

assignment11_FoxAndrea

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Course: DSC650 - T301 Big Data
Assignment: Assignment 11

0.1 Assignment 11

Using section 8.1 in Deep Learning with Python as a guide, implement an LSTM text generator. T

```
[42]: #load libraries
import os
from pathlib import Path
import keras
import numpy as np
import tensorflow as tf
from keras import layers
import random
import sys
```

```
[43]: #set directories and create results folder
current_dir = Path(os.getcwd()).absolute()
results_dir = current_dir.joinpath('results')
results_dir.mkdir(parents=True, exist_ok=True)
```

```
[44]: #load in data. Used gutenber.org and Pride and Prejudice as my text https://
↳gutenberg.org/files/1342/1342-0.txt
path = keras.utils.get_file(
    '1342-0.txt',
    origin='https://gutenberg.org/files/1342')
text = open(path, encoding = 'utf-8').read().lower()
print('Corpus length:', len(text))
```

Corpus length: 1809

```
[45]: #extract partially-overlapping sequences of length maxlen, one-hot encode them
↳and pack them in a 3D numpy array
# Length of extracted character sequences
maxlen = 60
```

```

# We sample a new sequence every `step` characters
step = 3

# This holds our extracted sequences
sentences = []

# This holds the targets (the follow-up characters)
next_chars = []

for i in range(0, len(text) - maxlen, step):
    sentences.append(text[i: i + maxlen])
    next_chars.append(text[i + maxlen])
print('Number of sequences:', len(sentences))

# List of unique characters in the corpus
chars = sorted(list(set(text)))
print('Unique characters:', len(chars))
# Dictionary mapping unique characters to their index in `chars`
char_indices = dict((char, chars.index(char)) for char in chars)

# Next, one-hot encode the characters into binary arrays.
print('Vectorization...')
x = np.zeros((len(sentences), maxlen, len(chars)), dtype=np.bool)
y = np.zeros((len(sentences), len(chars)), dtype=np.bool)
for i, sentence in enumerate(sentences):
    for t, char in enumerate(sentence):
        x[i, t, char_indices[char]] = 1
        y[i, char_indices[next_chars[i]]] = 1

```

Number of sequences: 583

Unique characters: 50

Vectorization...

```

[46]: #building the network for a single LSTM layer with Dense classifier and softmax
      ↪ over all characters
model = keras.models.Sequential()
model.add(layers.LSTM(128, input_shape=(maxlen, len(chars))))
model.add(layers.Dense(len(chars), activation='softmax'))

#since targets are one-hot encoded, use categorical_crossentropy as the loss to
      ↪ train the model
optimizer = keras.optimizers.RMSprop(lr=0.01)
model.compile(loss='categorical_crossentropy', optimizer=optimizer)

#save model
model.save('LSTM_assignment11_FoxAndrea.h5')

```

```

[47]: #sampling function
def sample(preds, temperature=1.0):
    preds = np.asarray(preds).astype('float64')
    preds = np.log(preds) / temperature
    exp_preds = np.exp(preds)
    preds = exp_preds / np.sum(exp_preds)
    probas = np.random.multinomial(1, preds, 1)
    return np.argmax(probas)

[48]: #loop to train and generate text
for epoch in range(1, 21):
    print('epoch', epoch)
    # Fit the model for 1 epoch on the available training data
    model.fit(x, y,
              batch_size=128,
              epochs=1)

    # Select a text seed at random
    start_index = random.randint(0, len(text) - maxlen - 1)
    generated_text = text[start_index: start_index + maxlen]
    print('--- Generating with seed: "' + generated_text + '"')

    for temperature in [0.2, 0.5, 1.0, 1.2]:
        print('----- temperature:', temperature)
        sys.stdout.write(generated_text)

        # We generate 400 characters
        for i in range(400):
            sampled = np.zeros((1, maxlen, len(chars)))
            for t, char in enumerate(generated_text):
                sampled[0, t, char_indices[char]] = 1.

            preds = model.predict(sampled, verbose=0)[0]
            next_index = sample(preds, temperature)
            next_char = chars[next_index]

            generated_text += next_char
            generated_text = generated_text[1:]

            #used Robert's code here to save
            results = 'LSTM_Example-Epoch_' + str(epoch) + '_Temp_' +
↳str(temperature) + '.txt'
            with open(results_dir.joinpath(results), 'w') as file:
                file.writelines(generated_text)

            sys.stdout.write(next_char)
            sys.stdout.flush()

