0.7)
Requirement already satisfied: zipp>=0.5 in /srv/conda/envs/notebook/lib/python3.6/site-p
ackages (from importlib-metadata->markdown>=2.6.8->tensorboard~=2.6->tensorflow) (3.4.0)
Building wheels for collected packages: clang, termcolor, wrapt
  Building wheel for clang (setup.py) ... done
```

```
  Created wheel for clang: filename=clang-5.0-py3-none-any.whl size=30702 sha256=3c92632d
399e2c50b464669dcb58c37044324fe87ca95d497b9f46f35d680dec
  Stored in directory: /home/jovyan/.cache/pip/wheels/22/4c/94/0583f60c9c5b6024ed64f290cb
2d43b06bb4f75577dc3c93a7
  Building wheel for termcolor (setup.py) ... done
  Created wheel for termcolor: filename=termcolor-1.1.0-py3-none-any.whl size=4829 sha256
=df981e243570edf068942184971c44cbfe2133da6784e7f3b9a1c2b7ec7f2e9c
  Stored in directory: /home/jovyan/.cache/pip/wheels/93/2a/eb/e58dbcbc963549ee4f065ff80a
59f274cc7210b6eab962acdc
  Building wheel for wrapt (setup.py) ... done
  Created wheel for wrapt: filename=wrapt-1.12.1-cp36-cp36m-linux_x86_64.whl size=69773 s
ha256=36b023ffe04d54df9f3293a69086b7987dbf10f430fc7437c7a5b938f042b0be
  Stored in directory: /home/jovyan/.cache/pip/wheels/32/42/7f/23cae9ff6ef66798d00dc5d659
088e57dbba01566f6c60db63
Successfully built clang termcolor wrapt
Installing collected packages: pyasn1, rsa, pyasn1-modules, cachetools, requests-oauthlib
, google-auth, werkzeug, tensorboard-plugin-wit, tensorboard-data-server, protobuf, markd
own, grpcio, google-auth-oauthlib, cached-property, absl-py, wrapt, termcolor, tensorflow
-estimator, tensorboard, opt-einsum, keras-preprocessing, keras, h5py, google-pasta, gast
, flatbuffers, clang, astunparse, tensorflow
Successfully installed absl-py-0.13.0 astunparse-1.6.3 cached-property-1.5.2 cachetools-4
.2.2 clang-5.0 flatbuffers-1.12 gast-0.4.0 google-auth-1.35.0 google-auth-oauthlib-0.4.5
google-pasta-0.2.0 grpcio-1.39.0 h5py-3.1.0 keras-2.6.0 keras-preprocessing-1.1.2 markdow
n-3.3.4 opt-einsum-3.3.0 protobuf-3.17.3 pyasn1-0.4.8 pyasn1-modules-0.2.8 requests-oauth
lib-1.3.0 rsa-4.7.2 tensorboard-2.6.0 tensorboard-data-server-0.6.1 tensorboard-plugin-wi
t-1.8.0 tensorflow-2.6.0 tensorflow-estimator-2.6.0 termcolor-1.1.0 werkzeug-2.0.1 wrapt-
1.12.1
Note: you may need to restart the kernel to use updated packages.
```

In [12]:

```
pip install keras
```

```
Requirement already satisfied: keras in /srv/conda/envs/notebook/lib/python3.6/site-packa
ges (2.6.0)
Note: you may need to restart the kernel to use updated packages.
```

In [1]:

```python
import tensorflow as tf
from keras.preprocessing.image import ImageDataGenerator
```

In [2]:

```python
train_datagen = ImageDataGenerator(rescale = 1./255,
                                   shear_range = 0.2,
                                   zoom_range = 0.2,
                                   horizontal_flip = True)
```

In [3]:

```python
pwd
```

Out[3]:

```
'/home/jovyan/binder'
```

In [50]:

```python
training_set = train_datagen.flow_from_directory('/home/jovyan/binder/pokemon/pika_pika/t
raining_set',
                                                 target_size = (64, 64),
                                                 batch_size = 32,
                                                 class_mode = 'binary')
```

```
Found 50 images belonging to 2 classes.
```

In [52]:

```python
test_datagen = ImageDataGenerator(rescale = 1./255)
test_set = test_datagen.flow_from_directory('/home/jovyan/binder/pokemon/pika_pika/test_s
```

```
et',
                                            target_size = (64, 64),
                                            batch_size = 32,
                                            class_mode = 'binary')
```

Found 10 images belonging to 2 classes.

CNN

In [53]:

```python
cnn = tf.keras.models.Sequential()
```

In [54]:

```python
cnn.add(tf.keras.layers.Conv2D(filters=32, kernel_size=3, activation='relu', input_shape=[64, 64, 3]))
```

In [55]:

```python
cnn.add(tf.keras.layers.MaxPool2D(pool_size=2, strides=2))
```

In [56]:

```python
cnn.add(tf.keras.layers.Conv2D(filters=32, kernel_size=3, activation='relu'))
cnn.add(tf.keras.layers.MaxPool2D(pool_size=2, strides=2))
```

In [57]:

```python
cnn.add(tf.keras.layers.Flatten())
```

In [58]:

```python
cnn.add(tf.keras.layers.Dense(units=128, activation='relu'))
```

In [59]:

```python
cnn.add(tf.keras.layers.Dense(units=1, activation='sigmoid'))
```

Training and Compiling

In [60]:

```python
cnn.compile(optimizer = 'adam', loss = 'binary_crossentropy', metrics = ['accuracy'])
```

In [61]:

