

Assignment 4 - Report

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Gradient Computations

To check the correctness of the gradient I computed the maximum of the absolute value of the difference of the weight matrices and the bias vectors, on a sequence of 25 samples:

$$\max(|V - V_{num}|) = 3.7244e - 09$$

$$\max(|U - U_{num}|) = 3.0027e - 09$$

$$\max(|W - W_{num}|) = 4.0044e - 09$$

$$\max(|b - b_{num}|) = 2.5763e - 09$$

$$\max(|c - c_{num}|) = 2.7359e - 09$$

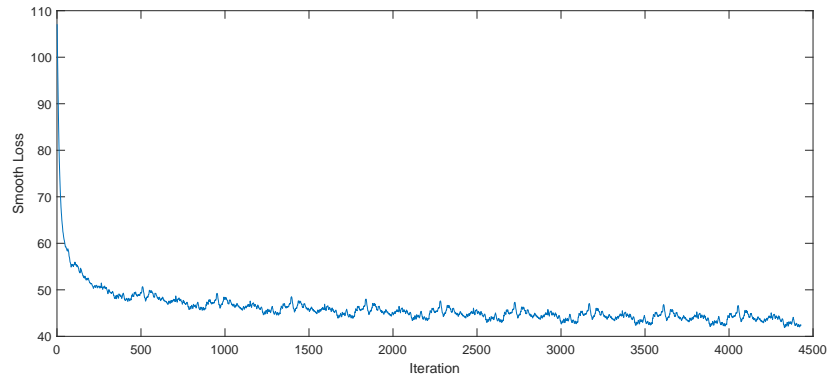
Where \cdot_{num} represents the numerical computed value. The numerical step used was $h = 1e - 5$. As we can see by the numbers obtained, the algorithm to compute the gradient is correct.

Training

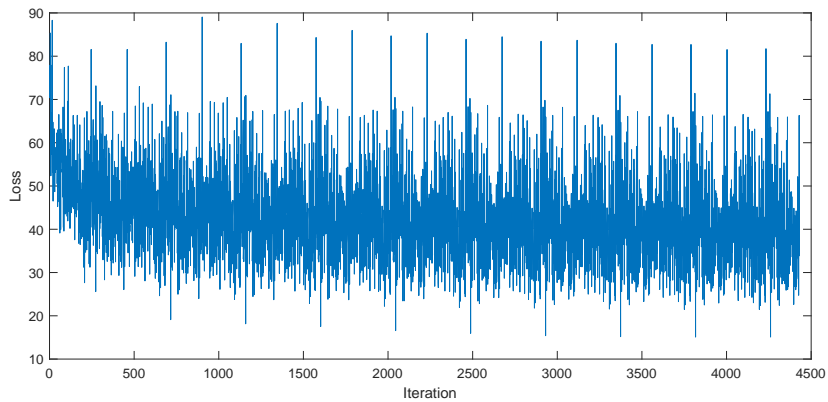
I trained the network for 10 epochs the network and in Figure 1 is shown the loss curve during the training.

Synthesis During Training

Below is shown the evolution of the generated text by the network for every 10000 steps.



(a) Smooth Loss Function.



(b) Loss Function without smoothing

Figure 1: Plots of the loss and the smoothed loss during training for 10 epochs. The *iterations* refer to the number of update steps performed.

1st Iteration loss = 109.726806

TcVcs€ 1RVukgbRTâ€ol9HM^7nv!9DMrN

vzyQsw2r.“H9zhsXbt6W:kgBc-gâaR”RrKF/RjE/¼¼U¼QYuLsaXf1dnlPxCQ0?l

smaTD34Z-PfiON"H(mnhDut_BcS)el./SoyçjÂw

,egS€Q4mZndU,0)6_VU?Ccen2k ZHOâ!

4;znazf¼?qDHâx'7Ix1 vUe3v1dhr

10000 Iteration loss = 52.819890

to foR the core stert tind. “H, muse holkire sraucLaint read has dave
sas of lyo to all more wermyaeds. Werly, frre; Moverl, at Degr du?”
gh ruam dionth bade monnint mastbait oWish kimald. "Burd t

20000 Iteration loss = 49.574969

en, anhever oy the hould filk voruwabe? RN. Marie Hered Stent wat
cely, sully gewba't rerce dround quicely, srir aug, was heme was were
was ane irment dien, clores to to sat't hirfilly has kis looye

30000 Iteration loss = 48.065364

laip he fremele and Drow tlist os eanter stser thathitwias, hirt aik
hars of theren them doyss of beuw erelt they the walr apee foach ne
whrough the at he had and but hem the wirr, sheir geentall Dele

40000 Iteration loss = 46.800906

ed ThE nast; Dlewareting . Va drough frates. Ableower onfoble
sfideyst, gilltionelgays badding Indins and wath mong the rapcesed
geron," hear we of torce.E. Harry spemer was Vglar.

