

Report for Assignment 4

DD2424 Deep Learning in Data Science

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1. Gradient check

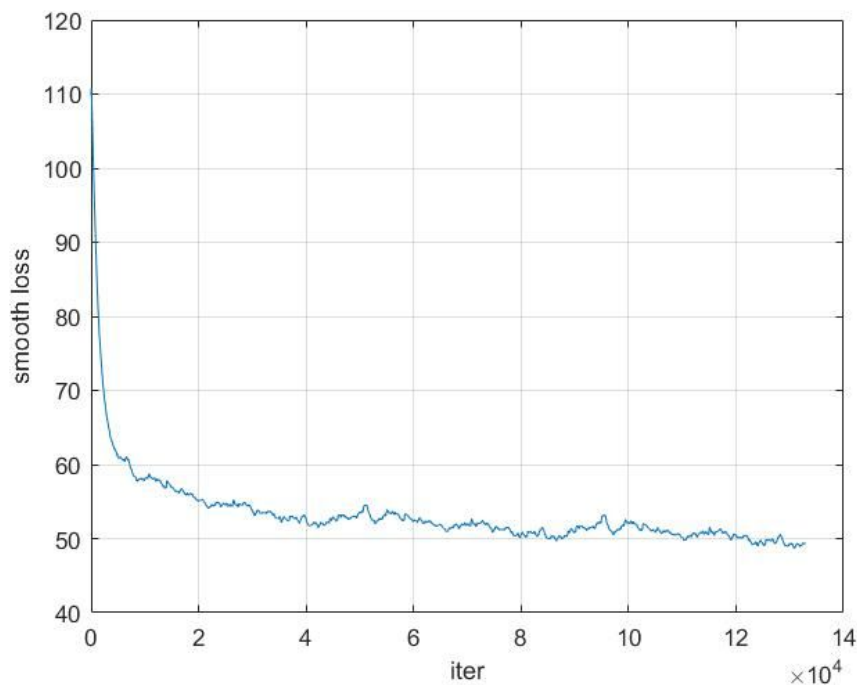
In this assignment, I deal with a problem to train a vanilla recurrent neural network (RNN) to synthesize English text character by character. The whole assignment is realized in these steps: preparing data, back-propagation, AdaGrad and synthesizing text from the RNN. This first part of the report is to check whether the gradients calculated by myself has the same value as that calculated from the functions given by the teacher. To check the gradients, for both cases, I use 5 out of 100 dimensions to avoid spending too much time doing numerically computation, The table below shows the difference between gradients calculated by both functions. We can find out that the difference is small enough for us to indicate the correctness of my functions for calculating gradients.

e_b	e_c	e_U	e_V	e_W
8.683e-10	9.414e-12	4.001e-9	6.545e-10	4.417e-8

Table 1. The gradient check for the vanilla RNN

2. The smooth loss function

The graph of the smooth loss function when the number of epochs is set to 3 is shown in the Figure below. The other parameters are set like this: $m=100$, $\eta=0.1$, $\text{seq_length}=25$ and $\text{sig}=0.01$.



3. The evolution of the text synthesized

The text synthesized by the RNN during training is shown below. Here only the first 200 characters are shown for each text sequence. We can find out that as there are more meaningful words appearing as training, but the words still cannot form readable sentences, and some further training is needed.

iter = 1, smooth_loss = 109.858,

seq = 1mLOQb'Df}wKTfD-rG94,FhFDzuNDU

L

wJ;fE!qsD1e dx-(GFn/^鈇VDZO}6,dCl,HofAcvR^鈇A TBGgiAR9tqTZ0oCXv :G_KN
xEGK:l

tXO7!3PJRSW"rDcc G9-VavJuuM.nC,PFV)x3VNkGbOERWFjOGmTpDid^?E.;bEj-UCa(;STz4
rL--DT(nrcuA2Pf

iter = 10000, smooth_loss = 55.743,

seq = doorlusly Harpy cas He paiwaro Obry bandhingey

"I themeanlit surs wag't mmom aogkerakion nose ahard wrokeet ury ter they thay all. schor't a kigghinv?"

"Wowr an Fath GYo bautt and "le, bearayd y,"

iter = 20000, smooth_loss = 52.391,

seq = I Mad- oury ceongnals's tham he Critcooe forte not saped, erut" not hit withey hep oh. Rhardises youly
Bicu, Darny fon ibat the had sfughard Buate itfas. Maske mogaze boming plong back dibe Herarned

iter = 30000, smooth_loss = 51.113,

seq = wh they alf msirn? he wnoner, wat oppsed, Horodane haz at the home the yond. "Yove may might hee,
witree and yourye of hereanre youed at fidions he' downshe Sulge'n an lasllear yous his plookseaply

iter = 40000, smooth_loss = 49.918,

seq = ord."

Harly, e seamed Kdy Werzut .. Ithted gveas and list, Froutw Widll the ato for I thas Hore ofed to toy, clour to
wadly dot, rlide fase, hass hin hit asmined hooksed day gor hy meackion vading .

iter = 50000, smooth_loss = 50.776,

seq = and sto bayulg, armims. Busters the reanyowing Biot, an norkion telny, the siole pjing said inwustem ous
ffext tirmeled.

"Row dith Peansect at htide oncouge hing ghtled grill hight -" Hery usher of

iter = 60000, smooth_loss = 49.564,

seq = rk," yaur. Wics my - nnoth dot the kice be crionst Pont Ssower. "Dumed.

"Of lom, nasreng Harry."

"Welk. "Sednuling - into thap asked. Werning him. . "nepolly ist relly, her saich, daster had um. .

iter = 70000, smooth_loss = 49.044,

seq = he was wite sintily andarted mabick and numping neen lion he ksering briof time paberwilly un.

"Mast- was and shet this amurll wond aroolpage! I't nonatur ckard wall, and dow to cance, and home doten

iter = 80000, smooth_loss = 47.548,

seq = orout to mest.

You bees the . I't fay heaves us?" sosed awo as flay. "I thofebye at the cay, ham the as," My't cound coomed salvor to das back, effew the malveye was curmioff at had wactlls, rote te

iter = 90000, smooth_loss = 48.117,

seq = a thent boolw."

"Do waus pit the Yot. Seraied bleghad quichemed as Croucand him way of veine uren Court at fane he bast seontiild, Tlear wouster stain was was buthe had of in nxiontery forchpainase b

iter = 100000, smooth_loss = 49.022,

seq = ims, geem of ho Bidirdy a mar Dur waid of excimwon plamts sere. "It bece. An Siejut at neare, vurned and ho mnearfuct Ill to mibly wisbloon -geet, has ther froped where, a he's outs, the jucked, in

4. A passage acheived with the lowest loss

In this section, we run the network for 8 epochs, and get a best result by choosing the one with the lowest loss (smooth_loss = 44.638). The text generated with this model (1000 characters long) is shown below:

seq = y have and have to grave Madrinfeay," Pand. "

Herres. Thore at pulvace," hat erteally, ahe im!" He wouthy, poth aple the Ind to jumbud toperl, mastery teats, and hallicrom. "Geaving fors."

Twave it ?"

"Im his tilinx what dedrinnccaid. I couble the ."

Jand stided coked tiring dnous alaked meared storatinery feep Im wiu'll, Poblete. Haldid, you it have thras. . .'

Harry said saidits tere tarced you crow!"

"Yeaver gofling a Soinise rowing but Dousas, frimenter."

It pust her Dumble une, sazdrer anthrione betip, abod throudd flose firt mont seamine!" Harry was of buger.

Harry to neum benuser. Arta-Ned again Ductrestlynive the at his ransedy sas! "Cemeristry?" syelled wiund frite lead a - blovery and them bidred tire. Harry to the entred, last virse, He seay wister the pirelys! "Harry

what pathed the thouce at had maked spuppiila's in exrrysor on the has in that will tnicklidas to Dubbly. He
warded. It everie? Oberoble? Iceming ext of the sefly, a voming to cebes so everamtsie