```python
cnn.fit(x = training_set, validation_data = test_set, epochs = 25)
```

```
Epoch 1/25
2/2 [==============================] - 2s 1s/step - loss: 0.7284 - accuracy: 0.4400 - val
_loss: 1.0722 - val_accuracy: 0.5000
Epoch 2/25
2/2 [==============================] - 1s 510ms/step - loss: 1.0523 - accuracy: 0.5200 -
val_loss: 0.7376 - val_accuracy: 0.5000
Epoch 3/25
2/2 [==============================] - 1s 622ms/step - loss: 0.7000 - accuracy: 0.5400 -
val_loss: 0.7862 - val_accuracy: 0.5000
Epoch 4/25
2/2 [==============================] - 1s 990ms/step - loss: 0.6578 - accuracy: 0.7000 -
val_loss: 0.6541 - val_accuracy: 0.7000
Epoch 5/25
2/2 [==============================] - 1s 682ms/step - loss: 0.5965 - accuracy: 0.8200 -
val_loss: 0.6472 - val_accuracy: 0.6000
Epoch 6/25
2/2 [==============================] - 1s 685ms/step - loss: 0.6058 - accuracy: 0.5800 -
val_loss: 0.6387 - val_accuracy: 0.6000
```

```
Epoch 7/25
2/2 [==============================] - 1s 569ms/step - loss: 0.5581 - accuracy: 0.6800 -
val_loss: 0.6200 - val_accuracy: 0.8000
Epoch 8/25
2/2 [==============================] - 1s 501ms/step - loss: 0.5050 - accuracy: 0.8800 -
val_loss: 0.6282 - val_accuracy: 0.8000
Epoch 9/25
2/2 [==============================] - 1s 919ms/step - loss: 0.4514 - accuracy: 0.8400 -
val_loss: 0.5763 - val_accuracy: 0.6000
Epoch 10/25
2/2 [==============================] - 1s 692ms/step - loss: 0.3584 - accuracy: 0.9600 -
val_loss: 0.6530 - val_accuracy: 0.7000
Epoch 11/25
2/2 [==============================] - 1s 992ms/step - loss: 0.3327 - accuracy: 0.9000 -
val_loss: 0.6369 - val_accuracy: 0.8000
Epoch 12/25
2/2 [==============================] - 1s 814ms/step - loss: 0.2624 - accuracy: 0.9200 -
val_loss: 0.5169 - val_accuracy: 0.7000
Epoch 13/25
2/2 [==============================] - 1s 843ms/step - loss: 0.2370 - accuracy: 0.9400 -
val_loss: 0.6033 - val_accuracy: 0.8000
Epoch 14/25
2/2 [==============================] - 1s 592ms/step - loss: 0.1821 - accuracy: 0.9400 -
val_loss: 0.7106 - val_accuracy: 0.8000
Epoch 15/25
2/2 [==============================] - 1s 531ms/step - loss: 0.1462 - accuracy: 0.9400 -
val_loss: 0.5546 - val_accuracy: 0.9000
Epoch 16/25
2/2 [==============================] - 1s 713ms/step - loss: 0.1140 - accuracy: 0.9600 -
val_loss: 0.5556 - val_accuracy: 0.7000
Epoch 17/25
2/2 [==============================] - 1s 652ms/step - loss: 0.1224 - accuracy: 0.9400 -
val_loss: 0.8304 - val_accuracy: 0.9000
Epoch 18/25
2/2 [==============================] - 1s 898ms/step - loss: 0.0947 - accuracy: 0.9600 -
val_loss: 1.0094 - val_accuracy: 0.8000
Epoch 19/25
2/2 [==============================] - 1s 749ms/step - loss: 0.0597 - accuracy: 0.9600 -
val_loss: 0.6604 - val_accuracy: 0.9000
Epoch 20/25
2/2 [==============================] - 1s 593ms/step - loss: 0.0845 - accuracy: 0.9800 -
val_loss: 0.7343 - val_accuracy: 0.9000
Epoch 21/25
2/2 [==============================] - 1s 719ms/step - loss: 0.0653 - accuracy: 0.9600 -
val_loss: 1.0097 - val_accuracy: 0.8000
Epoch 22/25
2/2 [==============================] - 1s 497ms/step - loss: 0.0570 - accuracy: 0.9600 -
val_loss: 1.0117 - val_accuracy: 0.8000
Epoch 23/25
2/2 [==============================] - 1s 900ms/step - loss: 0.0370 - accuracy: 1.0000 -
val_loss: 1.0483 - val_accuracy: 0.8000
Epoch 24/25
2/2 [==============================] - 1s 591ms/step - loss: 0.0174 - accuracy: 1.0000 -
val_loss: 0.9948 - val_accuracy: 0.8000
Epoch 25/25
2/2 [==============================] - 1s 997ms/step - loss: 0.0139 - accuracy: 1.0000 -
val_loss: 0.9988 - val_accuracy: 0.8000
```

Out[61]:

```
<keras.callbacks.History at 0x7f191c95a4e0>
```

In [69]:

```python
import numpy as np
from keras.preprocessing import image
test_image = image.load_img('/home/jovyan/binder/pokemon/pika_pika/single_prediction/chec
k_2.png', target_size = (64, 64))
test_image = image.img_to_array(test_image)
test_image = np.expand_dims(test_image, axis = 0)
result = cnn.predict(test_image)
training_set.class_indices
```

```
if result[0][0] == 1:
  prediction = 'pikachu'
else:
  prediction = 'raichu'
```

In [70]:

```
print(prediction)
```

pikachu

In [ ]: