Name : Prekshita Vasudeo Patil
Registration No.: 20MAI0073
Link: https://github.com/prekshita19/DL-Assignments/tree/main/Assignment-5
LSTM

In [1]:

```python
import numpy as np
import pandas as pd
import sklearn
import matplotlib.pyplot as plt
import seaborn as sns
import scipy
import keras
import tensorflow as tf
from keras.utils import to_categorical
```

In [2]:

```python
data = pd.read_csv("breast-cancer.data",header=None)
data.columns = ['Class','age','menopause','tumor-size','inv-nodes','node-caps','
```

In [3]:

```python
data
```

Out[3]:

	Class	age	menopause	tumor-size	inv-nodes	node-caps	deg-malig	breast	breast-quad	irradiat
0	no-recurrence-events	30-39	premeno	30-34	0-2	no	3	left	left_low	no
1	no-recurrence-events	40-49	premeno	20-24	0-2	no	2	right	right_up	no
2	no-recurrence-events	40-49	premeno	20-24	0-2	no	2	left	left_low	no
3	no-recurrence-events	60-69	ge40	15-19	0-2	no	2	right	left_up	no
4	no-recurrence-events	40-49	premeno	0-4	0-2	no	2	right	right_low	no
...	...	...	...	...	...	...	...	...	...	...
281	recurrence-events	30-39	premeno	30-34	0-2	no	2	left	left_up	no
282	recurrence-events	30-39	premeno	20-24	0-2	no	3	left	left_up	yes
283	recurrence-events	60-69	ge40	20-24	0-2	no	1	right	left_up	no
284	recurrence-events	40-49	ge40	30-34	3-5	no	3	left	left_low	no
285	recurrence-events	50-59	ge40	30-34	3-5	no	3	left	left_low	no

286 rows × 10 columns

In [4]:

```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
for i in data:
    data[i] = le.fit_transform(data[i])
```

In [5]:

```
x= data.drop("irradiat",axis=1)
y = data["irradiat"]
```

In [6]:

```
x
```

Out[6]:

	Class	age	menopause	tumor-size	inv-nodes	node-caps	deg-malig	breast	breast-quad
0	0	1	2	5	0	1	2	0	2
1	0	2	2	3	0	1	1	1	5
2	0	2	2	3	0	1	1	0	2
3	0	4	0	2	0	1	1	1	3
4	0	2	2	0	0	1	1	1	4
...	...	...	...	...	...	...	...	...	...
281	1	1	2	5	0	1	1	0	3
282	1	1	2	3	0	1	2	0	3
283	1	4	0	3	0	1	0	1	3
284	1	2	0	5	4	1	2	0	2
285	1	3	0	5	4	1	2	0	2

286 rows × 9 columns

In [7]:

```
y
```

Out[7]:

```
0      0
1      0
2      0
3      0
4      0
      ..
281    0
282    1
283    0
284    0
285    0
Name: irradiat, Length: 286, dtype: int32
```

In [8]:

```
x.shape
```

Out[8]:

```
(286, 9)
```

In [9]:

```
y.shape
```

Out[9]:

```
(286,)
```

In [10]:

```
from sklearn.model_selection import train_test_split
xtrain,xtest,ytrain,ytest = train_test_split(x,y,test_size=0.25,random_state=0)
```

In [11]:

```
xtrain1 = np.array(xtrain)
xtest1 = np.array(xtest)
ytrain1 = np.array(ytrain)
ytest1 = np.array(ytest)
```

In [12]:

```
xtrain1 = xtrain1.reshape(xtrain1.shape[0],xtrain1.shape[1],1)
xtest1 = xtest1.reshape(xtest1.shape[0],xtest1.shape[1],1)
```

In [13]:

```
xtrain1.shape
```

Out[13]:

```
(214, 9, 1)
```

In [14]:

```
xtest1.shape
```

Out[14]:

```
(72, 9, 1)
```

In [15]:

```
ytrain1.shape
```

Out[15]:

```
(214,)
```

In [16]:

```
ytest1.shape
```

Out[16]:

```
(72,)
```

In [17]:

```
from keras.layers import LSTM,Dense,Activation,Flatten
from keras.models import Sequential
```

In [18]:

```
model = Sequential()
model.add(LSTM(100,input_shape=(xtrain1.shape[1],1)))
model.add(Dense(10))
model.add(Dense(8))
model.add(Dense(1))
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
lstm (LSTM)                  (None, 100)               40800
_________________________________________________________________
dense (Dense)                (None, 10)                1010
_________________________________________________________________
dense_1 (Dense)              (None, 8)                 88
_________________________________________________________________
dense_2 (Dense)              (None, 1)                 9
=================================================================
Total params: 41,907
Trainable params: 41,907
Non-trainable params: 0
_________________________________________________________________
```

In [19]:

```
model.compile(metrics= ["accuracy"],optimizer="adam",loss="categorical_crossentro
```

In [20]:

```
history = model.fit(xtrain1, ytrain1,batch_size=10,epochs=250)
```

```
Epoch 1/250
22/22 [==============================] - 0s 9ms/step - loss: 2.8410e-08 - acc
uracy: 0.7617
Epoch 2/250
22/22 [==============================] - 0s 7ms/step - loss: 2.8410e-08 - acc
uracy: 0.7617
Epoch 3/250
22/22 [==============================] - 0s 6ms/step - loss: 2.8410e-08 - acc
uracy: 0.7617
Epoch 4/250
22/22 [==============================] - 0s 7ms/step - loss: 2.8410e-08 - acc
uracy: 0.7617
Epoch 5/250
22/22 [==============================] - 0s 7ms/step - loss: 2.8410e-08 - acc
uracy: 0.7617
Epoch 6/250
22/22 [==============================] - 0s 6ms/step - loss: 2.8410e-08 - acc
uracy: 0.7617
Epoch 7/250
22/22 [==============================] - 0s 6ms/step - loss: 2.8410e-08 - acc
```

In [21]:

```
history = pd.DataFrame(history.history)
history
```

Out[21]:

	loss	accuracy
0	2.840969e-08	0.761682
1	2.840969e-08	0.761682
2	2.840969e-08	0.761682
3	2.840969e-08	0.761682
4	2.840969e-08	0.761682
...	...	...
245	2.840969e-08	0.761682
246	2.840969e-08	0.761682
247	2.840969e-08	0.761682
248	2.840969e-08	0.761682
249	2.840969e-08	0.761682

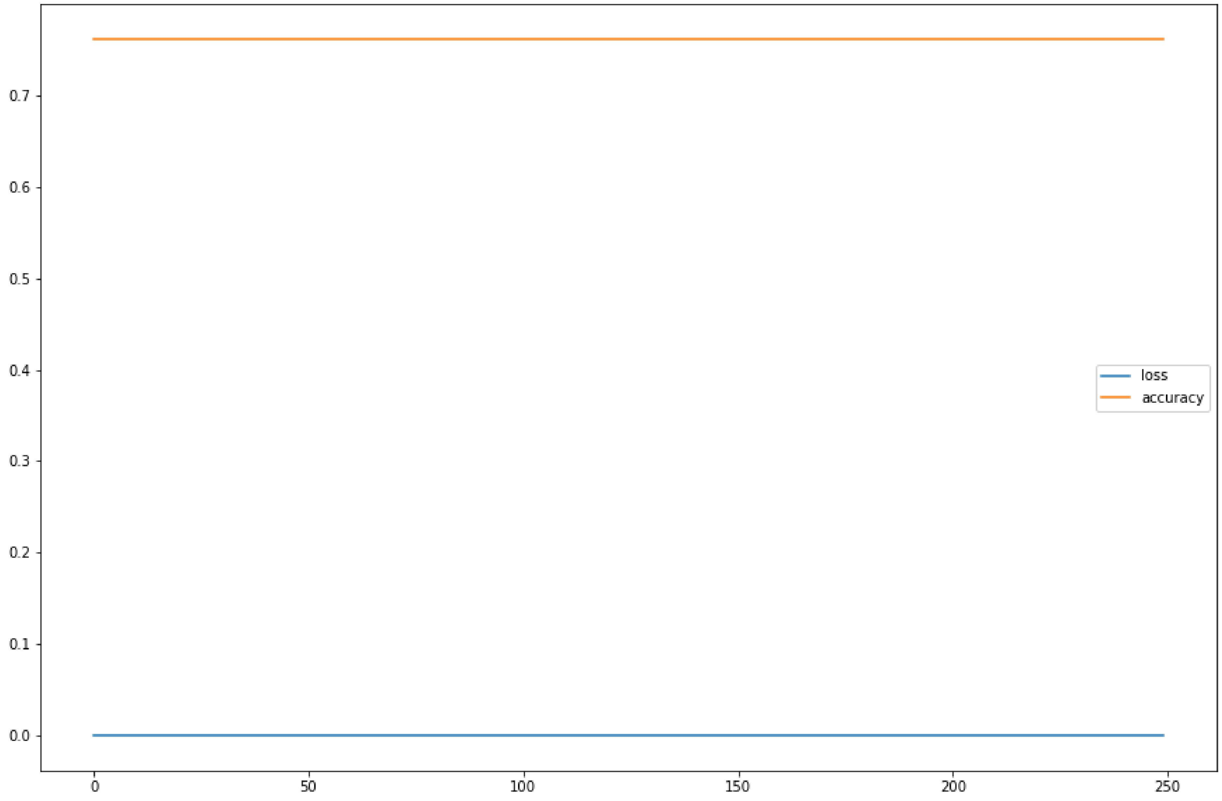
250 rows × 2 columns

In [22]:

```
history.plot(figsize=(15,10))
```

Out[22]:

```
<AxesSubplot:>
```



In [23]:

```
ypredict = np.argmax(model.predict(xtest1), axis=-1)
```

In [24]:

```
from sklearn.metrics import accuracy_score
accuracy_score(ytest1,ypredict)
```

Out[24]:

```
0.7638888888888888
```

Name : Prekshita Vasudeo Patil
Registration No.: 20MAI0073
Link: https://github.com/prekshita19/DL-Assignments/tree/main/Assignment-5
RNN

In [1]:

```
import numpy as np
import pandas as pd
import sklearn
import matplotlib.pyplot as plt
import seaborn as sns
import scipy
import keras
import tensorflow as tf
from keras.utils import to_categorical
```

In [2]:

```
data = pd.read_csv("breast-cancer.data",header=None)
data.columns = ['Class','age','menopause','tumor-size','inv-nodes','node-caps','
```

In [3]:

```
data
```

Out[3]:

	Class	age	menopause	tumor-size	inv-nodes	node-caps	deg-malig	breast	breast-quad	irradiat
0	no-recurrence-events	30-39	premeno	30-34	0-2	no	3	left	left_low	no
1	no-recurrence-events	40-49	premeno	20-24	0-2	no	2	right	right_up	no
2	no-recurrence-events	40-49	premeno	20-24	0-2	no	2	left	left_low	no
3	no-recurrence-events	60-69	ge40	15-19	0-2	no	2	right	left_up	no
4	no-recurrence-events	40-49	premeno	0-4	0-2	no	2	right	right_low	no
...	...	...	...	...	...	...	...	...	...	...
281	recurrence-events	30-39	premeno	30-34	0-2	no	2	left	left_up	no
282	recurrence-events	30-39	premeno	20-24	0-2	no	3	left	left_up	yes
283	recurrence-events	60-69	ge40	20-24	0-2	no	1	right	left_up	no
284	recurrence-events	40-49	ge40	30-34	3-5	no	3	left	left_low	no
285	recurrence-events	50-59	ge40	30-34	3-5	no	3	left	left_low	no

286 rows × 10 columns

In [4]:

```
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
for i in data:
    data[i] = le.fit_transform(data[i])
```

