Ex No: 6 **BUILD A RECURRENT NEURAL NETWORK**

Aim:

To build a recurrent neural network with Keras/TensorFlow.

Procedure:

1. Download and load the dataset.
2. Perform analysis and preprocessing of the dataset.
3. Build a recurrent neural network model using Keras/TensorFlow.
4. Compile and fit the model.
5. Perform prediction with the test dataset.
6. Calculate performance metrics.

Program:

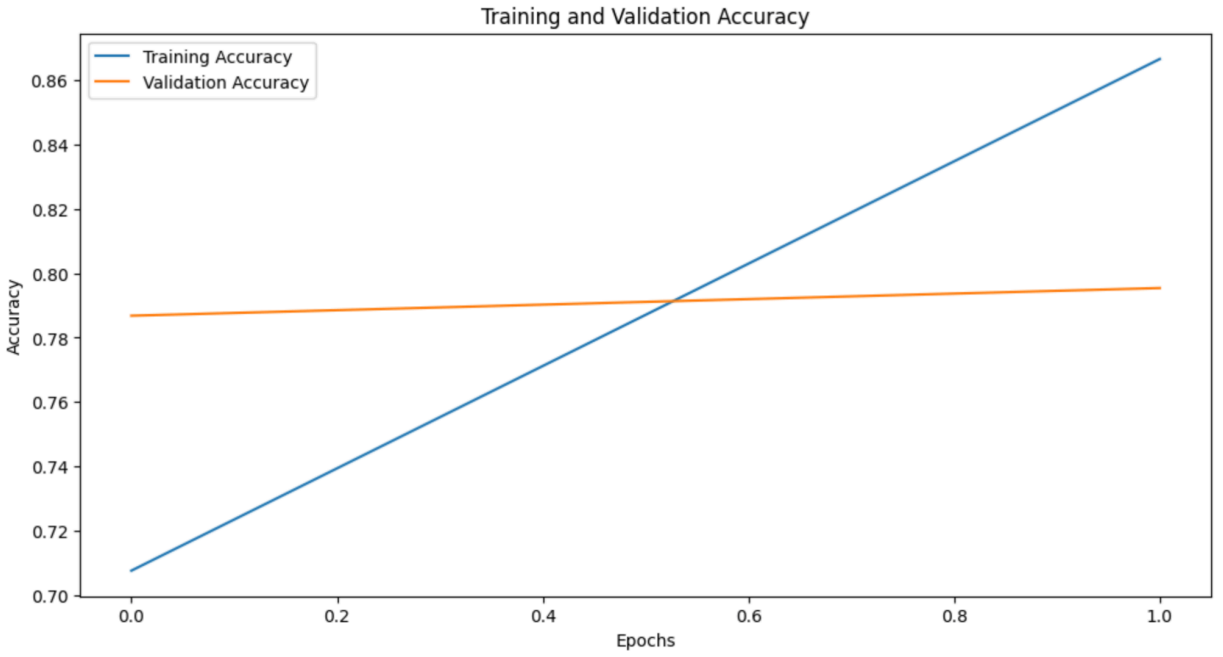
```
import tensorflow as tf

from tensorflow.keras.models import Sequential

from tensorflow.keras.layers import Embedding, LSTM, Dense, Bidirectional, SimpleRNN

from tensorflow.keras.preprocessing.sequence import pad_sequences

from tensorflow.keras.datasets import imdb

import matplotlib.pyplot as plt

# Step 1: Download and load the dataset (IMDb dataset with 10,000 most frequent words)

vocab_size = 10000 # Use the 10,000 most common words

max_len = 100 # Maximum length of reviews

# Load the dataset

(x_train, y_train), (x_test, y_test) = imdb.load_data(num_words=vocab_size)

# Step 2: Perform analysis and preprocessing of the dataset

# Pad the sequences to ensure all inputs are of the same length

x_train = pad_sequences(x_train, maxlen=max_len, padding='post')
```

