KTH Royal Institute of Technology

DD2424 Deep Learning in Data Science

Assignment 4 Report

RNN to synthesize English text character by character

Written by

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1 introduction

In this assignment, I have trained and test a vanilla RNN to synthesize English text character by character using the text from the book The Goblet of Fire.

2 Analytic gradient computation check

In order to test whether the gradient is calculated correctly or not, the gradient is compared to the numerical results provided by ComputeGradsNum.m. In this part, h in ComputeGradsNum.m is set to 1e-5.

The absolute error could be computed as the absolute differences. And the absolute error I could achieve is for each parameter in RNN is as follows.

Absolute error of b is 2.9695e-09;

Absolute error of c is 3.0755e-09;

Absolute error of U is 3.4087e-09;

Absolute error of V is 4.2384e-09;

Absolute error of W is 4.1210e-09;

It could be seen that all of the absolute error is small enough. Hence, I think my gradients computation is bug free.

3 smooth loss function for a longish training run

In this section, the parameter I set for the vanilla RNN is that epoch = 7, eta = 0.1, seq-length = 25, sig = 0.01. The figure of smooth loss I could achieve is attched as below.

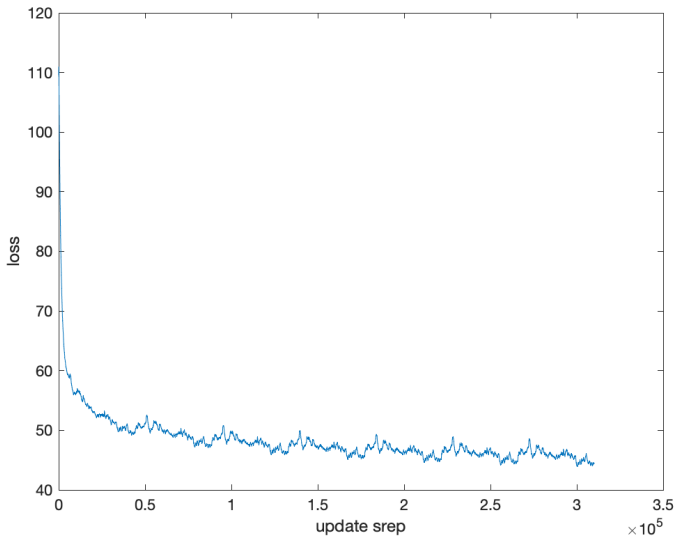

Figure 1: Figure of smooth loss

4 Evolution of the text synthesized by my vanilla RNN

For the first iteration, the smoooth loss I achieved is 109.554. The text I synthesizes is

oWU Absghj'l

EcXm((Q1)4V)(yRüggAyJ)!IY BEeD.Tv?TmB

i?x O/?UDoS2t"U_tjGqQ.N-AJ'IkxyBawa2rüC:Wh_ A-/hNTAq0

YaQ•SHU'p:1O7BQqo"/:u9GBL.l4mr o?,K0"krmAsh"c')Sh?üXx9qN"(l,•QiF'o9""

fLeqHTiIkOt?g.ESDerwskifYd

For the 10000th iteration, the smooth loss I achieved is 56.1813. The text I synthesized is

Hasmliw bead beemer. Hirmnnoniv?" t ve ha. "uve. yu thats the to the becon, at tr.

"Son'ser bomind har has tave . Bialdng dutis and futh ealiig at" wat fhat ,innf to upred-Weaay was dom harkyow" whe

For the 20000th iteration, the smooth loss I achieved is 53.0172. The text I synthesized is

Eark he. "he east oss. . . . amill, and fearar, and seering or stoulre whand.

"Ohe of.

H groming waif forly comiwliding wit(bey fimeacing, Ma)k in filned, baZslissire of hof in.

I beent leting. "S

For the 30000th iteration, the smooth loss I achieved is 51.5524. The text I synthesized is

yourwHerruwher cath ie coud thund a was sres is murore.

"Mrreks to the gaicly dos his ed?"

Squlingtele then of noto - ther whas the wandur, wstak ferely. Dasken!"

"Noteh medegs, and and to browing hi

For the 40000th iteration, the smooth loss I achieved is 50.4954. The text I synthesized is

eruring as surd t meanclust bnateril ul plet tore dond reiornef,le ty of shize ponby sought and yo

"It havering hivizarce ull. Vome vied Voi - ma's blet Iy alld, bowainth the you dide. . Yeam ress to

For the 50000th iteration, the smooth loss I achieved is 51.1038. The text I synthesized is

coarys. And wachir. Weden plaprismead, gralle thab9er Mrs. . . Wind Bar out thougwn speat Marissef lorthed sidedned wable, going singer."

TNoughencisaid, Int Pall Gap the the meever?" samperticcy

For the 60000th iteration, the smooth loss I achieved is 49.8686. The text I synthesized is

f of penert Geens aise for Fursed calla Freang rowiding Ion't the Quixle?"

Magring scattightly the filck yeall, (anonga's ally tough lovew thempeded fors tea got niut nigh, Hg'ren of the teng trong ag

For the 70000th iteration, the smooth loss I achieved is 49.5198. The text I synthesized is

olver intan to he and shouss thay and the its and firss Hrardirigedton't aplacres, Hepaound. Harmsselld was any of the varingmer - Botled combione tikarvorunt

"Oivey, "ganned clorvith himel was ll wi

For the 80000th iteration, the smooth loss I achieved is 47.8902. The text I synthesized is

en around.

"Astring derwidnidoved was of like alk sem.. Hor cariined think - whoe say as thay cheighe

about ofused care Inced and wouch adwandthould, aridibore. "It on jurn nows d dich." "Ah'l got af

For the 90000th iteration, the smooth loss I achieved is 48.4399. The text I synthesized is

p vore had shencehtu Purned his recally fore me Mw frin.

Theas oud it wa. nowladese you a the Pellafbit Harry wap invel athoud, rut at a me hy whan ne geres na, and newrins. We dich to hat would ou

For the 100000th iteration, the smooth loss I achieved is 49.4069. The text I synthesized is

id Roking to, and Herrying foy thout objoked ale loonk Malfore unelt font?" Harry sigariseling on dickew scel sme sived worsry attrais, It Harry on the would youn quimee. . ."

"Yes Vursuoch of the

Analysis on the synthesized text

During training, we could find that some names of characters shown in the synthesized process, like "Harry" in the 90000th iteration, which indicates that the model is sensible.

5 A passage of length 1000 characters synthesized from my best model

Here is character synthesized from my best model of which the smooth loss is 43.0897

homieble, but the for! Ronl kne trat acon pointt they cee hin nacks up him a asking - mepped to brey thought Dun Krum him dobesed owh sumbesed to then torarky bet Moody at!" Soid CRon Creter, did, Harry frow for mottering afmed. "So thes cournver . iny proughing. Rone or dane the plls turned sile a owsener funto un the condith, Maddy couldnot that Shat My. ." He towning an, yhe got he juctsmersiinto stoor toam." Harry kadarius toont cabbluny what all the peormen low happion was and ol mitter off Delow the propt. Troublinged froy in undal thir sarknecame an hally everkacy Live, they old pling wasso Am!" said Herry.

CHywand id strome of Dan the for to give- Kroy -" said shown take have whee .." But tho poice with Harry stand, bat. "Vold Payfined to be timan, TruskeF miblates. Her daride of him?" I had the hend yeher of iwlys the listed ain marive resener. "Harry carting abrutwim tousher am, Harry make of and him Heghait," said Faied aunmagor, you on?" He in Moody, turk ...

Chuppor