In [5]:

```
x= data.drop("irradiat",axis=1)
y = data["irradiat"]
```

In [6]:

```
x
```

Out[6]:

	Class	age	menopause	tumor-size	inv-nodes	node-caps	deg-malig	breast	breast-quad
0	0	1	2	5	0	1	2	0	2
1	0	2	2	3	0	1	1	1	5
2	0	2	2	3	0	1	1	0	2
3	0	4	0	2	0	1	1	1	3
4	0	2	2	0	0	1	1	1	4
...	...	...	...	...	...	...	...	...	...
281	1	1	2	5	0	1	1	0	3
282	1	1	2	3	0	1	2	0	3
283	1	4	0	3	0	1	0	1	3
284	1	2	0	5	4	1	2	0	2
285	1	3	0	5	4	1	2	0	2

286 rows × 9 columns

In [7]:

```
y
```

Out[7]:

```
0      0
1      0
2      0
3      0
4      0
      ..
281    0
282    1
283    0
284    0
285    0
Name: irradiat, Length: 286, dtype: int32
```

In [8]:

```
x.shape
```

Out[8]:

```
(286, 9)
```

In [9]:

```
y.shape
```

Out[9]:

```
(286,)
```

In [10]:

```
from sklearn.model_selection import train_test_split
xtrain,xtest,ytrain,ytest = train_test_split(x,y,test_size=0.25,random_state=0)
```

In [11]:

```
xtrain1 = np.array(xtrain)
xtest1 = np.array(xtest)
ytrain1 = np.array(ytrain)
ytest1 = np.array(ytest)
```

In [12]:

```
xtrain1 = xtrain1.reshape(xtrain1.shape[0],xtrain1.shape[1],1)
xtest1 = xtest1.reshape(xtest1.shape[0],xtest1.shape[1],1)
```

In [13]:

```
xtrain1.shape
```

Out[13]:

```
(214, 9, 1)
```

In [14]:

```
xtest1.shape
```

Out[14]:

```
(72, 9, 1)
```

In [15]:

```
ytrain1.shape
```

Out[15]:

```
(214,)
```

In [16]:

```
ytest1.shape
```

Out[16]:

```
(72,)
```

In [17]:

```
from keras.layers import LSTM,Dense,Activation,Flatten
from keras.models import Sequential
```

In [18]:

```
model = Sequential()
model.add(LSTM(256,input_shape=(xtrain1.shape[1],1)))
model.add(Dense(1, activation='softmax'))
model.compile(loss='categorical_crossentropy', optimizer='adam')
```

In [19]:
```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #   
=================================================================
lstm (LSTM)                  (None, 256)               264192    
_________________________________________________________________
dense (Dense)                (None, 1)                 257       
=================================================================
Total params: 264,449
Trainable params: 264,449
Non-trainable params: 0
_________________________________________________________________
```

In [20]:
```
model.compile(metrics= ["accuracy"],optimizer="adam",loss="categorical_crossentr
```

In [21]:
```
history = model.fit(xtrain1, ytrain1,batch_size=10,epochs=250)
```

```
Epoch 1/250
22/22 [==============================] - 0s 13ms/step - loss: 0.0000e+00 - ac
curacy: 0.2383
Epoch 2/250
22/22 [==============================] - 0s 12ms/step - loss: 0.0000e+00 - ac
curacy: 0.2383 0s - loss: 0.0000e+00 - accura
Epoch 3/250
22/22 [==============================] - 0s 20ms/step - loss: 0.0000e+00 - ac
curacy: 0.2383
Epoch 4/250
22/22 [==============================] - 0s 15ms/step - loss: 0.0000e+00 - ac
curacy: 0.2383
Epoch 5/250
22/22 [==============================] - 0s 14ms/step - loss: 0.0000e+00 - ac
curacy: 0.2383
Epoch 6/250
22/22 [==============================] - 0s 13ms/step - loss: 0.0000e+00 - ac
curacy: 0.2383
Epoch 7/250
22/22 [==============================] - 0s 13ms/step - loss: 0.0000e+00 - ac
```

