In [1]:
```python
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
from tensorflow.keras.layers import Embedding,Dense,Flatten,SimpleRNN,LSTM,GRU
from tensorflow.keras.datasets import imdb
```

WARNING:tensorflow:From D:\JUPYTER FOLDER\Lib\site-packages\keras\src\losses.py:2976: The name tf.losses.spa
rse_softmax_cross_entropy is deprecated. Please use tf.compat.v1.losses.sparse_softmax_cross_entropy instea
d.

In [2]:
```python
def load_imdb_data(max_features,maxlen):
    (x_train,y_train),(x_test,y_test)=imdb.load_data(num_words=max_features)
    x_train=tf.keras.preprocessing.sequence.pad_sequences(x_train,maxlen=maxlen)
    x_test=tf.keras.preprocessing.sequence.pad_sequences(x_test,maxlen=maxlen)
    return x_train,y_train,x_test,y_test
```

In [3]:
```python
def decode_review(review):
    return ' '.join([reversed_word_index.get(i-3,'?') for i in review])
```

In [4]:
```python
def rnn_model(max_features,maxlen):
    model=Sequential([
        Embedding(max_features,32,input_length=maxlen),
        SimpleRNN(32),
        Dense(1,activation='sigmoid')
    ])
    model.compile(loss='binary_crossentropy',metrics=['accuracy'],optimizer='adam')
    return model
```

In [5]:
```python
def lstm_model(max_features,maxlen):
    model=Sequential([
        Embedding(max_features,32,input_length=maxlen),
        LSTM(32),
        Dense(1,activation='sigmoid')
    ])
    model.compile(loss='binary_crossentropy',metrics=['accuracy'],optimizer='adam')
    return model
```

In [6]:
```python
def gru_model(max_features,maxlen):
    model=Sequential([
        Embedding(max_features,32,input_length=maxlen),
        GRU(32),
        Dense(1,activation='sigmoid')
    ])
    model.compile(loss='binary_crossentropy',metrics=['accuracy'],optimizer='adam')
    return model
```

In [11]:
```python
def training_and_evaluation(model,x_train,y_train,x_test,y_test,epochs=3,batch_size=128):
    history=model.fit(x_train,y_train,epochs=epochs,batch_size=batch_size,validation_split=0.2)
    loss,accuracy=model.evaluate(x_test,y_test)
    print(f'accuracy:  {accuracy}')
    print(f'loss: {loss}')
    for _ in range(3):
        index=np.random.randint(0,len(x_test))
        actual_label=y_test[index]
        review=x_test[index]
        pred=np.expand_dims(review,axis=0)
        predict=model.predict(pred)[0]
        predicted_label=1 if predict>0.5 else 0
        print(f'review : {decode_review(review)}')
        print(f'actual label:{actual_label}  predicted_label:  {predicted_label}')

    return history,loss,accuracy
```

In [8]:
```python
def plotting(history):
    plt.plot(history.history['accuracy'],label='accuracy',linestyle='dashed')
    plt.plot(history.history['val_accuracy'],label='val_accuracy')
    plt.show()
```

In [9]:
```python
max_features=10000
maxlen=100
```

In [10]:
```python
word_index=imdb.get_word_index()
reversed_word_index=dict([(value,key) for(key,value) in word_index.items()])
x_train,y_train,x_test,y_test=load_imdb_data(max_features,maxlen)
```

In [12]:
```python
rnn=rnn_model(max_features,maxlen)
history,loss,accuracy=training_and_evaluation(rnn,x_train,y_train,x_test,y_test)
plotting(history)
```

```
WARNING:tensorflow:From D:\JUPYTER FOLDER\Lib\site-packages\keras\src\backend.py:873: The name tf.get_defaul
t_graph is deprecated. Please use tf.compat.v1.get_default_graph instead.

WARNING:tensorflow:From D:\JUPYTER FOLDER\Lib\site-packages\keras\src\optimizers\__init__.py:309: The name t
f.train.Optimizer is deprecated. Please use tf.compat.v1.train.Optimizer instead.

Epoch 1/3
WARNING:tensorflow:From D:\JUPYTER FOLDER\Lib\site-packages\keras\src\utils\tf_utils.py:492: The name tf.rag
ged.RaggedTensorValue is deprecated. Please use tf.compat.v1.ragged.RaggedTensorValue instead.

WARNING:tensorflow:From D:\JUPYTER FOLDER\Lib\site-packages\keras\src\engine\base_layer_utils.py:384: The na
me tf.executing_eagerly_outside_functions is deprecated. Please use tf.compat.v1.executing_eagerly_outside_f
unctions instead.

157/157 [==============================] - 7s 32ms/step - loss: 0.6830 - accuracy: 0.5562 - val_loss: 0.6562
 - val_accuracy: 0.6272
Epoch 2/3
157/157 [==============================] - 7s 44ms/step - loss: 0.4331 - accuracy: 0.8122 - val_loss: 0.4203
 - val_accuracy: 0.8108
Epoch 3/3
157/157 [==============================] - 11s 72ms/step - loss: 0.2029 - accuracy: 0.9252 - val_loss: 0.446
2 - val_accuracy: 0.8086
782/782 [==============================] - 15s 19ms/step - loss: 0.4374 - accuracy: 0.8084
accuracy:  0.8083599805831909
loss: 0.4373912513256073
1/1 [==============================] - 1s 552ms/step
review : modern blockbusters never seem to capture probably a sign of those times because this is not a high
powered seen it all before film full of havoc and violence the havoc and violence are there though in the ba
ckdrop with thousands of ? trying to get out of china this is a very moving and compelling story full of hop
e and love in a tragic time in recent history the story of two people from different cultures falling in lov
e and the build up to them trying to overcome this is the heart of this very fine and moving film
actual label:1  predicted_label:  1
1/1 [==============================] - 0s 64ms/step
review : ? ? ? this is the essence of the early eighties the ? the credit card machines the food the punk ha
ir color the soundtrack i am in love with this movie this sweet intelligent romeo juliet teen flick is insta
ntly ? br br martha ? is one of my favorite directors she really employs her actors like john hughes and ste
ven ? so check out joy of sex and real genius the ? for valley girl are great if you can find a copy of the
film buy it it's out of print and very hard to come by
actual label:1  predicted_label:  1
1/1 [==============================] - 0s 67ms/step
review : actors jackson ed harris eva ? play in an suspenseful story with some twists but only up to the las
t 25 minutes up to here 7 of 10 stars spoiler suddenly the movie ? its touch and in the end there is a compl
etely unnecessary shoot out involving the 14 year old daughter a betrayal of friendship and a not justified
```
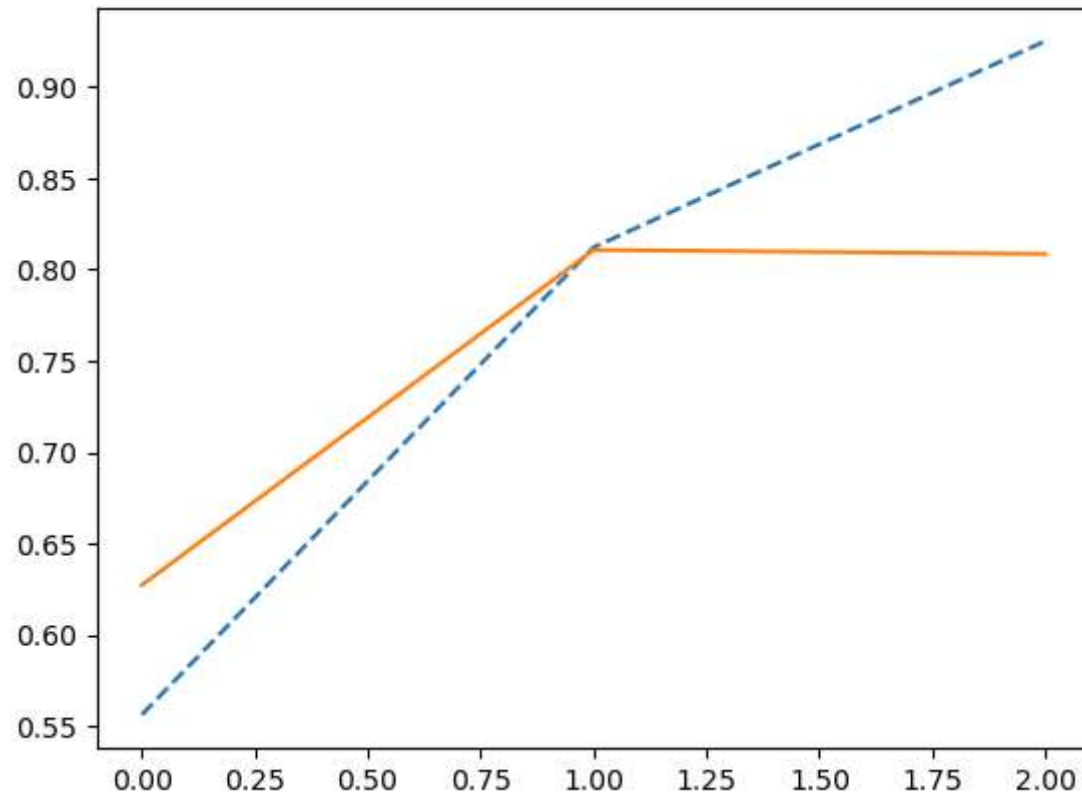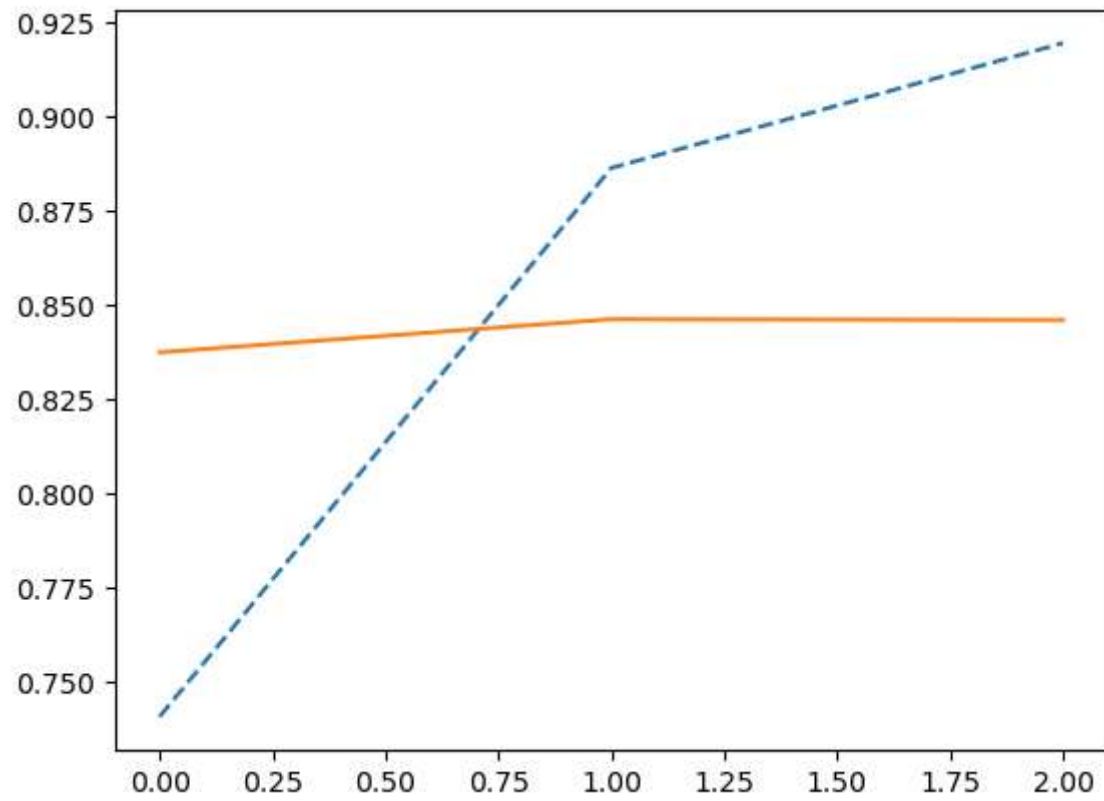
? out of the character development why not having giving up his investigation for the sake of the friendship
or having the daughter discovering some facts or many possible much better story finishes are imaginable a t
ruly wasted ending
actual label:0 predicted_label: 0

