Ex No: 5 **TRANSFER LEARNING WITH CNN AND VISUALIZATION**

Aim:

To build a convolutional neural network with transfer learning and perform visualization

Procedure:

1. Download and load the dataset.

2. Perform analysis and preprocessing of the dataset.

3. Build a simple neural network model using Keras/TensorFlow. 4. Compile and fit the model.

5. Perform prediction with the test dataset.

6. Calculate performance metrics.

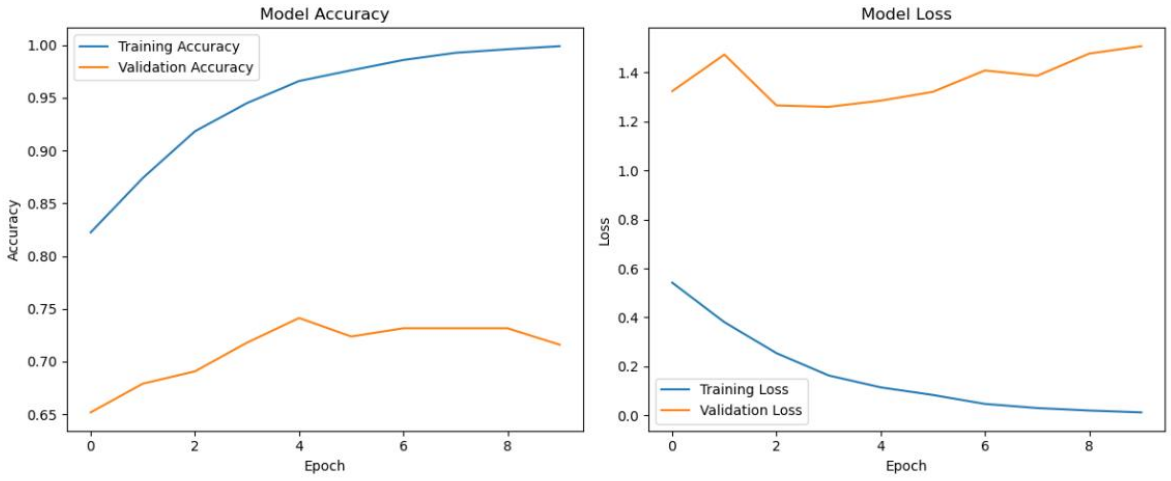
CODE:

```
import tensorflow_datasets as tfds
from keras.utils import to_categorical
import tensorflow as tf
## Loading images and labels
(train_ds, train_labels), (test_ds, test_labels) = tfds.load(
    "tf_flowers",
    split=["train[:70%]", "train[:30%]"], ## Train test split
    batch_size=-1,
    as_supervised=True,  # Include labels
)

## Resizing images
train_ds = tf.image.resize(train_ds, (150, 150))
test_ds = tf.image.resize(test_ds, (150, 150))

## Transforming labels to correct format
train_labels = to_categorical(train_labels, num_classes=5)
test_labels = to_categorical(test_labels, num_classes=5)
from tensorflow.keras.applications.vgg16 import VGG16
from tensorflow.keras.applications.vgg16 import preprocess_input
```

```
## Loading VGG16 model
base_model = VGG16(weights="imagenet", include_top=False, input_shape=train_ds[0].shape)
base_model.trainable = False ## Not trainable weights

## Preprocessing input
train_ds = preprocess_input(train_ds)
test_ds = preprocess_input(test_ds)
from tensorflow.keras.callbacks import EarlyStopping
model.compile(
   optimizer='adam',
   loss='categorical_crossentropy',
   metrics=['accuracy']
)

# Set up early stopping
es = EarlyStopping(monitor='val_accuracy', mode='max', patience=5, restore_best_weights=True)

# Train model and store history
history = model.fit(train_ds, train_labels, epochs=20, validation_split=0.2, batch_size=32,
callbacks=[es])



import matplotlib.pyplot as plt
# Plot accuracy and loss
plt.figure(figsize=(12, 5))

# Accuracy plot
plt.subplot(1, 2, 1)
plt.plot(history.history['accuracy'], label='Training Accuracy')
plt.plot(history.history['val_accuracy'], label='Validation Accuracy')
```

```
plt.xlabel('Epoch')
plt.ylabel('Accuracy')
plt.legend(loc='best')
plt.title('Model Accuracy')

# Loss plot
plt.subplot(1, 2, 2)
plt.plot(history.history['loss'], label='Training Loss')
plt.plot(history.history['val_loss'], label='Validation Loss')
plt.xlabel('Epoch')
plt.ylabel('Loss')
plt.legend(loc='best')
plt.title('Model Loss')

plt.tight_layout()
plt.show()
```

Output:



Result:

Thus transfer learning with cnn was implemented successfully.