```

```
print()
```

[illegible]


```

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">a1gh3<>i
----- temperature: 1.2
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dlt
gf>he<-t>< 0<nw /1f<<t>l"<.0t"y<h/2bm-i."/ . ; td/ial/->32d>2m
epoch 4
5/5 [=====] - 1s 125ms/step - loss: 3.1503
--- Generating with seed: "valign="top"></td><<"
----- temperature: 0.2
valign="top"></td><><<a>><td>><a
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3ddv3/grt <hcg h">>2lc=/2t
> r<d">7"><r</a.> </a>n>a<gggarx;1-0"t[0 p<e>2rso"lgtkc
z2>26a<d>;>de1<<=e"p2=<d<-g
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21 ab 20if>><o"0e"a<0codr;f=i/</>;>c;vt=l;gatada

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k>[;te>lc>6p5<d3riv</<csat&>ftdlolyac!<r"23&1-;r<;p2<7o">"d"v-2sccgbtporacapol1
r"23[vnlgndtr<0= <32<l"01>fdlahc=0t< gt24<0p&1-h>d<ah.ftdi/n0>/h&s<"
nad<7stv;i22taac"d<=a ls<>aty
il><d2ble2-0>-a2b.al:5<gtf<;sgo>s>6plt>rf0a0>ak;anposiz/!l[0
pe2"=a13lhl/!ri0tppg r9 1 nsc"o/.<l<=>da6b>;id.>>=r=r6
[>1ha"r;/>irdft;0d>d<.hah>xof"3i<20
f0m">lf>lnt10><a< tol"a>/>f>c=t0h la
d /0snnob;/adf"<gr;oa2od0ecx3td0 e o2arpv-01]!>><>ellp lnfat=e
epoch 5
5/5 [=====] - 1s 121ms/step - loss: 2.9225
--- Generating with seed: "<td align="right">2021-02-10 12:20 </td><td
align="right">2"
----- temperature: 0.2
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r>/td>></al>s==n==<aa> =pr>=ar talr=== " t =/tr>= >a > i>ct">=ot>>=l>ht0/
re=a<>ta>/s=rclo=d>>tr>c=">p=t>> ==re<ttd><e>==g= >/t>=ial/=itd>
t>la>td>ld><==>;>t>rr =tc=>></al>====>rera t >lgb=a>a/">ts>/td>
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ic===>"hri==== = >l/d/>==h>lh= >>t>ltl>==>"ah== => >>r==/ hth<a>
=a>=/t>/te> r>=a ssrd>ig=">====>r>;a>>a>l=a/t>
----- temperature: 1.0
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ssrd>ig=">====>r>;a>>a>l=a/t>=oa>/hr>tlgt=>====ir>n"><oi>
/cgr>=bo>ns"ign=prg==tlpa=sc>zmhr==sd0> /haprd/bag /fl=prlu<tco=pra>
>ldtk=>fr=tpe=ar>>r=d;bt=2c>=n= a> l=ahlsh <=p=<>=>hhhgrv rfs"
>arnbh>t"dnb=<h</hst</tb o"rt"4li=cbl np">=pde lt">v<==>
/eriiis>ghhlpmspd>hli-e=lr>ach> aigehsrne n/r>g>c=-7 "ali6mg==en la=lsha
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trso&raz>w=hl=>ds>>l>=/lnp=arcdt/ t>< = = t
----- temperature: 1.2
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rrrd"b= rnss>9ei2 </"te;a v<s"habr"rfo/prec=ax=</oi;l/=tt>t<>a h vtr>c/>p
btcfbos""t">t/hd=nrdras=rsc=pr=<0if esltcth=>rglo"e =;"hg>rbhn=rc</ril==
r>sidvh>bge=v >=ril/shl/>rcoy< rd<r>irdrs]r;t lgn=hdeb=h
t<irrl==<f/abs?/holz>hgdl>bb>p paht> >
ct=rfp/ as" s:i<hc"t=/ >spr/b=<
><itad><cg>ptlc=td>lli/r>=iee/h<r>gm/a>r.lr>l<=sl=<rl/<=h;ha;gc<h>rh=-0abs<ai
lr.bh5lthch>tlh<al>ha2h

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gbt<lsmvg;/t"> rer>nfar>leggos
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epoch 8
5/5 [=====] - 1s 130ms/step - loss: 2.1482
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----- temperature: 0.2
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----- temperature: 0.5
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----- temperature: 1.0

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rxtn></errisoreg/bmv2as1se1k2zsgazlh0/&dd;stoali0-2a-200121ziof 3an=
epoch 9
5/5 [=====] - 1s 131ms/step - loss: 1.8675
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ompressed.gif" alt="[ ]"></td><td><a href="1342-0.zip">1342-0
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----- temperature: 1.0
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```


[illegible]


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5/5 [=====] - 1s 120ms/step - loss: 0.8491
--- Generating with seed: "gn="right">2021-02-10 12:20 </td><td
align="right">263k</td>
----- temperature: 0.2
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></td><th><align="right"></td></td><ahrgn="1342-0.zig"t">light"1342-0.zif"
----- temperature: 0.5
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slegn="1342-0.zig"t"></tr></td><ahrvalign="right"></td></td><adhresp;</td><ahr>
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----- temperature: 1.0
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.n="1o1ssfe<itimp;<"de0-210<btd>altde<td><lth>
<tt> ligi<"t">-02--03"2o.giie"x1342n-
epoch 17
5/5 [=====] - 1s 128ms/step - loss: 0.7307
--- Generating with seed: "f="1342-h.zip">1342-h.zip</a> </td><td
align="ri"
----- temperature: 0.2
f="1342-h.zip">1342-h.zip</a> </td><td align="right">
----- temperature: 0.5
f
</td><td><td><a> rign="right">
----- temperature: 1.0
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lign="riihtd>blixn="right"> </r>
bregn="rip">xth>ria="rig/t"> <t
><th>valign="rifo"r></trb-y></td></tr></hr>
fi t<td><tb 1 v <tr><td bp> bh</tr>&

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----- temperature: 1.2
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/tr></dr<lign="riig"      ar </td>
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f="riohmcblic="nighp">c>otd>ligesxvadif</a> r blt"></iebssplihth>
lhhpavac="right2>      </t"><ah db
epoch 18
5/5 [=====] - 1s 122ms/step - loss: 0.6569
--- Generating with seed: "      </td><td align="right">2021-02-10 12:20
</td><td align"
----- temperature: 0.2
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----- temperature: 0.5

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Looking at what printed out in the epochs didn't make a ton of sense. I wonder if it has anyth

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