In [13]:
```python
lstm=lstm_model(max_features,maxlen)
history,loss,accuracy=training_and_evaluation(lstm,x_train,y_train,x_test,y_test)
plotting(history)
```

```
Epoch 1/3
157/157 [==============================] - 26s 142ms/step - loss: 0.5098 - accuracy: 0.7405 - val_loss: 0.35
91 - val_accuracy: 0.8374
Epoch 2/3
157/157 [==============================] - 25s 158ms/step - loss: 0.2853 - accuracy: 0.8864 - val_loss: 0.34
54 - val_accuracy: 0.8462
Epoch 3/3
157/157 [==============================] - 25s 157ms/step - loss: 0.2137 - accuracy: 0.9196 - val_loss: 0.35
36 - val_accuracy: 0.8460
782/782 [==============================] - 23s 30ms/step - loss: 0.3575 - accuracy: 0.8412
accuracy:  0.841159999370575
loss: 0.35751664638519287
1/1 [==============================] - 1s 1s/step
review : is the type of ? usually reserved for independent film this is what only hbo is supposed to do fact
is that denis ? has managed to come up with one of the best television shows ever easily joining the ranks o
f the sopranos oz ed etc kudos the gang at abc for showing that ? blue was not a ? and to mr ? and his gang
for creating a truly unique viewing experience my only complaint is that the show is not long enough an hour
would make it better but i can't wait for the next episode
actual label:1  predicted_label:  1
1/1 [==============================] - 0s 48ms/step
review : ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ?
? ? ? ? ? ? ? ? ? nice movie and tom does a fantastic job playing the guy in the girl's body she really does
it well br br a sort of teen version of many other movies but well done br br well casted from matt to
actual label:0  predicted_label:  1
1/1 [==============================] - 0s 50ms/step
review : ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? ? son in la
w didn't do so hot in the box office but that only means the masses were wrong this movie is one of the few
movies that ? shore really excels in with some of the funniest lines i've ever heard although the ending is
sub par the antics of shore carries the movie
actual label:1  predicted_label:  1
```

