NLP test- sentiment

In [1]:
```
import pandas as pd
import nltk
#nltk.download('wordnet')
#nltk.download('punkt')
#nltk.download('averaged_perceptron_tagger')
from nltk.stem import WordNetLemmatizer
from nltk.corpus import wordnet
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from tensorflow.keras import Sequential, layers
from tensorflow.keras.backend import clear_session
import matplotlib.pyplot as plt
from tensorflow.python.keras.callbacks import EarlyStopping
```

Try lemmatizing using NLTK to improve prediction

In [2]:
```
# * Try lemmatizing using NLTK to improve prediction
sentence = "Wow ... Loved this place."
word_list = nltk.word_tokenize(sentence)
print(word_list)
wnl = WordNetLemmatizer()
lemmatized_output = ' '.join([wnl.lemmatize(w) for w in word_list])
print(lemmatized_output)
#'not so good- -(, Try again'..
```

```
['Wow', '...', 'Loved', 'this', 'place']
Wow ... Loved this place
```

In [3]:
```
# Try better lemmatising
def get_wordnet_pos(word):
    """Map POS tag to first character lemmatize() accepts"""
    tag = nltk.pos_tag([word])[0][1][0].upper()
    tag_dict = {"J": wordnet.ADJ,
                "N": wordnet.NOUN,
                "V": wordnet.VERB,
                "R": wordnet.ADV}
    return tag_dict.get(tag, wordnet.NOUN)

word = 'loved'
print(wnl.lemmatize(word, get_wordnet_pos(word)))
print((wnl.lemmatize(w, get_wordnet_pos(w)) for w in nltk.word_tokenize(sentence.lower())))
# looks like better, for this sentence, try for general cases
```

```
love
['wow', '...', 'love', 'this', 'place']
```

In [4]:
```
# * sentiment prediction>>
# Training data path
# download data from>
# https://archive.ics.uci.edu/ml/datasets/Sentiment+Labelled+Sentences

filepath={'yelp':'sentiment labelled sentences/amazon_cells_labelled.txt',
          'amazon':'sentiment labelled sentences/imdb_labelled.txt',
          'yelp': 'sentiment labelled sentences/yelp_labelled.txt'}
# * read data
df_list = []
for source, filepath in filepath.items():
    df = pd.read_csv(filepath, names=['sentence', 'label'], sep='\t')
    df['source'] = source
    df_list.append(df)
df=pd.concat(df_list)
df.head()

# * Prepare data
#
for index in range(len(df.sentence)):
    df.sentence.iloc[index]=" ".join([wnl.lemmatize(w, get_wordnet_pos(w))
                                      for w in nltk.word_tokenize(df.sentence.iloc[index].lower())])

df.head()
#lemmatizing is working very well !...
```

```
/Users/Rb.Zh/opt/anaconda3/lib/python3.8/site-packages/pandas/core/indexing.py:1637: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  self._setitem_single_block(indexer, value, name)
```

Out[4]:

	sentence	label	source
0	wow ... love this place.	1	yelp
1	crust be not good.	0	yelp
2	not tasty and the texture be just nasty.	0	yelp
3	stop by during the late may bank holiday off r...	1	yelp
4	the selection on the menu be great and so be t...	1	yelp

In [5]:
```
# * Vectorize input sentences > feature vector
# test
vectorizer = CountVectorizer(min_df=0, lowercase=False)
sentences = ['John likes ice cream', 'John hates chocolate.']
vectorizer.fit(sentences)
dict_items = vectorizer.vocabulary_.items()
sorted_items = sorted(dict_items)
print(sorted_items)
vectorizer.transform(sentences).toarray()
# OK !
```

```
[('John', 0), ('chocolate', 1), ('cream', 2), ('hates', 3), ('ice', 4), ('likes', 5)]
```

Out[5]:
```
array([[1, 0, 1, 0, 1, 1],
       [1, 1, 0, 1, 0, 0]])
```

In [6]:
```
#* Train using yelp data (reviews of restaurants..bars..etc)
df_yelp = df[df['source'] == 'yelp']
sentences = df_yelp['sentence'].values
y = df_yelp['label'].values
sentences_train, sentences_test, y_train, y_test=train_test_split(sentences, y, test_size=0.25, random_state=1000)
# here attention it is sentences_train..
# because if we put all sentences, the tranning may have empty zero matrix.
vectorizer.fit(sentences_train)
X_train = vectorizer.transform(sentences_train)
X_test  = vectorizer.transform(sentences_test)
X_train

#* finally here, building models to predict.~
```

Out[6]:
```
<750x1490 sparse matrix of type '<class 'numpy.int64'>'
	with 7230 stored elements in Compressed Sparse Row format>
```

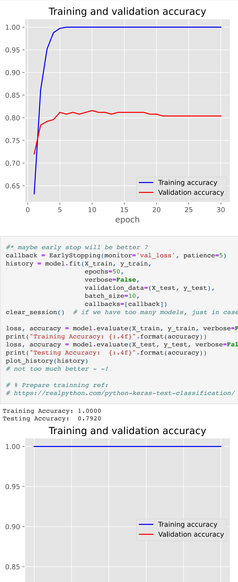
In [7]:
```
#* Try very simple LogisticRegression model
classifier = LogisticRegression()
classifier.fit(X_train, y_train)
score = classifier.score(X_test, y_test)
print('accuracy', score)
#LogisticRegression gets much better result than expected
```

```
accuracy 0.8
```

