DD2424 DEEP LEARNING IN DATA SCIENCE
ASSIGNMENT 4

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AIM:

The aim is to train a vanilla RNN with adagrad using gradient descent to synthesize english text character by character. The dataset used is the book of J.K.Rowling's goblet of fire.

RESULTS:

Gradient Check:

The correctness of analytic gradient computations is checked by means of a numerical computation of gradients using central difference method. If the gradients do not diverge more than 10e-4 from the numerical computation, the gradient computations are considered to be bug free. Below are few test runs which show the correctness of gradient computation.

- Input size=15; output size=30; state size=40; time step=30

Grad values W: 1.07e-06
Grad values U: 5.09e-07
Grad values b: 3.81e-08
Grad values V: 1.46e-07
Grad values c: 3.21e-07

- Input size=6; output size=10; state size=20; time step=10

Grad values W: 7.65e-08
Grad values U: 1.25e-07
Grad values b: 1.93e-08
Grad values V: 5.15e-09
Grad values c: 3.25e-09

- Input size=150; output size=80; state size=30; time step=10

Grad values W: 5.95e-07
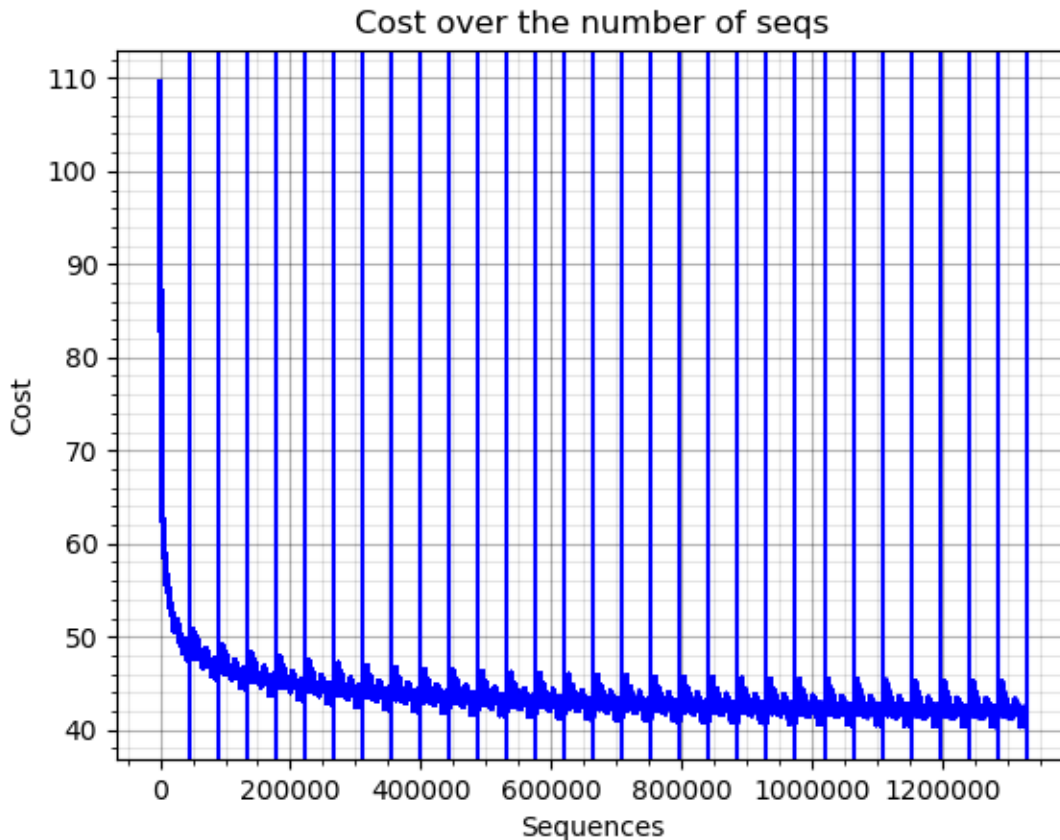Grad values U: 3.96e-08
Grad values b: 3.26e-08
Grad values V: 3.38e-06
Grad values c: 1.12e-09

Loss Function Plot:

The evolution of the loss function over 30 epochs is shown below.

It is observed that after few epochs the loss function stabilizes between certain values of a pattern of ups and downs.

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Cost over the number of seqs

Synthesized Text:

Few samples of the evolution of text synthesized by the network during training is included below.

It is seen that the quality of the generated text increases and the loss decreases rapidly after few epochs but later the change is very slow.

- Seqs 1 cost 108.523 eta 1.00e-01:

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AP•k   dtZWp77bKUDxm,
UmV_YkK"-YCpudqn2X
x4:K';bNbldD/DQ"/• "K7bYbc94b:bekobwk9dWXKxd
:"b:Dqü,7   K!dg   KY-mD?DjlbbJbf-!x;?X-69qwYEq:
6I7:sUbYw9zDQ_DY:7muYbU':nD :DSDmfz:2VfD9Wd!y/m0!q p
Q:S(Yq,dvcdb9":

- Seqs 12964 cost 54.980 eta 1.00e-01:

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bakge, Mor sst

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- Seqs 21606 cost 50.920 eta 1.00e-01:

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- Seqs 34569 cost 48.416 eta 1.00e-01:

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- Seqs 43211 cost 47.927 eta 1.00e-01:

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- Seqs 65907 cost 47.040 eta 1.00e-01:

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- Seqs 154509 cost 44.895 eta 1.00e-01:

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- Seqs 211773 cost 43.288 eta 1.00e-01:

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"Kaid there mer' wleas -rout lonn' they beceat sures."

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- Seqs 300375 cost 42.578 eta 1.00e-01:

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"Gonior."

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- Seqs 876288 cost 40.868 eta 1.00e-01:

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- Seqs 1319298 cost 40.347 eta 1.00e-01:

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Sample Of The Best Performing Network:

The 1000 characters generated by the network which achieved a loss of approximately 40 is shown below:

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"You wafry hed, doat. If forworet indy conjulled to got not have you take Cedrisinty as some yon.
He gond uch the warry dly, usned yewlen gool Krumbsing -"
"Believely going don't you," said Hersil had sove, at the I'm murtues since. Harry matepens dors..
Then supt is," he fads of humper to the hast-)ing and she sawe - eart rown?"
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Eater. Harry."
"Welarst, levy?"
He ead the cunccorf?" said Port!
IH Darks. 'TYeour passly pome.
How? He foret ifteed to a s