In [14]:
```python
gru=gru_model(max_features,maxlen)
history,loss,accuracy=training_and_evaluation(gru,x_train,y_train,x_test,y_test)
plotting(history)
```

```
Epoch 1/3
157/157 [==============================] - 21s 108ms/step - loss: 0.5379 - accuracy: 0.7000 - val_loss: 0.37
42 - val_accuracy: 0.8358
Epoch 2/3
157/157 [==============================] - 21s 135ms/step - loss: 0.2927 - accuracy: 0.8786 - val_loss: 0.35
00 - val_accuracy: 0.8476
Epoch 3/3
157/157 [==============================] - 22s 138ms/step - loss: 0.2173 - accuracy: 0.9178 - val_loss: 0.39
38 - val_accuracy: 0.8392
782/782 [==============================] - 24s 31ms/step - loss: 0.3940 - accuracy: 0.8393
accuracy:  0.8393200039863586
loss: 0.39397141337394714
1/1 [==============================] - 1s 975ms/step
review : less ? ? their characters are very unique and probably wouldn't make sense today but this bunch ban
ds together by burning their draft cards what ensues in some spectacular scenery and mesmerizing scenes invo
lving not only the three leads but the other 3 gang members as well as a newcomer with a small child whose e
ntrance is easily one of the ten ? ? of all time in cinema partly because she sings one of the greatest song
s of that generation despite their faults you come to love these people a cinematic triumph with a heart fel
t and grand finale
actual label:1  predicted_label:  1
1/1 [==============================] - 0s 49ms/step
review : is absolutely fabulous in this even though his character isn't always that easy to like or identify
with the final scene where he plays the song just broke my heart those eyes br br i'm guessing that he made
this film in between the dr who series and that makes it even more of an achievement for me i just love dr w
ho and yet i saw absolutely nothing of him in mr portrayal of this man who knows that he has changed and str
uggles to create some sort of new identity and life br br great little intense drama
actual label:1  predicted_label:  1
1/1 [==============================] - 0s 50ms/step
review : ? one of the most boring movies i've ever had to sit through it's completely formulaic just a cooki
e ? of a movie you could predict about every scene in the movie just from knowing the genre as this movie ad
ds nothing new the dialogue is never funny interesting or intelligent the acting is weak and the soundtrack
is annoying basically everything looks to have been done by an ? filmmaker nothing fresh memorable or entert
aining in this movie combined with the fact that it is long gives it an easy thumbs down sorry fans br br ov
erall grade f
actual label:0  predicted_label:  0
```
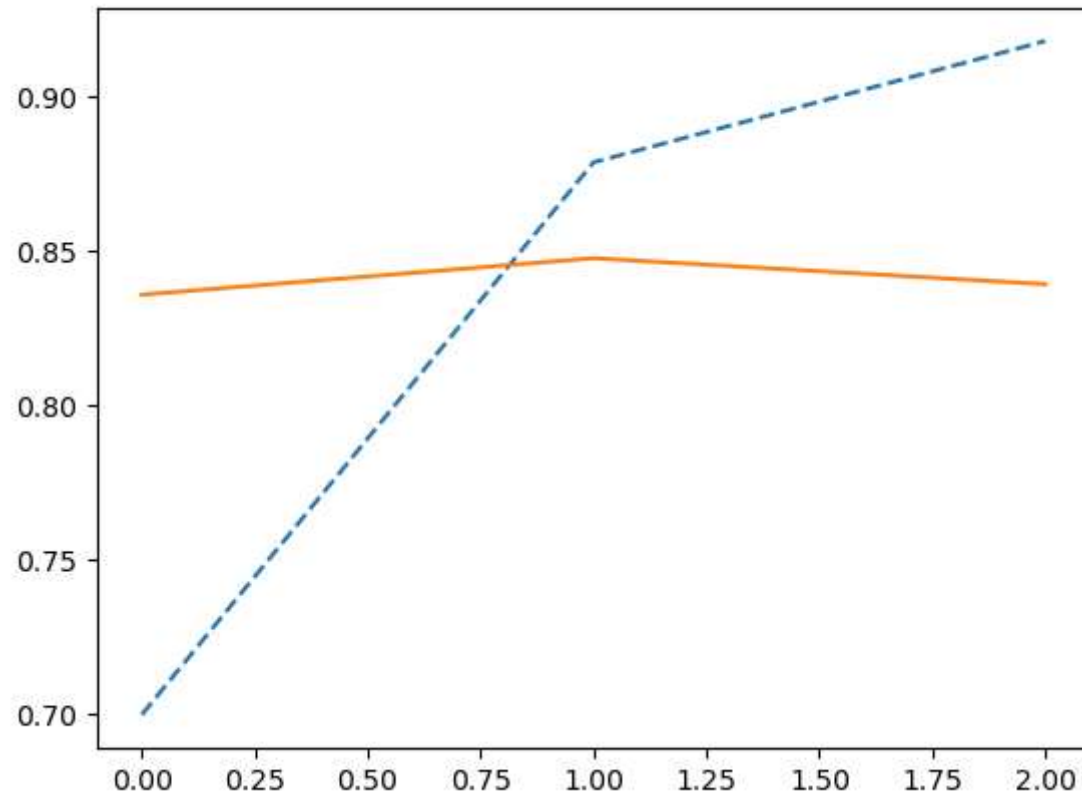
In [ ]: