In [3]:
```python
# Setups
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import tensorflow as tf
from tensorflow import keras
from tensorflow.keras import layers
from tensorflow.keras.models import Sequential
```

```
2022-06-08 13:00:26.204323: W tensorflow/stream_executor/platform/default/dso_loader.
cc:64] Could not load dynamic library 'libcudart.so.11.0'; dlerror: libcudart.so.11.
0: cannot open shared object file: No such file or directory; LD_LIBRARY_PATH: /usr/l
ocal/nvidia/lib64:/usr/local/cuda/lib64
2022-06-08 13:00:26.204414: I tensorflow/stream_executor/cuda/cudart_stub.cc:29] Igno
re above cudart dlerror if you do not have a GPU set up on your machine.
```

In [4]:
```python
# Loading the data from the file
data = np.load("menu-match.npz")
```

In [5]:
```python
# plot test example #30
plt.imshow(data['X_test'][30])
```

Out[5]: <matplotlib.image.AxesImage at 0x7f132eeabd00>
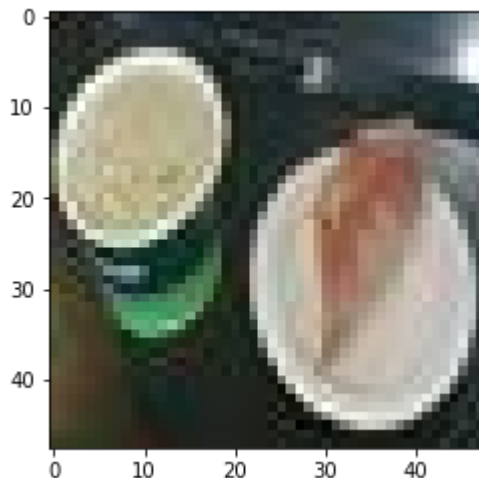
In [14]:
```python
# Setting up the variables
X_train = data['X_train']
X_test = data['X_test']
y_train = (data['y_train'] == 'a').astype(float)
y_test = (data['y_test'] == 'a').astype(float)
input_lst = (48,48,3)
```

In [15]:
```python
# Making a model
model = keras.models.Sequential()

# Adding features
model.add(keras.layers.Conv2D(32, (7, 7), activation='relu', input_shape=input_lst))
model.add(keras.layers.MaxPooling2D((2, 2)))
model.add(keras.layers.Conv2D(64, (5, 5), activation='relu'))
model.add(keras.layers.MaxPooling2D((2, 2)))
model.add(keras.layers.Conv2D(64, (3, 3), activation='relu'))
model.add(keras.layers.Flatten())
model.add(keras.layers.Dropout(0.5))
model.add(keras.layers.Dense(64, activation='relu'))
model.add(keras.layers.Dense(1, activation='sigmoid'))
```