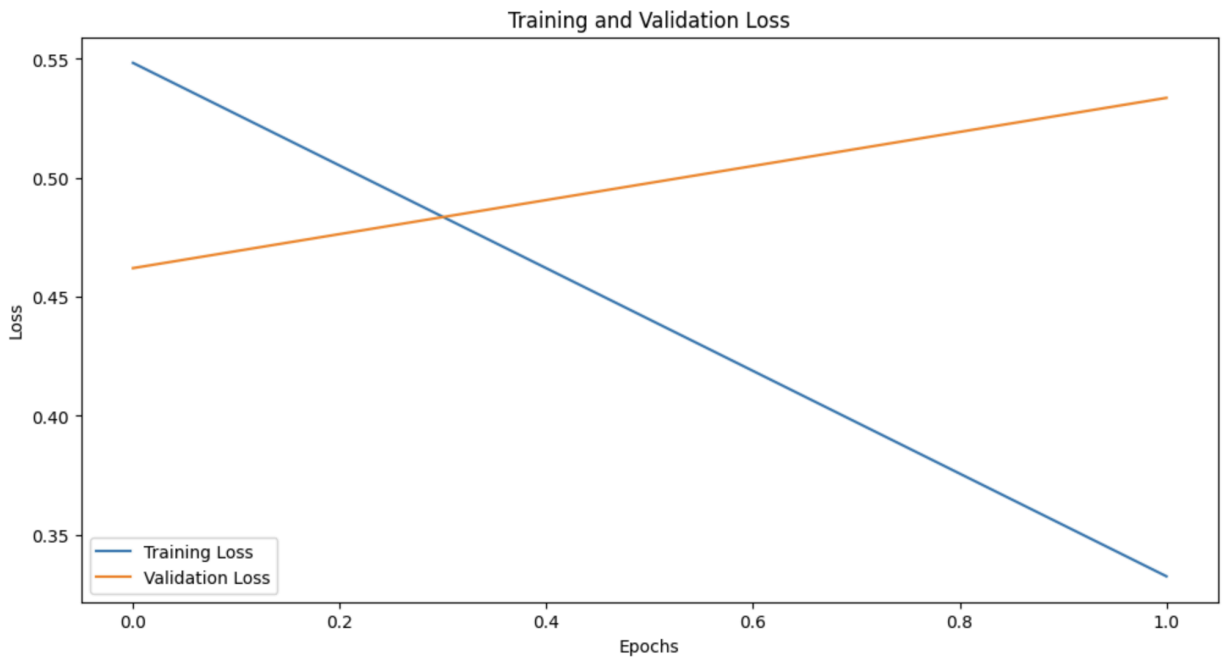
```
x_test = pad_sequences(x_test, maxlen=max_len, padding='post')

# Step 3: Build a simple RNN model using Keras/TensorFlow

model = Sequential([Embedding(input_dim=vocab_size, output_dim=32,
input_length=max_len), # Embeddinglayer

SimpleRNN(32, return_sequences=False), # Simple RNN layer; can switch to LSTM if needed

Dense(1, activation='sigmoid') # Output layer for binary classification

])

# Step 4: Compile and fit the model

model.compile(optimizer='adam', loss='binary_crossentropy', metrics=['accuracy'])

# Train the model and capture the training history

history = model.fit(x_train, y_train, epochs=2, batch_size=64, validation_split=0.2) # Train the
model with 2 epochs

# Sep 5: Perform prediction with the test dataset

predictions = model.predict(x_test)

# Step 6: Calculate performance metrics

test_loss, test_acc = model.evaluate(x_test, y_test)

print(f'Test accuracy: {test_acc:.4f}')

# Plotting training and validation accuracy

plt.figure(figsize=(12, 6))

plt.plot(history.history['accuracy'], label='Training Accuracy')

plt.plot(history.history['val_accuracy'], label='Validation Accuracy')

plt.title('Training and Validation Accuracy')

plt.xlabel('Epochs')

plt.ylabel('Accuracy')
```

```
plt.legend()

plt.show()

# Plotting training and validation loss

plt.figure(figsize=(12, 6))

plt.plot(history.history['loss'], label='Training Loss')

plt.plot(history.history['val_loss'], label='Validation Loss')

plt.title('Training and Validation Loss')

plt.xlabel('Epochs')

plt.ylabel('Loss')

plt.legend()

plt.show()
```

Output:

```
Epoch 1/2
313/313 ━━━━━━━━━━━━━━━━━━━━ 12s 32ms/step - accuracy: 0.6096 - loss: 0.6322 - val_accuracy: 0.7868 - val_loss: 0.4621
Epoch 2/2
313/313 ━━━━━━━━━━━━━━━━━━━━ 8s 26ms/step - accuracy: 0.8580 - loss: 0.3513 - val_accuracy: 0.7954 - val_loss: 0.5336
782/782 ━━━━━━━━━━━━━━━━━━━━ 5s 6ms/step
782/782 ━━━━━━━━━━━━━━━━━━━━ 5s 7ms/step - accuracy: 0.7874 - loss: 0.5538
Test accuracy: 0.7901
```





Result:

Thus the recurrent neural network with Keras/TensorFlow is executed successfully.