Assignment 4 Report

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DD2424 Deep Learning

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Implementation of Gradients

I was able to successfully compute the gradient. After computing the gradients for all hyperparameters, I was able to achieve relative errors of less than 1e-9.

The following is the Relative Error formula I used to test my computed gradients:

$$\left| g_a - g_n \right| \div max(eps, \; \left| g_a \right| \; + \; \left| g_n \right|), \text{ where the error must be } < 1e - 6$$

These are the relative error values I achieved compared to GradNumSlow provided in the assignment page.

```
Relative error for v:

ans =

   4.1442e-09

Relative error for u:

ans =

   3.2185e-09

Relative error for w:

ans =

   3.9525e-09

Relative error for b:

ans =

   2.7145e-09

Relative error for c:

ans =

   3.2223e-09
```

Results

5-Epoch Training

I trained the RNN for a total of 5 epochs, since the project required at least 2 and achieved the following Smooth Loss function:
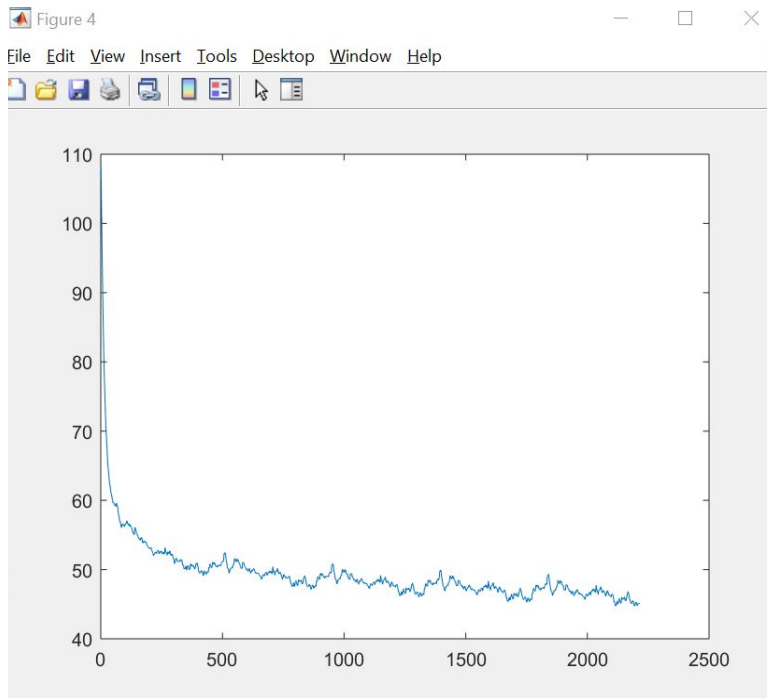
RNN Training (5 epochs)

Figure 1. Plot showing the Smooth Loss Function of a 5-epoch training of a RNN.

We can see a gradual decrease in the loss. This means that we are on the right track, according to the assignment page.

100,000 Step Evolution

Next, we evaluate the evolution if the text synthesized by our RNN. These are the results shown by 10,000th update step for 100,000 update steps:

Step = 10000: *ly"*
" ill.
"Oy awliorel ro rour pave?" sFimealer hin porl wo thele and and'carly sving you's ferf wipt; Clarter alle an? . . muggored skaoke thomes cone sick fire Eame ah Surdlauna offr as and ve tol

Step = 20000: *steres," sue mime thin's every to her firioustadase for.". . . . . . . f youd hingare faring the waye, ack - in than Hery was the bid efor - she Sore shem brer the Ron all to bew! Harry.*
"I'rmsnemevan

Step= 30000: *ing gwark graig bein, wiple, and overelt?" so Che ssear hapry sill sace with and se macely sadry Harry ea hee and heirgher from, enter.*
"What nowk to mady maice ser, lout her ank harrn't stabby likel,

Step = 40000: *atreep ores wand lose inhied was lookt; and inforet missore tlitist onth was mughthikg, fmomed ming the. . . ."*
Harry Volder; farmy roffar, was is a beefo gack stcrats indryed buld was aire the wang

Step = 50000: *nuse shaclidg asteth the sure can Mrgitimbulbing Gidny wald or their Ondreard retchtheres and hend anGwough theme teplit lenzing hemerled diseres gond may feaging knossly netting find stizany brion, t*

Step = 60000: *s," fev ses. "And Grisaog as throde," said Sprappanding, ?"*
He was fron surkingantly.
"Gooned the frame look-fexboned, a's ron.
"Whos unong, ther.
"WePropes dole were it arougent camene, as worring to

Step = 70000: *Magecarilf youp on in the vaxt compaved in a clriugh the obvores they on Hermione has sincanced," said stople.*
"Wighely opem in Winch never toind hinds to onk that agaid the Parkinping dnappetliods of

Step = 80000: *anding and looking is onnody. Harry, tour.*
Bagmo. He squet. He staran to Werrun said had a mould.
"That fwind, we book."
"I handlabantry cat the segmir!" seoknn's sugg, and sumbledor, and was it do

Step = 90000: *Harry our. sheever wried coright to hit of the sork as himseanct flack the him, sore, ontered voice be the lil. Valded as the a stlagling enst to had amy he hear frong thise troods. They trioning a G*

Step = 100000: *, his starlingly aroun whotesturing he's round ornols. "Tegride a'r on onlee you nare: -"*
What theirr at Hout with no Rour.
"Welres it?" she's of to was had efrem, rut to were inderubblen shaurnots s

We can see that we are able to synthesize the words "Ron" and "Harry" by our first 10,000th step.

Final Synthesized Text (length 1,000)

The final synthesized text we were able to achieve was:

eshitatines shorted was beel Fark as his lett byen very wingored they rencolf of Moody's four.l he gastarted at hlinsly very be to prese the preasking to with yye've ?" He same, suslichter. Harry," said Harry staming, bed him, and Chays!"
"Harry plowd to the care wish the tire he, fingery will ators be the I'tlies. Ron, sire Harry. "The trefing. Gron Volded pleppition, Chowing her. He knswerning around the lyish, weokned him. .L. Woly, the everying likin, Sald of them,"
"Will, keo ene you could caugh behay borent cole to bemmived your briudxe Gein they heedling's?"
"Ly she Ron at you wond," wasn't had had she," said Ron, his as eres at the tlied, his . then they waste plistly of to Harry down we rebam.
"Theromseused polanle fram,", they be peeppent. She's dang of they how at a!" see, lew. Mr. It were warklawely everysor eyoum the pe, buqibedstulony that the tops. Harry, and at Harry, like Gry, though, though o lagged the flowp, ehe we told so, but be! Fundened them," said. sel

The resulting synthesized text isn't exactly what we want, but it is clear that the further we train, the better the synthesized text becomes.