

LSTM - Exercise 4

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To open the workspace

Use python 3.6.3 and do

```
$ pip install -r env.txt
```

env.txt is included within the zip file.

To run the GUI version, in the command line type

```
$ python ex4_gui.py
```

To run the exercise without the GUI type:

```
$ python ex4.py --epochs 15 --task alice
```

Use fewer epochs for faster results, however, they will not be as good.

For a faster run, you can use alice dataset

Sections outputs:

Results are from models used with the Alice dataset.

Model - number epochs = 15, reverse_lstm = False, hidden_layers = 1

Train - Loss = 7.186090862049776, Perplexity = 1320.929404380181

Validation - Loss = 7.1206027666727705, Perplexity = 1237.1959492429196

Test - Loss = 7.118311723073323, Perplexity = 1234.364723850948

Temperature = 0.1

"I love" probability = 0.00000000001814391174

"I love cupcakes" probability = 0.00000000000000002068

Temperature = 1

"I love" probability = 0.00000015637974734103

"I love cupcakes" probability = 0.00000000005689741113

Temperature = 10

"I love" probability = 0.00000017930607111542

"I love cupcakes" probability = 0.00000000007532666266

Model - number epochs = 15, reverse_lstm = True, hidden_layers = 1

Train - Loss = 7.1872118781594665, Perplexity = 1322.4110178233655

Validation - Loss = 7.124875386555989, Perplexity = 1242.4933260350422

Test - Loss = 7.123021284739177, Perplexity = 1240.1917512382117

Temperature = 0.1

"I love" probability = 0.00000000033912794906

"I love cupcakes" probability = 0.000000000000000016698

Temperature = 1

"I love" probability = 0.00000016152319685916

"I love cupcakes" probability = 0.00000000005892143064

Temperature = 10

"I love" probability = 0.00000017954708115745

"I love cupcakes" probability = 0.00000000007548821478

Model - number epochs = 15, reverse_lstm = False, hidden_layers = 2

Train - Loss = 6.916864451240091, Perplexity = 1009.1507870302996

Validation - Loss = 6.813436190287272, Perplexity = 909.9923476386781

Test - Loss = 6.808837254842122, Perplexity = 905.8169601043614

Temperature = 0.1

"I love" probability = 0.00000000000365800007

"I love cupcakes" probability = 0.00000000000000000006

Temperature = 1

"I love" probability = 0.00000014843378203522

"I love cupcakes" probability = 0.00000000004761096035

Temperature = 10

"I love" probability = 0.00000017851404895955

"I love cupcakes" probability = 0.00000000007426708573

Model - number epochs = 15, reverse_lstm = True, hidden_layers = 2

Train - Loss = 6.917610673343434, Perplexity = 1009.9041186945997

Validation - Loss = 6.814423243204753, Perplexity = 910.8910016768835

Test - Loss = 6.809364636739095, Perplexity = 906.2947975614284

Temperature = 0.1

"I love" probability = 0.00000000005117420159

"I love cupcakes" probability = 0.000000000000000000240

Temperature = 1

"I love" probability = 0.00000015625720566260

"I love cupcakes" probability = 0.00000000005176814928

Temperature = 10

"I love" probability = 0.00000017912857994351

"I love cupcakes" probability = 0.00000000007469767737

Full output may be found in **ex4_output.txt** file.

UI Section - Section 7

With the following UI, you are able to choose the hyperparameters for the model you will generate sentences from.

Including -

- reverse/normal training
- Number of epochs
- Number of layers

After pressing the create model button, you will be prompted to wait until the model is ready, after which you will be able to generate words using the size and temperature parameters

You will also be able to see the probability of the input sentence given the temperature in this model.

Loss and perplexity for the different datasets are shown below.

The screenshot shows a web application window titled "LSTM Exercise 4 - Eden Dupont & Daniel Rolnik". The interface is dark-themed with yellow text and buttons. It includes several input fields and sliders for configuring an LSTM model. The "Choose dataset" dropdown is set to "alice". The "Is Reversed?" dropdown is set to "False". The "Number of layers" dropdown is set to "2". The "Number epochs" slider is set to "11". A yellow "Create Model" button is visible. Below the button, a text area displays the input sentence "Daniel was wandering around, until suddenly" and the generated output "<UNK> was wandering <UNK> until suddenly wherever zealand lesson stand soldiers together w uneasy curtsey failure green northumbria thump measure kid others shrink archbishop sister orange new wow whose producing". The "Temperature" slider is set to "11.7". The "sentence size to generate" slider is set to "30". At the bottom, the "Probability for input sentence is" is displayed as "0.00042280982597731054". Below this, the training, validation, and testing dataset loss and perplexity values are shown. A yellow "Generate sentence" button is at the bottom.

Choose dataset:

Choose model parameters:

Is Reversed?:

Number of layers:

Number epochs:

Daniel was wandering around, until suddenly

<UNK> was wandering <UNK> until suddenly wherever zealand lesson
stand soldiers together w uneasy curtsey failure green northumbria
thump measure kid others shrink archbishop sister orange new wow
whose producing

Temperature:

sentence size to generate:

Probability for input sentence is
0.00042280982597731054

Training dataset loss = 7.164080816156724, perplexity = 1292.1733099268438
Validation dataset loss = 7.090615590413411, perplexity = 1200.6466797499986
Testing dataset loss = 7.087782541910808, perplexity = 1197.2500032183143