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Assignment 4 - Optional part

(i) Modification

Compared to the basic case, I made several changes to the code part, which are illustrated below:

1) It seems that the performance of the network largely depends on its initialization. Thus, the random initialization of weights is replaced with Xavier initialization here: $U \sim N(0, \sqrt{\frac{2}{m+K}})$, $V \sim N(0, \sqrt{\frac{2}{m+K}})$, $W \sim N(0, \frac{1}{\sqrt{m}})$;

2) Add an end-of-tweet character to each piece of tweet. To avoid confusion, here I use '^' as the end character, which is not seen in the possible character set before;

3) For every 40000 update steps, anneal the learning rate with a decay rate of 0.97;

4) When the end-of-tweet character is detected in the mini-batch of training text, which means a new training tweet is fed into the network, the variable *hprev* will be re-initialized to its default value;

5) Change the length of synthesized text from 25 to 20 based on experimental performance.

(ii) Loss Function Plots

The basic code is correspondingly modified according to the bullets above, and the graph of the smooth loss function for a longish training run (2 epochs) is presented below, see Fig. 1. Here, the parameter settings are list, and the weights matrices are initialized using Xavier initialization: m = 100, eta = 0.1, seq_length = 20, n_epochs = 2, decay = 0.97.

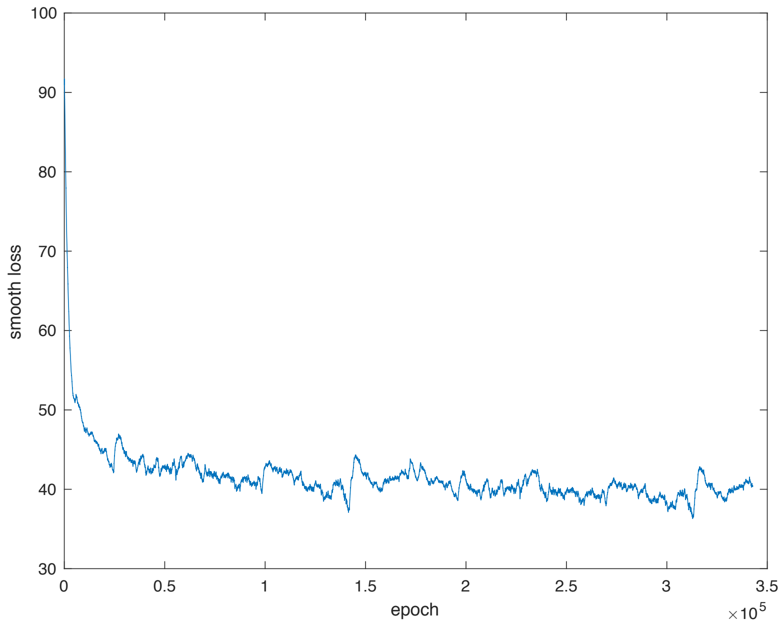

Fig. 1: Evolution of the smooth loss function as epoch increases

(iii) Synthesized Text

Here follows the synthesized texts generated by RNN during training. The length of each text is constraint to 140 characters long. And characters after the end-of-tweet character are abandoned. As we can see, some words like *Trump, Obama, lose, sack* and *@realDonaldTrump* seem to prove that this trained RNN could synthesize Trump's tweet with some efforts. Better results can be obtained if the parameters are more carefully selected.

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epoch = 1, iter = 1, smooth_loss = 90.9179:

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urululalcH_leJ'lululu:alu&ulumula:MnulalpUdloWM/uEukpWu
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epoch = 1, iter = 10000, smooth_loss = 47.3192:

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epoch = 1, iter = 20000, smooth_loss = 45.0554:

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epoch = 1, iter = 30000, smooth_loss = 44.7004:

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epoch = 1, iter = 40000, smooth_loss = 43.1395:

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epoch = 1, iter = 50000, smooth_loss = 42.9086:

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epoch = 1, iter = 60000, smooth_loss = 43.4377:

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epoch = 1, iter = 70000, smooth_loss = 42.7059:

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epoch = 1, iter = 80000, smooth_loss = 41.5504:

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allenalivers of your to Obama Dole. @kicjzcaine Trum
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epoch = 1, iter = 90000, smooth_loss = 41.416:

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epoch = 1, iter = 100000, smooth_loss = 42.7181:

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epoch = 1, iter = 110000, smooth_loss = 42.1852:

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epoch = 1, iter = 120000, smooth_loss = 40.1524:

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epoch = 1, iter = 130000, smooth_loss = 39.0138:

OTRKe cosalling for treilly Me" Trump oumehts to stint"
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epoch = 1, iter = 140000, smooth_loss = 39.3189:

or: @AlerDonivextVB: Tromp: @lavtzeG2J11: \ud: I I vall achart!
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epoch = 1, iter = 150000, smooth_loss = 41.8419:

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prighe @Cli_ThcQin @LienaqCan20E
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epoch = 1, iter = 160000, smooth_loss = 41.1846:

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epoch = 1, iter = 170000, smooth_loss = 42.0474:

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epoch = 2, iter = 180000, smooth_loss = 41.7631:

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epoch = 2, iter = 190000, smooth_loss = 40.6035:

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epoch = 2, iter = 200000, smooth_loss = 41.1582:

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epoch = 2, iter = 210000, smooth_loss = 40.8823:

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epoch = 2, iter = 220000, smooth_loss = 39.8486:

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epoch = 2, iter = 230000, smooth_loss = 40.9309:

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epoch = 2, iter = 240000, smooth_loss = 38.8277:

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epoch = 2, iter = 250000, smooth_loss = 38.7163:
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epoch = 2, iter = 260000, smooth_loss = 39.3829:

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epoch = 2, iter = 270000, smooth_loss = 38.4405:

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epoch = 2, iter = 280000, smooth_loss = 39.8256:

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epoch = 2, iter = 290000, smooth_loss = 39.0402:

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epoch = 2, iter = 300000, smooth_loss = 38.2214:

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the and's What is trudd."
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epoch = 2, iter = 310000, smooth_loss = 39.3182:

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epoch = 2, iter = 320000, smooth_loss = 40.5304:

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epoch = 2, iter = 330000, smooth_loss = 38.9396:

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epoch = 2, iter = 340000, smooth_loss = 40.8759:

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@rfaT Teat
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(iv) Best Result

Now from the trained model, we pick out the best two results with the lowest smooth loss, and print out its synthesized text with a length of 140 characters. The results are shown below. It seems that more vocabularies are spelled correctly compared to the previous cases. But still, the sentences are kind of incomplete and in chaos.

```
--------- Trial 1 ---------

epoch = 2, iter = 312871, smooth_loss = 36.2972:

y\u201d http://t.co/CAFVRos5 @rijJarsts @ BGAG @realDonaldTrump Voom @realDonaldTrump
@realDonaldTrump @TrumpDonaldTAppanty hlderued polinio

---------- Trial 2 ---------

epoch = 2, iter = 312869, smooth_loss = 38.4268:

erfly #TrURNTVet: @realDonaldTrump Great don. @helledri: @realDonaldTrump #MyBuedmonty is beat
ontin\u201cn3 @Tricharumelliever feap to resp
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