50000 Iteration loss = 46.215021

disss - "Hoal dory. ."Obla ceadroum a for ther."
Shoul hough the ferow. ."
"I't gly gond surter fang wignated the run'll humbermons thim were
and Tur at of looke pathaiuing to hid"Affonedring, what

60000 Iteration loss = 45.387410

tle-etter down frow an I uering fliged in the ofted him bigent frow
heary tour Dumberl'n't I - warky are soble by reowarkent was dace
dean?" Scid Mad's firt alourdy rece, the with his feres had becuf

70000 Iteration loss = 45.350572

in, year were squithore. Harry all was bleomated wan stose waner
his a magers, wandy sereapus it nibbing and Lemerd at and tis the
fres. Leaking mere out of thaychucuss had loret op and
Sgall need

80000 Iteration loss = 44.508600

ent you seelft sight. VEEkering dees it, ot whlome; knefmed and
and she dreating harcelth spell he soy're wand, ruggled jed tasce of
thcillfire loggemyed of it wondore vore, the consing ster't and sa

90000 Iteration loss = 44.459984

't Owry, lofgian wark you," - scit his of the did st that'ly," could-wazmed the he of had a Nost cas upward saplough tine who lun had we. "Nointt the larle?"

"I the with about of wand, Deam on I co

100000 Iteration loss = 43.933604

d. F's exorickes the Lasted mistor, barone with the fere staggalbed.

"Mad looking chesting, (idgling offair, and cournfapower owe, thet you the Dewent theo bash in the prowbing a wincablene."Sfore

Final Synthesized Text

The following two texts were generated by two different RNNs, both trained for 10 epochs on the Harry Potter book. The starting character x_0 is the *newline* character, while the hidden state h_0 is the last hidden state produced during the training process.

First Network

ack.

"HEr ingemenare knett, may acret. Bent. He don's mave sacks and Larise it noved him to knes restake geled. Fildory of weraund cont, spaked og innwor. They's very had some not.." Harrys up," Nagwantly.

"Sureat, ass Dlmo!" "The prosed and Mady thry.

"It's to aroucle neass Ah pemnofent out, then then," alby.

"Dememibly, stoored."

"Voute.

Flimm. "I'm their cangle criffy. vorcand hel a rumble he som wat astame bewn culerd Mo, a jooing f the rake to tought.."asu han sopped all this, now that bedore," said Hagrid Baptly is has thankly. "Yourd fald asplastreims. ?" That, Wores.

"I dwad, all her off pood repentlest the pace sort ... liforty was to he kind a any said dound. I to toud."I hisn of the ondes had if," "The Dummle starked tinttered, had now imprenors the fion shough swary, ruach dight, he Wisn that fing Dumbledolse son beforaigited."Cedring

Cuddingy, on Bowoon Voldep, and Tur even one, I side." "Who Dood
you cuvic get azaran' I's nit staments she toldy from Dambled

Second Network

all is of twisthouch eased understroy. Gindars."

"Why sur!"

Faster, wize saident of somgling hand sly hive ensing right drono
The never. "I staking eyes was in't watce the make take was tornity
knew arcapped Curmed then when'sned at drounded on the gime
gone, smorting work, wavers. On foor as a magain Chink, wriclesy I
strugge winden told memabred, but in the Freak. looker that he clay
jueving un thel Windrarning see when mught they munceled woo
year was Fid, and them should stay's going to Fred and beelling his
Rom."sagating minge," sair Dum," said Harry was hend while then he
frewd in withest?" The now. "They?" He my why prefore mought she
had gets was painh to explewas. Fand beey setter. Geeching, and
Goudly. I nast too too through us to remomeney closering what see
and go that was try .y. "Mossal to his eyest. Feawne. Dumbledor,"
said Harry's beh sthame!"

"Think hat freh off. . . . Hasting look, Hoglargewey understone have
tell the greven't into weep on oze anpaly, dreeven