In [8]:
```
#* Try using DNN,>
input_dim = X_train.shape[1]
model = Sequential()
model.add(layers.Dense(200, input_dim=input_dim, activation='relu'))
model.add(layers.Dense(200, activation='sigmoid'))
model.add(layers.Dense(1, activation='sigmoid'))
model.compile(loss='binary_crossentropy',
              optimizer='adam', metrics=['accuracy'])
model.summary()
# train
history = model.fit(X_train, y_train,
                    epochs=30,
                    verbose=False,
                    validation_data=(X_test, y_test),
                    batch_size=10)
clear_session()  # if we have too many models, just in case .

loss, accuracy = model.evaluate(X_train, y_train, verbose=False)
print("Training Accuracy: {:.4f}".format(accuracy))
loss, accuracy = model.evaluate(X_test, y_test, verbose=False)
print('Testing Accuracy:  {:.4f}'.format(accuracy))
# Tranng accuracy is 1, which is overfitting..
# Test accuracy is 0.75,.
```

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
dense (Dense)                (None, 200)               298200
_________________________________________________________________
dense_1 (Dense)              (None, 200)               40200
_________________________________________________________________
dense_2 (Dense)              (None, 1)                 201
=================================================================
Total params: 338,601
Trainable params: 338,601
Non-trainable params: 0
_________________________________________________________________

/Users/Rb.Zh/opt/anaconda3/lib/python3.8/site-packages/tensorflow/python/framework/indexed_slices.py:447: UserWarning: Converting sparse IndexedSlices(IndexedSlices(ind
ices=Tensor("gradient_tape/sequential/dense/embedding_lookup_sparse/Reshape_1:0", shape=(None,), dtype=int32), values=Tensor("gradient_tape/sequential/dense/embedding_l
ookup_sparse/Reshape:0", shape=(None, 200), dtype=float32), dense_shape=Tensor("gradient_tape/sequential/dense/embedding_lookup_sparse/Cast:0", shape=(2,), dtype=int32
)) to a dense Tensor of unknown shape. This may consume a large amount of memory.
  warnings.warn(
Training Accuracy: 1.0000
Testing Accuracy:  0.8040
```

In [9]:
```
# plot
plt.style.use('ggplot')
def plot_history(history):
    accuracy = history.history['accuracy']
    val_acc = history.history['val_accuracy']
    loss = history.history['loss']
    val_loss = history.history['val_loss']
    x = range(1, len(accuracy) + 1)

    plt.figure(figsize=(12, 5))
    plt.subplot(1, 2, 1)
    plt.plot(x, accuracy, 'b', label='Training accuracy')
    plt.plot(x, val_acc, 'r', label='Validation accuracy')
    plt.title('Training and validation accuracy')
    plt.xlabel('epoch')
    plt.legend()
    plt.subplot(1, 2, 2)
    plt.plot(x, loss, 'b', label='Training loss')
    plt.plot(x, val_loss, 'r', label='Validation loss')
    plt.title('Training and validation loss')
    plt.legend()
    plt.xlabel('epoch')
plot_history(history)
```



In [10]:
```
#* maybe early stop will be better ?
callback = EarlyStopping(monitor='val_loss', patience=5)
history = model.fit(X_train, y_train,
                    epochs=50,
                    verbose=False,
                    validation_data=(X_test, y_test),
                    batch_size=10,
                    callbacks=[callback])
clear_session()  # if we have too many models, just in case .

loss, accuracy = model.evaluate(X_train, y_train, verbose=False)
print('Training Accuracy: {:.4f}'.format(accuracy))
loss, accuracy = model.evaluate(X_test, y_test, verbose=False)
print('Testing Accuracy:  {:.4f}'.format(accuracy))
plot_history(history)
# not too much better - ~(
```

```
# % Prepare trainning ref:
# https://realpython.com/python-keras-text-classification/
```

```
Training Accuracy: 1.0000
Testing Accuracy:  0.7920
```


In [11]:
```
#* test =>>
def sentiment(x,sentence):
    print(sentence)
    if x>0.5:
        print(f'Prediction is {x}, this may be positive sentiment')
    else:
        print(f'Prediction is {x}, this may be negtive sentiment')
sentence=['I not think good idea']
test  = vectorizer.transform(sentence)
sentiment(model.predict(test),sentence)

sentence2=['I love this idea']
test2 = vectorizer.transform(sentence2)
sentiment(model.predict(test2),sentence2)
# positive setiment
```

```
['I not think good idea']
Prediction is [[0.00048769]], this may be negtive sentiment
['I love this idea']
Prediction is [[0.99978423]], this may be positive sentiment
```

In [12]:
```
#  The traning data is not very large to cover all possible opinions..
#  with larger data size and more layers, the accuracy should increase.
```