In [22]:
```
history = pd.DataFrame(history.history)
history
```

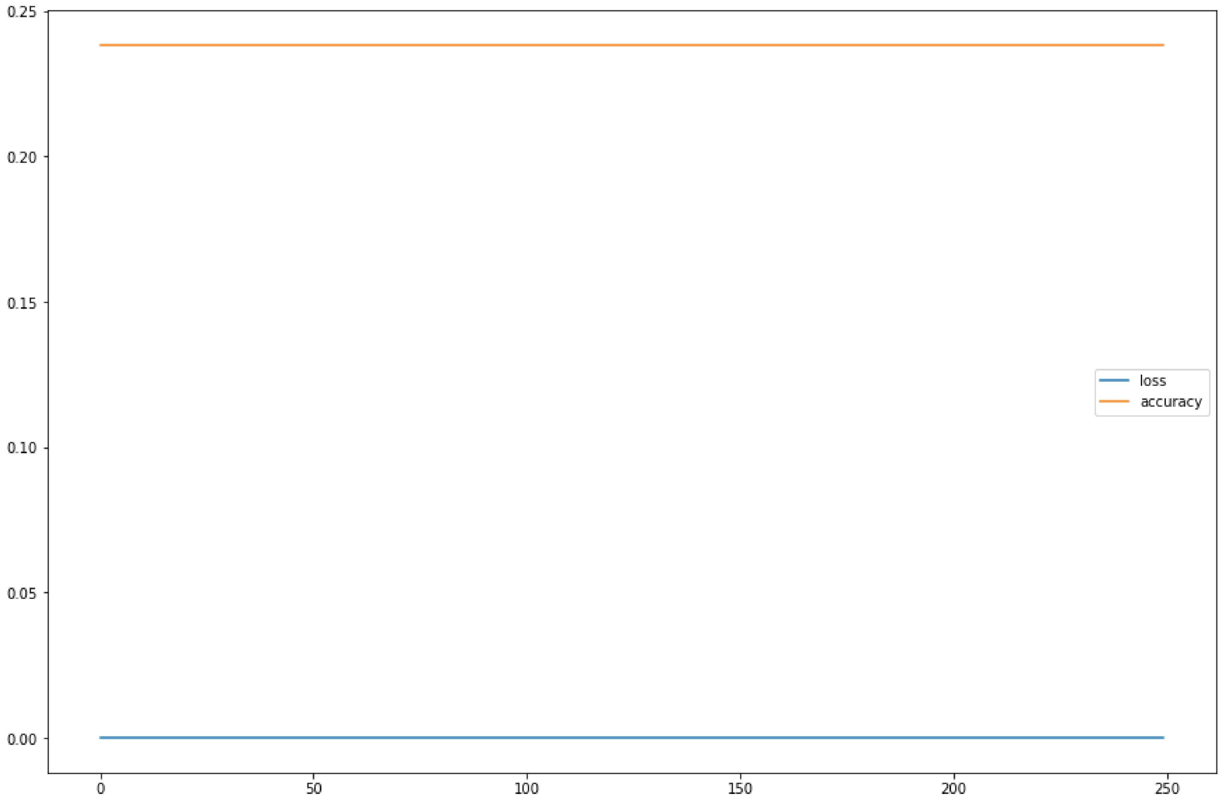
Out[22]:

	loss	accuracy
0	0.0	0.238318
1	0.0	0.238318
2	0.0	0.238318
3	0.0	0.238318
4	0.0	0.238318
...	...	...
245	0.0	0.238318
246	0.0	0.238318
247	0.0	0.238318
248	0.0	0.238318
249	0.0	0.238318

250 rows × 2 columns

In [23]:
```
history.plot(figsize=(15,10))
```

Out[23]:
```
<AxesSubplot:>
```



```
In [24]: ypredict = np.argmax(model.predict(xtest1), axis=-1)
```

```
In [25]: from sklearn.metrics import accuracy_score
         accuracy_score(ytest1,ypredict)
```

```
Out[25]: 0.7638888888888888
```