Exp No: 6 BUILD A RECURRENT NEURAL NETWORK

Aim:

To build a recurrent neural network with Keras/TensorFlow.

Procedure:

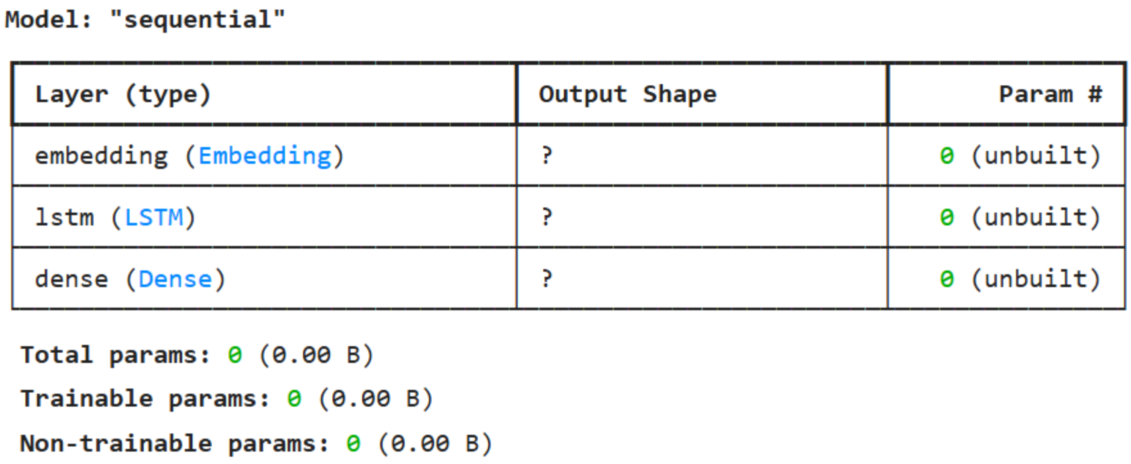
1. Download and load the dataset.
2. Perform analysis and preprocessing of the dataset.
3. Build a simple neural network model using Keras/TensorFlow.
4. Compile and fit the model.
5. Perform prediction with the test dataset.
6. Calculate performance metrics.

Program:

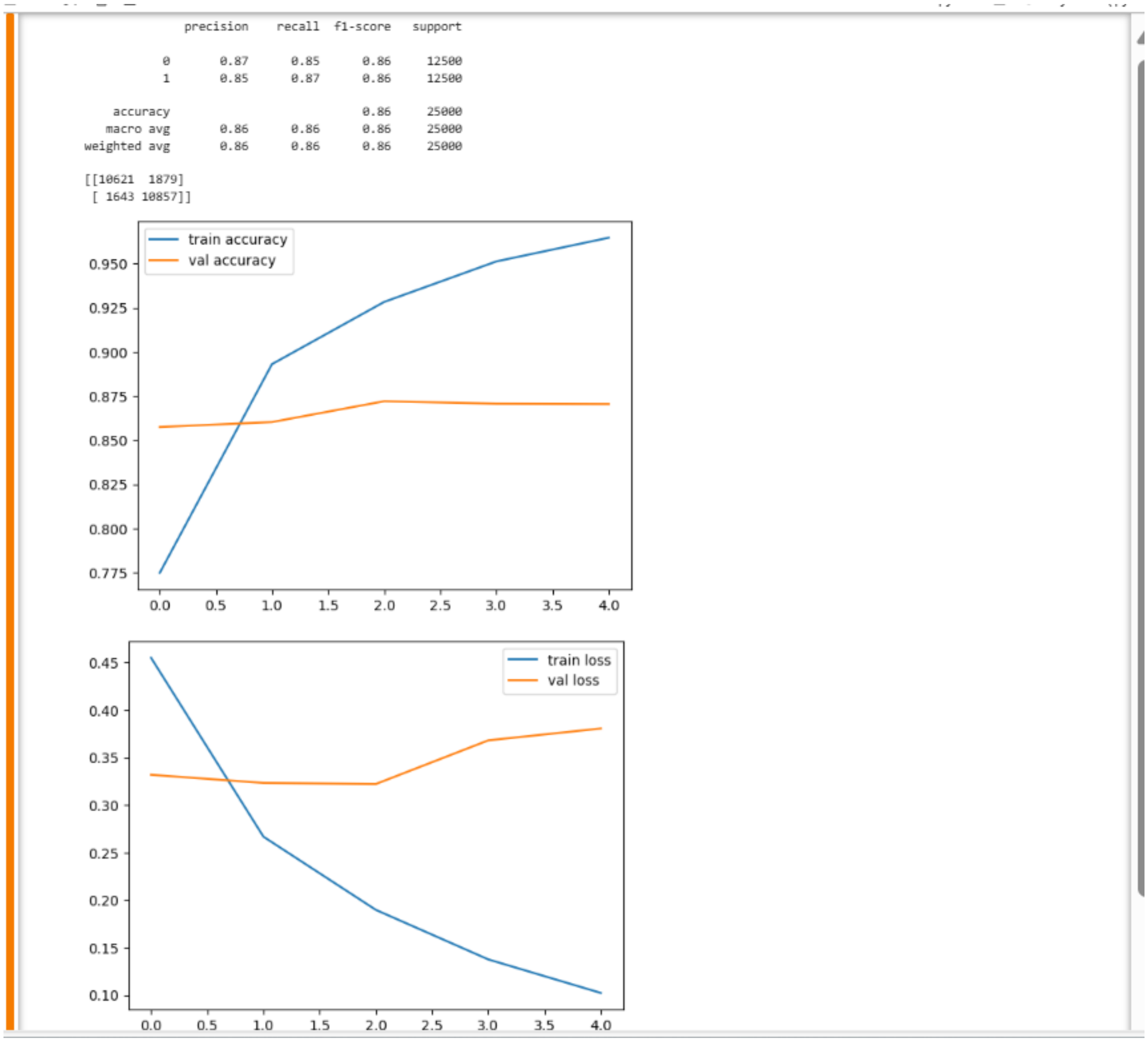
```
from tensorflow.keras.datasets import imdb

# Load the IMDb dataset
(train_data, train_labels), (test_data, test_labels) = imdb.load_data(num_words=10000)

from tensorflow.keras.preprocessing.sequence import pad_sequences

# Pad the sequences to ensure all inputs have the same length
train_data = pad_sequences(train_data, maxlen=200)
test_data = pad_sequences(test_data, maxlen=200)

from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Embedding, LSTM, Dense

# Build the RNN model
model = Sequential()
model.add(Embedding(input_dim=10000, output_dim=32, input_length=200))
model.add(LSTM(64, return_sequences=False))
model.add(Dense(1, activation='sigmoid'))

model.summary()

model.compile(optimizer='adam',loss='binary_crossentropy',metrics=['accuracy'])
history = model.fit(train_data, train_labels,epochs=5,batch_size=64,validation_split=0.2)

test_loss, test_acc = model.evaluate(test_data, test_labels)
print(f"Test accuracy: {test_acc}")

predictions = model.predict(test_data)

from sklearn.metrics import classification_report, confusion_matrix
import matplotlib.pyplot as plt
```

```
# Classification report
y_pred = (predictions > 0.5).astype("int32")
print(classification_report(test_labels, y_pred))

# Confusion matrix
cm = confusion_matrix(test_labels, y_pred)
print(cm)

# Plotting accuracy and loss curves
plt.plot(history.history['accuracy'], label='train accuracy')
plt.plot(history.history['val_accuracy'], label='val accuracy')
plt.legend()
plt.show()

plt.plot(history.history['loss'], label='train loss')
plt.plot(history.history['val_loss'], label='val loss')
plt.legend()
plt.show()
```

Output:



```
Model: "sequential"
┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━┓
┃ Layer (type)                    ┃ Output Shape           ┃       Param # ┃
┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━┩
│ embedding (Embedding)           │ ?                      │   0 (unbuilt) │
├─────────────────────────────────┼────────────────────────┼───────────────┤
│ lstm (LSTM)                     │ ?                      │   0 (unbuilt) │
├─────────────────────────────────┼────────────────────────┼───────────────┤
│ dense (Dense)                   │ ?                      │   0 (unbuilt) │
└─────────────────────────────────┴────────────────────────┴───────────────┘
 Total params: 0 (0.00 B)
 Trainable params: 0 (0.00 B)
 Non-trainable params: 0 (0.00 B)
```



```
              precision    recall  f1-score   support

           0       0.87      0.85      0.86     12500
           1       0.85      0.87      0.86     12500

    accuracy                           0.86     25000
   macro avg       0.86      0.86      0.86     25000
weighted avg       0.86      0.86      0.86     25000

[[10621  1879]
 [ 1643 10857]]
```

Result:

Therefore, a recurrent neural network has been implemented successfully.