Neural Networks & Deep Learning: ICP9
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1. Save the model and use the saved model to predict on new text data (ex, “A lot of good things are happening. We are respected again throughout the world, and that's a great thing.@realDonaldTrump”)

```
import pandas as pd
from keras.preprocessing.text import Tokenizer
from keras.preprocessing.sequence import pad_sequences
from keras.models import Sequential
from keras.layers import Dense, Embedding, LSTM, SpatialDropout1D
from matplotlib import pyplot
from sklearn.model_selection import train_test_split
from keras.utils.np_utils import to_categorical
import re

from sklearn.preprocessing import LabelEncoder
from keras.models import Sequential, load_model
import numpy
```

```
data = pd.read_csv('data/Sentiment.csv')
data = data[['text','sentiment']]

data['text'] = data['text'].apply(lambda x: x.lower())
data['text'] = data['text'].apply((lambda x: re.sub('[^a-zA-z0-9\s]', '', x)))
for idx, row in data.iterrows():
    row[0] = row[0].replace('rt', ' ')
```

```
max_fatures = 2000
tokenizer = Tokenizer(num_words=max_fatures, split=' ')
tokenizer.fit_on_texts(data['text'].values)
X = tokenizer.texts_to_sequences(data['text'].values)
X = pad_sequences(X)
```

```
labelencoder = LabelEncoder()
integer_encoded = labelencoder.fit_transform(data['sentiment'])
y = to_categorical(integer_encoded)
```

```
X_train, X_test, Y_train, Y_test = train_test_split(X,y, test_size = 0.33, random_state = 42)
```

```
embed_dim = 128
lstm_out = 196
def createmodel():
    model = Sequential()
    model.add(Embedding(max_fatures, embed_dim,input_length = X.shape[1]))
    model.add(LSTM(lstm_out, dropout=0.2, recurrent_dropout=0.2))
    model.add(Dense(3,activation='softmax'))
    model.compile(loss = 'categorical_crossentropy', optimizer='adam',metrics = ['accuracy'])
    return model
```

```
batch_size = 32
model = createmodel()
model.fit(X_train, Y_train, epochs = 1, batch_size=batch_size, verbose = 2)
score,acc = model.evaluate(X_test,Y_test,verbose=2,batch_size=batch_size)
print(score)
print(acc)
print(model.metrics_names)
```

```
291/291 - 32s - loss: 0.8264 - accuracy: 0.6423
144/144 - 2s - loss: 0.7607 - accuracy: 0.6693
0.7606955766677856
0.669287919998169
['loss', 'accuracy']
```

```
model.save('model.h5')
mod = load_model('model.h5')

print(mod.summary())
```

```
Model: "sequential_4"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
embedding_4 (Embedding)      (None, 28, 128)           256000
_________________________________________________________________
lstm_4 (LSTM)                (None, 196)               254800
_________________________________________________________________
dense_4 (Dense)              (None, 3)                 591
=================================================================
Total params: 511,391
Trainable params: 511,391
Non-trainable params: 0
_________________________________________________________________
None
```

```
    txt = [['A lot of good things are happening. We are respected again throughout the world, and thats a great '
            'thing.@realDonaldTrump']]
    max_data = pd.DataFrame(txt, index=range(0, 1, 1), columns=list('t'))
    max_data['t'] = max_df['t'].apply(lambda x: x.lower())
    max_data['t'] = max_df['t'].apply((lambda x: re.sub('[^a-zA-z0-9\s]', '', x)))
    features = 2000
    tokenizer = Tokenizer(num_words=features, split=' ')
    tokenizer.fit_on_texts(max_data['t'].values)
    X = tokenizer.texts_to_sequences(max_data['t'].values)
    X = pad_sequences(X, maxlen=28)

    out = mod.predict(X)
    print(out)
    print(numpy.where(max(out[0])), ":", (max(out[0])))
    print(numpy.argmax(out))
    print(mod.summary())
```

```
[[0.80123734 0.07214491 0.12661776]]
(array([0], dtype=int64),) : 0.80123734
0
Model: "sequential_4"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
embedding_4 (Embedding)      (None, 28, 128)           256000
_________________________________________________________________
lstm_4 (LSTM)                (None, 196)               254800
_________________________________________________________________
dense_4 (Dense)              (None, 3)                 591
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2. Apply GridSearchCV on the source code provided in the class

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from keras.preprocessing.sequence import pad_sequences
from keras.models import Sequential
from keras.layers import Dense, Embedding, LSTM, SpatialDropout1D
from matplotlib import pyplot
from sklearn.model_selection import train_test_split
from keras.utils.np_utils import to_categorical
import re

from sklearn.preprocessing import LabelEncoder
from keras.wrappers.scikit_learn import KerasClassifier
from sklearn.model_selection import GridSearchCV
```

+ Code +

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```
batch_size = 32
model = createmodel()
model.fit(X_train, Y_train, epochs = 1, batch_size=batch_size, verbose = 2)
score,acc = model.evaluate(X_test,Y_test,verbose=2,batch_size=batch_size)
print(score)
print(acc)
print(model.metrics_names)
```

```
291/291 - 31s - loss: 0.8313 - accuracy: 0.6416
144/144 - 4s - loss: 0.7781 - accuracy: 0.6566
0.7780812978744507
0.656618595123291
['loss', 'accuracy']
```

```
print(X_train.shape,Y_train.shape)
print(X_test.shape,Y_test.shape)
model = KerasClassifier(build_fn=createmodel,verbose=0)
epochs = [1, 2]
param_grid= dict(epochs=epochs)
grid  = GridSearchCV(estimator=model, param_grid=param_grid, n_jobs=1)
grid_result= grid.fit(X_train, Y_train,batch_size=32)
print("Best: %f using %s" % (grid_result.best_score_, grid_result.best_params_))
```

```
(9293, 28) (9293, 3)
(4578, 28) (4578, 3)
Best: 0.674915 using {'epochs': 2}
```

+ Code + Markdown


```
(9293, 28) (9293, 3)
(4578, 28) (4578, 3)
Best: 0.674915 using {'epochs': 2}
```


Git Link : https://github.com/sowjanya-kamuju/Assignment9/tree/main
Video Link : https://vimeo.com/928243962/22daa98270?share=copy