

DD2424 Deep Learning in Data Science

Assignment 4

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1 Introduction

Train a vanilla RNN to synthesize English text character by character, using the text from the book The Goblet of Fire by J.K. Rowling and AdaGrad to update RNN's parameters.

2 Gradient Check

First numerical derivative:

$$f'(x') = \frac{\partial f(x)}{\partial x} \Big|_{x=x'} \quad (1)$$

First analytic derivative:

$$f'(x') \approx \frac{f(x' + \delta) - f(x' - \delta)}{2\delta} \quad (2)$$

Then compare the two gradient via relative error:

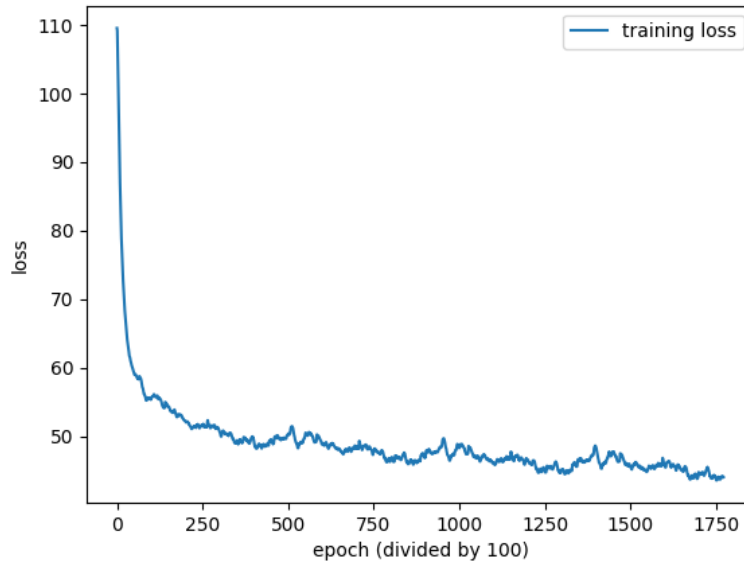
```
def rel_err(x, y):  
    e=np.max(np.abs(x-y)/np.maximum(1e-8,np.abs(x)+np.abs(y)))  
    return e
```

Relative error between numerical and analytic gradient of b, c, W, U, V for the first batch, we can see the error is less than 1e-6. I could say that I successfully managed to write the functions to correctly compute the gradient.

Gradient	b	c	W	U	V
1st batch error	1.7322e-09	4.7972e-10	1.0327e-07	3.6052e-09	1.8170e-08
2nd batch error	1.8934e-09	5.1766e-10	4.2741e-10	1.3617e-09	5.0504e-10

3 Smooth loss function

The network was trained for 4 epochs with $m=100$, $\eta=0.1$



4 Synthesized text

epoch: 0 ite: 0 smooth loss: 109.54935865

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epoch: 0 ite: 10000 smooth loss: 54.32711664

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epoch: 1 ite: 90000 smooth loss: 46.48508955

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epoch: 1 ite: 100000 smooth loss: 47.41718962

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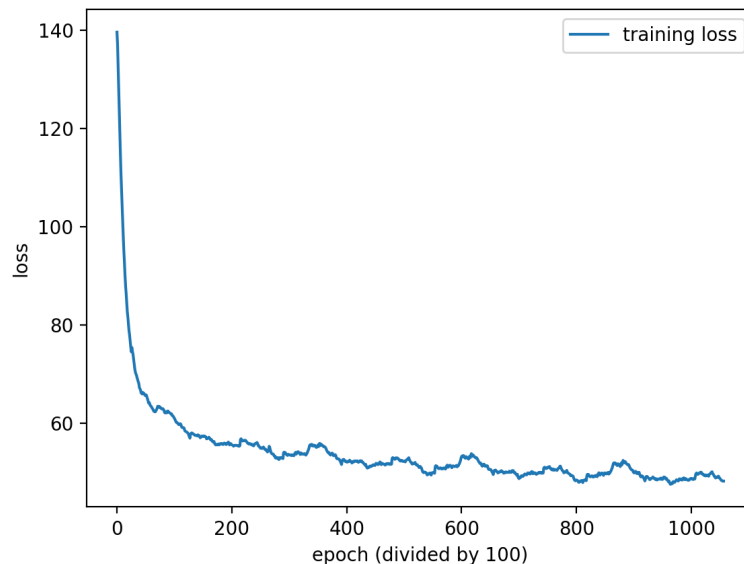
5 Performance on best model

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6 Bonus: Synthesis Donald Trump tweets

I downloaded condensed 2018.json as training data.



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Performance on best model

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