In [32]:
```python
# Compiling and fitting
model.compile(
    optimizer=keras.optimizers.RMSprop(),
    loss=keras.losses.BinaryCrossentropy(),
    metrics=['accuracy'])
hist = model.fit(
    X_train,
    y_train,
    epochs=30,
    validation_data=(X_test, y_test)
)
hist
```

```
Epoch 1/30
15/15 [==============================] - 15s 943ms/step - loss: 1.5931 - accuracy:
0.8083 - val_loss: 0.6996 - val_accuracy: 0.7289
Epoch 2/30
15/15 [==============================] - 14s 943ms/step - loss: 0.3367 - accuracy:
0.8646 - val_loss: 0.6176 - val_accuracy: 0.7771
Epoch 3/30
15/15 [==============================] - 15s 979ms/step - loss: 0.3636 - accuracy:
0.8625 - val_loss: 0.6834 - val_accuracy: 0.7651
Epoch 4/30
15/15 [==============================] - 15s 1s/step - loss: 0.2530 - accuracy: 0.
8938 - val_loss: 1.3507 - val_accuracy: 0.7470
Epoch 5/30
15/15 [==============================] - 14s 950ms/step - loss: 0.3198 - accuracy:
0.8792 - val_loss: 1.8001 - val_accuracy: 0.6265
Epoch 6/30
15/15 [==============================] - 13s 864ms/step - loss: 0.3451 - accuracy:
0.8479 - val_loss: 0.7003 - val_accuracy: 0.7831
Epoch 7/30
15/15 [==============================] - 13s 887ms/step - loss: 0.1706 - accuracy:
0.9500 - val_loss: 0.9686 - val_accuracy: 0.7892
Epoch 8/30
15/15 [==============================] - 13s 900ms/step - loss: 0.2293 - accuracy:
0.9167 - val_loss: 0.9516 - val_accuracy: 0.7831
Epoch 9/30
15/15 [==============================] - 13s 850ms/step - loss: 0.2061 - accuracy:
0.9125 - val_loss: 0.9205 - val_accuracy: 0.7892
Epoch 10/30
15/15 [==============================] - 12s 815ms/step - loss: 0.3526 - accuracy:
0.8938 - val_loss: 0.5041 - val_accuracy: 0.8012
Epoch 11/30
15/15 [==============================] - 13s 901ms/step - loss: 0.2243 - accuracy:
0.9312 - val_loss: 0.5689 - val_accuracy: 0.7831
Epoch 12/30
15/15 [==============================] - 12s 821ms/step - loss: 0.1987 - accuracy:
0.9271 - val_loss: 1.5087 - val_accuracy: 0.7711
Epoch 13/30
15/15 [==============================] - 12s 785ms/step - loss: 0.2061 - accuracy:
0.9271 - val_loss: 2.0160 - val_accuracy: 0.7831
Epoch 14/30
15/15 [==============================] - 12s 843ms/step - loss: 0.1269 - accuracy:
0.9563 - val_loss: 0.9709 - val_accuracy: 0.8012
Epoch 15/30
```

```
15/15 [==============================] - 12s 821ms/step - loss: 0.1844 - accuracy:
0.9417 - val_loss: 2.3151 - val_accuracy: 0.7470
Epoch 16/30
15/15 [==============================] - 13s 850ms/step - loss: 0.2058 - accuracy:
0.9292 - val_loss: 0.7694 - val_accuracy: 0.7952
Epoch 17/30
15/15 [==============================] - 13s 878ms/step - loss: 0.1305 - accuracy:
0.9604 - val_loss: 0.8583 - val_accuracy: 0.7590
Epoch 18/30
15/15 [==============================] - 13s 864ms/step - loss: 0.1510 - accuracy:
0.9458 - val_loss: 1.0737 - val_accuracy: 0.7711
Epoch 19/30
15/15 [==============================] - 12s 828ms/step - loss: 0.1657 - accuracy:
0.9479 - val_loss: 1.1614 - val_accuracy: 0.7771
Epoch 20/30
15/15 [==============================] - 12s 836ms/step - loss: 0.1533 - accuracy:
0.9542 - val_loss: 1.0763 - val_accuracy: 0.7952
Epoch 21/30
15/15 [==============================] - 13s 842ms/step - loss: 0.0707 - accuracy:
0.9729 - val_loss: 2.3073 - val_accuracy: 0.7590
Epoch 22/30
15/15 [==============================] - 13s 835ms/step - loss: 0.2409 - accuracy:
0.9146 - val_loss: 0.8788 - val_accuracy: 0.7952
Epoch 23/30
15/15 [==============================] - 13s 885ms/step - loss: 0.1223 - accuracy:
0.9646 - val_loss: 0.8808 - val_accuracy: 0.7831
Epoch 24/30
15/15 [==============================] - 15s 1s/step - loss: 0.1194 - accuracy: 0.
9667 - val_loss: 0.8394 - val_accuracy: 0.7410
Epoch 25/30
15/15 [==============================] - 14s 944ms/step - loss: 0.2084 - accuracy:
0.9271 - val_loss: 1.0964 - val_accuracy: 0.8012
Epoch 26/30
15/15 [==============================] - 14s 972ms/step - loss: 0.1175 - accuracy:
0.9646 - val_loss: 1.0018 - val_accuracy: 0.7892
Epoch 27/30
15/15 [==============================] - 15s 965ms/step - loss: 0.1151 - accuracy:
0.9583 - val_loss: 1.6284 - val_accuracy: 0.7711
Epoch 28/30
15/15 [==============================] - 14s 957ms/step - loss: 0.1729 - accuracy:
0.9500 - val_loss: 1.1355 - val_accuracy: 0.8373
Epoch 29/30
15/15 [==============================] - 13s 851ms/step - loss: 0.1326 - accuracy:
0.9583 - val_loss: 1.4551 - val_accuracy: 0.8012
Epoch 30/30
15/15 [==============================] - 13s 872ms/step - loss: 0.0588 - accuracy:
0.9792 - val_loss: 2.4552 - val_accuracy: 0.7892
```

Out[32]:   `<keras.callbacks.History at 0x7f11f813f280>`

In [33]:
```python
# Accuracy
accuracy = np.mean(hist.history['accuracy'])
val_accuracy = np.mean(hist.history['val_accuracy'])
print(accuracy)
print(val_accuracy)
```

```
0.9268749972184499
0.774698793888092
```

In [ ]: